City of Phillipsburg

Technical Specifications

Construction and Material Specifications

November 2013

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SECTION 0010 - GENERAL TECHNICAL PROVISIONS

PURPOSE

These Technical Specifications ("Specifications") are adopted by the City of Phillipsburg, Kansas to provide minimum construction standards to safeguard the public welfare by regulating and controlling construction and the quality of materials; to promote uniformity and clarity of intent; and to encourage standardization.

SCOPE

Alternative Materials, Processes and Equipment: The provisions of these Specifications are not intended to prevent the installation of any material or to prohibit any construction process or equipment not specifically prescribed by these Specifications. Alternative materials, processes or equipment may be approved provided the material or work offered is, for the purpose intended, at least the equivalent in quality, strength, effectiveness, durability and safety to that prescribed by these Specifications as determined by the Department of Public Works. All deviations must be approved in writing by the Public Works Supervisor.

Specific sections of the Kansas Department of Transportation Standard Specifications for State Road and Bridge Construction ("KDOT Standards") are referenced throughout. These specific sections are hereby made a part of these specifications.

GENERAL REQUIREMENTS

Protection of Property Pins and Monuments. The contractor shall be responsible for the protection and preservation of all property pins and monuments. Prior to the beginning of construction, the contractor shall locate and record the location of all such property pins and monuments and shall erect suitable markers and barricades to protect said pins and monuments. After the construction is complete and before final payment is made by the City, the contractor shall account for all pins and monuments that existed prior to construction and shall have replaced any such pins or monuments which have been damaged or destroyed without the permission of the Public Works Supervisor. The replacement of any pins or monuments shall be by a surveyor licensed in the state of Kansas and acceptable to the City.

Utilities Encountered. Utility lines and facilities are located on the plans based upon the best information available. The actual location of these facilities is the responsibility of the Contractor and should any such facilities have to be relocated, it shall be the responsibility of the contractor to give adequate notice to do so to the respective utility company.

Traffic Control. All construction areas shall have adequate traffic control devices in accordance with the following.

1. All traffic control devices shall conform to applicable sections of the current edition of the Manual on Uniform Traffic Control Devices (MUTCD). This includes signs, signals, lighting devices, markings, barricades, and channelizing and hand signaling devices.
2. Specific traffic control plans shall be reviewed and approved by the Public Works Supervisor prior to beginning any work.
3. The Contractor shall be responsible for notifying City departments including police, fire/medical, and the school district if work is to be done while school is in session, before closing any street.
4. Notice of all revisions to planned or in-place traffic control shall be given to the City and other agencies 48 hours in advance of making changes.
5. The Contractor shall furnish and maintain adequate signs, barricades, warning lights, and all other necessary equipment in accordance with the MUTCD. The Contractor will be responsible for redirecting traffic and providing flaggers as required.

Environmental Compliance. Contractor shall be responsible for conducting all work in compliance with city, state and federal environmental regulations. Erosion control measures and practices shall conform to the approved Kansas Department of Health and Environment (KDHE) National Pollutant Discharge Elimination System (NPDES) permit and the approved Stormwater Pollution Prevention Plan (SWP3) for the project. No direct discharge of water used for washout, cleanup or other construction processes shall be allowed into the storm drainage system. Inlet protection, designated ponding and settling areas, or other best management practices shall be used to prevent contaminated runoff from entering the drainage system.

Access to Adjacent Properties. When access to adjacent property is required to be maintained during construction, the Contractor shall be responsible for providing and maintaining temporary surfacing to each location to be accessed for the duration of the work. Unless otherwise indicated in the drawings or specifications, temporary surfacing shall be crushed rock, gravel or other approved materials. Material shall be supplemented or replaced as needed to maintain required access. Once permanent access has been restored or provided, all temporary surfacing material shall be removed from the site and the area restored to pre-construction conditions.

Temporary Facilities. Contractor when required shall provide portable toilets on the project site. Contractor shall be responsible for providing temporary field offices and sheds, job trailers, and temporary utilities as required for performance of the work. An on-site field office is not

mandatory unless specified in the Project Special Provisions and/or included in the proposal.

Site Maintenance. The Contractor shall be responsible for maintenance of the site for the duration of the work. Contractor shall execute periodic cleaning to keep the Work, site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris resulting from construction operations.

Provide sufficient onsite containers for the collection of waste materials, debris and rubbish. Containers shall be clearly marked with the Contractor's name and shall be conveniently located for use by workers. Refuse containers shall be covered to prevent wind from removing debris, and Contractor shall relocate containers as required during the course of the Work for convenient use by workers.

Construction debris includes, but is not limited to, excess dirt, rock, pavement materials, concrete splatters, overspray, and oil tracking from the area of the construction. The debris removed on this project becomes the property of the Contractor and must be hauled off site.

Contractor shall not allow concrete trucks to washout on the project site, in curb inlets and storm sewers, or on adjacent or nearby properties unless an approved washout area has been provided. All material in the washout area shall be removed at the end of construction and the area restored to original condition. If no washout area is provided concrete trucks must return to the plant before washing out. Concrete trucks that do not observe restrictions on washout may be prohibited from further deliveries to the project site.

The Contractor shall be responsible for keeping trucks and equipment clean for the duration of the Contract. If mud is deposited as a result of any of the Contractor's actions on any paved area, the Contractor will remove the mud immediately after being notified by the Public Works Supervisor.

Contractor Employee Conduct: Contractor’s personnel shall not use sanitary facilities or utility services on adjacent or nearby private property without specific written permission from the property owner. Any worker observed not using portable toilet facilities provided on the site will be removed from the project. Contractor’s personnel must not take breaks or eat lunch on adjacent private property.

MEASUREMENT AND PAYMENT

The Work of this Contract consists of furnishing all equipment, labor, material, and incidentals required, and performing all construction, installation and testing of all improvements, modifications and additions, all as shown on the drawings and detailed in the specifications. The term “all costs”, as used in the payment descriptions is defined as full compensation for all equipment, labor, material and incidental costs.

Measurement and payment shall be as specified in this Section. All work shown on the drawings or detailed in the specifications and not specifically set forth in the Itemized Proposal as a pay item shall be considered a subsidiary obligation of the contractor, and all costs in connection therewith shall be included in the prices named in the proposal.

Items not listed in this Section but included in the Proposal shall be paid for based on the plan quantities and at the unit prices indicated in the Proposal unless otherwise specified in the Project Special Provisions.

Bid Items

1. Demolition And Removal

    a. Final measurement will not be made. Contract quantity shall be plan quantity unless changes to the bid quantity are authorized.

    b. Payment for demolition and removal shall be based on the lump sum price as set forth in the Proposal. Said price shall include all costs necessary to complete the work including, but not limited to, demolishing, removing, disposing, plugging and capping of all structures and improvements, such as existing pavement, curb, sidewalk, pipes and structures (such as sanitary, storm and water) fences, poles and footings, within the construction limits, unless included in other items of work, as required by the drawings and specifications.

2. Clearing And Grubbing

    a. Final measurement will not be made. Contract quantity shall be plan/bid quantity unless changes to the bid quantity are authorized.

    b. Payment for clearing and grubbing shall be based on the lump sum price as set forth in the Proposal. Said price shall include all costs necessary to complete the work including, but not limited to, demolishing, removing and disposing of all trees, shrubs, bushes, stumps and roots within the construction limits as required by the drawings and specifications.

3. Excavation And Embankment

    a. Final measurement will not be made. Contract quantity shall be plan/bid quantity unless changes to the bid quantity are authorized.

    b. Payment for excavation and embankment shall be based on the unit price per cubic yard as set forth in the Proposal. Said price shall include all costs necessary to complete the work including, but not limited to, roadway grading, excavation of whatever material is

encountered (earth, shale, limestone), borrow material, loading, hauling, placement, compacting, finish grading, subgrade preparation and reconstruction, topsoil removal and replacement (including additional materials to sustain plant growth) and loading and hauling excess material as required by the drawings and specifications.

4. Subgrade Stabilization

   a. Final measurement will not be made. Contract quantity shall be plan/bid quantity unless changes to the bid quantity are authorized.

   b. Payment for stabilized subgrade shall be based on the unit price per square yard as set forth in the Proposal, per the type of material and thickness of the installed item. Said price shall include all costs necessary to complete the work including, but not limited to, placing, compacting, rolling and watering as required by the drawings and specifications.

5. Drainable Base

   a. Final measurement will not be made. Contract quantity shall be plan/bid quantity unless changes to the bid quantity are authorized.

   b. Payment for drainable base shall be based on the unit price per square yard as set forth in the Proposal, per the type of material and thickness of the installed item. Said price shall include all costs necessary to complete the work including, but not limited to, placing, compacting, rolling and watering as required by the drawings and specifications.

6. Drain Tile (Edge Drain Or Under Drain)

   a. Final measurement will be based on the horizontal length of the completed and installed item.

   b. Payment for edge drain shall be based on the unit price per linear foot as set forth in the Proposal, per the type and size of the installed item. Said price shall include all costs necessary to complete the work as required by the drawings and specifications. Note: Drain tile installed in retaining walls will be considered subsidiary to the wall pay item.

7. Asphalt Pavement

   a. Final measurement will be based either on the tonnage or the square yards of each type of asphalt used. The Project Special Provisions and bid form will indicate which option is to be used. When square yards are used asphalt tickets must still be submitted to the Public Works Supervisor.

   b. Payment for asphalt pavement shall be based on the unit price per ton or square yard as set forth in the Proposal. Said price shall include all costs necessary to complete the work including, but not limited to, preparing surface, placing pavement, compacting, rolling, connecting

to existing pavement, and sealing, as required by the drawings and specifications.

8. Concrete Pavement

   a. Final measurement will be based on the square yard of the completed and installed item.

   b. Payment for concrete pavement shall be based on the unit price per square yard as set forth in the Proposal, per the type of pavement and thickness of the installed item. Said price shall include all costs necessary to complete the work including, but not limited to, placing, compacting, saw cutting, milling, doweling, jointing, curing and sealing, as required by the drawings and specifications

9. Temporary Surfacing (Aggregate)

   a. Final measurement will be based on the tons of the completed and installed item.

   b. Payment for aggregate (crushed stone or gravel) shall be based on the unit price per ton as set forth in the Proposal. Said price shall include all costs necessary to complete the work, including but not limited to, hauling, grading, placing, tamping, removing, and restoring surfaces after removal as required by the drawings and specifications.

10. Driveways

   a. Final measurement will be based on the square yard of the completed and installed item.

   b. Payment for driveways shall be based on the unit price per square yard as set forth in the Proposal, per the type of pavement and thickness of the installed item. Said price shall include all costs necessary to complete the work including, but not limited to, placing, compacting, saw cutting, milling, doweling, jointing, curing and sealing, as required by the drawings and specifications.

11. Sidewalks and Recreation Paths

   a. Final measurement will be based on the square foot or yard of the completed and installed item.

   b. Payment for sidewalks and paths shall be based on the unit price per square foot or yard as set forth in the Proposal, per the type of pavement and thickness of the installed item. Said price shall include all costs necessary to complete the work including, but not limited to, placing, compacting, saw cutting, doweling, jointing, curing and sealing, as required by the drawings and specifications.

12. Access Ramps

   a. Final measurement will be based on each completed and installed item.

b. Payment for access ramps shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work including, but not limited to, subgrade preparation, placing, compacting, saw cutting, jointing, curing, sealing and installing detectable surface as required by the drawings and specifications.

13. Curb And Gutter (All Types)

a. Final measurement will be based on the horizontal length of the completed and installed item, as measured along the gutter line.

b. Payment for curb and gutter shall be based on the unit price per linear foot as set forth in the Proposal, per the type of curb and gutter. Said price shall include all costs necessary to complete the work including, but not limited to, subgrade preparation, forming, placing, doweling, jointing, deflector construction, finishing, curing and backfilling, as required by the drawings and specifications.

14. Flowable Fill/Mortar

a. Final measurement will not be made. Contract quantity shall be plan/bid quantity unless changes to the bid quantity are authorized.

b. Payment for flowable fill/mortar will be based on the unit price per cubic yard as set forth in the Proposal. Said price shall include all costs necessary to place the material and complete the work as required by the drawings and specifications.

15. Storm Sewer Structures (Inlets, Junction Boxes And Manholes)

a. Final measurement will be based on each completed and installed item.

b. Payment for storm sewer structures shall be based on the unit price per each as set forth in the Proposal, per the type and size of structure. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), bedding, placing or building structure, invert construction, structure to pipe connections, final grade adjustments to the top, sealing, curing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

16. Storm Sewer Pipe (All Types)

a. Final measurement will be based on the horizontal length of the completed and installed item, as measured along the centerline.

b. Payment for storm sewer pipe shall be based on the unit price per linear foot as set forth in the Proposal, per the type and size of pipe. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), bedding, placing, pipe to pipe connections, sealing, backfilling, compacting,

grading and removal of excess or unsuitable material, as required by the drawings and specifications.

17. Storm Sewer End Sections (All Types)

    a. Final measurement will be based on each completed and installed item.

    b. Payment for storm sewer end sections shall be based on the unit price per each as set forth in the Proposal, per the type and size of end section. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), bedding, placing or building the end section, end section to pipe connections, toe wall construction, sealing, curing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

18. Rip Rap (All Types)

    a. Final measurement will be based on the square yard of the completed and installed item.

    b. Payment for rip rap shall be based on the unit price per square yard as set forth in the Proposal, per thickness of rip rap. Said price shall include all costs necessary to complete the work item including, but not limited to, filter fabric, all excavation (earth, rock, shale), backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

19. Water Line Pipe (All Types)

    a. Final measurement will be based on the horizontal length of the completed and installed item, as measured along the centerline.

    b. Payment for water line pipe shall be based on the unit price per linear foot as set forth in the Proposal, per the type and size of pipe. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), dewatering, bedding, polyethylene encasement, placing, pipe to pipe connections, restraint measures, flushing, disinfection, pressure testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

20. Water Line Valves (All Types)

    a. Final measurement will be based on each completed and installed item.

    b. Payment for valves in water mains will be paid at the unit price per each size and type as set forth in the Proposal. Said price shall include, but not be limited to, furnishing and installing the valve, valve box, and appurtenances; excavation and backfill not included under piping; and all other costs not included under other bid items.

21. Water Line Fittings (Bends, Crosses, Reducers, Sleeves, Tees)

    a. Final measurement will be based on each completed and installed item.

    b. Payment for water line fittings shall be based on the unit price per each as set forth in the Proposal, per the type and size of fitting. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), dewatering, bedding, polyethylene encasement, placing, pipe to pipe connections, restraint measures, flushing, disinfection, pressure testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

22. Water Line Connections (Main Line Connections)

    a. Final measurement will be based on each completed and installed item.

    b. Payment for water line connections shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), dewatering, bedding, polyethylene encasement, placing, pipe to pipe connections, restraint measures, flushing, disinfection, pressure testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

23. Water Line Splice And Relocation

    a. Final measurement will be based on each completed and installed item.

    b. Payment for water line splice and relocation shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), dewatering, bedding, polyethylene encasement, placing, pipe to pipe connections, restraint measures, valve box, flushing, disinfection, pressure testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

24. Water Meter Removal And Abandonment

    a. Final measurement will be based on each completed and installed item.

    b. Payment for water line relocation shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), dewatering, bedding, polyethylene

encasement, placing, pipe to pipe connections, capping, restraint measures, flushing, disinfection, pressure testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

25. Water Meter Installation or Relocation

    a. Final measurement will be based on each completed and installed item.

    b. Payment for water line relocation shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), dewatering, bedding, polyethylene encasement, placing, pipe to pipe connections, restraint measures, flushing, disinfection, pressure testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications. Except for the actual water meter, contractor shall supply all parts to relocate the meter. Contractor shall reuse the existing meter. If meter cannot be reused, Owner will supply a new meter.

26. Fire Hydrant Assembly Installation or Relocation

    a. Final measurement will be based on each completed and installed item.

    b. Payment for fire hydrant relocation shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), dewatering, bedding, polyethylene encasement, placing, pipe to pipe connections, restraint measures, flushing, disinfection, pressure testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

27. Manhole or Water Valve Lid Adjustments

    a. Final measurement will be based on each completed and installed item.

    b. Payment for adjustments shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all pavement removal, adjustment rings, concrete and sealant as required by the drawings and specifications. Contractor shall reuse the existing lids if possible. If lids cannot be reused, Owner will supply new lids.

28. Air Release Valves

    a. Final measurement will be based on each completed and installed item.

b. Payment for air release valves will be paid at the unit price per each size and type as set forth in the Proposal. Said price shall include, but not be limited to, furnishing and installing the valve, miscellaneous piping, valve box or manhole, and other appurtenances; excavation and backfill not included under piping; and all other costs not included under other bid items.

29. Sanitary Sewer Pipe (All Types)

    a. Final measurement will be based on the horizontal length of the completed and installed item, as measured along the centerline.

    b. Payment for sanitary sewer pipe shall be based on the unit price per linear foot as set forth in the Proposal, per the type and size of pipe. Said price shall include all costs necessary to complete the work item including, but not limited to, all trenching (earth, rock, shale), dewatering, bedding, placing, testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

30. Sanitary Sewer Stubs and Plugs

    a. Final measurement will be based on each completed and installed item.

    b. Payment will be based on the unit price per each size and type as set forth in the Proposal. Said price shall include, but not be limited to, furnishing and installing stub or plug, and excavation and backfill (not included under piping) as required by the drawings and specifications.

31. Concrete Encasement

    a. Final measurement will be based on the horizontal length of the completed and installed item, as measured along the centerline.

    b. Payment for concrete shall be based on the unit price per linear foot as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all placing, reinforcing, and compacting as required by the drawings and specifications.

32. Standard Sanitary Manholes (All Types)

    a. Final measurement will be based on each completed and installed item.

    b. Payment for manholes shall be based on the unit price per each as set forth in the Proposal, per the type and size of structure. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), bedding, placing or building manhole, invert construction, manhole to pipe connections, final grade adjustments to the top, sealing, curing, backfilling,

compacting, grading, testing and removal of excess or unsuitable material, as required by the drawings and specifications.

33. Extra Depth Sanitary Manholes

    a. Final measurement will be based on the vertical height of the completed and installed item, measured from the base to the top of the cone.

    b. Payment for extra depth manholes shall be based on the unit price per vertical foot as set forth in the Proposal, per the type and size of structure. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), bedding, placing or building manhole, invert construction, manhole to pipe connections, final grade adjustments to the top, sealing, curing, backfilling, compacting, grading, testing and removal of excess or unsuitable material, as required by the drawings and specifications.

34. Adjustment of Existing Manhole

    a. Final measurement will be based on each completed and installed item.

    b. Payment for adjustments shall be based on the unit price per vertical foot of adjustment as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation, adjustment rings or sections, sealing, curing, backfilling, grading and testing, as required by the drawings and specifications.

35. Connection to Existing Manhole

    a. Final measurement will be based on each completed and installed connection.

    b. Payment for manhole connections shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation (earth, rock, shale), dewatering, bedding, pipe connections, testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

36. Force Main Connections

    a. Final measurement will be based on each completed and installed connection.

    b. Payment for force main connections shall be based on the unit price per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, all excavation, dewatering, bedding, pipe connection,

testing, backfilling, compacting, grading and removal of excess or unsuitable material, as required by the drawings and specifications.

37. Traffic Control

    a. Final measurement for lump sum bids will not be made unless changes to the bid quantity are authorized. For work under a force account, final measurement will be based on records of equipment and labor used during the work.

    b. Payment for lump-sum traffic control shall be based on the lump sum price as set forth in the Proposal. Said price shall include all costs necessary to complete the work including, but not limited to, temporary striping, edge drop-off treatment, construction signs, barricades and channelization devices, as required by the drawings and specifications. Payment for relocation and reuse of the items shall be considered subsidiary to the payment for the initial installation.

    c. Payment for force account work shall be based on the actual quantities of equipment, materials, and labor hours used in performance of the work and the unit prices for each item as submitted by the contractor.

38. Pavement Marking (Permanent and Temporary)

    a. Final measurement will be based on the horizontal length for each of the completed and installed items.

    b. Payment for pavement marking shall be based on the unit price per linear foot or per each as set forth in the Proposal. Said price shall include all costs necessary to complete the work item including, but not limited to, removal of old markings, surface preparation, layout, and taping, as required by the drawings and specifications.

39. Permanent Signage

    a. Final measurement will be based on each completed and installed item.

    b. Payment for permanent signage shall be based on the unit price per each as set forth in the Proposal, per each type of sign. Said price shall include all costs necessary to complete the work item including, but not limited to, excavation, concrete, posts, signs face, and hardware as required by the drawings and specifications.

40. Fence (All Types)

    a. Final measurement will be based on the horizontal length of the completed and installed item.

    b. Payment for fence shall be based on the unit price per linear foot as set forth in the Proposal, per each type of fence. Said price shall include all costs necessary to complete the work item, as required by the drawings and specifications.

41. Seeding (Temporary Or Permanent)

    a. Final measurement will not be made. Contract quantity shall be plan/bid quantity unless changes to the bid quantity are authorized.

    b. Payment for seeding shall be based on the unit price per acre as set forth in the Proposal, per each type of seed. Said price shall include all costs necessary to complete the work item including, but not limited to, aeration, fertilization, mulching and watering, as required by the drawings and specifications. Contractor shall water seed until final acceptance.

42. Sod (All Types)

    a. Final measurement will be based on the square yards of the completed and installed item.

    b. Payment for sod shall be based on the unit price per square yard as set forth in the Proposal, per each type of sod. Said price shall include all costs necessary to complete the work item including, but not limited to, aeration, fertilization, mulching and watering, as required by the drawings and specifications. Contractor shall water sod until final acceptance.

43. Sediment Control Devices (All Types)

    a. Final measurement will be based on counting the number, measuring the linear footage or measuring the area of the completed and installed item.

    b. Payment for sediment control shall be based on the unit price as set forth in the Proposal, per linear foot for sediment fence and per each for inlet protection and check dams. The unit price shall include full compensation for equipment, labor, material, repair, maintenance and incidental costs, including removal of materials. Removal of sediment, repair and maintenance of installed sediment control shall be subsidiary to sediment control.

MATERIAL TESTING.

This section shall apply to all required testing services for soils, asphalt and concrete. Unless otherwise indicated or specified, on-site testing, may be performed by an inspector employed by the City of Phillipsburg or by personnel of an approved testing firm hired by the City at the City's option.

1. Asphalt Testing. Sampling and testing of the asphalt mix may be required on all asphalt paving projects constructed in the City of Phillipsburg.

   Samples of the actual asphalt mix being used on a paving project shall be acquired at either the construction site or the batching plant per ASTM Standards D979 and D3665. These samples shall be used to perform an

aggregate gradation test (ASTM C136), asphalt extraction test (ASTM D2172), and bulk specific gravity test (ASTM D2726).

In-place density tests may be conducted with a nuclear testing device during the course of the work by inspectors at the City's option to give general indication of level of compaction. The inspector shall determine the number of tests to be taken and the locations thereof based upon observation of the paving process. Tests performed with a nuclear device shall be conducted as per the requirements of ASTM D2950. Actual in-place density for payment purposes shall be determined from pavement cores unless otherwise specified.

During compaction, cores may be taken to verify final in-place densities, unless otherwise specified, and as an aid for verifying thickness. Cores shall be made by means approved by the Public Works Supervisor. Core locations shall be repaired using epoxy concrete, high-strength non-shrink grout, or other approved product. Contractor shall supply equipment and labor for obtaining cores and repairing holes.

2. Concrete Testing. Sampling and testing may be required on all concrete work including curb and gutter, sidewalk, slope paving, retaining walls, inlets, manholes or any other structures.

   During the progress of the work, compression tests of the concrete used shall be made as directed by the Public Works Supervisor in accordance with the requirements of ASTM C31, C143, and C172. Cylinder will generally be broken at seven (7) days, fourteen (14) days and twenty-eight (28) days noting the compressive strength of each break. Slump and air tests will also be taken with cylinders.

3. Soil Testing. Sampling and testing may be required on all subgrade preparation for street construction and all trench backfilling operations within the City of Phillipsburg.

   Prior to commencing earthwork for any street improvement project, the Contractor shall acquire samples of soil and submit samples to an approved laboratory to perform a moisture density test (ASTM D698 for cohesive soils and ASTM D2049 for non-cohesive soils). These tests shall be at the Contractor's expense. The number of tests required will be based on the types of soils encountered on the project. Contact project inspector prior to obtaining samples in order to allow inspector to be present during sampling if desired.

   Reports for moisture-density tests shall include the date, the location of the tests, the elevation or depth at which the test was taken, the maximum dry density, and the optimum moisture content as well as properly

constructed moisture-density curves for each sample. Also included shall be a determination of the soils plasticity index (PI) and liquid limit and classification in accordance with ASTM D2487. Submit test results to Public Works Supervisor a minimum of 48 hours prior to beginning earthwork.

During the progress of the earthwork, in-place density tests shall be performed with a nuclear density meter. The inspector shall determine the number of tests to be taken and the location thereof based upon his observation of the work. Results of these tests shall indicate whether or not the performance specifications stated in Sections 1100 and 1200 of this specification manual have been achieved. If the tests indicate the compaction is not sufficient, the Contractor shall increase the compactive effort on all such inadequately compacted areas. Tests performed with a nuclear device shall be conducted as per the requirements of ASTM D2922.

During the progress of the work of trench backfilling, in-place density tests shall be performed with a nuclear meter. The inspector shall determine the number of tests to be taken and the locations thereof based upon his observation of the backfilling process. Results of these tests shall indicate whether or not the performance specifications stated in Sections 1100 and 1200 of this specification manual have been achieved. If the tests indicate the compaction is not sufficient, the Contractor shall increase the compactive effort on all such inadequately compacted areas.

Waterline and Sanitary Sewer Testing

1. Waterline testing shall conform to the requirements outlined in Section 2900 of the technical specifications.
2. Sanitary sewer testing shall conform to the requirements outlined in Section 2509 of the technical specifications.

SECTION 1000 - SITE PREPARATION

1001 SCOPE. This section covers the necessary clearing, grubbing, demolition, and other appurtenant work at the locations shown on the contract drawings.

1002 DEFINITIONS.

A. Clearing. Clearing shall consist of the removal of all vegetative matter, such as trees, brush, downed timber, rotten wood, sod, grass, agricultural crop or residue, and other objectionable materials encountered on or above the surface of the site. It shall include the removal of fences, lumber, waste dumps, and trash, the salvaging of such materials as may be specified, and the disposal of the debris in accordance with all applicable federal, state and local regulations and ordinances.

B. Grubbing. Grubbing shall consist of the removal of all stumps, roots, buried trees and brush, and other objectionable materials encountered on or below the surface of the ground or subgrade, whichever is lower, which has not been included under the definition of "*Clearing*" above.

C. Stripping all areas to receive embankment shall be stripped of existing organic and other undesirable material to a minimum depth of six (6) inches. This material shall be disposed of in a manner approved by the Public Works Supervisor. All topsoil shall be removed and stockpiled for use in final grading.

D. Demolition. Demolition shall consist of the destruction and removal of all non-vegetative matter encountered above, on, or below the ground surface within the construction limits. This shall include, but not be limited to, buildings, abandoned utilities, all material derived from the demolition of concrete items such as base courses, curbs, curb and gutters, sidewalks, floors, steps, driveways, drainage structures of all sorts, guard fences, and other miscellaneous items such as foundations or walls of any sort, iron or steel items, and asphaltic items such as pavement and base courses. Materials shall salvaged as indicated or specified, or disposed of in accordance with all applicable federal, state and local regulations and ordinances.

E. Trees. Vegetative growth forty (40”) inches or greater in circumference, measured two (2’) feet above the ground shall be classified as a tree.

F. Brush. Vegetative growth less than forty (40”) inches in circumference, measured two (2’) feet above the ground shall be classified as brush.

G. Salvageable Material. All salvageable material indicated or specified for the project shall be handled with care and delivered to a location as directed by the Public Works Supervisor.

1003 LIMITS OF CONSTRUCTION. The limits for clearing, grubbing, and demolition shall be as defined on the plans or as specified but in no case shall work extend beyond the limits of the right-of-way, city property lines, or easements.

1004 PROGRESS OF CONSTRUCTION.

A. General. Clearing, grubbing and demolition shall proceed well in advance of the construction operation so as not to delay the progress of the work. Grubbing shall parallel the clearing as nearly as the sequence of operations will permit..

B. Clearing. The refuse resulting from clearing may be hauled to a waste site secured by the Contractor or shall be burned or buried in such a manner as to meet all laws, regulations, and requirements of any governing authority regarding health, safety, and public welfare. When authorized by the fire department, the Contractor may dispose of such refuse by burning on the site of the project, provided all requirements as determined by the Fire Marshall are met. Under no circumstances will the authorization to burn on the site relieve the Contractor in any way from damages, which may result from his operations. In no case shall any materials be left on the project site, shoved into abutting properties, or buried in embankments or trenches on the site.

B. Grubbing. Except for the special circumstances enumerated below, all stumps, roots, and other objectionable matter within the construction area shall be removed to a minimum depth of twelve (12”) inches below the subgrade or the original ground, whichever is lower. All stumps, roots, and other objectionable matter outside the limits of the construction area, but within the right-of-way shall be cut off flush with the final grade.

All stumps, roots, and other objectionable matter within the specified limits of embankments having a depth of two (2’) feet or less shall be removed and disposed of. Piling and butts of utility poles within the limits shall be removed to a minimum depth of two (2’) feet below the subgrade or the original ground, whichever is lower.

All stumps, roots, and other objectionable matter found within borrow material to be used for embankment or fill material shall be removed. All stumps, roots, and other objectionable matter found within the

bottoms or sidewalls of excavation and trenching areas shall be completely removed from the respective bottom areas, and removed to a minimum depth of twelve (12”) inches below the respective sidewalls.

C. Demolition. Masonry and concrete walls, miscellaneous foundations, or other objects extending below ground shall be removed to a depth of at least twelve (12”) inches below the original ground or the subgrade, whichever is lower. When explosives are used in demolition, the Contractor shall comply with the provisions of the Fire Marshall.

In removing items such as concrete pavement, base courses, curbs, curb and gutters, gutters, sidewalks, and similar objects where portions of said objects are to be left in place, they shall be removed to an existing joint or to a new joint sawed to along a line and to a depth adequate to provide a true line and vertical face. Sufficient portions of these objects shall be removed to provide for the proper grade and connection to the new work.

1005 PROTECTION OF TREES AND SHRUBS. During construction operation, the Contractor shall leave in place and protect from damage all trees, shrubbery, and flower beds unless shown on the drawings to be removed. Where trees existing on the project site are not to be removed, it shall be the responsibility of the Contractor to trim low branches, which would interfere with the normal operation of his equipment. The trimming shall be performed in accordance with accepted horticultural practices prior to any machine operation.

SECTION 1100 – GRADING

1101 SCOPE. This section covers the performance of all work required for grading the project in coordination with all previous work performed at the locations shown on the contract drawings.

1102 MATERIALS AND DEFINITIONS.

A. Grading. Grading shall be defined as meaning the performance of all excavation, embankment and backfill in connection with the construction of all improvements.

B. Excavation. Excavation is defined as the removal of materials from the construction area to the lines and grades as shown on the contract drawings.

Unless otherwise provided for in the Special Provisions and included in the proposal, all excavation shall be unclassified excavation and the Contractor shall satisfactorily remove and dispose of all materials encountered regardless of their nature.

C. Embankment. Embankment - Fill or Backfill, is defined as the placing and compacting of material in the construction area to the lines and grades as shown on the contract drawings.

Materials suitable for earth embankment shall be free of organic materials, waste material, trash and debris, contain less than ten (10) percent by volume of rock and gravel, and contain no particles having a dimension greater than three (3”) inches.

Materials suitable for rock embankment shall be free of organic materials, waste material, trash and debris, and contain ten (10) percent or greater by volume of rock or gravel containing particles ranging in size from a minimum dimension of three (3") inches to a maximum of twenty-four (24") inches.

Material not suitable for use as embankment material shall include, but shall not be limited to, frozen material, organic material, topsoil, rubbish, brick, asphaltic concrete, and other debris and soil not containing the characteristics and moisture content to obtain the required compaction. Rock and broken concrete shall not be included in embankment material unless rock embankment is specified in the Special Provisions and the materials meet the size requirements indicated in this section.

D. Topsoil. Topsoil shall be soil which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1 1/2" in any dimension, and other extraneous or toxic matter harmful to plant growth. Topsoil may be obtained from the project site by segregating appropriate material from other material during excavation and trenching operations, or from off-site locations at no additional cost to the Owner.

E. FLOWABLE FILL. Provide low-strength, air-entrained flowable fill (flowable mortar) mix that has adequate flow characteristics to fill all voids and complies with the following compressive strength and unit weight requirements.

3-day Compressive Strength (minimum)	20 psi
28-day Compressive Strength (maximum)	100 psi
Unit Weight (maximum)	120 pcf

Fine aggregate, cement, fly ash, water and additives used in the mix shall conform to applicable sections of the current KDOT Standard Specifications.

F. Structures. Structures, as used herein, refers to bridges, basins, drainage structures, headwalls, retaining walls, and similar construction.

Material for structure backfill shall be composed of earth only and shall contain no organic materials, broken concrete, stones, trash, or debris of any kind.

1103 CONSTRUCTION - GENERAL. During grading the work shall be performed in a manner and sequence that will provide drainage at all times. Soft spots or areas that develop during grading operations shall be removed, the area then backfilled with suitable material and compacted to obtain the required density. No additional payment will be made to the Contractor for this work.

1104 EXCAVATION - GENERAL Excavation shall be performed to the lines and grades indicated on the contract drawings. All suitable material removed by excavation shall be used as far as practicable in the formation of embankments or elsewhere as indicated or specified, or as directed by the Public Works Supervisor. It shall be the responsibility of the Contractor to handle excavation in a manner such that suitable materials will be available when required. No additional compensation will be allowed for any special sequence of excavating, placing of materials, or any re-handling of materials.

Follow all OSHA safety regulations for sloping the sides of excavations and trenches, using shoring and bracing as required.

The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the pipe to be installed therein is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result. Discharge of water from dewatering operations shall conform to local and state stormwater pollution prevention regulations.

Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

Excavated materials in excess of the amount needed to complete the grading shall be considered as waste material, which shall be removed from the site by and at the expense of the Contractor.

Any additional fill material required which is not available from excavation within the construction limits shall be supplied by the Contractor at no expense to the Owner unless provided for in the proposal and Special Provisions. All such material brought to the site and incorporated in the work shall be subject to the approval of the Public Works Supervisor.

During excavation and grading operations if materials are encountered which are determined as being unsuitable or unstable by the Public Works Supervisor they shall be removed to the depth required to reach stable material. The area involved shall then be backfilled with suitable material as determined by the Public Works Supervisor and compacted to obtain the required density. Suitable material may include suitable soils or aggregate materials such as KDOT AB-3 material.

All roadway excavation in rock or shale shall be undercut as indicated on the drawings or specified in the Special Provisions. If undercut is not included in the drawings or Special Provisions, remove material and backfill with suitable soil or granular material as directed by the Public Works Supervisor.

1105 EXCAVATION – TRENCHING. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. One block or four hundred (400) feet (whichever is the shorter) shall be the maximum length of open trench on any line under construction unless otherwise approved by the Public Works Supervisor. The Contractor shall backfill all open trench by the end of the day's work, except that which is

necessary for inspection or immediate continuation of the following day's work. All open areas shall be fenced.

The alignment, depth, width and grade of all trenches shall be in accordance with the drawings. Boulders and large stones shall be removed to provide a minimum clearance of six (6) inches below and on each side of all pipes.

1106 EMBANKMENT - FILL. Embankments shall be formed with suitable materials, as herein defined, procured from excavations made on the project site, or from Contractor furnished borrow pits as required to complete the grading work. Embankment construction shall not be performed when material contains frost, is frozen, or a blanket of snow prevents proper compaction.

The existing surface upon which embankment material is to be placed shall have all unstable and unsuitable material removed to the depths shown, or as directed by the Public Works Supervisor, before starting the embankment work.

Earth embankment shall be placed in successive horizontal layers distributed uniformly over the full width of the embankment area. Each layer of material shall not exceed eight (8") inches in thickness (loose measurement) and shall be compacted as specified in paragraph 1108 before the next layer is placed thereon. As the compaction of each layer progresses, continuous blading will be required to level the surface and to ensure uniform compaction.

Successive horizontal layers of rock embankment not exceeding two (2') feet in depth shall be made by placing larger stones uniformly over the embankment area. Small stone fragments, sand, earth, or gravel shall be placed between the larger stones to fill all voids. Each layer shall be thoroughly compacted before the next layer is placed.

Large rocks shall be withheld from the top two (2) feet or more of the embankment and only earth used in this layer unless otherwise indicated or specified.

1107 EMBANKMENT- BACKFILL.

A. GENERAL. Backfill shall not be placed when material contains frost, is frozen, or a blanket of snow prevents proper compaction. Backfill shall not contain waste material, organic material, or debris of any kind. The method of placement and compaction, and the type of equipment used shall be at the discretion of the Contractor subject to being appropriate for the material and obtaining the specified densities for the location.

The top portion of the backfill within right-of-way areas shall be finished with at least six (6”) inches of topsoil.

B. TRENCHES. Trench backfill shall be flowable fill for 1) all trenches crossing existing or proposed streets shall be backfilled with flowable fill from two (2) feet behind the back of curb on each side of the street, and 2) all portions of trenches running parallel to and within two (2) feet of the back of curb. All other trench backfill shall be either flowable fill or compacted earth as indicated on the drawings and standard details, or as specified in the Special Provisions.

Earth backfill material to be placed above pipe embedment shall be free of brush, roots more than two (2) inches in diameter, debris, cinders, or other corrosive material, but may contain rubble and detritus from rock excavation, stones, and boulders in certain portions of the trench depth. No backfill material containing rocks, or rock excavation detritus material, shall be placed within two (2) feet of final surface. No stone larger than eight (8) inches in its greatest dimension shall be placed within three (3) feet of the top of pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and arranged so that no backfill settlement will result due to voids.

Compact masses of stiff clay or other consolidated material more than one (1) cubic foot in volume, shall not be permitted to fall from a height of more than five (5’) feet into the trench.

C. FLOWABLE FILL. Flowable fill (flowable mortar) shall be placed so all voids in the excavation or around the structure are filled. Filling operations shall proceed simultaneously on both sides of pipe or conduit so that the two fills are kept at approximately the same elevation at all times. Place flowable fill around structures in lifts to prevent the buildup of excess hydrostatic pressure. Weather limitations for flowable fill shall be the same as for concrete.

D. STRUCTURES. Backfill around and outside of structures shall be deposited in layers not to exceed eight (8) inches in uncompacted thickness. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted. No tamped, rolled, or otherwise mechanically compacted backfill shall be deposited or compacted in water.

1108 COMPACTION

A. Moisture Control Requirements. The moisture content of the soil at the time of compaction shall be as indicated on the drawings or in the Special Provisions. If no moisture content requirements are provided, moisture content shall be as necessary to obtain the density specified for the particular location unless it is determined by the Public Works Supervisor that the soil is unstable at that moisture content.

When the moisture content of the soil is not satisfactory to the Public Works Supervisor, water shall be added or the material aerated, whichever is needed to adjust the soil to the proper moisture content. Moisture content shall be distributed uniformly and water for correction of moisture content shall be added sufficiently in advance that proper moisture distribution and compaction will be obtained. In no case, shall water be added without the consent of the Public Works Supervisor.

All work involved in either adding moisture to, or removing moisture from soils shall be considered incidental to the completion of the grading operation.

B. Compaction Control Requirements. Earth embankment/fill and backfill materials shall be placed in horizontal layers not exceeding eight (8”) inches unless otherwise specified or approved by the Public Works Supervisor and compacted as specified below before the next layer is placed. Effective spreading equipment shall be used on each lift to obtain uniform thickness prior to compaction.

1. Subgrade for Embankments: Compact to a minimum of 95% of standard proctor maximum density as determined by ASTM D698.
2. Embankments/Fills: Compact to a minimum of 95% of the standard proctor maximum density for the material used as determined by ASTM D698.
3. Backfill: Unless otherwise specified, compact to a minimum of 95% of the standard proctor maximum density for the material used as determined by ASTM D698.
4. All fill or backfill material placed behind the curb and gutter or beneath and either side of sidewalks within the right-of-way shall be compacted such that no further consolidation is evident after additional rolling or tamping.
5. Structure Backfill: Compact to a minimum of 90% of standard proctor maximum density as determined by ASTM D698. Backfill around and outside of structures that will ultimately lie under proposed pavements shall be compacted to the requirements of SECTION 1200 "Subgrade Preparation."

1109 FINAL GRADING. After embankments and backfills are completed, all areas on the site of the work, which are to be graded, shall be brought to grade at the indicated elevations, slopes, and contours, including shoulder, berm, and sidewalk spaces. The graded surface shall be made free of rock, concrete, and brick, or fragments thereof, or rubbish. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and conforming to the lines and grades shown on the plans. Grades on areas to receive topsoil shall be established and maintained as a part of the grading operations. The Contractor shall repair any damaged surface and shall not use any equipment that will leave a marred surface.

Topsoil shall be placed to a minimum depth of six (6) inches in all areas indicated or specified to be seeded or sodded. Immediately prior to dumping and spreading topsoil, the surface shall be loosened by scarifying to a depth of two (2") inches to permit bonding of the topsoil to the underlying surface. Placement of all topsoil should be done in a manner so that roadway surfaces, sidewalks, manholes, valve boxes, and other utility structures or facilities are not covered by material being placed.

1110 CLEANUP. Cleanup shall follow the work progressively and final cleanup shall follow immediately behind the finishing. The Contractor shall remove from the site of the work all debris, equipment, tools, discarded materials and other construction items. The entire right-of-way or easement shall be left in a finished and neat condition. Cleanup shall be considered a subsidiary obligation of the grading work.

In the event the Contractor does not promptly comply with the terms of such instructions, the city may have the defective work corrected or the rejected work removed and replaced. All direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be paid by the Contractor. The Contractor will also bear the expenses of repairing work of others destroyed or damaged by the correction, removal or replacement of defective work.

1111 SETTLEMENT. The Contractor shall be responsible for all settlement of backfill, fills, and embankments, which may occur within one year after final acceptance of the contract under which the work was performed. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Public Works Supervisor.

SECTION 1200 - SUBGRADE PREPARATION

1201 SCOPE. This section governs the performance of all work connected with subgrade preparation, prior to constructing pavements, sidewalks, drive approaches and concrete curb and gutters. This section does not include the construction of any base courses.

1202 DEFINITIONS.

A. Subgrade. Subgrade is defined as a well-graded and compacted surface, constructed as specified herein to the grades, lines, and cross-section shown, bladed and compacted to the specified density, preparatory to constructing pavements, or other improvements thereon.

B. Subgrade Preparation. Subgrade preparation is the repeated operation of fine grading and compacting the subgrade until the specified lines, grades, and cross-sections have been obtained and the materials are compacted to the specified depth and density.

1203 CONSTRUCTION REQUIREMENTS.

A. General. All underground work contemplated, including clearing, grubbing, and demolition, shall be completed in accordance with the requirements of Sections 1000 *Site Preparation* and 1100 *Grading* prior to commencement of any subgrade preparation.

Unless otherwise specified, prior to beginning any work on street subgrade the Contractor shall secure the services of a qualified testing agency to acquire samples of the material to be used for subgrade construction. These samples shall be analyzed to determine Proctor values and Atterberg limits. Copies of the analysis shall be provided to the Publick Works Supervisor for review at least 48 hours prior to commencing subgrade preparation.

The subgrade surface shall be brought to the specified lines, grades and cross-sections by repeatedly adding or removing material and compacting to the specified density with equipment suitable to perform these operations.

When unstable or unsuitable subgrade materials are encountered they shall be removed to the depth required to reach stable material or as directed by the Publick Works Supervisor. The over-excavated area shall be backfilled with suitable soil material, as defined in Section 1100 – *Grading*, or KDOT AB-3 aggregate material, as approved by

the Publick Works Supervisor. Backfilled subgrade shall be compacted in accordance with requirements of this Section.

B. Foundation Treatment. All subgrade in rock shall be undercut as indicated on the drawings or specified in the Special Provisions. If undercut is not included in the drawings or Special Provisions, remove material and backfill with suitable soil or granular material as directed by the Publick Works Supervisor.

1204 FLY ASH SUBGRADE TREATMENT

A. GENERAL: Fly ash shall be used for treatment of the subgrade section to a depth of 9 inches, unless otherwise indicated or specified. The addition of fly ash applies to natural ground, fills or cuts and shall be constructed as specified and to the lines, grades and typical sections as indicated on the plans or established by the Publick Works Supervisor. It shall be the responsibility of the Contractor to regulate the sequence of work, to process a sufficient quantity of material to provide a full depth layer as shown on the plans, to use the proper amounts of fly ash, to maintain the work, and to rework areas as necessary to meet the requirements**.**

When specified or indicated on the plans, the Contractor shall secure the services of a qualified testing agency to perform on site testing. A qualified field technician shall monitor placement, mixing, moisture content and in-place density. Copies of the test results shall be provided to the Publick Works Supervisor for review at least 48 hours prior to pavement placement. All costs incurred through the use of the testing agency shall be included in the Contractor's bid for fly ash subgrade.

B. MATERIALS

1. Fly ash shall be Class C complying with the physical requirements of ASTM D5239 Section 6.4 maintaining a minimum compressive strength of 500 psi at 7 days and the chemical requirements of ASTM C618 Section 3.3, when sampled and tested in accordance with Sections 5,6 and 8, unless otherwise indicated on the plans. The minimum calcium oxide (CaO) content of the fly ash shall be 25%. Fly ash that has been partially caked or set shall not be used.

2. A certification indicating compliance to these specifications shall be attached to or be part of the scale ticket for each load delivered. The producer's representative shall sign the certification. The Contractor shall provide weigh tickets from a certified public scale to the Inspector for each load of fly ash delivered to the site.

3. Potable water shall be used in the stabilized mixture.

4. The subgrade soil shall be uniform in quality and gradation, and shall be approved by the Publick Works Supervisor. The soil shall be free of roots, sod, weeds, and stones larger than three (3") inches.

C. CONSTRUCTION REQUIREMENTS

1. Preparation of Roadbed: The subgrade shall be trimmed to finish subgrade elevations as shown on the plans. The Contractor shall allow for potential swell of material to minimize waste during final trimming. This may require the subgrade to be trimmed to slightly below proposed finished grade depending on the soil characteristics.

2. Equipment: The machinery, tools, and equipment appropriate and necessary for proper execution of the work shall be on the project prior to beginning of construction operations. Pulveration of existing subgrade and blending of the mixture shall be accomplished by use of a drum-rotary type tiller equipped with an adjustable water proportioning system. Initial compaction shall be achieved using a self-propelled sheepsfoot compactor having an operating weight adequate to achieve the required results. Rubber-tired or smooth-wheeled rollers shall be used for final compaction of the stabilized section. All machinery, tools and equipment used shall be maintained in satisfactory and workmanlike manner.

3. Storage: Fly ash shall be stored and handled in closed weatherproof containers until immediately before distribution. Fly ash exposed to moisture prior to mixing with recycled material shall be discarded. Temporary storage (less than 12 hours) of fly ash in open pits will be allowed provided fly ash is protected from rain and groundwater.

4. Application: Fly ash shall be added to the subgrade at a rate of 16% based on dry unit weight unless approved geotechnical studies indicate different rates. The fly ash shall be spread in an approved manner. Care shall be taken to prevent the fly ash from flowing off the area to be treated. The fly ash shall be distributed at a uniform rate in such a manner as to minimize the scattering of fly ash by wind. Fly ash shall not be applied when wind conditions, in the opinion of the Publick Works Supervisor, are such that blowing fly ash becomes objectionable to adjacent property owners or significantly reduces the amount of fly ash incorporated into the work.

Mixing operations shall commence within one (1) hour after distribution of the fly ash and will proceed until all material has been mixed. No fly ash shall be placed on roadway that can not be incorporated within the weather limitation.

5. Moisture Control: The required moisture content will be established by the Contractor's testing agency based on laboratory tests on the materials and specific fly ash content to be used for the treatment. Water shall be introduced directly into the rotary mixing drum during the tilling procedure. Final moisture content of the mix, immediately prior to compaction shall be uniform. If the moisture content is too high or low to achieve required compaction results, additional fly ash may be added to lower the moisture content or additional water shall be added and uniformly blended with the mixture. Additional fly ash added to lower the moisture content shall be at the expense of the Contractor.

6. Mixing: The pulverized subgrade material and fly ash shall be thoroughly mixed and the mixing continued until a homogenous, friable mixture of pulverized subgrade material and flyash meeting the specified size requirements is obtained. The subgrade material shall be pulverized through use of the specified equipment. Depth of pulverization shall be as designated on the plans. All clods shall be reduced in size by mixing until the pulverized subgrade material-fly ash mixture meets the following size requirement when tested.

Sieve Size	Percent Retained
1"	0
½"	50

7. Compaction

Compaction of the mixture shall begin immediately after mixing and confirmation that the moisture content is within the specified range. The specified compaction shall be obtained within 1 hour after the incorporation of the fly ash. Compaction of the mixture shall continue until the entire depth of mixture is uniformly compacted to the specified density.

All non-uniform (too-wet, too dry or insufficiently treated) areas, which appear, shall be corrected immediately by scarifying the areas affected, adding material as required and reshaping and recompacting.

The stabilized section shall be compacted in compliance with Section 1108.

After each section is completed, tests will be made by the Publick Works Supervisor or authorized representative. If the material fails to meet the density requirements, the Publick Works Supervisor may require it be reworked as necessary to meet those requirements and/or require the Contractor to change his construction methods to obtain required density on the next section. Additional fly ash will be added to the areas that are reworked at no additional cost to the owner, and the Publick Works Supervisor or authorized representative shall determine the amount required. Should the section, due to any reason or cause, lose the required stability, density and finish before the surface is placed or the work is accepted, it shall be reprocessed, recompacted and refinished at the sole expense of the Contractor. Reprocessing shall follow the same patterns as the initial stabilization including the addition of fly ash**.**

8. Finishing and Curing

   Following the compaction of the stabilized section the surface shall be protected from rapid drying by maintaining a continuous moist condition by sprinkling for a period of not less than seventy-two (72) hours or until overlying pavement is placed. Prior to paving, the treated section will be trimmed to the required lines and grade by means of equipment, which is automatically controlled with regard to grade. The surface shall then be compacted with a smooth wheel or pneumatic tired roller and proof rolled. If ruts or other damage to the treated section is apparent during trimming, compaction and proof rolling operations, all work will cease and not recommence for at least 24 hours.

   The Publick Works Supervisor may waive the use of automatically controlled equipment on projects containing narrow or irregular dimensions where operation of the automated equipment is impractical. Finishing of these areas may be as set forth above or the surface will be lightly scarified during finishing operations and bladed to a uniform grade and cross section to eliminate and imprints left by the equipment.

9. Weather Limitations

   Fly ash mixing operations shall not be performed when the subgrade is frozen. Mixing operation shall not be allowed until the ambient air temperature and surface temperature is forty (40) degrees F and rising. The Contractor shall be responsible for protection and quality of the fly ash modified subgrade mixture under any weather conditions.

1205 MOISTURE AND COMPACTION CONTROL REQUIREMENTS. The moisture content of the soil at the time of compaction and compaction control requirements shall conform to the requirements of Section 1108.

1206 COMPACTION REQUIREMENTS.

A. Beneath Street Pavements and Commercial Drives. The subgrade shall be compacted to a minimum density of 95% of standard Proctor maximum density for the material used as determined by ASTM D698. Material shall be compacted to a depth of nine (9") inches below the finished subgrade elevation or as indicated on the plans, whichever is greater.

B. Beneath Residential Drives, Sidewalks and Multi-Use Paths. The top six (6") inches of the subgrade for sidewalks and recreational paths shall be compacted such that no further consolidation is evident after additional rolling or tamping.

C. Beneath Curb or Curb and Gutter. For curb or curb and gutter installed directly on the subgrade rather than on a lift of pavement, the subgrade shall be compacted to the same density as the subgrade for the adjacent pavement.

1207 PROTECTION AND MAINTENANCE OF SUBGRADE. The newly finished subgrade shall be protected from action of the elements. Any settlement or washing that occurs prior to the acceptance of the work shall be repaired and the specific lines, grades, and cross-section reestablished.

1208 COMPACTION TESTING AND PROOF ROLLING. Compaction testing will be required prior to placement of pavements. The subgrade must successfully pass compaction testing by a nuclear density/moisture measuring device or other accepted method and proof rolling. Proof rolling shall be accomplished with a loaded tandem dump truck carrying a minimum loaded weight of twenty five (25) tons (gross weight) with three cycles of loading over three separate paths. Proof rolling must be completed a minimum of 24 hours before paving operations. If as a result of the testing/proof rolling the Publick Works Supervisor determines that further compaction is required, the Contractor shall revise methods or procedures as necessary to obtain density and stability.

SECTION 1300 - ASPHALTIC CONCRETE PAVEMENT

1301 SCOPE. This section covers asphaltic concrete (AC) pavement for roadways and parking areas.

1302 GENERAL. Pavement shall be constructed to the lines, grades, dimensions, and details as shown on the plans. Allowable mixes for AC pavements shall be the following:

Surface Course Mix – KDOT HMA-Commercial Grade 12.5A
Base Course Mix – KDOT HMA-Commercial Grade 12.5A, BM-2B, or BM-2
Leveling Course Mix – KDOT BM-1

Alternative mix designs may be used only where approved by the Public Works Supervisor prior to bidding a project.

Materials.

A. Asphalt cement shall conform to the Performance Graded (PG) system. The asphalt oil used for residential, collector, and arterial streets shall be PG 64-22 for all types of AC mixes. PG 64-22 oil shall also meet the additional testing requirements:

	PG 64-22
Separation Test (AASHTO PP-5)	≤ 10
Elastic Recovery Test (ASTM D6084)	≥ 45

B. The quality of individual aggregates and mineral filler supplements shall meet the requirements of the current KDOT Standards for aggregates for hot mix asphalt.

C. Recycled asphalt pavement (RAP) shall be processed such that 100% will pass the 1-1/2 inch sieve and shall be free of debris and foreign material.

D. Tack oil shall be SS-1, SS-1H, CSS-1 or CSS-1H grade oil. Alternative materials must be submitted for approval by the Public Works Supervisor prior to submitting a bid on a project. Certification shall be submitted to Public Works Supervisor.

Composition of Mix. Immediately prior to the addition of the asphalt, the combined virgin aggregate shall meet the following requirements:

SIEVE SIZE	PERCENT MASTER GRADING LIMITS (PERCENT RETAINED)				RETAINED DESIGN JOB-MIX TOLERANCES			
	12.5A	BM-2	BM-2B	BM-1	12.5A	BM-2	BM-2B	BM-1
1”			0					
¾”	0	0	0-5					
½”	0-10							
3/8”	10 Min	8-30	10-30	0-8	+/-6	+/-6	+/-6	
4				18-39	+/-6	+/-6	+/-6	+/-5
8	42-61	42-72	42-72	35-53	+/-5	+/-6	+/-6	+/-5
16				50-68	+/-5	+/-5	+/-5	+/-5
30		64-88	64-88	60-80	+/-4	+/-5	+/-5	+/-5
50				70-90	+/-4	+/-4	+/-4	+/-4
100				82-95	+/-3	+/-4	+/-4	+/-3
200 (wash&Scr)	90-98	92-98	92-98	92-98	+/-2	+/-2	+/-2	+/-2
Plastic Index = 6 max.								
Moisture in Final Mix: = 0.5% max.								

In addition, there shall not be less than three (3%) percent nor more than twenty-three (23%) percent material between any two of the following successive sieves: Numbers 4, 8, 16, 30, and 50.

The asphalt content for each mix shall be the optimum content plus or minus one-half (1/2%) percent, based on the approved mix design for the project. Mix design shall be submitted to the Public Works Supervisor by the Contractor a minimum of ten (10) days in advance of the paving operation.

The Contractor may use virgin materials or a blend of virgin materials in combination with a maximum of 15% reclaimed asphalt pavement (RAP) in the surface course and 25% in the base course. No RAP will be allowed in the leveling course mix. The use of recycled roofing materials will not be allowed in asphaltic mixes.

1303 SUBGRADE PREPARATION. Subgrade preparation for pavement shall be as specified in Section 1200 *Subgrade Preparation*.

1304 TRANSPORTATION OF MIX. The mix shall be transported to the jobsite in vehicles cleaned of all foreign material including asphalt left from previous loads. The inside of the truck beds shall be lubricated with a thin non-petroleum based oil to prevent the mix from adhering to the bed, but an excess of lubricant will not be permitted. Vehicles shall be provided with covers of sufficient size and design to protect the load and to prevent

cooling of the mix during transportation to the site. The Contractor shall provide a sufficient number of haul vehicles of the proper size, speed, and condition to ensure an orderly and continuous nonstop paving operation. Contractor must have a minimum of 3 loaded trucks onsite before paving will be allowed to commence.

No diesel or petroleum base solvents will be permitted on tools or on equipment that comes in contact with asphalt, or to clean equipment on the job site.

1305 PLACING REQUIREMENTS. The bituminous mixture shall be spread and finished true to crown and grade by a mechanical, self-propelled paving machine. AC mixture may be spread and finished by other methods only where machine methods are impractical as determined by the Public Works Supervisor.

All construction activities shall be completed during daylight hours. **Nighttime work on projects will not be permitted unless approved in advance by the Public Works Supervisor.**

All AC mixtures shall be delivered to the paver at a temperature between 250°F and 325°F. Delivery of the material to the paver shall be at a continuous rate and in an amount well within the capacity of the paving and compacting equipment. If asphalt plant or trucks cannot keep up with the paver, the speed of the laydown operation shall be reduced to match the supply of material to the job site and avoid “stop-and-start” operations.

The maximum depth of any individual lift shall be four (4) inches for base course and two (2) inches for surface course.

When AC pavement is being placed, the surface of all structures, driveways, entrances, curb and gutters, and other roadway appurtenances shall be protected in a satisfactory manner to prevent them from being splattered with paving materials or marred by equipment operation. In the event that any appurtenances become splattered or marred, the Contractor shall, at his own expense, remove all traces of material and repair all damage, and leave the appurtenances in the same condition as before the work began and to the satisfaction of the Public Works Supervisor.

Pavement may be placed only when either the ambient air temperature or the road surface temperature is equal to or greater than the temperatures in the table below. No pavement shall be placed when there is frost in the subgrade, on wet subgrade, or at any other time when weather conditions are unsuitable without the expressed consent of the Public Works Supervisor.

Paving Course	Thickness (inches)	Air Temperature (Degrees F)	Road Surface Temperature (Degrees F)
Surface	All	50	55
Base	Less than 3	40	45
Base	3 or more	30	35

When the ambient temperature falls below 55°F, precautions shall be taken to compact the mix before it cools below 175°F to obtain the required density. In no case shall successive lifts of asphalt be placed until the previous lift has cooled to 150°F or less.

During placement, excess material raked from the surface shall not be placed back onto the new pavement surface prior to rolling.

1306 MECHANICAL PAVING MACHINES. Mechanical pavers shall be capable of spreading the mix, within the specified tolerances, true to the line, grade, and crown indicated on the contract drawings.

Pavers shall be equipped with quick and efficient steering devices and shall be capable of traveling both forward and in reverse. They shall be equipped with hoppers and distributing screws, which place the mix evenly in front of adjustable screeds. They shall be equipped with a vibrating screed.

The screed shall include any strike-off device operated by cutting, crowding, or other action which is effective on mixes at workable temperatures without tearing, shoving, or gouging them and which produces a finished surface of an even and uniform texture. The screed shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required.

Pavers shall be capable of spreading mixes without segregation or tearing. They shall also be capable of placing courses in varying thicknesses and from widths of eight (8') feet to at least thirteen (13') feet.

1307 COMPACTION REQUIREMENTS. Compacting equipment shall conform to the requirements of the KDOT Standards. Rollers and other compaction devices shall be operated by competent and experienced roller personnel and shall be kept in operation continuously so that all parts of the pavement will receive substantially equal compaction. The Public Works

Supervisor shall order the paver to cease operations at any time proper rolling is not being performed.

After spreading and strike-off and as soon as the temperature and mix conditions permit the compacting to be performed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted.

The selection of the type of roller to be utilized in breakdown rolling may be varied to suit mix characteristics and shall be acceptable to the Public Works Supervisor. The final rolling of the top or surface course shall be accomplished with a steel roller unless otherwise approved by the Public Works Supervisor. In the event a vibratory roller is used for finish rolling, it shall be operated with the vibratory unit in its off position.

During rolling, the roller wheels shall be kept moist with only sufficient water to avoid picking up the material.

The line of rolling shall not be changed suddenly or the direction of rolling reversed suddenly. If rolling causes displacement of the material, the affected areas shall be loosened at once with lutes or shovels and restored to the original grade of the loose material before being re-rolled. Rollers shall not be permitted to stand on the finished surface before it has been compacted and has thoroughly cooled.

In laying a surface mix adjacent to any finished area, it shall be placed sufficiently high so that, when compacted, the finished surface will be true and uniform and match the existing surface.

Any mixture that does not comply in all respects with the requirements set forth herein, shall be removed, replaced with suitable material, and finished, by and at the expense of the Contractor, in accordance with these specifications.

1308 TACK COAT. Tack coat shall be placed on all contact surfaces such as existing or previously placed pavement, curb and/or gutter, manholes, and other structures. Contact surfaces shall be adequately coated so as to ensure a thorough and continuous bond between the existing surface and the new AC mixture.

Prior to the distribution of the tack coat, the Contractor shall remove all debris, trash and loose materials from the surface by means of preapproved enclosed mechanical sweepers with watering systems, hand brooms and/or other approved equipment as required, until it is as free from dust and other foreign materials as is practicable. Extra care will be used to ensure dust control. If dust is found to be in excess as determined

by the Public Works Supervisor, work will be stopped until dust can be controlled.

Tack coat shall be placed on only one lane of the roadway at a time. Place tack coat just enough in advance of paving operations to allow the tack to cure before overlying pavement is placed. No traffic shall be allowed on tacked surfaces.

The tack coat shall be applied to areas to be surfaced at the rate of from 0.05 to 0.15 gallons/square yard at application temperature. It shall be applied by means of approved pressure distributors operated by skilled workmen. The spray nozzles and spray bar shall be so adjusted and frequently checked that uniform distribution is ensured. The distribution shall cease immediately upon any clogging or interference of any nozzle and corrective measures taken before distribution is resumed. Hand sprays shall be used only in tacking small patches or inaccessible areas that have been missed by the distributor.

The tack coat shall be entirely fogged over the surface to be paved and require no sand blot. If, however, it has not been uniformly distributed, sufficient sand shall be spread over the surface to blot up the excess asphalt and prevent it from picking up. Prior to laying an intermediate or surface course, all loose or excess sand shall be swept from the base.

The Contractor shall maintain the tack coat and the surface to be paved intact until it has been covered by the overlying course. Areas that have been damaged shall be repaired and shall receive additional applications of tack coat material in compliance with these specifications. The maintenance and repair of the tack coat shall be at the Contractor's expense.

The Contractor shall be responsible for protecting adjacent streets and other surfaces from tracking of tack material. Protection of surfaces and tack material tracking removal shall be performed at the Contractor’s expense.

1309 DENSITY AND SURFACE REQUIREMENTS. Both density and thickness shall be carefully controlled during construction and shall be in full compliance with plans and specifications. During compaction, 4-inch diameter cores will typically be taken to determine in-place densities and as an aid for verifying thickness. Contractor shall obtain cores by means approved by the Public Works Supervisor. Core locations shall be repaired using epoxy concrete, high-strength non-shrink grout, or other approved product.

Unless otherwise specified, the completed asphaltic concrete pavement shall have a density greater than or equal to ninety-two (92%) percent of Theoretical Maximum Specific Gravity. Upon request by the Public Works Supervisor, representative samples of the compacted asphalt paving shall be obtained by the Contractor under the supervision of the Public Works Supervisor and shall be tested by a suitable independent or municipal testing laboratory as necessary to verify compliance with respective density requirements.

The testing laboratory shall be selected and compensated by the Owner, unless otherwise specified. The Public Works Supervisor will establish the number, timing, location and testing procedures for the representative samples. Copies of each report covering the details and results of the tests shall be provided to the Contractor.

The surface of the final course shall be of a uniform texture, without segregation, and conform to lines and grades shown on the plans. It shall not vary from a ten (10') foot straight edge, applied parallel to the centerline, by more than one-fourth (1/4") inch. Segregation checks, in accordance with KDOT procedures, may be run in areas that appear to be segregated.

Correct all surface irregularities exceeding the specified tolerances using equipment and methods approved by the Public Works Supervisor. Method for correction shall be approved by the Public Works Supervisor and may include:

- Diamond grinding
- Remove and replace the entire pavement thickness
- Mill the surface and replace the specified surface course
- Other methods proposed by the Contractor as approved by the Public Works Supervisor.

When specified densities are not achieved payment for the material will be reduced, or the pavement shall be removed and replaced, as follows:

% GMM	% of Payment
≥ 92	100
90-91.9	98
88-89.9	96
86-87.9	94
< 86	50 OR remove & replace at Contractors option

Reduced payment will apply only to the amount of material represented by each test but no more than 500 tons. If a test indicates a density below the minimum required, additional tests will be performed to better define the

extent of the area subject to reduced payment. No more than one test per 150 tons will be performed.

1310 PROTECTION OF PAVEMENT. The Contractor shall protect all sections of newly compacted base and surface courses from traffic until they have hardened properly, or as directed by the Public Works Supervisor.

1311 ROLLING PROCEDURE. At the option of the Public Works Supervisor, the effectiveness of the rolling procedure will be verified using a nuclear density-moisture measuring device. The Contractor shall revise the rolling procedure as necessary to obtain the specified density.

1312 CLEANUP. Cleanup shall follow the work progressively and final cleanup shall follow immediately behind the finishing. The contractor shall remove from the site of work all equipment, tools, discarded material, and other construction items. The entire right-of-way shall be left in a finished and neat condition. Clean up shall be considered a subsidiary obligation.

SECTION 1400 - CONCRETE PAVEMENT

1401 SCOPE. This section governs the furnishing of all labor, equipment, tools, and materials and the performance of all work necessary to construct concrete pavement.

1402 MATERIALS.

A. Concrete. Concrete for pavement shall be air-entrained as specified in Section 2000 *Concrete* unless otherwise specified or approved by the Public Works Supervisor.

B. Reinforcing. Materials shall be as specified in Section 2000 *Concrete* or as indicated on the plans.

C. Isolation Joint Fillers. Isolation joint fillers shall conform to ASTM D1751.

D. Joint Sealing Compound. Joint sealing compounds shall conform to the following.

Joint Seals and Sealants	AASHTO	ASTM
Hot-poured, Polymeric Asphalt Based	M 301	D 3405
Hot-poured, Elastomeric Type	M 282	D 3406
Preformed Polychloroprene Elastomeric	M 220	D 2628
Lubricant for Installation of Preformed Seal	--	D 2835

E. Curing Membrane. All material to be used or employed in curing concrete must be approved by the Public Works Supervisor prior to its use. It shall be of the liquid membrane type and shall conform to ASTM C1315, Type II, Class A – white pigmented cure.

1403 CONSTRUCTION DETAILS. The Portland cement concrete pavement shall be constructed to the configuration, lines and grades shown on the plans.

A. Grading and Subgrade Preparation. All excavation or embankment required shall be completed in accordance with Sections 1100 *Grading* and 1200 *Subgrade Preparation*.

B. Forms. All forms shall be in good condition, clean, and free from imperfections. Each form shall not vary more than one fourth (1/4) inch in horizontal and vertical alignment for each ten (10) feet in length. Forms may be wood or steel. No aluminum forms shall be allowed.

1. Size. Forms shall have a height equal to or greater than the prescribed edge thickness of the pavement slab unless otherwise approved by the Public Works Supervisor.

2. Strength. Forms shall be of such cross-section and strength, and so secured as to resist the pressure of the concrete when struck off, vibrated, and finished, and the impact and vibration of any equipment, which they may support.

3. Installation. Forms shall be set true to line and grade, supported through their length and, joined neatly in such a manner that the joints are free from movement in any direction.

4. Preparation. Forms shall be cleaned and lubricated with a release agent prior to each use and shall be so designed to permit their removal without damage to the new concrete.

5. Paving Machine. A slip-form paving machine may be used in lieu of forms. The machine shall be capable of placing the concrete pavement to the correct cross-section, thickness, line and grade within the allowable tolerances as approved by the Public Works Supervisor. The machine must be equipped with mechanical internal vibrators of the same type and size, mounted with a maximum spacing of 12 inches centers. Vibrators shall be mounted so that they enter the concrete in a vertical position under the influence of their own weight, with enough flexibility to work themselves around the reinforcing steel.

1404 JOINTS. Generally joints shall be formed at right angles to the true alignment of the pavement, and to the depths and configuration specified by the standard drawings or as modified by the plans and project specifications.

A. Isolation Joints. Isolation joints shall extend from the subgrade to one inch below the surface of the pavement or the material will have a suitable tear strip provided to allow for the application of the joint sealer. Under no circumstances shall any concrete be left across the isolation joint at any point.

1. Location: Isolation joints shall be placed at all locations where shown on the plans and standard details or as directed by the Public Works Supervisor.

2. Material. Isolation joints shall be formed by a one-piece, preformed joint filler cut to the configuration of the correct section. For pavement the filler shall be three fourths (3/4) inch thick.

3. Stability. Isolation joints shall be secured in such a manner that they will not be disturbed during the placement, consolidation and finishing of the concrete.

4. Dowels. If isolation joints are to be equipped with dowels they shall be of the size and type specified, and shall be firmly supported in place by means of a dowel basket which shall remain in place. The basket shall be installed in such a position that the center line of the joint assembly is perpendicular to the center line of the slab and the dowels lie parallel to the slab surface and parallel the center line of the slab. One half of each dowel shall be lightly painted or greased with an approved lubricant.

B. Contraction Joints. Contraction joints shall be of the type and dimensions and at the spacing shown on the plans or standard drawings or as directed by the Public Works Supervisor. Contraction joints shall be sawed to produce a controlled crack in the proper location unless other methods are approved by the Public Works Supervisor.

1. Configuration: The standard contraction joint is a one eighth (1/8) inch wide joint to a depth of one third of the slab thickness plus one fourth inch (D/3 + ¼") unless otherwise indicated or specified.

2. Sawing. Sawed contraction joints shall be cut as soon as the concrete has hardened sufficiently to prevent excessive tearing and raveling regardless of the time or weather. Joints shall be sawed and finished before conditions induce uncontrolled cracks. Material created by sawing shall be removed from the pavement surface before it has had time to dry or set.

3. Spacing: The spacing shall be as shown on the plans or as directed by the Public Works Supervisor.

C. Longitudinal and Construction Joints. Longitudinal joints or construction joints shall be placed as shown on the plans or where the Contractor's construction procedure may require them to be placed.

1. Center Joints. Longitudinal center joints shall be constructed using the methods specified in Section 1404B "Contraction Joints" or as specified for longitudinal construction joints as required.

2. Longitudinal Construction Joints. Longitudinal construction joints (joints between constructions lanes) shall be constructed with tiebars. Joint configuration shall conform to the dimensions shown on the plans or standard drawings.

3. Transverse Construction Joints. Transverse construction joints shall be constructed with tiebars and placed wherever concrete

placement is suspended for such a time that the concrete has begun to take its initial set.

4. Tiebars. Tiebars shall be of deformed steel of the dimensions specified by the plans or standard drawings. Tiebars shall be installed at the specified spacing and be firmly secured so as not to be disturbed by the construction procedure. They shall be free from dirt, oil, paint, grease, loose mill scale, and thick rust, which could impair bond of the steel with the concrete.

5. Sawing and Sealing. All construction joints shall be sawed and sealed.

1405 PLACING, FINISHING, CURING, AND PROTECTION. Concrete shall be furnished in quantities required for immediate use and shall be placed in accordance with the requirements of Section 2000--*Concrete* of these technical specifications and as specified herein.

A. Concrete Placement. Prior to placement of the concrete pavement, all debris and foreign material shall be removed from the inner surfaces of the forms and all forms and subgrade properly moistened. All required reinforcement shall be properly and firmly set into position to preclude movement during placement of the concrete.

The concrete shall be deposited over the entire width of the prepared subgrade between the forms in such a manner to prevent segregation and to require as little re-handling as possible. The pour shall be made to the required depth and width of the construction lane in successive batches and in a continuous operation without the use of intermediate forms or bulkheads. Concrete shall be thoroughly vibrated. Attachments on finishing machines to vibrate the concrete will be permitted provided satisfactory results are attained. Care shall be taken that the vibrator does not penetrate the subgrade or dislodge or move the joints. The vibrating shall be sufficient to produce a smooth pavement. Under no circumstances shall the vibrator be used to move concrete. Honeycomb in the edge may be cause for rejection of the pavement.

When the forward motion of the vibrating screed is stopped, the vibrator shall be shut off; it shall not be allowed to idle on the concrete. Internal mechanical vibration shall be used along all formed surfaces.

No concrete shall be placed around manholes or other structures until they have been brought to the required grade, alignment, and cross slope. All utility appurtenances shall be boxed out or otherwise isolated using isolation joint material as indicated or as directed by the Public

Works Supervisor. Concrete shall not be allowed to extrude below the forms.

B. Concrete Finishing. The pavement shall be finished to the elevations as shown on the drawings by either mechanical or hand-finishing methods.

Misting the concrete by means of a spray nozzle is acceptable. No brushes will be allowed.

1. Floating. All surfaces shall be consolidated and floated after strike-off prior to final surface finish.

2. Final Surface Finish. A burlap drag or a broom finish shall be used as the final finishing method. When a drag is used it shall be at least three (3') feet in width and long enough to cover the entire pavement width. It shall be kept clean and saturated while in use. It shall be laid on the surface of the pavement and dragged in the direction in which the pavement is being laid. When broom finishing, a hard bristle broom shall be used. The broom shall be kept clean and used in such a manner as to provide a uniform textured surface.

   The final surface of the concrete pavement shall have a uniform gritty texture free from excessive harshness and true to the grades and cross section shown on the plans. The Public Works Supervisor may require changes in the final finishing procedure as required to produce the desired final surface texture.

C. Curing. Curing shall conform to the requirements set forth in Section 2000 – *Concrete.*

D. Protection. The Contractor shall, at his own expense, protect the concrete work against damage or defacement of any kind until it has been accepted by the city.

All vehicular traffic, including construction vehicles, shall be prohibited from using the new concrete pavement for a period of seven (7) days unless approved otherwise by the Public Works Supervisor.

When approved for use, high early strength (8-sack) concrete may be opened to vehicular traffic after ninety-six (96) hours. If a Contractor wishes to open the concrete pavement to traffic earlier than ninety-six (96) hours, material test results indicating the concrete has reached a minimum compressive strength of 3000 psi must be provided.

Concrete pavement, which is damaged or defaced, shall be removed and replaced, or repaired, to the satisfaction of the Public Works Supervisor. All costs for replacement or repairs shall be the responsibility of the Contractor.

Pavement that develops uncontrolled or undesirable cracks shall be removed and replaced at the Contractor's expense. If approved by the Public Works Supervisor, the Contractor may be allowed to make repairs to cracked pavement and/or a reduction in payment for the concrete pavement will be negotiated. All damaged sections to be removed shall be sawed a minimum of three (3) feet from a joint or removed to the nearest joint.

E. Temperature Limitation. Concrete work shall proceed in accordance with the requirements established in Section 2000-*Concrete*.

1406 BACKFILL. A minimum of twenty four (24) hours shall elapse before forms are removed and a minimum of five (5) days shall elapse before pavement shall be backfilled unless otherwise approved by the Public Works Supervisor.

1407 JOINT SEALING. All sawed joints shall be sealed with an approved joint sealer applied in accordance with the manufacturer's recommendations. The joints shall be sealed after seven (7) days following placement of the concrete and prior to the opening of the pavement to traffic.

1408 CLEANUP. The Contractor shall be responsible for the removal of excess dirt, rock, broken concrete, concrete splatters and overspray from the area of the construction.

1409 SURFACE TOLERANCES. Concrete pavement shall have a surface tolerance in all directions of one fourth (1/4) inch in ten (10) feet when checked with a ten (10) foot straightedge. Pavement surface must drain when complete. No low areas, which allow water to pond, shall be left on the surface.

When surface tolerances are not met, use one of the following methods for corrections:

- Diamond grinding
- Remove and replace the entire pavement thickness
- Other methods proposed by the Contractor as approved by the Public Works Supervisor.

The corrected areas shall have uniform texture and appearance.

1410 THICKNESS TOLERANCES. It is the intent of these specifications that pavement shall be constructed strictly in accordance with the thickness

shown on the plans. The thickness of the pavement may be measured by coring. If any pavement is found deficient in thickness, it may be compensated for at an adjusted unit price or shall be removed and replaced. In removing pavement, it shall be removed from the outside edge of the curb and gutter (curb and gutter with tiebars may remain if in good condition) to a longitudinal joint and on each side of the deficient measurement until no portion of the exposed cross sections are more than two tenths (2/10) inch deficient.

SECTION 1500- CONCRETE CURB, CURB AND GUTTER, SIDEWALK, AND DRIVEWAY ENTRANCES

1501 SCOPE. This section covers concrete curb, curb and gutter, concrete sidewalk, concrete driveway entrances, and exposed aggregate concrete work, including reinforcing steel, forms, joints, finishing, curing, and other appurtenant work.

1502 GENERAL. All construction covered in this section shall conform to the requirements of Section 2000 *Concrete*. All forms shall be in good condition with not more than one-fourth (1/4") inch variation in horizontal and vertical alignment for each ten (10') feet in length.

1503 MATERIALS.

A. Concrete, Exposed Aggregate Concrete, and Reinforcing Steel: Conform to the requirements of Section 2000 *Concrete.*

B. Isolation Joint Filler: Isolation joints shall be formed with pre-formed isolation joint filler of the non-extruding and resilient type which shall meet the requirements of ASTM D1751 or D1752.

C. Detectable Material for Ramps: The material used to provide contrast shall be an integral part of the walking surface. The material for detectable surface shall consist of either paving bricks or panels. Surface applied retrofit tiles shall not be allowed.

1. Paving Bricks: Nominal size shall be 2 ¼" x 4" x 8" and shall meet the requirements of ASTM C902 for Class SX, Type 1 brick and ASTM C1272.

2. Tiles or Panels: Acceptable products include Detectable Warning System's E-Z-Set Ceramic Composite Detectable Warning Panels, Armor Tile's Cast In Place System, ADA Solution's Composite Paver, CASTinTACT Detectable Warning Panel, or approved equal.

3. Color for all surfaces options shall be 'brick red'. Any color variation to meet contrast requirements must be approved by Public Works Supervisor.

D. Concrete Sealant: Material for sealing exposed aggregate concrete shall be W.R. Meadows' *Decra-Seal* or similar non-yellowing, acrylic-based sealing product.

1504 GRADING AND SUBGRADE PREPARATION. All grading and preparation shall be done in conformance with Sections 1100 *Grading* and 1200 *Subgrade Preparation*.

1505 JOINTS.

A. Isolation joints in concrete sidewalks shall be placed adjacent to existing concrete structures, as indicated in the standard details, or as directed by the Public Works Supervisor. Material shall be one half (½) inch thick and extend for the full depth and width of the walk.

B. Isolation joints in curbs and curb and gutter shall be placed at each end of curves, curb inlets, or other locations as indicated on the plans or as directed by the Public Works Supervisor. Material shall be one half (½) inch thick and extend for the full depth and width of the joint.

C. Contraction joints shall consist of planes of weakness created by sawing the surface of the concrete. Sawed joints shall be constructed by sawing through the surface of the concrete with an approved concrete saw. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to prevent excessive raveling.

D. For sidewalks only, contraction joints may be tooled rather than sawed. The edges of tooled joints shall be rounded with a one fourth (¼) inch radius.

E. Contraction joints in curb/curb and gutter shall be placed at maximum intervals of 10 feet except as specified for curb and gutter with concrete pavement. Transverse joints in sidewalk shall be spaced at a distance equal to the width of the sidewalk.

F. Contraction joints in separate curb and gutter shall be located to coincide with contraction joints in concrete pavement. They shall extend through the entire curb section from the top of curb to a depth of two (2) inches below pavement surface. Contraction joints shall be sawed.

1506 CONCRETE CURB. Concrete curb will be constructed as shown on the plans unless otherwise approved by the Public Works Supervisor. Curb may be either integral with or separate from concrete pavement. Concrete in curbs and gutter shall be vibrated. If curbs are hand-poured, a strap shall be used for shaping. All excess material below, in front of, or behind forms shall be removed before the concrete hardens.

A. Integral curb Integral curb shall be constructed during or immediately following the finishing operation unless otherwise shown on the plans.

Special care shall be taken so that the curb construction does not lag behind the pavement construction and form a "cold joint."

Curb forms or integral slipforming shall be required to form the backs of all curbs except where impractical because of small radii street returns or other special sections or as otherwise approved by the Public Works Supervisor.

In placing curb concrete, sufficient spading shall be done to secure adequate bond with the paving slab and eliminate all voids in the curb.

Curbs shall be formed to the cross section as shown on the drawings with a mule or templates supported on the side forms and with a float not less than four (4) feet in length.

The finished surface of the curb and gutter shall be checked by the use of a ten (10) foot straightedge and corrected if necessary. Where grades are less than one percent (1%) and while the concrete is still plastic, the drainage of the gutter should be checked with a four (4) foot level to ensure positive drainage is provided.

B. Separate Curb and Gutter with Tiebars for Concrete Pavement. Separate curb and gutter may be poured prior to the remaining pavement. Tiebars one half (½) inch in diameter and eighteen (18) inches long shall be cast in the curb and gutter at thirty (30) inch centers as shown on the standard details. Tiebars may be placed in drilled holes after the curb is placed as long as the required embedment length can be obtained and the bars are epoxied in place.

C. Separate Curb and Gutter for Asphaltic Pavements. Contraction joints shall be spaced no more than 10 feet apart and shall extend through the entire curb section from the top of curb to a depth of two (2) inches below pavement surface. Contraction joints shall be sawed.

1507 FINISHING. Misting of concrete is allowed by spray nozzle only. Brushes are prohibited. Brooms for finishing concrete surfaces shall be periodically cleaned during finishing operations to remove excess concrete materials.

A. Curb and Curb and Gutter. In all cases the resulting surface shall be smooth and of uniform color with all rough spots, projections, and form stakes removed. No plastering of the concrete will be allowed on exposed surfaces. The finished curb shall have a true surface, free from sags, twists, or warps, and shall have a uniform appearance, and shall be true to the specified lines, grades, and configurations shown on the drawings. Curbs and gutter shall be broom finished with brush strokes parallel to the back of curb.

B. Sidewalk and Driveway Entrances. After the concrete has been thoroughly consolidated and leveled, and the initial set has taken place, the surface shall be finished with a float and then broom finished with no other mortar than that contained in the placed concrete. The resulting surface shall be uniform in color and contain no imperfections. The edges shall be tooled with a one fourth (¼) inch radius. Special care shall be taken to ensure a straight, neat appearance along the edges of the sidewalk or driveway entrance and at the joints.

C. Surface Tolerances. Finished sidewalks, drives, and multi-use paths shall have a surface tolerance of one-fourth (1/4) inch in 10 feet when checked with a 10-ft straightedge. Vertical deflections at sidewalk joints shall not exceed one-fourth (1/4) inch. All surfaces must drain and no low spots, which allow water to pond, shall be left in the finished surface.

When surface tolerances are not met, use one of the following methods for corrections:

- Grinding
- Remove and replace the entire section as directed by the Eningeer
- Other methods proposed by the Contractor as approved by the Public Works Supervisor.

The corrected areas shall have uniform texture and appearance.

1508 REINFORCEMENT. Reinforcement shall be as shown on the contract drawings and/or standard details for the project.

1509 DETECTABLE WARNINGS IN SIDEWALK OR RAMPS. Detectable warnings shall extend across the full width of the walking surface of the sidewalk or ramp, and shall be 2 feet long in the direction of pedestrian travel. Detectable warning materials shall be installed in accordance with manufacturer's recommendations.

1510 EXPOSED AGGREGATE CONCRETE. Place as specified in Section 2000 *Concrete* and as follows:

After the mixture has been properly struck off, to the line and grade as shown on the plans or as directed by the Public Works Supervisor, the surface shall be lightly finished as not to force the coarse aggregate too deep into the mix. As soon as the bleed water has dissipated apply a uniform coating of an approved surface retarder at the rate specified by the manufacturer. Once sufficient cure has been attained on the concrete the Contractor shall pressure wash and or broom surface exposing the coarse aggregate to the desired affect.

Once concrete surface has sufficiently dried so that surface water has completely disappeared, an approved clear sealant shall be applied in accordance with the manufacturer's recommendations. Sealant shall be applied by rolling or by an approved sprayer and nozzle.

When the concrete has hardened enough so that excess raveling or spalling will not occur, and before random cracking occurs, the Contractor shall saw one-eighth (1/8) to one-fourth (1/4) inch wide relief joints to a depth equal to one-third the pavement thickness plus one-fourth inch (D/3 + ¼"). Joints shall be located as shown on the plans or as directed by the Public Works Supervisor. For raised islands care should be taken to joint the exposed aggregate concrete to match the curb and gutter joints. Joints shall be sealed with a gray or beige silicone or polyurethane caulk approved by the Public Works Supervisor.

1511 PROTECTION. The Contractor shall, at his own expense, protect the concrete work against damage or defacement of any kind until it has been accepted by the city.

All vehicular traffic, including construction vehicles, shall be prohibited from using new concrete pavement for a period of seven (7) days unless approved otherwise by the Public Works Supervisor.

Concrete work, which is not acceptable to the Public Works Supervisor because of damage or defacement, shall be removed and replaced, or repaired to the satisfaction of the Public Works Supervisor. Sections of cracked curb and gutter, sidewalk or driveways shall be replaced joint-to-joint. Cracks identified during inspection at the end of the warranty period may be sawed and sealed if approved by the Public Works Supervisor.

SECTION 1600 - PAVEMENT MARKING

1601 SCOPE. This section covers the work necessary to furnish and install permanent or temporary pavement marking materials.

1602 GENERAL. The permanent pavement markings shall be installed immediately after the roadway surface is complete. The installation of the yellow markings (as required) is the first priority.

Contractor's personnel must be completely knowledgeable of all application requirements and procedures prior to product application. It is the responsibility of the Contractor to contact the supplier of the cold plastic material if questions regarding application procedures or conditions arise.

1603 GENERAL INSTALLATION AND REMOVAL. The proposed permanent markings shall be laid out by the Contractor in advance of the marking installation. Markings shall not be applied until the layout and conditions of the surface have been approved by the Public Works Supervisor. If a paint line is used for layout purposes, in lieu of a chalk line or string line, the paint line shall not be wider than ½ inch in width. If wider, the paint shall be removed following the application of the final permanent marking. New markings shall match existing markings as applicable in areas abutting existing road surfaces. The surface shall be dry. All dust, debris, oil, grease, dirt, temporary markings and other foreign matter shall be removed from the road surface prior to the application of the permanent marking material.

The Contractor shall be responsible for keeping traffic off freshly applied markings until they have set sufficiently to bear traffic. Traffic control is the responsibility of the contractor and shall conform to the Manual on Uniform Traffic Control Devices (MUTCD). Failure to comply with traffic control guidelines will result in the Pavement Marking Contractor being directed to stop operations and leave the site until proper and approved traffic control has arrived and put in place on site.

Removal: Temporary pavement markings on milled surfaces scheduled to be overlaid do not have to be removed prior to performing the overlay. Permanent pavement markings installed on new asphalt surfaces shall be removed without structurally damaging the pavement or scarring the surface. The method of pavement marking tape removal shall be by high-pressure water blast, low-pressure water and sand blast, steel shot blast, or burning. Grinding or black paint covering shall not be allowed on new pavement surfaces.

1604 PREFORMED THERMOPLASTIC PAVEMENT MARKING

A. Materials: This specification is for the furnishing of retroreflective preformed thermoplastic pavement marking materials that can be adhered to asphalt pavements by means of heat fusion. The applied markings shall be very durable, oil and grease impervious and provide immediate and continuing retroreflectivity.

1. Characteristics
The preformed marking material shall consist of a resilient white and yellow polymer thermoplastic with uniformly distributed glass beads throughout its entire cross section.

Preformed words and symbols shall conform to the applicable shapes and sizes as prescribed in the latest revision of the MUTCD.

The preformed markings shall be fusible to asphalt pavements by means of the normal heat of a propane type of torch. Adhesives, primers or sealers shall not be used prior to the preformed marking application on asphalt pavements.

The preformed markings shall conform to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics and be capable of fusing to itself and previously applied worn hydrocarbon and/or alkyd thermoplastic pavement markings.

The preformed markings shall be capable of application on new, dense and open graded asphalt wearing courses during the paving operation in accordance with the manufacturer's instructions. After application, the markings shall be immediately ready for traffic. The preformed markings shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

The preformed thermoplastic markings shall not be brittle and must be sufficiently cohesive and flexible at temperatures exceeding 50 degrees F for one person to carry without the danger of fracturing the material prior to application.

2. Composition: The retro-reflective pliant polymer thermoplastic pavement markings shall consist of a homogeneous mixture of high quality polymeric thermoplastic binders, pigments, fillers, and glass beads. The thermoplastic material must conform to AASHTO designation M 249 with the exception of the relevant differences due to the material being supplied in a preformed state.

3. Glass Beads: The markings shall contain thirty (30%) percent glass spheres, which shall conform to AASHTO M 247 Type 1, except that glass spheres shall have a minimum of seventy (70%) percent true spheres on each sieve and eighty (80%) percent true spheres overall. The glass beads must be homogeneously blended throughout the material with a securely bonded protruding exposed layer of beads that provide immediate and continuous retro-reflectivity. Curved arrows must be available without protruding glass beads if reversibility is needed.

4. Retro-reflectivity: The preformed marking shall upon application exhibit uniform adequate nighttime retro-reflectivity. At 86 degree thirty (30') feet incidence angle and 1 degree thirty (30') feet divergence angle, the markings shall have average minimum intensities of 350 millicandelas for white and 175 mill candelas for yellow as measured with a Mirolux retroreflectometer. Using a Taber Abraser with an H–18 wheel and a 4.4 ounce (125 g) load, the sample shall be inspected at 200 cycles, under a microscope, to observe the extent and type of bead failure. No more that fifteen (15%) percent of the beads shall be lost due to popout and the predominant mode of failure shall be "wear down" of the beads.

5. Color Characteristics: The thermoplastic material without glass beads shall meet the following:

   White: Daylight reflectance at 45-degree/0 degree of 80% minimum
   Yellow: Daylight reflectance at 45-degree/0 degree of 45% minimum

   The daylight reflectance shall not change significantly when the preformed thermoplastic is properly applied to the roadway surface.

   For highway use, the white markings shall contain a minimum of 8% by weight of titanium dioxide pigment to ensure a color similar to Federal Highway White, color No. 17886 Standard 595. Yellow color shall reasonably match color chip Number 13538 of Federal Standard number 595 and be lead free.

6. Skid Resistance: The surface of the preformed thermoplastic markings shall provide a minimum skid resistance value of 45 BPN when tested according to ASTM E303.

7. Thickness: The width of the supplied material shall have a minimum average thickness of 90 mils.

8. Flexibility**:** The preformed thermoplastic marking material shall have flexibility at 50 degrees F such that no cracking occurs in the test sample when a one (1") inch by six (6") inches sample is bent through an arc of 90 degrees at a uniform rate in 10 seconds (9 seconds per degree) over a one inch mandrel. The sample must be conditioned prior to testing at 50 + 2 degrees F for a minimum of four (4) hours. At least two specimens tested must meet the flexibility requirements at 50 degrees F for a passing result.

9. Environmental Resistance**:** The applied markings shall be resistant to deterioration due to exposure to sunlight, water, oil, diesel fuels, gasoline, pavement oil content, salt and adverse weather conditions.

10. Effective Performance Life**:** When properly applied, in accordance with the manufacturer's instructions, the pavement markings shall be neat and durable. The markings shall remain retroreflective and show no fading, lifting, shrinkage, tearing, roll back or other signs of poor adhesion.

B. Installation: The markings shall be applied in accordance with the manufacturer's recommendations on clean and dry surfaces.

1. Asphalt: The materials shall be applied using the propane torch method recommended by the manufacturer.

   a. At temperatures below 50 degrees F, the preformed thermoplastic pavement markings shall be kept as warm as possible to maintain flexibility.

   b. Remove pavement surface moisture by holding a propane torch approximately six (6") inches above the section of asphalt using a continuous circular motion.

   c. Heat the pavement with the torch upon placing the material to a temperature of 200 degrees F for 90 mil,and up to 300 degrees F for 125 mil materials.

   d. Immediately after the road surface has been properly preheated, position the material with exposed bead side up and heat.

   e. Position the torch approximately 12 inches over the marking so the flame is extended and heat is evenly applied moving the torch in a circular motion across the marking. When the correct temperature of the marking has been reached, it will turn slightly

darker or pale yellow if the material is white. Over heated or burned material shall be removed.

f. After the entire material section has been heated and bonded to the pavement, re–heat the perimeter of the marking and the road surface to bond the edges.
g. If installing reversible arrows, which do not contain a top coating of glass beads, the glass spheres shall be hand applied on the molten material.

h. Feather the leading edge of the pavement marking with a putty knife or bevel with the torch. Leading edges are any edge that would be susceptible to snow plow blades approaching from the direction of normal travel.

2. Concrete: Entirely remove curing compound from new concrete surfaces prior to applying marking material using a method approved by the Public Works Supervisor. The same application procedure shall be used as described for asphalt pavements. However, a compatible primer sealer may be applied before application to assure proper adhesion

1605 COLD PLASTIC PAVEMENT MARKINGS

A. Materials: This specification covers a white and yellow pre–formed cold plastic reflectorized pavement marking material of a type that is applied to a road surface by an inlaid, pre–coated pressure sensitive adhesive that produces an adherent reflectorized stripe of specified thickness and width and is capable of resisting deformation.

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1. Characteristics: The material shall be manufactured without the use of lead-chromate pigments or other similar lead-containing chemicals.

Glass beads shall be incorporated to provide immediate and continuing retroreflection. Ceramic skid particles shall be bonded to the top layer to provide a skid-resistant surface.

Preformed word and symbol markings shall conform to the applicable shapes and sizes as outlined in the Manual on Uniform Traffic Control Devices.

The preformed markings shall be capable of being adhered to pavements by an inlaid, pre–coated pressure sensitive adhesive. A surface preparation adhesive may be used to precondition the inlay pavement surface.

The preformed marking film shall mold itself to pavement contours by the action of traffic. Following proper inlay application and tamping, the markings shall be immediately ready for traffic.

2. Composition: The retroreflective pavement marking film shall consist of a mixture of high–quality polymeric materials, pigments and glass beads distributed throughout its base cross–sectional area. A reflective layer of glass beads and a layer of skid–resistant ceramic particles shall be bonded to the top urethane-wearing surface. The urethane wear surface shall have a nominal thickness of five one thousands of (0.005") inches. The film shall have a pre–coated, shear–resistant, pressure sensitive adhesive.

3. Color: The daytime color the white film shall provide a minimum initial luminance factor, Y, of 80 and shall conform to the following chromaticity requirements. The daytime color of the yellow film shall provide an initial luminance factor, Y, in a range of 36 to 59 and shall conform to the following chromaticity requirements.

White		Yellow	
X Values	Y Values	X Values	Y Values
0.290	0.315	0.474	0.455
0.310	0.295	0.491	0.435
0.330	0.360	0.512	0.486
0.350	0.340	0.536	0.463

Measurements shall be made in accordance with ASTM #1349, using illuminant "C" and 0/45 (45/0) geometry. Calculations shall be in accordance with ASTM E308 for the 2-degree observer.

4. Reflectance: The white and yellow films shall have the following initial minimum reflectance values as measured in accordance with the testing procedures of ASTM D4061. The photometric quantity to be measured shall be coefficient of retroreflected luminance (R_L) and shall be expressed as millicandelas per square foot per foot-candle (mcd-ft^{-2}-fc^{-1}).

	White			Yellow		
Entrance Angle	86.0°	86.0°	86.5°	86.0°	86.0°	86.5°
Observation Angle	0.2°	0.5°	1.0°	0.2°	0.5°	1.0°
Retroreflected Luminance, R_L	700	500	400	410	250	175

5. Skid Resistance: The surface of the retroreflective films shall provide an initial minimum skid resistance value of 55 BPN as measured by the British Portable Skid Tester in accordance with ASTM E303.

   The surface of the retreoreflective film shall retain an average skid resistance value of 45 BPN when tested in accordance with ASTM E303, for a period of one year when installed in non-snow removal areas. The 45 BPN minimum value shall be an average of several readings taken in both the wheel track and the non-wheel track areas.

6. Tensile Strength and Elongation: The film shall have a minimum tensile strength of 150 lbs. per square inch of cross-section when measured in the direction of the length of the roll and tested in accordance to ASTM D638, except that a sample 6 inch x 1 inch shall be tested at a temperature between 70 degrees F and 80 degrees F using a jaw speed of 10 to 12 inches per minute. The sample shall have a maximum elongation of 50% at break when tested by this method.

7. Reflectivity Retention: The glass beads must be strongly bonded and not be easily removed by traffic wear. Using a Taber Abraser with an H-18 wheel and a 4.4 ounce load, the sample shall be inspected at 200 cycles, under a microscope, to observe the extent and type of bead failure. No more than 15% of the beads shall be lost due to popout and the predominant mode of failure shall be "wear down" of the beads.

8. Glass Beads: The size, quality and refractive index of the glass beads shall be such that the performance requirements for the markings shall be met. The bead adhesion shall be such that beads are not easily removed when the material surface is scratched.

   The film shall have glass bead retention qualities such that when a 2-inch x 6-inch sample is bent over a ½-inch diameter mandrel, with a 2-inch dimension perpendicular to the mandrel axis, microscopic examination of the area on the mandrel shall show no more than 10% of the beads with entrapment by the binder of less than 40%.

9. Thickness**:** The film, without adhesive, shall have a minimum thickness of 60 mils.

B. Installation: The Contractor shall furnish and install white and yellow permanent retro-reflectorized cold preformed plastic pavement marking

material at the location shown on the plans, in conformance with the details and material specifications included herein.

The cold plastic markings shall consist of a homogeneous, extruded, prefabricated material of specified thickness and width which shall contain reflective glass spheres uniformly distributed through–out the cross–section, and shall be applied to pavement surfaces by means of an approved inlaid process with pre–coated adhesive and pressure.

1. Procedure**:** Apply the tape according to manufacturer's instruction in conjunction with an approved method. Cold plastic pavement markings shall be installed as soon as practical.

2. Road conditions**:** Clean the surface of the road using a broom and/or high–pressure air blower. If either of these methods fails to clean the road surface, then high–pressure water wash shall be used. Road surface must be dry and all dust, dirt, debris, oil, grease and foreign material removed before applying tape.

3. Application Conditions: Road surfaces must be clean and dry, and temperatures must be above the minimum required for application of all tapes. If rainfall occurs within 24 hours prior to application, a surface moisture test (plastic wrap or roofing paper method as approved by the inspector) may be performed and approval obtained from the inspector.

    a. Air temperature 60 degrees F and rising.
    b. Surface temperature 70 degrees and rising.
    c. Overnight air temperature 40 degrees F (minimum) the night before tape application.
    d. Butt splices must be used. Do not overlap tape ends.

4. Tape Application:
    a. Cold plastic shall be inlaid into hot asphalt and rolled in to asphalt surfaces.
    b. Groove the pavement surface on concrete pavements prior to installation. Grooving shall be performed using a cutting head with diamond-tipped cutting blades. The groove width shall be equal to the tape width plus a maximum of two (2) inches. The depth of the groove shall be the tape thickness plus 10 mils. The bottom of the groove should have a smooth, flat surface. If a coarse tooth pattern is present, increase the number of blades and decrease the thickness of the spacers between the blades on the cutting head. Water-cool the blades as necessary on long lines. If water–cooling is used, flush the groove immediately after grooving to clean the surface.

c. If there is a crack in the pavement, or if the tape is to be applied over a bridge expansion joint, manhole or utility box, lay the tape over the crack, joint or fitting, then cut the tape 1 inch away from the crack or joint on each side.
d. Apply the required surface preparation adhesive and allow to dry completely, but not over 30 minutes, before tape is applied.
e. Traffic must be kept off of pavement surfaces coated with a surface preparation adhesive prior to tape application. Follow manufacturer's instructions regarding the use of surface preparation adhesive.

5. Tamping: Tamp the tape thoroughly with a tamping cart with a minimum 200 pound load, three times back and forth (six passes) over each part of the tape. Start in the center of the marking and work out to the edges removing any trapped air. Do not twist or turn the tamper on the tape. Make sure all edges are firmly adhered.

1606 TEMPORARY TAPE

A. Materials: This material shall be a pavement striping tape designed to provide reflective delineation under both dry and moderate rainfall conditions. It shall be white or yellow, and either Type I – Regular or Type II – Removable, as indicated on the drawings or specified in the Special Provisions.

The tape shall consist of glass spheres tightly embedded to a binder on a conformable backing precoated with a pressure sensitive adhesive. The striping material shall be thin, flexible, formable and following application shall remain conformed to the texture of the pavement surface. The tape shall be furnished in the color and type designated on the Plans or in the contract. The markings shall be capable of being adhered to asphalt concrete or Portland cement concrete in accordance with manufacturer's instructions without the use of heat, solvents or other additional adhesive means, and shall be immediately ready for traffic after application. The adhesive shall not require a liner or release paper. The striping material shall have a uniform appearance, free from cracks and the edges shall be true, straight and unbroken. The material shall be weather resistant and show no appreciable fading, lifting or shrinkage when applied in accordance with the manufacturer's recommendations.

1. Color and Daylight Reflectance: The daylight reflectance (ASTM E1347) of white shall be not less than 70%. The color of yellow shall be within the red and green tolerance limits of the Highway Yellow Color Tolerance Chart issued by the U.S. Department of Transportation.

2. Dimensions: The width and length shall be as shown on the Plans or in the contract. The material shall be available in rolls and there shall be no more than three splices per 50 yards of length.

3. Packaging: The material shall be packaged in accordance with accepted commercial standards and, when stored under normal conditions, shall be suitable for use for a period of at least one year after purchase.

4. Adhesion: The material shall adhere to asphalt and concrete surfaces when applied according to manufacturer's recommendations at surface temperatures above 50 degrees F and shall be immediately ready for traffic following application.

5. Removability: Type II tape shall be removable from asphalt and Portland cement concrete intact or in large pieces, either manually or with a roll-up devise, at temperatures above 40 degrees F without use of heat, solvent, grinding or blasting.

6. Reflection: The white and yellow material shall be retroreflective, reflecting white or yellow respectively and shall be readily visible at night when viewed with automobile headlamps using high beams from a distance of at least 300 feet.

7. Durability: Type II material shall maintain adhesion, show no alligatoring, show no signs of pulling apart, and shall suffer no more than a 25% loss of beads, sand and grit when subjected to 30,000 revolutions on a small-wheel circular track as described in ASTM E660, with the following variations or exception:

    a. Two opposite wheels mounted with Goodyear 3.40-5 NHS Industrial Rib tires shall be used with a total load of 51.5 lbs. on each tire. Tire air pressure shall be maintained at 25 lbs. The wheels shall be mounted perpendicular to the specimens and toed out 2° to produce a slight abrading action.

    b. Specimens shall be applied to 6-inch diameter dense-graded bituminous concrete surface which has been compacted at 3000 psi for two minutes. After application, the specimens shall be allowed to cure at least 16 hours before beginning the test.

B. Installation: Temporary pavement markings shall be installed the same day that the existing pavement markings are damaged, removed or covered up prior to lane opening. Temporary pavement markings shall be installed using the same cycle length as the permanent markings

and be at least 2 feet long. Double yellow marking shall be used for temporary centerline and single white markings shall be used for temporary lane lines on four lane roadways. Single yellow markings shall be used for temporary centerline on two lane roadways as directed by the Public Works Supervisor. Contractor shall maintain temporary markings in good condition until overlying pavement or permanent markings are installed, or project completion if required.

SECTION 1800- PAVEMENT MAINTENANCE

1801 CRACK REPAIR

A. Materials.

1. Material for sealing cracks up to one inch in width shall be Deery Super Stretch Hot applied DF sealant or Crafco, Inc. Superflex.

2. Material for filling cracks greater than one inch and up to two inches in width shall be Crafco PolyPatch Fine Mix – Type 2.

3. For cracks greater than two inches in width material shall be Crafco PolyPatch Type 2.

4. Glensoil 20 Plus or Crafco DETACK shall be used to remove surface tackiness of the sealant.

5. Alternative materials may be acceptable if submitted prior to the bid and approved by the Public Works Supervisor.

B. Installation.

1. All cracks up to one inch in width are to be sealed including transverse, longitudinal, block, reflective cracks and the longitudinal joints/crack between the edge of pavement and toe of the gutter. Wider cracks shall be filled if specified in the Project Special Provisions or indicated on the plans. Where alligator cracking is found, the Public Works Supervisor will determine if sealing is to be completed.

2. Cracks shall be cleaned to a minimum depth of 2 inches with an air compressor followed by the use of a hot air lance or other approved equipment immediately ahead of the sealant placement. Contractor shall control dust from cleaning and remove blown debris from adjacent properties.

3. Sealant shall be placed in the clean, dry crack using the methods and equipment recommended by the sealant manufacturer. The crack shall be slightly overfilled and immediately squeegeed to provide a band-aid type effect approximately two (2) inches wide, flush with the pavement surface, and with the edges feathered out.

4. Hot asphalt sealer shall be continuously, mechanically agitated during heating so that localized heating does not occur. Crack sealer shall not be placed when the air temperature in the shade is

less than forty (40) degrees F. No sealant shall be installed when the air temperature exceeds 90 degrees F.

5. Apply a de-tack product on freshly installed sealant in accordance with manufacturer's instructions to prevent tracking of material by traffic.

6. Contractor shall cleanup all excess material from the pavement or other adjacent surfaces.

1802 PAVEMENT PATCHING

A. General: Areas where base failure of the roadway has occurred, or where the surface is broken out, shall be repaired prior to surfacing operations. The failed sections will be marked by the Public Works Supervisor.

B. Materials.
1. Hot-mix asphaltic patching material shall conform to the requirements of Section 1300 – *Asphaltic Concrete Pavement*.

2. Concrete patch mixes shall conform to the requirements of Section 2000 – *Concrete.*

C. Removal.
1. For surface and full-depth patches, the failed material shall be removed by sawing and/or milling a neat rectangular section into the pavement creating clean vertical sidewalls.

2. Over-excavate areas where unsuitable subgrade material is encountered then backfill and compact to bottom of pavement with approved material.

3. Do not remove more area than can be fully patched or plated and reopened to traffic by the end of the work day. Do not leave excavated areas in roadways that are open to traffic unless approved by the Public Works Supervisor.

4. All failed asphalt material shall be removed without damage to the adjacent pavement. When existing pavement designated to remain is damaged during the patching process, the pavement shall be repaired by the Contractor at Contractor's expense.

D. Repair: Patching shall conform to standard city details and as follows.

1. Prior to placing patch material, all loose material and debris shall be removed.

2. For asphalt patching, all surfaces shall be properly tacked.

3. Asphaltic material shall be placed in layers not to exceed 3 inches and thoroughly compacted before the next layer is placed.

4. The vertical sidewalls of the patch shall be well bonded with the existing pavement and the surface shall be level with the existing pavement.

5. When approved for use, high early strength (8-sack) concrete patches may be opened to vehicular traffic after ninety-six (96) hours. If a Contractor wishes to open concrete patched areas to traffic earlier than ninety-six (96) hours, material test results indicating the concrete has reached a minimum compressive strength of 3000 psi must be provided. Small areas may also be temporarily plated with the approval of the Public Works Supervisor.

1803 CHIP AND SEAL

A. General. Single asphalt surface treatment (chip and seal) shall be completed in accordance with KDOT Standards Section 609.

B. Materials. Cutback asphalt shall be RC-800 conforming to requirements of KDOT Section 1204. Cover material shall be type CM-K conforming to requirements of KDOT Section 1108.

C. Procedures. Conform to requirements of KDOT Standards. The Contractor shall include in the unit price the cost of cleaning or sweeping all streets to be sealed.

1804 MICRO-SURFACING AND SLURRY SEAL

A. General. The work shall consist of the application of micro-surfacing or slurry seal on existing paved surfaces. Each process shall consist of spreading a properly proportioned mixture of emulsified asphalt, mineral aggregate and water on a prepared surface in accordance with this specification and as directed by the Public Works Supervisor. Micro-surfacing shall be a polymer modified asphalt emulsion.

1. Phasing Plan. A minimum of two weeks prior to beginning surfacing work, Contractor shall submit a phasing plan identifying specific lane closures and sequencing of streets and subdivisions. No work

shall be performed until the phasing plan has been reviewed and accepted by the Public Works Supervisor. Work shall not begin before 8:00 a.m. and must be completed and streets open to traffic by 6:00 p.m. Changes to the phasing plan must be requested in writing a minimum of three (3) business days in advance of implementation.

2. Property Owner Notification. Contractor shall supply and place door tags on doors of all residences and/or businesses affected by micro-surfacing operations 48 hours prior to beginning work. Submit a sample door tag for approval at the pre-construction conference.

3. Maintenance of Traffic. All streets shall have one thru-lane open to traffic at all times. Cul-de-sacs may be completely closed until the material has cured adequately to allow traffic. The Contractor shall provide adequate advance signing, barricades, and/or flaggers to control traffic around and through the construction area. Directions for allowable travel paths shall be clearly indicated. Adequate trained personnel shall be available on-site to oversee traffic control. Any damage done by traffic to the surfacing shall be repaired by the Contractor at the Contractor's expense.

B. Materials.

1. Emulsified Asphalt.
   a. For micro-surfacing, the emulsified asphalt shall be a quick polymer modified cationic type CSS-1H emulsion and shall conform to the requirements specified in ASTM D2397. The cement mixing test shall be waived for this emulsion. The polymer materials shall be milled or blended into the asphalt or emulsifier solution prior to the emulsification process.

      The emulsified asphalt shall have not less than 62% residue after distillation when tested in accordance with ASTM D244 at a temperature below 280º F. Emulsified asphalt shall have a penetration of between 40 and 90 when tested in accordance with ASTM D2397 at 77º F and shall have a minimum softening point of 135º F when tested in accordance with ASTM D36. Contractor shall submit to Public Works Supervisor a certificate of analysis/compliance matching the material used in the mix design for each load of emulsified asphalt delivered to the project.

b. For slurry seal, emulsified asphalt shall be either Grade SS-1h conforming to ASTM D977, or CSS-1h conforming to ASTM D2397.

2. Aggregate. The aggregate shall be natural or manufactured crushed granite, slag or chat which is a by-product from the milling of lead and zinc ores and shall conform to one of the following gradations for the specific surfacing method. The percent passing shall not go from the high end to the low end of the range for any two consecutive screens. Unless otherwise specified in the Project Special Provisions, aggregate shall be Type II for micro-surfacing and Type I for slurry seal.

	Amount Passing Sieves, % by Weight		
Sieve Size	Type I – For Slurry Seal	Type II – For Microsurfacing	Tolerance
3/8 inch	100	100	
No. 4	100	90-100	±5%
No. 8	90-100	65-90	±5%
No. 16	65-90	45-70	±5%
No. 30	40-65	30-50	±5%
No. 50	25-42	18-30	±4%
No. 100	15-30	10-21	±3%
No. 200	10-20	5-15	±2%

a. Aggregate quality shall meet the following requirements.

Quality	Required	Test No.
Sand Equivalent	65 min.	ASTM D2419
Soundness	15% max. w/NA_2SO_4 or 15% max. w/ $MgSO_4$	ASTM C88
Abrasion Resistance	30% max.	ASTM C131

b. Public Works Supervisor may obtain samples for gradation testing from aggregate stockpiles designated by the Contractor for use. Samples for asphalt content may be taken from the completed mix. The frequency of sampling and testing will be established by the Public Works Supervisor. Precautions shall be taken to insure that stockpiles do not become contaminated. The mineral aggregate shall be screened to remove any over-sized aggregate or foreign material at the Contractor's stockpile.

3. Mineral Filler. Mineral filler shall be any recognized brand of non-air/entrained Portland cement that is free from lumps and accepted upon visual inspection.

4. Water. Water shall be potable and shall be free from harmful soluble salts or contaminants.

5. Latex or Polymer Modifier. For micro-surfacing, natural rubber or polymer, certified from an approved source, shall be milled or blended into the asphalt or emulsifier solution prior to the emulsification process.

6. Other Additives. Additives may be added to the emulsion mixture or any of the component materials for micro-surfacing to provide the specified properties. Additives must be included as part of the mix design and be compatible with the other components of the mix.

C. Mix Design. The Public Works Supervisor shall approve the mix design and all materials prior to use. The component materials shall be within the following limits. The mix design shall be made with the same materials the Contractor will be using on the project.

1. Micro-surfacing

Mineral Aggregate	10.0-20.0 lbs. per sq. yd. minimum weight of dry aggregate
Residual Asphalt	5.5% to 10.5% by dry weight of aggregate
Mineral Filler	0.0 to 3.0% by dry weight of aggregate
Latex or Polymer Based Modifier	Minimum of 3.0% solids based on asphalt weight
Water	As required to provide proper consistency
Additives	As needed

2. Slurry Seal

Mineral Aggregate	8.0 - 12.0 lbs. per sq. yd. minimum weight of dry aggregate
Residual Asphalt	10.0% to 16.0% by weight of dry aggregate
Mineral Filler	1.5% to 3.0% by weight of dry aggregate
Water	As required to provide proper consistency

D. Construction.

1. Weather Limitations. The material shall be spread only when either the ambient air temperature or the pavement temperature is at least fifty (50°) degrees F and rising, the weather is not foggy or rainy, and there is no forecast of temperatures below thirty-two (32°) degrees F within twenty four (24) hours from the time of placement of the mixture.

2. Surface Preparation. The area to be sealed shall be thoroughly cleaned of all debris, trash, vegetation, loose aggregate and soil. Sweep pavement just prior to surfacing. Water used in pre-wetting the surface shall be applied at a rate to dampen the entire surface without any free flowing water ahead of the spreader box.

3. Equipment.
Each mixing unit used on the project shall be calibrated prior to construction. Contractor shall submit calibration documentation indicating individual calibration for each material at various settings, which can be related to the machine metering devices. No mixing machine will be allowed on the project until a calibration has been completed. Final calibration sheets shall be submitted to the Public Works Supervisor.

Individual volume or weight controls for proportioning each material to be added to the mix shall be provided and properly marked.

Appropriate hand tools, which will provide the required results, shall be used to spread the mixture where machine spreading is not possible.

Power brooms, pickup sweepers, power blowers, air compressors and hand brooms may be used to provide a clean surface; however, care must be taken with power equipment to minimize dust and minimize debris blown onto adjacent properties. All debris from cleaning the surface must be removed from the project site.

a. Micro-surfacing. The mixing machine shall be specifically designed and manufactured to lay micro-surfacing. The machine shall be a self-propelled, continuous flow mixing unit able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, additives and water to a revolving multi-blade double shafted mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified

asphalt, mineral filler, additives and water to maintain adequate supply to the proportioning controls.

Spreading equipment shall include a surfacing box with twin-shafted paddles or spiral augers fixed in the spreading box. A flexible front seal shall be provided to insure no loss of mixture at the road surface contact point. The rear flexible seal shall act as a final strike-off and shall be adjustable in width. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved to produce a free flow of material to the rear strike-off box. The box shall have suitable means provided to side-shift the box to compensate for variations in pavement geometry. A secondary strike-off shall be provided to improve the surface texture. It shall have the same leveling adjustments as the spreader box.

b. Slurry Seal. The mixing machine shall be a continuous flow mixing unit and shall be capable of accurately delivering a predetermined proportion of aggregate, water and asphalt emulsion to the mixing chamber and to discharge the thoroughly mixed product on a continuous basis. The equipment shall be capable of pre-wetting the aggregate immediately prior to mixing with the emulsion. The mixing unit of the mixing chamber shall be capable of thoroughly mixing all components together without violent mixing. The mixing machine shall be equipped with an approved fines feeder that includes an accurate metering device or method to introduce a predetermined proportion of mineral filler into the mixer. The mineral filler shall be fed at the same time and location as the aggregate. The fines feeder shall be required whenever added mineral aggregate is a part of the aggregate blend. The mixing machine shall be equipped with a water pressure system and fog-type spray bar, adequate for completing fogging of the surface receiving slurry treatment.

Attached to the mixer shall be a mechanical-type squeegee distributor, equipped with flexible material in contact with the surface of the pavement to prevent loss of slurry from the distributor. It shall be maintained so as to prevent loss of slurry on varying grades and crown by adjustments to insure uniform spread. There shall be a steering device and a flexible strike-off. The spreader box shall have an adjustable width. The box shall be kept clean and build-up of asphalt and aggregate on the box or in the corners shall not be permitted. Use of burlap drags or other drags shall be approved by the Public Works Supervisor.

Slurry seal mixing machine may be either truck mounted or continuous run design and shall be able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, and water to a revolving mixer and to discharge the mixed product on a continuous flow basis.

The spreader box shall have suitable means provided to side shift the box to compensate for variations in the pavement geometry. A burlap drag or other approved screed may be attached to the rear of the spreader box to provide a uniform, highly textured mat.

4. Application.
   a. The aggregate shall be weighed before delivery to the job site. Emulsified asphalt shall be weighed or measured by volume. Individual volume or weight controls for proportioning each item to be added shall be provided. Each material control device shall be calibrated and properly marked as such. They shall be readily accessible for ready calibration and placed so that the Public Works Supervisor may determine the amount of material used at all times.

   b. The mixture shall be spread to fill cracks and minor surface irregularities and leave a uniform skid resistant application of aggregate and asphalt on the surface.

   c. All longitudinal and transverse joints shall be uniform and neat in appearance.

   d. All excess material shall be removed immediately from the end of each run. All excess material that overruns in gutters shall be removed or squeegeed back onto the surface and burlap mopped as directed by the Public Works Supervisor.

   e. All drag material shall be changed as required to prevent streaks or slick spots. No streaks or slick spots shall be left in the uncured pavement surfacing.

   f. When needed, all joints, radii, ends and returns will be squeegeed and burlap mopped as required to provide complete and uniform coverage.

   g. All discolored curbs and sidewalks shall be cleaned immediately before material sets up and all material tracked or lost past ends of job site shall be cleaned up before sealing crew leaves for

next location. All removed material shall disposed of properly at an off-site location.

h. All manhole covers and water valve covers included in the area to be sealed shall be protected a suitable method. All covers are to be opened after the sealing has cured and are to be left in an operable condition for utility maintenance. After the mixture has been placed at the above mentioned locations, it shall be tapered by a squeegee to improve ride quality.

i. Test Strip for Micro-surfacing. The contractor shall construct a test strip one lane in width, 500 feet in length, to be evaluated by the Public Works Supervisor. When multiple machines are used, each machine shall be required to lay a test strip that will be compared to the other machines for variance in surface texture and appearance. Test strip will not be acceptable if any of the conditions listed under Final Acceptance exist.

j. A sufficient amount of surfacing material shall be carried in the spreader box at all times to obtain complete, uniform coverage. No lumping, balling, or unmixed aggregate shall be permitted. The mixture shall be free of excess water and emulsion, and free of segregation of the emulsion and aggregate fines from the coarser aggregate.

k. Application Rates. Daily reports on yields shall be submitted to the Public Works Supervisor to confirm the rate at which material was placed.
   1) Micro-surfacing. The mixture shall be applied at a minimum rate of 10.0 lbs. per square yard.
   2) The mixture shall be applied at a minimum rate of 8 lbs. per square yard.

5. Curing. Adequate means shall be provided to protect the slurry seal or micro-surfacing from damage by traffic until the mixture has cured sufficiently so that it will not adhere to or be picked up by the tires of vehicles. Any damage done by traffic to the slurry seal or micro-surfacing shall be repaired by the Contractor.

E. Final Acceptance. After the micro-surfacing or slurry seal has been completely cured, the roadway surface shall provide a uniform surface texture. It shall be free of objectionable longitudinal lines, and shall be free of any objectionable transverse lines or grooves. The surface will not be considered acceptable if any of the following conditions exist.
   - More than 1 surface irregularity that is 1/4 –inch or wider and 10 feet or longer in any 100 foot section of surfacing;

- More than 3 surface irregularities that are ½-inch or wider and more than 6 inches long in any 100 foot section of surfacing; or
- Any surface irregularity that is I inch or wider and more than 4 inches long.

Joints will not be considered acceptable if any of the following conditions exist.

- Buildup of surfacing material at the joints;
- Uncovered areas at the joints;
- Longitudinal joints with more than ½-inch vertical space between the surface and a 4 foot straightedge placed perpendicular to the joint; or
- Transverse joints with more than ¼-inch vertical space between the surface and a 4 foot straightedge placed perpendicular to the joint.

If determined by the Public Works Supervisor that the final surface or joints do not provide an acceptable riding surface, the Contractor shall be required to correct the unacceptable area(s) at the Contractor's expense.

. The Contractor is responsible for maintaining all streets sealed for thirty (30) days after application. This includes removing or adding cover material as required by the Public Works Supervisor or authorized representative.

1805 COLD MILLING

A. Equipment. Milling the surface of pavements shall be completed by the use of a milling machine conforming to the following:

1. The cold milling machine shall be self-propelled and shall have in combination the means of milling and cutting (without softening the old surface) and blading the cuttings into a single windrow, or depositing them directly into a truck.

2. The machine shall be equipped with a dust suppression system including water storage tanks and high-pressure spray bars. Additional measures for dust suppression may be required by the Public Works Supervisor.

3. It is desirable that the cutting width be greater than six (6) feet. In the event the cutting width is less than six (6) feet a system of electronic grade control for consecutive passes will be required.

4. The cutting drum shall be totally enclosed to prevent discharge of any loosened material on adjacent work areas.

5. In localized areas where use of the milling machine is not feasible, other equipment may be used as approved by the Public Works Supervisor.

B. Construction.

1. Utilities and Monuments. Street surfaces adjacent to manholes, water valves, other utility facilities and monument boxes shall be completely removed to the full depth of cut specified for the street unless otherwise specified by the Public Works Supervisor.

2. Milling Depth. Sufficient passes, shall be made such that all irregularities or high spots are eliminated, and that 100% of the surface is milled to a depth of two (2) inches over the entire street section unless specified otherwise. Removal of additional material below the 2-inch milling depth shall be accomplished by methods acceptable to the Public Works Supervisor within 2 working days of the initial milling operation. Payment for the additional removal shall be as indicated in the bid form.

3. Milling Area. Mill only the area that can be patched and paved within the specified time limits at any one time. Contractor must plan work accordingly to include adequate number of mobilizations for milling operations in the bid price for milling.

3. Surface Conditions. The drum lacing patterns shall produce a smooth surface finish after milling, with groove depths not to exceed one fourth (1/4) inch and groove spacing not to exceed one (1) inch unless otherwise approved by the Public Works Supervisor.

4. Cleanup. The material windrowed by the machine shall be removed immediately from the surface of the pavement and properly disposed of by the Contractor. All trash, loose material from milling operations, and other debris shall be removed from the street surface and curb and gutter by the end of each day. Any material and debris that adheres to the curb and gutter shall be removed. Additional dust suppression measures may be required by the Public Works Supervisor to minimize impacts on adjacent properties.

6. Maintenance of Milled Surface. It shall be the responsibility of the Contractor to maintain the street once the pavement surface is milled. Such responsibilities include, but are not limited to, the timely filling of potholes, removing rebar, correcting damaged areas that pose a hazard to the traveling public, and maintenance of

temporary pavement markings where required, as deemed necessary by the Public Works Supervisor to prevent further pavement damage. The Contractor shall be responsible for repairing damaged areas prior to the overlay at Contractor's expense.

1806 OVERLAY

1. Materials. Asphaltic concrete, leveling course and tack oil for overlay shall conform to Section 1300 – *Asphaltic Concrete Pavement.* Overlay pavement shall conform to the requirements for surface course materials and installation.

2. Construction.
   a. Conform to requirements of Section 1300 of these specifications for equipment, placement, compaction and finishing of pavement.

   b. All manholes and valves shall be accessible to the owning utility through all phases of the work.

   c. The surface of all structures, monument boxes, manhole and valve covers, and other roadway appurtenances shall be protected to prevent them from being damaged, splattered or covered with asphalt material. If damage occurs, the Contractor shall restore and/or replace the appurtenances at their expense. Hot mix asphalt, or other method or material approved by the Public Works Supervisor, shall be used for wedging adjacent to all appurtenances to provide an acceptable temporary riding surface.

   d. Temporary patches applied to maintain milled surface shall be removed and replaced with permanent patches in accordance with the plans and specifications prior to placing the overlay.

   e. All milled surfaces shall be overlaid within five (5) working days of completion of milling. Streets that require pavement patching shall be overlaid within ten (10) working days. If the Contractor fails to adhere to this stipulation, the Public Works Supervisor will direct the Contractor to place a hot mix asphalt leveling course over the entire milled area at the Contractor's expense. As directed by the Public Works Supervisor, any additional full depth patching required, because the placement of the asphalt overlay was not achieved in the required time period, will be completed by the Contractor at the Contractor's expense. Additional liquidated damages may apply for failure to meet these deadlines if specified in the Project Special Provisions.

1807 CONCRETE CURB AND GUTTER REPLACEMENT

1. Materials.
   a. Concrete materials for curb and gutter shall conform to requirements of Section 2000 – *Concrete* of these specifications.

   b. Topsoil behind curb shall be free of all debris, roots, vegetation, foreign material, concrete, rocks, stones, and clods.

2. Construction.
   a. Curb and gutter to be removed shall be neatly sawed to the full depth of existing pavement. Use appropriate equipment to minimize removal of adjacent pavement with the curb and gutter. When existing pavement designated to remain is damaged during the removal and replacement of the curb and gutter, the pavement shall be repaired by the Contractor at Contractor's expense.

   b. Contractor shall provide temporary surfacing at drives for access.

   c. New curb and gutter shall be installed per plans.

   d. The new curb and gutter shall be constructed within five (5) working days of the removal of the existing curb and gutter. Contractor shall not remove more curb and gutter than can be replaced within the five (5) working day limit. As directed by the Public Works Supervisor, any additional damage that occurs to the existing pavement, because the placement of the curb and gutter was not achieved in the required time period, will be repaired by the Contractor at the Contractor's expense. Additional liquidated damages may apply for failure to meet these deadlines if specified in the Project Special Provisions.

   e. All curb and gutter shall be backfilled with topsoil between 4 and 10 working days after the new curb and gutter has been constructed. Topsoil may be clean on-site material stockpiled for the purpose but shall be tilled before seeding to remove clods, breakup roots, etc. The topsoil shall be placed to a minimum of 1 foot wide, up to a maximum of 15 feet wide, behind the curb in order to achieve positive drainage.

   f. All disturbed ground shall be seeded, fertilized, and mulched. Mulch must be punched into the topsoil. All seeded and mulched areas shall be watered at least once after mulch is secured.

g. New curb and gutter shall NOT be paid for until backfilling is complete, the area has been cleaned and prepared for seeding, and all debris taken off site.

SECTION 2000 - CONCRETE

2001 SCOPE. This section covers all cast-in-place concrete, including reinforcing steel, forms, finishing, curing, and other appurtenant work.

2002 GENERAL. All cast-in-place concrete shall be accurately formed, and properly placed and finished as shown on the drawings and specified herein.

The Contractor shall inform the Public Works Supervisor at least twenty four (24) hours in advance of the times and places at which the concrete is to be placed.

2003 MATERIALS.

Concrete Materials: All concrete materials shall conform to the specifications of the Kansas Department of Transportation Standard Specifications for State Road and Bridge Construction ("KDOT Standards")

Liquid Curing Membrane: Type 2-White Pigmented compound, AASHTO Designation M148.

Polyethylene Sheeting Curing Material: White, opaque polyethylene sheeting/film with a 4 mil nominal thickness.

Curing Mats: New or used burlap composed of jute, manila hemp or kenaf. Used burlap shall have been previously used for curing concrete. Burlap fabricated from bags shall not be used.

Reinforcing Steel: ASTM A615; Grade 60.

Welded Wire Fabric: ASTM A185, and AASHTO Designation M55. Material shall be provided in flat sheets. Rolled fabric will not be allowed.

Fibers: Fiber reinforcement may used in place of wire mesh where indicated. Provide graded fibers that are one hundred (100%) percent virgin polypropylene, fibrillated, rough textured, interconnected fibers containing no reprocessed olefin materials and specifically manufactured as concrete reinforcement. Material shall conform to ASTM C1116, Type III.

2004 CONCRETE MIX DESIGNATIONS.

A. Concrete mixes for pavement, curbs, and curb and gutter shall conform to the specifications of and be approved by the Kansas

Department of Transportation Standard Specifications for State Road and Bridge Construction ("KDOT Standards")

B. All City projects shall use Class 1 course aggregates in all concrete mixes as specified in this section, as specified in the current edition of the KDOT Standard Specifications. Proportions for the mix shall meet the same criteria as specified for alternative mixes.

C. Exposed aggregate concrete shall conform to the following mix design.

Proportions

Materials	One Cubic Yard
Cement, Type I/II	395 lbs
Slag	169 lbs
Coarse Aggregate (smooth river rock)	1816 lbs
Fine Aggregate	1211 lbs
Water	248 lbs
Air Entraining Agent	3 +/- oz

Properties

Cementations Material, sack/yard	6.00
Water/Cement Material Ratio	.44
Fine Aggregate percent of total (by absolute volume)	40%
Unit weight pcf	32 +/- 1
Air Content	7 +/- 1
Slump	4 +/- 1
Compression Strength (not determined)	-------

D. All concrete delivery tickets shall include the plant name, design w/c ratio, batch weights per cubic yard, total batched weight of all materials for quantity delivered, time batched, design slump, water withheld (2 gal/yd maximum), allowable slump range, moisture correction for aggregates, and dosages of all approved admixtures.

E. Water may not be added to concrete after initial mixing except when it is withheld at the batch plant. Up to 2 gallons/cubic yard may be added at the project site to adjust the slump to meet the specifications. The need for additional water must be determined as soon as the load arrives at the site. Water must be added to the entire load using a calibrated measuring device. Do not add more water than was withheld at the batch plant. After adding water, turn the drum or blades an additional 20 to 30 revolutions at mixing speed. The Public Works Supervisor will observe the addition of water and will allow the procedure only once per load.

2005 PLACEMENT. The limits of each concrete pour shall be predetermined by the Contractor and shall be acceptable to the Public Works Supervisor. All concrete within such limits shall be placed in one continuous operation.

Before concrete is placed, forms, reinforcements, and embedments shall be rigidly secured in proper position and all dirt, mud, water and debris shall be removed from the space to be occupied by the concrete. Bonding surfaces shall be cleaned of all foreign material and shall be free from laitance. Concrete shall not be placed on frozen subgrade or in excavations, which have not been dewatered.

Placement of concrete shall conform to requirements of ACI 304. Concrete shall be placed within forty-five (45) minutes of mixing operations, with the exception that the Public Works Supervisor may extend the period to ninety (90) minutes (maximum) dependent upon weather conditions. Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. Concrete shall not be placed in horizontal layers exceeding eighteen (18") inches and shall not be deposited in large quantities at any point in the forms and then run or worked along the forms, thus causing segregation of the materials. During and immediately after placement, concrete shall be thoroughly consolidated and worked around all reinforcements and embedments and into the corners of the forms. The concrete shall be vibrated or spaded to produce a solid mass without honeycomb or surface air bubbles.

Concrete shall not be dropped in the forms a distance of more than five (5') feet, unless confined by chutes or pipes; and care shall be taken to fill each part of the form by depositing the concrete as near final position as possible. After initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the ends of projecting reinforcement.

2006 COLD WEATHER CONCRETE. Unless authorized in writing by the Public Works Supervisor, mixing and concreting operations shall be discontinued when the descending air temperature in the shade and away from artificial heat reaches thirty-five (35°) degrees F. Concrete operations may be resumed when the ascending air temperature in the shade and away from artificial heat reaches thirty five (35°) degrees F.

When concrete work is authorized during cold weather, the concrete may be heated in accordance with ACI specifications. The temperature of the concrete shall be not less than sixty (60°) degrees F and not more than eighty (80°) degrees F at the time of placement in the forms.

No concrete shall be placed on frozen subgrade. Sudden cooling of concrete shall not be permitted. Concrete exposed to frost action or

freezing weather shall be removed and replaced at the Contractor's expense.

A sufficient supply of approved blanketing material shall be provided and placed on all concrete placed between November 1 and April 1 and at other times when the ambient air temperature is expected to drop below forty (40°) degrees F. Blanketing materials shall protect the concrete and maintain a minimum temperature of forty (40°) degrees F in the concrete as measured on the surface. Concrete shall be covered for at least four days.

2007 HOT WEATHER CONCRETE. The provisions of this section shall apply to all concrete work, which is done when the air temperature is above eighty (80°) degrees F at the time of placement. The temperature of the concrete, when placed, shall not be high enough to cause excessive loss of slump, flash set or cold joints. Forms, reinforcing and sub-grade surfaces against which the concrete is to be placed shall be wetted down immediately before placement. In no case shall the temperature of the concrete, when placed, exceed ninety (90°) degrees F.

When the air temperature exceeds ninety (90°) degrees F and as soon as practicable without causing damage to the surface finish, all exposed concrete shall be kept continuously moist by means of fog sprays, wet burlap, cotton mats, or other means acceptable to the Public Works Supervisor at no expense to the Owner. This cooling with water shall be in addition to the initial sealing by membrane curing compound.

No concrete shall be placed when the air temperature is above ninety-five (95º) degrees F.

2008 CURING AND PROTECTION. Concrete shall be cured by protection against loss of moisture, rapid temperature changes and mechanical injury for at least four days after placement. Acceptable methods shall be moist curing, white polyethylene sheeting, liquid membrane-forming compounds, or a combination thereof, unless specified otherwise. After concrete finishing operations have been completed, the entire surface of the newly placed concrete shall be covered by the curing medium. The Contractor shall have the necessary equipment for adequate curing on hand and be ready to install prior to concrete placement.

Moist curing shall be accomplished by a covering of burlap or other approved fabric mat used singly or in combination. Curing mats shall be thoroughly wet when applied and kept continuously wet and in intimate contact with the surface for the duration of the moist-curing period. Burlap or fabric mats shall be long enough to cover the entire surface of the work and lapped at joints to prevent drying between adjacent sheets.

White polyethylene sheets shall be large enough to cover the entire surface of the work and shall be lapped not less than eighteen (18”) inches. The sheets shall be adequately weighted to prevent displacement or billowing due to wind. Tear holes appearing in the material during the curing period shall be immediately repaired or replaced with material in acceptable condition.

White membrane curing compound shall be applied after finishing operations have been completed and immediately after the free water has left the surface. The surface of the work shall be completely coated and sealed with a uniform layer of the curing compound at a rate of not less than one (1) gallon per one hundred fifty (150) square feet. The compound shall not be thinned and shall be kept agitated to prevent settlement of pigment. On surfaces where forms are removed prior to the end of the specified curing period, the entire exposed surface shall be coated at the specified rate of coverage. If rain falls on the newly coated surface before the film dries sufficiently to resist damage, or if the film is damaged in any other way, the Contractor will be required to apply a new coat of compound to the affected area.

2009 FORMS. Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions shown on the drawings. They shall be sufficiently tight to prevent leakage of mortar and shall be braced or tied to maintain the desired position, shape, and alignment during and after concrete placement.

Forms may be of wood or non-aluminum metal and plastic shall be designed to permit easy removal without injury to the concrete. Forms for all exterior exposed surfaces which will be visible after backfilling shall be prefabricated plywood panel forms, job-built plywood forms, or forms that are lined with plywood or fiberboard. Forms shall be coated with an approved light oil to prevent concrete from adhering and shall be thoroughly cleaned and re-oiled before re-use.

Care shall be taken in form removal to avoid surface gouging, corner or edge breakage, and other damage to the concrete.

2010 REPAIRING DEFECTIVE AND DAMAGED CONCRETE. Any concrete found not to be formed as indicated on the plans, out of alignment or level, having a defective surface, or damaged prior to acceptance, shall be considered as not conforming to the intent of these specifications and may be ordered removed and replaced by the Contractor at his expense unless the Public Works Supervisor authorizes patching of the defective or damaged area.

Concrete repair work shall conform to the current edition of ACI standards and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. Repair work shall be adequately cured and protected from further damage.

Surface defects such as ridges and bulges shall be removed by grinding.

Honeycombed and other defective concrete that does not affect the structural integrity of the structure shall be filled. The methods used in this type of repair shall be approved by the Public Works Supervisor. Material used for patching shall be a nonshrink, non-metallic grout with a minimum twenty eight (28) day compressive strength of five thousand (5000) psi or a similar material approved by the Public Works Supervisor. Prior to placement of the repair filling, the contact surface of the affected area shall be thoroughly cleaned of all loose and foreign material.

2011 REINFORCEMENT. The metal reinforcement shall be protected by the thickness of concrete indicated on the construction drawings or as specified. Protect all metal reinforcement from weather while stored on-site.

Reinforcing steel shall be accurately placed and positioned on supports, spacers, hangers, or other reinforcing steel according to the plans or as approved by the Public Works Supervisor and shall be secured in place with wire ties or suitable clips.

Metal reinforcement at the time concrete is placed shall be free from rust, scale, or other contaminants that will destroy or reduce the bond.

2012 CONSTRUCTION JOINTS. Construction joints shall be made at locations indicated on the drawings, as specified, or as approved by the Public Works Supervisor and shall conform to the requirements of ACI 318.

2013 ISOLATION AND CONTRACTION JOINTS. Isolation and contraction joints shall be of the type and at locations as specified, as indicated on the drawings or as required by the Public Works Supervisor.

City of Phillipsburg
Construction and Material Specifications
Section 2500 – Sanitary Sewer (8" to 18" Mains)

SECTION 2501 SCOPE

This division governs all work, materials and testing required for installation of gravity and pressure pipelines of the respective types and sizes shown on the Plans for the particular location and conforming to the requirements of these specifications. All pipelines shall be constructed to proper line and grade as shown on the Plans and shall result in an unobstructed, smooth and uniform conduit.

SECTION 2502 GENERAL

2502.1 Description: Sanitary sewer construction shall consist of furnishing all labor, materials and equipment for the complete installation of sewers and appurtenances in accordance with the contract documents, standard drawings, approved shop drawings, General Provisions and these specifications.

2502.2 Specification Modifications: It is understood that throughout this section these Specifications may be modified by appropriate items in the Project Specifications, or by notes on the Contract Drawings.

2502.3 Revisions of Standards: When reference is made to a Standard Specification i.e. ASTM, ANSI, AWWA, MCIB, the Specification referred to shall be understood to mean the latest revision of said specification as amended at the time of the Notice to Bidders, except as noted on the Plans or in the Project Specifications. The City may, at its option, update and revise these specifications periodically in response to changing technology and construction methodologies.

2502.4 Pipe Sizes: These standards shall apply to gravity sewers 8” to 18”, and force mains 4” to 6”. For all other pipe sizes, Design Engineer shall submit type of pipe proposed for approval by Public Works Public Works Supervisor.

2502.5 Definitions: “Public Works Supervisor” shall mean the Utilities Public Works Supervisor or Utilities Public Works Supervisor’s representative. “Design Engineer” shall mean the licensed individual or firm who developed, sealed, and signed the improvement plans. “Contractor” shall mean any employee, agent or subcontractor of the construction company responsible for completing the work. “Inspector” shall mean the City of Phillipsburg Utilities Department inspector assigned to the project or authorized representative thereof. “Special Project Specifications” shall mean specifications modified due to special or unusual project conditions identified by the Design Engineer that warrant deviation from the City of Phillipsburg Construction and Material Specifications Section 2500 – Sanitary Sewer (8” to 18” Mains), current edition.

2502.6 Contractor’s Warranty: During a period of one year from the date of final acceptance by the City, the Contractor is responsible for making any necessary repairs arising out of defective workmanship or materials. This includes, but is not limited to, trench settlement of sanitary sewer lines constructed as part of this project. The Contractor is responsible for repairing all trench settlement including removing and replacing sidewalks, streets, driveways, and entrance walks constructed since the project was accepted by the City. Representatives from the City and the Contractor shall conduct an

inspection of this project 11 months after the project has been accepted by the City to determine what repairs need to be made.

SECTION 2503 MATERIALS

2503.1 General: This section governs materials that may be required to complete pipeline construction, exclusive of structures, as shown on the Plans and/or as provided for in the Project Specifications.

1. Requirements: Furnish pipe of materials, joint types, sizes, and strength classes indicated or specified. Higher strengths may be furnished at the Contractor's option at no additional cost to the project.

2. Manufacturer: The manufacturer shall be experienced in the design, manufacture and commercial supplying of the specific material.

3. Inspection and Testing: Inspection and testing shall be performed by the Manufacturer's quality control personnel in conformance with applicable standards. Testing may be witnessed by Design Engineer, Public Works Supervisor or approved independent testing laboratory. The Contractor shall provide one (1) copy of certified test reports indicating the materials conform to the specifications to the Inspector.

4. Handling: Equipment and methods shall be adequate to protect the pipe, joint elements and prevent shock contact of adjacent units during moving or storage. Damaged sections that cause reasonable doubt as to their structural strength or water- tightness will be rejected.

2503.2 Pipe, Fittings, Joints, Coatings and Linings:

1. General: Furnish pipe and fittings of materials, joint types, sizes, strength classes, coatings and linings as indicated and specified.

2. Ductile-Iron Pipe and Fittings: Pipe and fittings shall conform to ANSI A21.51, except as otherwise specified herein.

    a. General: Furnish maximum pipe lengths normally produced by the manufacturer except for fittings, closures and specials.

    b. Design: All ductile iron pipe shall meet the requirements of ANSI A21.50 and ANSI A21.51 and shall be of the thickness class specified therein or shown on the drawings. All ductile iron pipe shall have linings, conforming to Section 2503.2.2.f.

    c. Joints: Mechanical and push-on joints for pipe and fittings shall conform to the requirements of ANSI A21.11. Flanged joints for ductile iron pipe and fittings shall conform to the requirements of A21.10. Gaskets shall be neoprene or other synthetic rubber material. Natural rubber gaskets will not be acceptable. Restrained joints shall be Griffin Snap-Lok or approved equal.

d. Fittings: Fittings shall be in accordance with ANSI/AWWA C 153 and shall have a pressure rating of not less than that specified for the pipe. Fittings used with ductile iron pipe shall be ductile iron. Fittings for pipe with mechanical joints shall have mechanical joints. Fittings for pipe with push-on joints shall have mechanical joints.

e. Coatings: Coatings shall conform to the following:

    1. Pipe and fittings shall be furnished with exterior bituminous coating conforming to ANSI A 21.51.

f. Linings: Pipe and fitting linings shall conform to the following:

    1. Interior lining of pipe shall be Induron “Protecto 401 Ceramic Epoxy”.

g. Polyethylene Encasement: Polyethylene encasement shall conform to the following:

    1. All ductile iron pipe sewer mains shall be polyethylene encased and shall conform to ASTM A674.

    2. Polyethylene Film. Tubular or sheet form without tears, breaks, or defects, conforming to the following requirements shall be used to encase ductile iron pipe. Linear low-density film, minimum 8 mil thickness, manufactured from virgin polyethylene material conforming to ANSI/AWWA C105/A21.5-99.

    3. PVC Pipe Wrapping Tape. PVC pipe wrapping tape, minimum 2” width and 10 mil thickness, shall be used to secure all ends, joints, and repairs of polyethylene film. Duct tape shall not be used. Installation shall be as described in detail in ASTM 674-05.

    4. Repairs. Repair any cuts, tears, punctures, or damage to polyethylene film with PVC pipe wrapping tape or short length of polyethylene sheet or cut open tube, wrapped around pipe to cover damaged area, and secured in place.

    5. Backfill. Prevent damage to film by assuring that backfill material is free from cinders, refuse, boulders, rocks, stones, or other material that could damage the film. Follow AWWA C600 for backfilling.

    6. Certification. The Contractor shall provide written certification that he has furnished polyethylene material that meets the ANSI/AWWA C105/A21.5-99 specification and written certification that he has installed this material according to ASTM 674-05. This certification shall be provided in duplicate to the City Inspector.

7. Polyethylene encasement and PVC pipe wrapping tape shall be purple in color for all pressurized systems and green in color for all gravity sewer applications.

3. Polyvinyl chloride (PVC) Pressure Rated Plastic Pipe (SDR) and Fittings: Pipe and fittings shall conform to ASTM D 2241, except as otherwise specified herein.

   a. General: Furnish maximum pipe lengths normally produced by the manufacturer, except for fittings, closures and specials. Pipe shall be used only for pressure flow systems.

   b. Materials: The pipe shall be made of purple PVC plastic pipe having a cell classification of 12454 B or 12454 C as defined in ASTM D 1784.

   c. Design: Pressure flow systems, i.e., force mains, shall have the wall thickness shown on the plans, with a minimum wall thickness conforming to SDR 18 with a minimum burst pressure not less than 400 psi conforming to pipe materials designation codes PVC 1120, PVC 1220, or PVC 2120.

   d. Joints: Pressure flow systems shall be joined in accordance with ASTM D 3139 with particular attention given to Section 5.3. Restrained joints, when specified, shall be Certa-Lok C900 RJ (Coupled) or C900 RJIB(Integral Bell) or approved equal.

   e. Fittings: Fittings shall be in accordance with ANSI/AWWA C 153 and shall have a pressure rating of not less than that specified for the pipe. Fittings used with polyvinyl chloride (PVC) pipe shall be ductile iron complying with Section 2503.2 of these specifications. Fittings for pipe with mechanical joints shall have mechanical joints. Fittings for pipe with push-on joints shall have mechanical joints.

4. Type PSM polyvinyl chloride (PVC) Sewer Pipe and Fittings: 8 through 18 inch diameter pipe and fittings shall conform to ASTM D 3034 or ASTM F679, as applicable.

   a. General: Furnish maximum pipe lengths normally produced by the manufacturer except for fittings, closures and specials.

   b. Materials: The pipe shall be made of green PVC plastic having a cell classification of 12454 B or 12454 C or 13364 B as defined in ASTM D 1784.

   c. Design: Pipe shall have an integral bell and spigot joint. Wall thickness shall be SDR 21 as shown on plans. All pipe between any two (2) manholes shall be of the same SDR.

   d. Joints: Joint tightness shall conform to ASTM D 3212. Joints shall be push-on type only with the bell-end grooved to receive a gasket. Elastomeric seal (gasket) shall have a basic polymer of synthetic rubber conforming to ASTM F477.

Natural rubber gaskets will not be accepted. Restrained joints pipe, when specified, shall be CertaFlo Greenline or approved equal.

e. Fittings: Fittings defined as a tee (T) connection suitable for assembly to four (4) inch or six (6) inch building service lines shall be bell-end with a minimum wall thickness conforming to SDR 21 and shall be furnished by the pipe manufacturer. A special design is required for service connections 8 inches and larger. Couplings for transition from restrained joint pipe (IPS) to type PSM PVC when required shall be gasket x gasket fittings with a minimum wall thickness conforming to SDR21.

5. PVC Composite (Truss) Pipe, meeting the requirements of ASTM D2680, will be allowed only for connection to existing truss pipe or existing vitrified clay pipe (VCP).

6. Service Saddles; Service saddles shall be molded PVC conforming to ASTM D1784. All service saddles shall utilize elastomeric seals, stainless steel straps, bolts, and nuts, and shall be compatible with the outside diameter (OD) of the existing sanitary sewer main.

2503.3 Pipe Embedment Materials.

1. Scope: Pipe embedment materials shall be furnished and installed to complete the work shown on the Plans or as called for in the Contract Documents.

2. Bedding Aggregate: All materials used for crushed stone pipe bedding shall conform to KDOT specifications for SCA-3 or CM-H or approved equal.

3. Concrete for encasement:

   a. Concrete shall test not less than a twenty-eight (28) day compressive strength of 4000 psi and shall otherwise conform to Section 2510.3.6.

   b. Reinforcing steel when required shall be placed as shown on the Plans and shall conform to Section 2510.3.7.

2503.4 Backfill Materials:

1. Scope: Backfill materials shall be as required and/or permitted to complete the work shown on the Plans or called for in the Contract Documents.

2. Select Earth Backfill Material: Select earth backfill shall be finely divided job excavated material free from debris, organic matter, rocks larger than one (1) inch and/or frozen materials.

3. Other Earth Backfill: Other backfill may be job excavated material free from debris and organic matter. No rock greater than six inches in its longest axis, shall be placed in any trench excavation as backfill.

4. Flowable Mortar, conforming to Section 2507.3, shall be used in areas as defined in Section 2507.3 and as indicated on the plans.

2503.5 Tunneling, Boring and Jacking Materials:

1. Scope: This section governs the furnishing of all materials necessary for the construction of tunnels at locations shown on the Plans or where constructed at the Contractor's option when approved by the Public Works Supervisor.

2. General: Furnish materials and necessary accessories with strengths, thicknesses, coatings, and fittings indicated, specified and/or necessary to complete the work.

3. Steel Liner Plate: Steel tunnel liner plates shall be galvanized in accordance with ASTM A123. The design and shape of the liner plates shall be such that assembly can take place entirely from within the tunnel liner. Liner Plates shall be capable of withstanding the ring thrust load and transmitting this from plate to plate. The minimum outside diameter shall be four (4) feet and the minimum wall thickness shall be United States Standard Gauge 12 (0.2046 inches). Sufficient sections shall be provided with one and one-half (1-½) inch or larger grouting holes located near the centers so that when the plates are installed there will be one line of holes on either side of the tunnel and one at the crown; the lower line of holes on each side shall not be more than eighteen (18) inches above the invert. The holes in each line shall not be more than five (5) feet apart and unless otherwise approved, shall be staggered. Bolts and nuts shall conform to ASTM A 153, A 307, A 325 and A 449 as applicable. Steel liner plates shall have bolted joints in both longitudinal joints in adjacent rings when assembling.

4. Steel Casings: Steel casings for bored or jacked construction shall be steel pipe conforming to ASTM A 139 with a minimum diameter as shown on the Plans.

    a. Minimum wall thickness shall be in accordance with the following table:

Diameter of	Nominal Wall Thickness - Inches	
Casing - Inches	Under Railroads	All other Uses
16	0.312	0.188
18	0.312	0.250
20	0.375	0.250
22	0.375	0.250
24	0.406	0.281
26	0.438	0.281
28	0.469	0.312
30	0.469	0.312
32	0.500	0.312
34	0.500	0.312
36	0.500	0.344

b. Steel shall be Grade A on all uses unless a higher standard is required by the responsible agency.

c. Steel pipe shall have welded joints in accordance with AWWA C 206.

d. Casing Spacers shall be CCI stainless steel casing spacers or approved equal.

e. The end seals shall be Advance Products & Systems (APS) model AW or approved equal.

f. The annular space between lining and sewer pipe shall be not be filled.

g. Carrier pipe installed in casing pipe shall be restrained joint pipe in accordance with Section 2503.2 of these specifications.

SECTION 2504 SITE PREPARATION:

2504.1 Scope: This section governs normal project site preparation for construction.

2504.2 General:

1. Contractor shall do all clearing necessary for performance of his work and shall confine his operations to that area provided through easements, licenses, agreements and rights-of-way. The Contractor's entrance upon any lands outside of that area provided by easements, licenses, agreements or public rights-of-way, shall be strictly prohibited without the express written consent of the affected property owner. The Contractor shall be required to provide copies of all permissions and agreements to the Inspector.

2. The Contractor shall not occupy any portion of the Project Site prior to the date established in the Notice to Proceed without prior approval of the Public Works Supervisor.

2504.3 Obstructions:

1. General: Natural obstructions, existing facilities and improvements encountered during site preparation shall be removed, relocated, reconstructed or worked around as herein specified. Care shall be used while performing site preparation work adjacent to any facilities intended to remain in place. Except as otherwise specified, the Contractor shall be responsible for any damage to existing facilities and improvements and any repairs required shall be promptly made at the Contractor's expense. Waste materials shall be disposed of in a satisfactory manner off the work site. Existing utilities damaged by the Contractor shall be restored as directed by the utility company at no additional cost to the project. Unless identified as a specific bid item, no separate or additional payment will be made for any work in connection with removal, relocation or restoration of obstructions and existing facilities.

2. Surface Obstructions:

   a. Sidewalks, curb and gutter, drainage structures and similar obstructions shall be tunneled under if tunneling is best suited. Otherwise the obstruction shall be cut in straight lines or removed to the nearest construction joint if located within five feet of the center-line of the trench. In no case shall the joint or line of cut be less than one foot outside the edge of the trench. Surface obstructions removed to permit construction shall be reconstructed as specified and to the dimensions, lines and grades of original construction. Backfill of tunneled sections shall be performed in accordance with Section 2507. All restoration shall be in accordance with Section 2508.

   b. Mailboxes shall be maintained in the manner that the Postal Service requires to prevent interruption of mail delivery.

   c. Site preparation shall include, where necessary and permitted, the removal of trees, shrubs, brush, crops, and other vegetation within the limits of the easements (right- of-way) or as may be provided for in licenses, permits and agreements. The following procedures for protection of existing greenery are required.

      1. Trees: All reasonable effort shall be made to save as many trees as possible. Trees are defined as two inches in diameter and greater when measured at a point three feet above the ground surface. If trees can be saved by trimming, this shall be done in accordance with acceptable pruning practices.

         All trees within easements or right-of-way provided, which are specifically to be removed or saved, have been marked on the plans with the following notations:

         (a)Trees marked “S” shall be saved.
         (b)Trees marked “X” shall be removed.
         (c)Trees marked “R” shall be removed and replaced.

         Trees to be removed shall be completely removed, including stump and large roots, unless such removal may result in damage to existing pipelines. In that event, trees shall be sawn off not more than four (4) inches above the ground and the stump shall be removed to twelve (12) inches below finish grade. Any tree replaced shall be outside the permanent utility easement and shall be a like species of nursery stock. (Generally, 2 to 2 ½ inch caliper).

      2. Small Plants and Flowers: At least two weeks prior to the start of construction, property owners shall be notified by the contractor of the proposed starting date. The purpose of this notification is so that the property owners can remove any small plants or flowers that they, the property owners, desire to save.

d. Fences. Fences interfering with construction, and located within public rights-of-way or utility easements or as may be allowed for in permits or agreements, may be removed by the Contractor only if the opening is provided with a temporary gate that will be maintained in a closed position except to permit passage of equipment and vehicles. Fences within temporary construction easements may be removed by the Contractor provided that temporary fencing is installed in such a manner as to serve the purpose of the fencing removed. The contractor shall locate and record all fence corners prior to removal. All fencing removed shall be restored by the Contractor to the pre-construction condition unless otherwise specified in the Special Project Specifications. The Contractor is and shall be solely liable for the straying of any animals' protected or corralled or other damage caused by any fence so removed.

e. Property Pins: The Contractor shall preserve all property corners, pins or markers. In the event any property corners, pins, or markers are removed by the Contractor, such property points shall be replaced at the Contractor's expense and shall be reset by competent surveyors properly licensed to do such work. In the event such points are section corners or Federal land corners, they shall be referenced and filed with the appropriate authority.

f. Sodded and Landscaped Areas: Sodded and/or landscaped areas on or adjacent to improved property shall be disturbed only to the extent required to permit construction. Such areas shall not be used as storage sites for construction supplies and shall be kept free from stockpiles or excavated materials.

3. Subsurface Obstruction:

a. Where existing utilities and service lines are to be encountered, the owner thereof shall be notified by the Contractor at least 48 hours (not including weekends and/or holidays) in advance of performing any work in the vicinity. All excavation, pipeline installation and backfilling work in the vicinity of such utilities shall be accomplished in the manner required by the respective owner and, if requested, under their direct supervision. The Contractor shall be responsible for any and all damages to a public or private utility that may occur as the result of the construction.

b. The Contractor shall make every reasonable effort to ascertain the existence of obstructions and shall locate obstructions prior to machine excavation where definite information is not available as to their exact location. Where such facilities are unexpectedly encountered and damaged, responsible officials and other affected parties shall be notified and arrangements made for the prompt repair and restoration of service. All utilities shall be properly supported in the excavation.

c. Private Sewer Facilities: The Contractor shall make every reasonable effort to protect private sewer facilities not shown on the Plans. When these facilities are disturbed or damaged by the work, the Contractor shall make necessary repairs

to the facilities for continuous service prior to the close of the work day at no cost to the owner thereof.

SECTION 2505 EXCAVATION:

2505.1 Scope: This section governs the methods and procedures required for pipeline excavations for open cut and tunneling.

2505.2 General: The terms "excavation" and "trenching" shall mean the removal and subsequent handling of all material required to perform the work.

1. All pipeline excavation work shall be accomplished under supervision of a person experienced with the materials and procedures, which will provide protection to existing improvements, including utilities and the proposed pipeline. A currently certified competent person shall be present during all excavation operations according to OSHA regulations.

2. Contractor shall have a trench safety plan for the trench conditions to be encountered on the project. The trench safety plan shall be available on the job site at all times and shall be designed by a licensed professional engineer should conditions warrant.

3. The alignment, depth, and pipe subgrades of all sewer trenches shall be determined by overhead grade lines parallel to the sewer invert.

4. When pipe is to be installed in embankment or fill, the embankment shall be built up to a plane at least 18 inches above the top of the pipe prior to the excavation of the sewer trench.

5. The Contractor shall not open more trench in advance of pipe laying than is necessary. Four hundred (400) feet will be the maximum length of open trench allowed on any line under construction, unless otherwise approved, in advance, by the Public Works Supervisor. All open trenches shall be adequately protected and shall conform with OSHA safety standards.

6. In the event hazardous wastes as defined by the Resource Conservation and Recovery Act of 1976 (PL94-580) are encountered, work shall be halted and the Public Works Supervisor shall be notified. Work shall be resumed only after the Contractor has notified the proper authorities and permission has been given by the governing authority to resume construction activities. Regulation of removal, handling and disposal of hazardous wastes is the responsibility of Federal and State agencies.

2505.3 Unclassified Excavation: Unclassified excavation is defined as the removal of all material encountered regardless of its nature. All material excavated will be considered as Unclassified Excavation.

2505.4 De-Watering: The Contractor shall remove any water that may accumulate or be found in the trenches and other excavations made under the Contract.

The Contractor shall form all dams, flumes or other works necessary to keep the excavation clear of water while the sewers and their foundations, and other foundation works, are being constructed. All water shall be removed from such excavation in a manner that will not damage property.

2505.5 Blasting: When blasting is permitted by Phillipsburg County Fire and Medical Services, the Contractor shall use the utmost care to protect life and property. The Contractor shall comply with all laws, ordinances, and the applicable safety code requirements and regulations relative to the handling, storage and use of explosives and protection of life and property, and he shall be responsible for all damage thereto caused by his or his subcontractor's operations.

The Contractor shall provide insurance as required by the General Provisions and Covenants and Special Project Specifications before performing any blasting. The governing agency shall be notified at least 24 hours before blasting operations begin.

2505.6 No Blasting Areas: No blasting of any kind for rock excavations or any other purpose will be allowed if so noted on the Plans.

2505.7 Open-Cut Method (Trenching):

1. Scope: This item establishes the requirements to be followed for pipeline excavation performed by the open-cut method (trenching).

2. General: Excavations for pipelines shall be accomplished by the open-cut method (trenching) except as specified or approved by the Public Works Supervisor. Trenching shall be with a minimum inconvenience and disturbance to the general public.

   The Contractor shall sort and stockpile the excavated material so the proper material is available for backfill.

3. Trench Depths: All trenches shall be excavated to depths required for proper pipe embedment. Over depth excavation shall be required when the subgrade is unstable. Over depth excavations shall be backfilled with granular pipe embedment material unless otherwise directed by the Public Works Supervisor.

4. Trench Walls: Undercutting of trench walls is not permitted.

5. Trench Widths:

   a. Minimum Widths: Trench widths and pipe clearances shall be not less than that shown in the following table.

MINIMUM TRENCH WIDTHS AND PIPE CLEARANCES (INCHES)

Nominal Pipe Diameter	Trench Width [1]	Pipe Side Clearance [2]	Soil/Incompressible Pipe Bottom Clearance
4	22	6	6
6	22	6	6
8	22	6	6
10	24	6	6
12	27	6	6
15	30	6	6
18	34	6	6
21	39	7	6
24	43	7	6
27	48	8	6
30	54	8	6

[1] Measured below a horizontal plane six (6) inches above the top of the pipe line.

[2] Measured from the outside face of pipe barrel to inside face of trench.

b. Maximum Widths: The maximum allowable trench widths hereinafter specified apply only to that portion of the trench below the horizontal plane parallel to and six (6) inches above the top of the pipe.

   Maximum side clearance shall be twelve (12) inches, measured horizontally from outside face of pipe to trench wall. When the side clearance exceeds twelve inches, for 8" to 18" diameter pipe, it shall be the Contractor's responsibility, at no additional cost to the project, to provide bedding adequate to develop the required lateral support for the pipe and/or provide a pipe of sufficient strength class to accommodate the loading conditions as approved by the Public Works Supervisor.

   The maximum allowable widths may be exceeded at manholes, bore pits, tees, and in unstable earth material. Where the maximum trench width is exceeded the Contractor shall provide the appropriate strength class of pipe embedment to provide safe support strength to the pipeline.

c. Trench Slope: The trench width above a horizontal plane six (6) inches above the top of the pipe may vary and side sloping is permissible unless otherwise specified.

d. Trench Shields: When trench shields are utilized by the Contractor, said shields or any part thereof shall not extend lower than six (6) inches above the top of the proposed pipeline nor shall the maximum allowable trench width be exceeded.

6. Maximum Trench Widths for Ductile Iron Pipe: When ductile iron pipe is utilized, the strength class and the maximum allowable trench width as established by the Design Engineer will be shown on the Plans.

7. Option to Trenching: Contractor may perform excavation by tunneling methods as set forth herein at no additional cost to the project provided prior written approval for each such location is obtained from the Public Works Supervisor.

2505.8 Tunneling, Boring and Jacking:

1. Scope: This item establishes the requirements to be followed for pipeline excavation performed by tunneling, boring and jacking methods.

2. General: Tunneling, boring and jacking includes all underground horizontal excavations necessary to install the pipeline. The Contractor shall submit to the Public Works Supervisor, prior to actual work, a written description of his proposed tunneling, boring or jacking operations. It shall include the types and locations of shafts, methods to provide safe support strength for the pipeline when the shafts or bore pits exceed maximum allowable trench widths and other features that would affect the pipeline.

   Tunneling, boring and jacking shall be done with a minimum inconvenience and disturbance to the general public and abutting property owners.

3. Tunnel, Bored or Jacked Cross Section: Cross sections shall be circular and of the size specified for all tunneling, boring or jacking operations. Alternate size and shape may be submitted for consideration by the Public Works Supervisor.

4. Construction:

   a. General: All tunneling, boring or jacking excavation shall provide an excavation conforming to outside diameter of the casing and/or carrier conduit. The excavation shall be to an alignment and grade which will allow the carrier conduit to be installed to proper line and grade as shown on the Plans and as established in Section 2506 – Installation.

   b. Excavation: Conduct excavation in a manner to prevent disturbing overlying and adjacent material. Perform dewatering and chemical soil stabilization or grouting, if necessary, due to existing field conditions.

SECTION 2506 INSTALLATION:

2506.1 Scope: This section governs construction methods and procedures for the installation of gravity and pressure pipelines and appurtenances.

2506.2 General: All pipeline installations shall conform to the following requirements:

1. Governmental Requirements: Sanitary sewer line installation shall comply with applicable State and County Health and Environment Departments requirements.

2. Trench Dewatering: Contractor shall maintain a dry and stable trench, obtain necessary permits, and provide for the proper method of discharging such water from the work site at all times until pipeline installation is completed to the extent that hydrostatic pressure flotation or other adverse effects will not result in damage to the pipeline.

   Proper dewatering techniques are the Contractor's responsibility. All work performed by the Contractor which is adversely affected by his failure to adequately dewater trenches will be subject to rejection by the Public Works Supervisor. The Contractor shall repair and/or replace the affected pipeline without additional compensation.

3. Trench Shoring and Bracing: All shoring, bracing or blocking shall be furnished and installed as necessary to preserve and maintain exposed excavation faces, to protect existing improvements, to protect the proposed pipeline and to provide for safety.

   Shoring or other methods for support of trench walls is the responsibility of the Contractor and shall be accomplished by methods that will not adversely affect pipeline alignment, grade and/or structural integrity. All excavation shall be in accordance with OSHA CFR 1926-(P).

   All bracing, sheeting and/or shoring installed below a horizontal plane six (6) inches above top of proposed pipe shall not be disturbed or removed after pipe and/or pipe embedment has been installed unless otherwise specified. The bottom skids of a trench shield shall not extend lower than six (6) inches above top of proposed pipe.

4. Pipe Embedments: All pipe embedment shall conform to Section 2506.2.6 unless otherwise specified. Installation shall be in strict conformance with instructions for the appropriate embedment being utilized.

5. Bedding Installation:

   a. The trench subgrade shall be prepared to provide a uniform and continuous pipe support between pipe bells and joints.

   b. Place and densify embedment material by shovel slicing or vibrating and prepare embedment material so that the pipe will be true to line and grade after installation.

   c. After each pipe has been brought to grade, aligned, and placed in final position, deposit and densify by shovel slicing sufficient bedding material under the pipe haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations.

Place bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

d. Place pipe that is to be bedded in Concrete Encasement or Flowable Mortar in proper position on temporary supports consisting of concrete blocks. When necessary, anchor or weight the pipe to prevent flotation when the concrete is placed.

e. Place concrete for encasement uniformly on each side of the pipe and deposit at approximately its final position. Do not move concrete more than five (5) feet from its point of placement.

f. If unstable subgrade conditions are encountered and it is determined by the Public Works Supervisor that the bedding specified will not provide suitable support for the pipe, additional excavation to the limits determined by the Public Works Supervisor will be required. This additional excavation shall be backfilled with material approved by the Public Works Supervisor.

6. Pipe Embedment Designations and Descriptions:

   a. Granular Embedment:
   The pipe shall be bedded in granular material, with a minimum thickness below the pipe as specified in Section 2505.7.5.a. The granular material shall be placed to a point six (6) inches above the top of the pipe bell or coupling. Backfill to a level not less than thirty (30) inches above the top of pipe shall be carefully placed select earth backfill compacted to ninety percent (90%) of maximum density at an optimum moisture + or – 2% as defined in AASHTO T99 or ASTM D 698. The select material shall be free from debris, organic matter, frozen material and rocks larger than one (1) inch. Embedment materials shall conform to 2503.3.

   b. Concrete Encasement
   All Concrete Encasements require a 4000 psi, 28-day strength concrete except as otherwise specified. After initial set of concrete, one (1) foot of backfill material should be placed over the conduit or concrete. The backfill above this point shall not be placed nor sheeting removed until at least forty-eight (48) hours after placement of the concrete. Time requirements may be adjusted by the Engineer to obtain structural integrity.

7. Service Connections: Service connections shall be installed as shown on the Plans or as specified herein. Building service connections shall be tee connections.

   a. Service connections shall be installed at forty-five (45) degrees with pipe spring line for pipe sizes 8 through 12 inch diameter. Service connections shall not be installed in pipe sizes greater than or equal to eight (8) inch diameter unless approved by the Public Works Supervisor.

b. Services shall be schedule 40 PVC with solvent welded joints. All pipe shall be cut with a saw or special cutting tool. Cutting shall be done in a neat manner without damage to the pipe. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed and beveled. Beveling shall be done with a specifically designed beveling tool. Hand beveling will not be allowed. When cutting pipe with couplings, mark the field cut pipe end the same distance in as the mark appeared on the original full length pipe section.

c. The Contractor shall maintain an accurate record for submittal to the Public Works Supervisor of location, size and direction of each service connection. Locations shall use the pipeline stationing as shown on the Plans or the distance from the first downstream manhole. In the event such records are not kept or are lost before final acceptance of the work, the required information shall be redetermined by the Contractor at his own expense.

8. Gravity Sewers: All gravity sewers shall be installed to the alignment, elevation, and slope, and shall include pipe embedment as specified and/or shown on the Plans.

   Joint deflection shall not exceed the maximum allowable deflection per joint according to ASTM C 425 and AWWA C 600.

9. Pressure Sewers (Force Main): All pressure sewers shall be installed with required pipe embedment to depths shown on the Plans (not less than 42 inches) and to a continuous slope when not shown. Approved air relief valves shall be installed at all locations shown on the Plans or where required by the Public Works Supervisor.

   The Contractor shall block and anchor the pipeline to accommodate thrust and testing forces at pipe deflections, bends, tees, and plugs in accordance with the Contract Documents. All damage caused by the Contractor's failure to provide adequate thrust supports shall be corrected by the Contractor at no additional cost to the project.

10. Location Wire: Location wire shall be buried above all pressure sewers in accordance with the following:

    a. Location wire shall be installed to enable the detection of all pressure sewer pipe. Location wire shall be 12 AWG annealed soft copper wire (solid) with blue 30mil HDPE jacket for open trench installations or 12 AWG copper clad steel (CCS), minimum break load of 380 lbs. with blue 30 mil HDPE jacket for directional drill installation.

    b. The location wire shall be placed no further than 6 inches to the side or above the sanitary sewer line.

    c. The location wire shall be accessible at test stations at least every 500 feet.

d. Test stations shall be Copperhead Industries LLC SnakePit Magnetized Tracer Box.

e. Splicing of location wire shall be accomplished by the use of Copperhead Industries LLC Locking SnakeBite Wire Connector.

f. Anodes shall be one pound bare magnesium or zinc. Anodes shall be placed at the beginning and end of the sewer line and at every test station or at least every 500 feet.

11. Anchors: Pipelines shall be anchored in accordance with the table below:

PIPELINE ANCHORS

Percent of Grade	Center to Center Maximum Spacing (feet)
15-35	36
35-50	24
>50	16

The anchor shall be of concrete or other material approved by the Public Works Supervisor. Concrete anchors shall have a minimum thickness of twelve (12) inches. The anchor shall extend not less than one (1) foot into undisturbed earth on the sides and bottom and one (1) foot above top of pipe. In incompressible material, the above dimensions may be six (6) inches each side and bottom. The anchor shall support a joint fitting.

12. Pipe Laying: All pipe shall be installed in accordance with the pipe manufacturer's recommendations, except as modified herein.

a. The grade alignment of all sewer lines shall be determined, maintained, and installed through the use of a laser. Other methods for determining the proper grade alignment must be approved by the Public Works Supervisor.

b. Pipe laying shall not proceed if the trench width as measured at the top of pipe exceeds the maximum allowable trench width. If this occurs, the Contractor shall submit to the Public Works Supervisor for approval a better bedding for the pipe or pipe of sufficient strength to provide safe supporting strength.

c. All pipe and fittings shall be stored and handled with care to prevent damage thereto. Do not use hooks to transport or handle pipe or fittings. Do not drop pipe or fittings.

d. Rejected pipe and fittings shall be marked and removed from the Project Site at no cost to the project. All pipe and fittings shall be examined for soundness and specification compliance prior to placement in the trench, and rejected pipe or fittings shall not be incorporated into the pipeline. Check the class or pipe strength to be sure proper pipe is installed.

e. Clean joint contact surfaces prior to jointing. Use lubricants, primers, or adhesives as recommended by the pipe or joint manufacturer.

f. Pipe laying normally shall begin at the lowest point.

g. Unless otherwise required, lay all pipe straight between manholes. Excavate bell holes for each pipe joint. When jointed, the pipe shall form a true and smooth pipeline.

h. Pipe connecting to a drop structure shall be supported with Flowable Mortar, outside the structure excavation, as shown on standard details. All other pipe connecting to a structure shall be supported with SCA-3 or CM-H.

i. All pipelines shall be plugged at the end of each day's progress. Plugs or other positive methods of sealing shall be utilized at all times to protect any existing system from entrance of storm water or other foreign matter.

j. When a sanitary sewer line crosses an existing pipeline and the clearance is less than two (2) feet, special embedment may be required.

13. Connection of Pipes of Dissimilar Materials: The connection of pipes of different materials shall be made using approved transition coupling and shall provide a permanent and watertight connection that will withstand the hydrostatic test pressure.

14. Connection of Pipes to Manholes: Connection to existing manholes shall be core drilled and booted.

2506.3 Detailed Installation Requirements: All pipes shall be installed in accordance with the following standards:

1. ASTM D-2321 – PVC Solid Wall.

2. ANSI/AWWA C 600 – Ductile Iron Pipe.

2506.4 Casing and Carrier Conduits: Casing and carrier conduits shall be installed at required locations by methods acceptable to the Public Works Supervisor. Installation of the carrier conduit shall be completed prior to installation of the adjacent portions of the pipeline to allow for adjustments.

1. Casing Types:

a. Steel Casing Pipe: Steel casing pipe is flexible conduit and shall be designed to conform with the following design concept (other methods may be submitted to the Public Works Supervisor for approval).

1. The steel casing conduit is considered a permanent installation to protect the carrier conduit and to support all loads, therefore, cathodic and corrosion protection and watertight removable end seals are required for the casing conduit. Care shall be exercised to prevent the carrier conduit from floating and receiving any load transfer from the casing conduit unless it is designed for such loading. The void between casing and carrier conduits shall not be filled. Cathodic and corrosion protection shall be provided for all casing conduits. One 32 lb. sacrificial anode package per 100 feet of casing pipe shall be provided at each end of the casing. Sacrificial, magnesium anodes shall be attached to the casing pipe by a #12 A.W.G. grounding wire at each end of the casing.

2. Casing Installation: Installation of casing shall be supervised by a contractor experienced in such work. Casing shall be installed by a combination of auguring and jacking or open cut trenching, where allowed. Alignment and gradient shall be such that the carrier conduit can be installed to line and grade shown on the drawings.

   Welding of steel casing pipe, when multiple pipe sections are used, shall be performed by a person experienced with the type of welding necessary. All welds shall conform to AWWA C 206.

3. Liner Plate Installation: Liner plates shall be assembled immediately following the excavation. Advance liner plates or casing continuously with excavation. All voids between liner and surrounding earth shall be filled with a pumpable grout resulting in a minimum set strength of 4000psi in 28 days, forced in under pressure. As the pumping through any hole is completed, it shall be plugged to prevent the back-flow of grout. After lining installation is complete, it shall be cleaned of all debris and all leaks sealed.

4. Carrier Conduit Installation: After completion of the installation of the casing, the carrier conduit shall be carefully pushed or pulled through the casing in a manner that will maintain proper jointing of the pipe joints and provide required gradient and alignment. Carrier conduit installed in casing pipe shall be restrained joint pipe in accordance with Section 2503.2 of these specifications.

5. Casing Spacers: Casing spacer type shall conform to section 2503.5.4.d. Casing spacer interval, size and installation method shall be as recommended by the manufacturer for the particular installation.

6. End Seals: End seals shall conform to Section 2503.5.4.e. End seal installation shall be as recommended by the manufacturer and shall be constructed after sewer pipe has been installed and approved.

7. The annular space between lining and sewer pipe shall not be filled.

8. Initial Testing: Air pressure and/or exfiltration test shall be required and shall be successfully performed on the carrier conduit prior to the sealing of the ends of the casing conduit.

9. Carrier Conduit Installed Without Casing: Carrier conduits installed without casing shall be assembled at the entrance to the auger hole and carefully pushed or jacked through the opening using a method designed to prevent disturbing the assembled joints. Auger holes shall be sized to accommodate the carrier conduit with a minimum of annular space around the conduit. When finally in place, carrier conduit shall be true to the line and grade required on the Plans. Carrier conduit installed without casing shall be restrained joint pipe in accordance with Section 2503.2 of these specifications.

SECTION 2507 BACKFILL:

2507.1 Scope: This section governs the furnishing of all labor, equipment, tools and materials to properly backfill trenches and structures.

2507.2 General:

1. All trash and debris shall be removed from the pipeline excavation prior to backfilling.

2. Unless otherwise specified, all sewer trenches and excavation around structures shall be backfilled to the original surface of the ground with suitable earth or earth and rock. When an earth and rock mixture is used, it shall be placed and thoroughly consolidated with sufficient earth to completely fill all voids between the rocks.

3. The backfill material shall be placed in loose lifts not to exceed 8 inches in depth. Each lift shall be compacted to the required density prior to the next lift being placed.

4. Commercial sand backfill shall not be used.

5. In areas designated on the plans, the original topsoil shall be replaced to original elevation and depth. (Minimum depth shall be six (6) inches).

6. Backfill material shall be carefully placed to avoid damage to or displacement of the pipe and other exposed utilities or structures.

7. Backfill shall not be placed when material contains frost, is frozen, or a blanket of snow prevents proper compaction. Contractor shall remove waste material, trees, organic material, rubbish, or other deleterious substances.

8. No rock greater than six (6) inches in its largest axis shall be placed in any trench excavation as backfill.

2507.3 Backfilling in Street or Alley Right-of-way and Under Pavement.

This work shall consist of placing flowable mortar fill material in all sanitary sewer trenches crossing existing or proposed public streets, alleyways or sidewalks to a point two (2) feet beyond the edge of the public pavement, and for all portions of trenches running parallel to and within two (2) feet of the edge of the public pavement.

1. Flowable mortar shall meet the requirements of the City of Phillipsburg Technical Specifications, Section 1100: Grading.

2. Flowable mortar shall be discharged from the mixer by a reasonable means into the trench area to be filled.

2507.4 Backfilling In Areas Other Than Street or Alley Right-of-way:

1. From the top of the pipe embedment (as defined in Section 2506.2.6) to a point at grade, the backfill material shall be compacted to no less than 90% of maximum density at optimum moisture plus or minus 2% as determined by ASTM 698.

2507.5 Backfill Around Structures:

1. No backfill shall be placed over or around any structure until the concrete or mortar has attained a minimum strength of 2000 psi and can sufficiently support the loads imposed by the backfill without damage.

2. The Contractor shall use utmost care to avoid any wedging action between the side of the excavation and the structure that would cause any movement of the structure. Any damage caused by premature or unbalanced backfill or by the use of equipment on or near a structure will be the responsibility of the Contractor.

3. No rock larger than six (6) inches maximum dimension shall be placed within one (1) foot of the exterior surface of any structure.

SECTION 2508 RESTORATION:

2508.1 Scope: This section covers all work required in surface restoration on private and public properties that are disturbed by construction.

2508.2 General: The Contractor shall restore the project site to conditions at least equal to those existing prior to entry unless otherwise specified.

1. Maintain adequate safety signs, barricades and lights until final restoration of work area is completed.

2. Public property shall be restored to the requirements of the public body having jurisdiction.

3. Private property shall be restored to conditions at least equal to those existing prior to the work or as indicated on the plans.

2508.3 Clean-Up: The Contractor, upon completion of installation and backfill operations, shall prepare the area for final grading including but not limited to the following items:

1. Clean-up shall follow the backfilling operations as closely as possible.

2. Excess material shall be removed from the site including material that has washed into the stream beds, storm water facilities, streets, etc., on or off site.

3. Tools, equipment and construction material shall be removed except for in designated storage areas along the pipeline route.

4. Restore surface and sub-surface drainage and provide erosion control measures where they are required and/or necessary.

2508.4 Finished Grading: The Contractor shall finish grade the area to lines and grades shown on the Plans or, if not shown, to those that existed prior to the area being disturbed. Special attention shall be directed to assure surface drainage. The area shall be smoothed by raking or dragging.

2508.5 Seeding and Sodding: Shall comply with the City of Phillipsburg Technical Specifications, Section 7200: Seeding.

2508.6 Pavement Replacement: This section covers the replacement of asphalt pavement, gravel surfacing, sidewalks, driveways, curbs, and other pavement construction removed or damaged during the progress of the work

1. All pavement replacement work shall comply with applicable sections of the City of Phillipsburg Technical Specifications, current edition.

2. All pavement replacement work shall be subject to acceptance by the Public Works Supervisor, and agency having jurisdiction thereof. All materials utilized for pavement replacement work shall be new unless otherwise specified on the Plans, Special Project Specifications, or as approved by the Public Works Supervisor.

2508.7 Trees, Shrubs and Bushes: Any tree, shrub or bush replaced shall be planted outside the permanent utility easement and shall be of the same species as the removed tree, shrub or bush. Any tree, shrub or bush species that is prohibited by local restrictions shall be substituted with a related species. Replacement planting shall conform to the guidelines ANSI-Z60.1-1980 “American Standard for Nursery Stock” specified by the American Association of Nurserymen. The Contractor shall notify private property owners at least two weeks prior to the start of construction so private property owners can remove small plants and flowers.

SECTION 2509 TESTING:

2509.1 Scope: This section governs the furnishing of all labor, equipment, tools and materials, and the performance of any or all acceptance tests.

2509.2 General: The Contractor shall furnish all labor, equipment, materials and reports for the required acceptance tests. All pipelines, including building service connections, shall undergo and pass all required tests to determine soundness and workmanship. Pipelines that do not conform to the project requirements shall be repaired and/or

replaced and shall be retested until the pipelines meet the project requirements. No testing shall be performed before backfill and compaction operation has been completed.

2509.3 Alignment and Grade: Alignment, grade and visible defects shall be checked as follows:

1. Television Inspection: Sewer lines and casing pipe installed under this project shall be inspected by closed circuit television. Video inspection shall be performed by the City of Phillipsburg Utility Department.

    a. Contractor shall clean pipe of excess mortar, joint sealant and other dirt and debris prior to inspection.

2509.4 Testing Procedures:

1. Air Test: The Contractor shall perform a low pressure air test. The section of pipe between successive manholes shall be sealed with suitable plugs. One of the plugs shall have an orifice through which to pass air into the section of pipe being tested. The air supply line shall have a positive on-off valve and suitable means for readily disconnecting it at the control panel. A second orifice in the plug shall be used for constantly reading the internal pressure of the pipe. This orifice shall be continuously connected to a pressure gauge having a range from 0 to 10 psi. The gauge shall have minimum divisions of 0.10 psi and shall have an accuracy of 0.04 psi. The line under test shall be pressurized to approximately 4 psi. The air supply will then be shut off, and the pressure will be allowed to stabilize for a minimum of 2 minutes. If, during this period, the pressure has dropped below 3.5 psi, more air shall be introduced to raise the pressure to a minimum of 3.5 psi. After this stabilization period, the air supply line shall be disconnected and timing will begin. The time of the test, in minutes, will be equivalent to one-half of the nominal diameter of the pipe being tested. As an example, for an 8-inch pipe, the time period will be 4 minutes; for a 10- inch pipe, 5 minutes; etc. The maximum allowable pressure drop during the specified time period will be 1.0 psi.

    Each sewer main tested shall be allowed two low pressure air tests. Should the main fail to produce satisfactory results and additional testing is required, the contractor will be charged a fee of $500 per test for inspection and testing.

2. Hydrostatic Testing for Pressure Systems:

    a. Conformance Procedure: All testing shall conform to AWWA C 600 procedures as modified herein. Tests shall apply to all pressure sewers.

    b. Sectionalizing: Test in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs. Contractor shall furnish and install test plugs at no additional cost to the project, including all anchors, braces, and other devices to withstand hydrostatic pressure on plugs. Contractor shall be responsible for any damage to public or private property caused by failure of plugs. Limit fill rate of line to available venting capacity.

c. Pressure Test: All pressurized sewer systems shall be pressure tested as follows:

1. The pipeline shall be filled with water and all air expelled from the pipeline. Vents shall be provided where necessary and suitable plugs shall be provided for tapped vents.

2. The Contractor shall provide all necessary pumping equipment, piping connections, pressure gauges, anchored or blocked test plugs, and all other equipment, materials, and facilities necessary to complete the pressure testing.

3. The test pressure at any point in the pipeline shall be 2.5 times the operating pressure not to exceed 200 psi.

4. The test pressure shall be maintained for a minimum of 30 minutes or whatever period is necessary for the Inspector to inspect the pipeline. Under no circumstance shall the Inspector be permitted to leave the project site during pressure testing activities.

5. Any drop in pressure across the tested section of the pipeline shall constitute failure of the pressure test.

6. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective shall be removed immediately and replaced with new and acceptable material, by and at the expense of the Contractor.

7. Pressure testing shall be repeated until the line and all parts thereof withstand the test pressure in a satisfactory manner.

8. Each sewer main tested shall be allowed two pressure tests. Should the main fail to produce satisfactory results and additional testing is required, the contractor will be charged a fee of $500 per test for inspection and testing.

2509.5 Deflection Test:

1. General: After all sewer pipe has been laid and backfilled, the Public Works Supervisor or authorized representative shall require a deflection test. The maximum allowable deflection shall not exceed 5.0% of the pipe's internal diameter. The deflection test shall consist of guiding a mandrel of the appropriate size through the pipe to accurately measure any deflection in the pipe. Attention should be given to the fact that the pipe's nominal diameter is greater than the actual internal diameter of the pipe. Lamping will not be approved for deflection testing. The mandrel shall conform to ASTM D-2680 or ASTM D-3034, whichever applies.

2509.6 Soil Density Tests:

1. General: Compaction tests shall be performed as specified on the Plans. All compaction tests shall be performed by a testing laboratory approved by the Public Works Supervisor. The Public Works Supervisor may require additional density tests if needed.

SECTION 2510 MANHOLES AND SPECIAL STRUCTURES:

2510.1 Scope: This section governs the furnishing of all labor, equipment, tools, and materials, and the performance of all work incidental to the construction of manholes, drop manholes and special sewer structures complete with covers, fittings, and appurtenances as required in accordance with the Plans and Special Project Specifications.

2510.2 General: As used herein special structures refers to manholes on large sewers, special junction structures, metering stations and similar structures constructed on the pipeline.

Manholes and special structures may be constructed of precast concrete sections or cast- in-place concrete.

2510.3 Manhole Materials:

1. Mortar and plaster coating: Mortar and plaster coatings for masonry manhole units shall conform to ASTM C 270. The mix shall consist of two (2) parts portland cement to one (1) part masonry cement to six (6) parts standard plaster sand. No mortar or plaster mixed more than thirty (30) minutes shall be incorporated in the work.

2. Non-Shrink Grout: Non-Shrink grout shall be in the plastic state and show no expansion after set as tested in accordance with ASTM C 827 and shall develop compressive strength not less than three thousand (3,000) pounds per square inch with a trowelable mix within twenty-four (24) hours per ASTM C 109. The placement time shall be not less than forty-five (45) minutes based on initial set per ASTM C 191.

3. Epoxy System: Where specified, interior surfaces shall be coated using a two part, 100 % solid, epoxy material spray applied on the job site. Approved systems are Raven 400, 404, 405, and 470. Interior surfaces shall be cleaned and prepared for spray applications in accordance with manufacturer's recommendations. Epoxy systems shall only be applied after manhole installation is complete and must be hand sprayed; spun application will not be permitted. All epoxy systems shall be holiday or spark tested per manufacturers' recommendations.

4. Polyurethane System: Where specified interior surfaces shall be coated using a 100% solids polyurethane. Approved systems are Zebron 386. Interior surfaces shall be cleaned and prepared for spray applications in accordance with

manufacturer's recommendations. Polyurethane systems shall only be applied after manhole installation is complete and must be hand sprayed; spun application will not be permitted. All polyurethane systems shall be holiday or spark tested per manufacturers' recommendations.

5. Precast Concrete: Precast concrete manholes shall conform to ASTM C 478 with The following modifications.

    a. Wall thickness not less than one-twelfth (1/12) of inside diameter or four (4) inches, whichever is greater, shall be used when the manhole depth is less than sixteen (16) feet; one-twelfth (1/12) of inside diameter plus one (1) inch or five (5) inches, whichever is greater, shall be used when manhole depth is sixteen (16) feet or greater.

    b. Cement, Fine Aggregate, Coarse Aggregate and Water used in the manufacture of precast manholes shall be as specified in Section 2510.3.5.

    c. Developed bases shall be used where practical. The diameter of the base pad shall be eight (8) inches greater than outside diameter of the manhole.

    d. Pipe openings shall be circular or horseshoe shaped with surfaces grooved or textured to improve mortar bond. Flexible gaskets shall be used with developed base manholes. Flexible gaskets shall be PSX, Press-wedge, A-Lok, or approved equal.

    e. When tying into an existing manhole, the pipe opening shall be core drilled and a modular or flexible gasket installed, such as Link Seal, Z-Lok, or approved equal.

    f. The minimum distance from the bottom of the downstream pipe to the top surface of the base shall be three (3) inches.

    g. Manhole steps shall not be provided.

    h. Joints between manhole sections, adjustment rings, and below the ring and cover shall be sealed with preformed bitumastic sealants, Kent-Seal, Ram-Nek, E-Z Stick or approved equal. The minimum bead dimension shall be one inch.

    i. Manhole Joint Sealants – Cold-Applied: Cold-applied joint sealants shall be Kent- Seal, Ram-Nek, EZ-Wrap, Infi-Shield Gator Wrap or approved equal.

    j. Manhole Joint Sealants – Heat Applied: Heat applied joint sealant shall be CanusaWrapidseal.

6. Manhole and Special Concrete: Manhole and special concrete shall conform to Section 2000 of the City of Phillipsburg Technical Specifications or as provided herein.

a. Standard Concrete: Standard concrete used for concrete encasements thrust blocks, pipe anchors, pipe collars, etc. shall be 4000 psi, 28-day strength, unless otherwise specified.

b. Structural Concrete: Structural concrete used for aerial crossing piers, wetwell walls, manhole walls, bases, inverts, and flat slabs, etc. shall be 4000 psi, 28-day strength, unless otherwise specified.

7. Reinforcement steel: Reinforcement steel shall conform with the following minimum requirements.

a. Design: Reinforcing steel shall conform to one of the following.

1. Welded Wire Fabric – ASTM A 185.

2. Reinforcing Bars – ASTM A615, Grade 60.

3. Fabricated Steel Bar and Rod Mats – ASTM A 184, Grade 40, or Grade 60.

b. Fabricating Tolerances: Tolerances for concrete reinforcement shall conform to the following requirements.

1. Sheared length =+/- 1 inch.

2. Stirrups, ties, and spiral = +/- 2 inches.

3. All other bends = +/- 1 inch.

8. Iron Castings: Casting shall conform to the requirements of ASTM A 48, Class 30.

Castings shall be clean and without surface defects that will impair serviceability. Plugging or filling of holes or other defects will not be permitted. Parting fins and pouring gates shall be removed.

a. Rings and Covers: Rings and covers shall meet the following minimum requirements.

1. Bearing surfaces between the ring and cover shall be machine finished or ground to assure interchangeability and a nonrocking fit in any position.

2. Provision shall be made for opening, such as concealed pick hole(s).

3. Bolt-down type manhole rings shall be anchored to the manhole walls with not less than four (4) three-fourths (3/4) inch diameter steel bolts embedded a minimum of four (4) inches, except where the entire ring is embedded in a concrete top slab.

4. Rings and bolt-down covers shall be provided with machined surfaces, O-ring gaskets and one-half (1/2) inch hex head stainless steel cover bolts and washers. Cover bolt heads shall fit flush or below the top of the cover. The O-ring rubber gasket shall be neoprene or other synthetic, sixty (60) plus or minus five (5) hardness when measured by ASTM D 2240 type durometer.

5. Rings and bolt down covers shall be Deeter Foundry model 1030-B or approved equal.

2510.4 Manhole Excavation:

1. Excavation: Excavation for manholes and special structures shall be governed by this Section and Section 2505. It shall be achieved in a suitable and orderly manner providing a minimum disturbance to the general public.

2. Depth of Excavation: Depth of excavation shall be to that required for proper installation of the manhole or structure. Over-depth excavation may be required by the Public Works Supervisor if the subgrade is unstable. Over-depth excavation due to unstable subgrade shall be backfilled as required by the Public Works Supervisor. Over-depth excavation occurring through an oversight by the Contractor shall be backfilled as required by the Public Works Supervisor at no additional cost to the project.

3. Side Clearances: Side clearances outside the manhole and/or structures shall be no greater than to allow for forming, connection of piping, proper application of special coatings, if required, and to permit inspection. When concrete is to be placed directly against excavated faces, excavation shall be sufficiently outside of the manhole or structure to provide not less than three (3) inches of concrete cover over the steel reinforcements.

2510.5 Manhole Installation: Manhole installation shall be governed by this Section and Section 2506. It shall be performed by the Contractor on a schedule that will provide an orderly progression of the work.

1. Bases:
   a. Precast developed bases shall be reinforced in accordance with ASTM C 478.

   b. If preferred developed bases are not used, poured concrete bases shall be used. Developed bases shall be installed on a maximum of 4 inches of crushed rock. Depths exceeding this amount shall be filled with mass concrete.

   c. Poured-in-place bases shall have a minimum thickness of eight (8) inches. When poured-in-place bases are used, the invert shall be poured monolithically with the base. The bottom wall sections shall be embedded in the base section a minimum of three (3) inches. The bottom precast wall section shall not be set upon a previously poured base. Solid concrete blocks shall be used for supporting and leveling the wall section prior to pouring the base.

2. Inside Dimensions: The minimum inside diameter of standard manholes shall be four feet. Drop manholes shall have a minimum five foot diameter.

3. Precast:

    a. Delivery: Written documentation (eg. Letter of Certification) must accompany manholes being delivered to the site and given to the Inspector. The documentation should state that either:

        1. The manholes being delivered have reached 80% of the required 4,000 psi 28- day design strength (ie. 3200 psi) prior to leaving the plant, or

        2. Prior to leaving the plant, the manholes being delivered have cured at least as long and under the same conditions, and are of the same design mix and lot, as a test cylinder that has reached 3200 psi.

    b. Inspection: Precast concrete components shall be inspected when delivered. Rejection of defective or cracked precast concrete components shall be in accordance with ASTM C478.

    c. Wall Thickness: Wall thickness shall conform to the requirements of Section 2510.3.5.a.

    d. Construction: Precast sections shall be cleaned of all dirt, grass, and other deleterious matter. Seal each joint (including adjustment rings and castings) with a double bead of preformed bitumastic joint sealant. Lift holes shall be patched with non-shrink grout. Each joint, including adjustment rings and castings, shall be sealed with approved heat or cold-applied sealant conforming to Section 2510.3.5.i or 2510.3.5.j of these specifications.

4. Inverts: Inverts shall be structural concrete or grout and steel-troweled to produce a dense, brushed finish. The invert channel shall be “U” shaped in cross section and extend upward one-half of the inside pipe diameter. Smooth transitions shall be formed for pipes of different sizes, elevation and bends. The invert bench shall be sloped to drain. A minimum drop of 0.2 feet shall be required across all manholes unless otherwise approved by the Public Works Public Works Supervisor.

5. Top Elevation: The finished top elevation of manhole castings shall conform to the following unless otherwise shown on the plans or directed by the Public Works Supervisor.

    a. In paved or future paved areas, the top of the casting shall conform to the slope of the pavement and be 1/8 inch below the finished pavement elevation.

    b. In non-pavement areas, the top of the casting shall be not more than six (6) inches above the surrounding ground. The final elevation shall be at a point where water will not pond over the manhole cover.

6. Manhole Adjustment: All new manholes will be provided with adjustment ring(s) underneath the casting as shown on Plans. The joints shall be sealed with preformed bitumastic sealant. The maximum allowable adjustment distance between the top of the cone and the bottom of the casting shall be 12" total, including extender and adjustment rings. If the top of an existing manhole is required to be raised to an elevation that will exceed the maximum adjustment distance or lowered more than the adjustment rings will allow, all vertical adjustments shall be made to the barrel of the manhole. Adjustment rings shall be sealed with an approved cold-applied sealant conforming to Section 2510.3.5.i of these specifications. Adjustment rings shall be sealed with an approved heat-applied sealant conforming to Section 2510.3.5.j if manhole location is governed by Section 2510.5.9, of these specifications.

7. Castings: Castings shall be installed with the mud ring inserted inside the manhole opening and resting on a minimum of two rows of preformed bitumastic sealer. Bolt- down castings shall be held in place as shown on the Plans and shall comply with Section 2510.3.8.a of these specifications.

8. Manholes in the 100 year floodplain shall be installed with bolt down gasketed lids conforming to the provisions of Section 2510.3.8.a of these specifications.

9. Manholes in the 100 year floodplain shall have all joints sealed with a heat-applied sealant conforming to Section 2510.3.5.j of these specifications.

2510.6 Manhole Backfilling: Manhole backfilling shall be governed by Section 2507.

2510.7 Restoration: Restoration shall be governed by Section 2508.

2510.8 Manhole Testing: Vacuum testing shall be performed in the following manner:

1. Each manhole shall be vacuum tested. Testing shall be completed prior to the application of any specified lining material.

2. All lift holes, removed step holes, core drill setup holes, or other imperfections inside the manhole shall be filled with an approved non-shrink grout prior to testing.

3. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.

4. The test head shall be placed at the inside of the top of the casting and the seal inflated in accordance with the manufacturer's recommendations.

5. A vacuum of 10 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 drop to 9 inches. The manhole shall pass if the time is greater than 60 seconds for 48" diameter, and 75 seconds for 60".

2510.9 Air Release Valves: Combination air release and vacuum relief valve assemblies shall be installed in the locations as indicated on the drawings. Each valve assembly shall be

installed complete with appurtenant piping and valves as shown on the standard drawings.

Combination air release and vacuum relief valves shall be A.R.I. Model D 025. All working parts shall be stainless steel and the valve body shall be reinforced nylon.

Combination air release and vacuum relief valves shall be housed in a precast concrete vault as detailed on the standard drawings.

SECTION 2511 SEPARATION REQUIREMENTS:

2511.1 Horizontal Separation:

1. A minimum of ten (10) feet horizontal separation, as measured from the outside edge to outside edge, shall be required between a sanitary sewer main or manhole and potable waterline.

2. Under no circumstance shall potable waterline and sanitary sewer be placed in the same trench.

3. Sanitary sewers shall meet the minimum separation requirements from public water supply wells or other water supply sources and resources as set forth by the appropriate reviewing agency.

2511.2 Vertical Separation:

1. A minimum of two (2) feet vertical separation, as measured from the outside walls of the pipe, shall be required between a sanitary sewer main and potable waterline.

2. In general sanitary sewer lines shall be located below potable waterlines.

2511.3 Protective Measures: When sanitary sewers and potable waterlines cross with less than two (2) feet of vertical clearance, and in all cases where the potable waterline, is located below the sanitary sewer, additional measures must be employed to protect the potable waterline.

Acceptable measures include:

1. Construction of the sanitary sewer line using one of the following materials:

   a. Ductile iron pipe conforming to ASTM A536 or ANSI/AWWA C151/A21.52 with a minimum thickness class 50, and gasketed, push-on, or mechanical joints in conformance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C111/A21.11.

   b. Reinforced concrete pipe conforming to ASTM C76 with gasketed joints in conformance with ASTM C361 or ASTM C443.

Install a minimum twenty (20) foot length of sanitary sewer pipe on the crossing to maximize the joint spacing to a minimum of ten (10) feet from the crossing.

2. Provide concrete encasement of the sanitary sewer line for a minimum distance of ten (10) feet either side of the pipeline crossing.

3. Sanitary sewer service lines may be constructed using schedule 40 PVC pipe with solvent welded joints. Pipe joints shall be located a minimum of ten (10) feet either side of the pipeline crossing.

SECTION 2512 MEASUREMENT AND PAYMENT:

2512.1 Scope: This section covers the methods of measurement and the basis of payment for the furnishing of all labor, equipment, tools and materials and for the performance of all related work necessary to complete any construction covered in Section 2500.

2512.2 General: The methods of measurement and payment shall be in accordance with City of Phillipsburg Technical Specifications Section 0010: General Technical Provisions, as specified herein, and as listed in the Proposal.

2512.3 Items not listed in the Proposal: There will be no measurement or separate payment for any items of work not specifically identified and listed in the Proposal and all costs pertaining thereto will be included in the Lump Sum Proposal or Contract Unit Prices for other items listed in the Proposal.

2512.4 Basis of Payment: Payment will be made of the respective unit at the unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Public Works Supervisor's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Contractor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

Bid Item	Quantity U
-inch SSP (SDR-)*	LF
-inch SSP Service Line	LF
-inch SSP Service Connection	EA
Standard Manhole (4’ Dia., 6’ depth)	EA
Standard Drop Manhole (5’ Dia., 6’ depth)	EA
Extra Depth Manhole (__’ Dia.)	VF
Connect to Existing Manhole	EA
Standard Doghouse Manhole	EA
Adjustment of Existing Manhole	EA
Flowable Mortar	CY
Seed, Fertilize, and Mulch	LS
Erosion Control	LS
Construction Staking	LS
Traffic Control	LS

2512.5 Standard Bid Items: The following is a list of standard bid items and quantity units for sanitary sewer projects. Project-specific or special items shall be added to the list where appropriate. Lack of inclusion of a specific item from the Standard Bid Items List will not be justification for non-performance. All work must meet City Standards.

*For PVC Pipe

City of Phillipsburg
Construction and Material Specifications
Section 2900 – Waterlines

SECTION 2901 GENERAL

2901.1 Description: Waterline construction shall consist of furnishing all labor, materials and equipment for the complete installation of pipelines and appurtenances in accordance with the contract documents, standard drawings, approved shop drawings, General Provisions and these specifications. These specifications govern materials for water mains having a diameter of two inches (50 mm) through 12 inches (300 mm).

2901.2 Specification Modifications: It is understood that throughout this section these Specifications may be modified by appropriate items in the Special Project Specifications or notes on the Contract Drawings.

2901.3 Revisions of Standards: When reference is made to a Standard Specification i.e. ASTM, ANSI, AWWA, MCIB the Specification referred to shall be understood to mean the latest revision of said specification as amended at the time of the Notice to Bidders, except as noted on the Plans or in the Special Project Specifications. The City may, at its option, update and revise these specifications periodically in response to changing technology and construction methodologies.

2901.4 Definitions: “Public Works Supervisor” shall mean the Public Works Supervisor or Utilities Public Works Supervisor’s representative. “Design Engineer” shall mean the licensed individual or firm who developed, sealed, and signed the improvement plans. “Contractor” shall mean any employee, agent or subcontractor of the construction company responsible for completing the work. “Inspector” shall mean the City of Phillipsburg Public Works Department inspector assigned to the project or authorized representative thereof. “Special Project Specifications” shall mean specifications modified due to special or unusual project conditions identified by the Design Public Works Supervisor that warrant deviation from the City of Phillipsburg Construction and Material Specifications Section 2900 – Waterlines, current edition.

2901.5 Contractor’s Warranty: During a period of one year from the date of final acceptance by the City, the Contractor is responsible for making any necessary repairs arising out of defective workmanship or materials. This includes, but is not limited to, trench settlement of water lines constructed as part of this project. The Contractor is responsible for repairing all trench settlement including removing and replacing sidewalks, streets, driveways, and entrance walks constructed since the project was accepted by the City. Representatives from the City and the Contractor shall conduct an inspection of this project 11 months after the project has been accepted by the City to determine what repairs need to be made.

SECTION 2902 MATERIALS

2902.1 Scope: This section governs materials that may be required to complete pipeline construction as shown on the Plans and/or as provided for in the Special Project Specifications.

1. Requirements: Furnish pipe of materials, joint types, sizes, and strength classes indicated or specified. Higher strengths may be furnished at the Contractor's option at no additional cost to the project.

2. Manufacturer: The manufacturer shall be experienced in the design, manufacture and commercial supplying of the specific material.

3. Inspection and Testing: Inspection and testing shall be performed by the Manufacturer's quality control personnel in conformance with applicable standards. Testing may be witnessed by Design Public Works Supervisor, Public Works Supervisor or approved independent testing laboratory. The Contractor shall provide one (1) copy of certified test reports indicating the materials conform to the specifications to the Inspector.

4. Handling: Handling of materials used in pipeline construction shall conform with section 2903.2 of these specifications. Damage to materials that cause reasonable doubt as to their structural strength or water-tightness will cause that material to be rejected.

2902.2 Pipe and Fittings:

1. Ductile Iron Pipe and Fittings: Unless indicated otherwise on the plans all ductile iron pipe shall be Class 50 conforming to ANSI A21.51, AWWA C151, ASTM A536, and shall be of Grade 64-42-10.

   All ductile iron fittings shall be mechanical joint fittings, class 350, meeting all applicable requirements of ANSI A21.10 and A21.11 and AWWA C153 and C111. Fittings shall be supplied with all necessary appurtenances to accomplish installation as shown on the plans. All fittings shall be provided with stainless steel grade 304 or better bolts, washers, and nuts; nuts shall be coated to prevent seizing and galling.

   a. Joints: Unless otherwise specified, shall be of the push-on type conforming to ANSI A21.11/AWWA C111, except gaskets shall be neoprene or synthetic rubber. Natural rubber gaskets will not be acceptable. Mechanical joints shall conform to ANSI A21.11. Restrained joints shall be Griffin Snap-Lok or approved equal.

   b. Lining: All ductile iron pipe shall be cement mortar lined, conforming to ANSI A21.4and AWWA C104. All ductile iron fittings shall be lined with a fusion bonded epoxy conforming to ANSI 21.16 and AWWA C116.

   b. Coating: All ductile iron pipes shall be bituminous coated per AWWA C151. All ductile iron fittings shall be shop coated with a fusion bonded epoxy inside and outside conforming to ANSI A21.16 and AWWA C116.

Anchor couplings shall be shop coated with a fusion bonded epoxy; asphalt varnish tar coating shall be acceptable when a fusion bonded epoxy coating is not available for the specified anchor coupling

2. Polyvinyl Chloride Pipe (PVC) and Fittings: PVC shall meet the requirements of ASTM D1784, cell classification 12454-B, for PVC compounds, and AWWA C900 with cast iron pipe O.D., for PVC pipe. Materials from which the pipe is manufactured shall have been tested and approved for conveying potable water by the National Sanitation Foundation. The NSF stamp of approval shall appear on the pipe. PVC pipe shall be blue in color and pressured rated at 200 psi with a dimension ratio (D.R.) of 14 as defined in AWWA C900. SDR-21 is subject to written approval from the Public Works Supervisor

   All fittings shall be ductile iron and shall be mechanical joint fittings, class 350, meeting all applicable requirements of ANSI A21.10 and A21.11 and AWWA C153 and C111. Fittings shall be supplied with all necessary appurtenances to accomplish installation as shown on the plans. All fittings shall be provided with stainless steel grade 304 or better bolts, washers, and nuts; nuts shall be coated to prevent seizing and galling.

   a. Joints: Joints for PVC pipe shall be slip on type with integral bell and spigot pipe, or pipe with extruded type couplings, meeting the requirements of ASTM D3139, except flexible elastomeric gaskets meeting the requirements of ASTM F477, shall be synthetic rubber. Natural rubber will not be acceptable. Restrained joints shall be Certa-Lok C900 RJ (Coupled) or C900 RJIB(Integral Bell) or approved equal.

   b. Lining: All ductile iron fittings shall be lined in conformance with Section 2902.2.1. B of these specifications.

   c. Coating: All ductile iron fittings shall be coated in conformance with Section 2902.2.1.c of these specifications.

3. Copper Pipe: Copper pipe and brass fittings shall be American made Type "K" soft copper, unless rigid is required, and shall be supplied in accordance with ASTM Specification B-88-62.

4. Polyethylene Tubing: Polyethylene Tubing for service connections sizes ½" to 2" shall be of cell classification PE 3608, a minimum of SDR-9 and shall conform to all applicable requirements of AWWA C901

2902.3 Valves and Valve Boxes:

1. Gate Valves: The type, size and location of valves shall be as shown on the Plans. All gate valves 3 inch and larger in pipe lines, except as modified herein,

shall be 200 psi, ductile iron body, gate valves with non-rising stems. Gate valves shall be resilient seated conforming with all applicable requirements of AWWA C515. All fittings shall be provided with stainless steel grade 304 or better bolts, washers, and nuts; nuts shall be coated to prevent seizing and galling.

All 2 inch and smaller valves shall be ball valve type brass curb stops and shall conform to the requirements of Section 2902.3.4 of these specifications.

2. Butterfly Valves: All butterfly valves 4" and larger shall be Henry Pratt Groundhog Buried Rubber Seated Butterfly Valve or approved equal. All butterfly valves shall conform to AWWA C504 and be rubber seated.

3. Hose Valves: Hose valves shall be Nibco No. 63 or Tanner No. 906.

4. Curb Stops: Curb stops shall be brass, ball valve type with a T-head for operation. End connections shall be either iron pipe threads or compression type depending upon application and with the approval of the Public Works Supervisor or authorized representative. Curb stops shall be Muller or Ford Meter Box Company, Inc. or approved equal, ball valve curb stop.

5. Corporation Stops: Corporation stops shall be brass construction, tee head type Muller or Ford FB-1000. All corporation stops shall be furnished with AWWA taper thread on inlets.

6. Valve Ends: Valve ends shall be of the mechanical joint type, conforming to ANSI A21.11/AWWA C111 except where flanged ends are required on the plans.

   The end flanges of flanged gate valves shall conform in dimensions and drilling to ANSI B16.10 for cast-iron flanges and flanged fittings, Class 125, unless explicitly provided otherwise on the Plans and Special Project Specifications. The laying lengths of the flanged valves shall conform to the dimensions of ANSI B16.10.

7. Bonnet Thrust Plates: The bonnet shall have a removable thrust plate to permit the removal and replacement of the valve stem and "O" ring seal while the valve is in service.

8. Tapping Valves: The size and location of the tapping valves shall be as shown on the plans. The valves shall be 200 psi, ductile iron body, resilient seat gate valves with non-rising stems conforming with all applicable requirements of ANSI/AWWA C515 except that the outlet end shall be standard mechanical joint end conforming to ANSI A21.11/AWWA C111 and the inlet shall have a raised male face, conforming to MSS-SP60, to

ensure true alignment of valve and tapping sleeve. Acceptable valves will be Muller or approved equal. All approvals will be written from the Public Works Department.

9. Stem Seals and Coatings:

    a. All valves shall be provided with stem seals of the "O" ring type. Two "O" rings shall be used with at least one "O" ring inserted above the thrust collar. The packing plate shall be attached to the valve bonnet by not less than two (2) bolts and one "O" ring below the thrust collar.

    b. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop coated with a fusion bonded epoxy for corrosion protection. The valve manufacturer's standard epoxy coating will be acceptable.

10. Valve Operation: All valves shall be equipped with a 2 inch square wrench nut and the direction of rotation to open the valve shall be counterclockwise. Each valve body shall have the word "OPEN" and an arrow indicating the direction to open the valve cast thereon. Wrench nuts shall comply with AWWA C515.

11. Extension Stems: When the distance from the top of the valve cover to the valve operating nut exceeds 3 feet, an extension stem to bring the valve stem to within 3 feet of the top of the valve cover shall be provided.

12. Valve Boxes, Lids and Covers: All valve boxes, lids, and covers shall be coated in bituminous varnish.

    a. Valve Boxes: All buried valves shall be provided with valve boxes.

        1. Valve box shall be cast iron screw type within paved areas.

        2. Valve box shall be 6" IPS PVC cut to depth required in turf areas.

        3. All valve boxes shall be set plumb and placed directly over the valve it serves.

    b. Lids and Covers:

        1. Lid and cover shall be Clay and Bailey #2194 or Star Pipe Products VB-0045 or approved equal for turf areas.

        2. All lids shall have "Water" cast in the lid.

        3. All lids shall be flush with finished grade.

c. Valve box adapters:

1. Valve box adapters shall be Clay and Bailey #P-1080 with drop type lid or approved equal.

2902.4 Fire Hydrants:

1. General: Fire hydrants shall be open right, dry barrel, standard compression, two- piece standpipe, break-away design conforming to AWWA C502 and shall comply with the following:

   a. Fire hydrants shall be supplied with hose nozzles specified by the Public Works Department with mechanical valve opening with bronze to bronze seating.

   b. Hydrant shall be equipped with a 4" or 6" mechanical joint shoe connection with all joint accessories furnished.

   c. Hydrant shoe shall be epoxy coated internally and externally and all below grade bolts except those on the mechanical joint shoe connection shall be stainless steel.

   d. Hydrants shall be Waterous WB-67, U.S or Mueller "Super Centurion", or AVK Model 2700 or 2780with traffic safety flanges.

2. Fire hydrants shall be painted Federal Safety Yellow to the ground line.

3. Nut Dimensions: Operating stem and nozzle cap nuts shall be 1 ½" point to flat pentagon.

4. Nozzle Threads and Caps: Hydrant nozzles shall meet NFPA standard thread requirements. All hydrant threads shall be oil lubricated by means of an oil reservoir.

2902.5 Specials

1. General: Vaults which, by their special nature, must be cast in place shall conform to the plans and concrete specifications in Section 2902.8.

2. Pressure Reducing Valves: Pressure reducing valves shall be designed to provide tight shutoff under conditions of no flow and shall not "hunt" under ordinary flow conditions. Pressure reducing valves shall be installed as shown on the Plans, and selected and sized as recommended by the valve

manufacturer. Pressure reducing valves shall be as suitable for operation under the pressure and flow conditions as shown on the Plans.

3. Air Release Valves: Air release valves shall be installed at the locations indicated on the Plans. Valves shall be designed for a working pressure of 150 psi and shall have floats and all working parts constructed of stainless steel. Each valve assembly shall be installed complete with all appurtenant piping as shown on the Standard Drawings and shall be APCO No. 200 or approved equal. Orifice size shall be determined by the manufacturer with a 3/16" diameter, minimum.

4. Check Valves: Check valves in air release piping shall be wafer style designed for installation between two pipe flanges and shall be Center Line "Center Check" or Mission "Style B Duo-Check Fig. 12 HMP" Each check valve shall conform to AWWA C550, have a ductile iron body per ASTM A536, stainless steel plates, stainless steel springs, and standard trim materials for IBBM construction. The coating shall be electrostatically applied fusion bonded epoxy.

5. Blow-Off Assemblies: Blow-off assemblies shall be installed at the locations indicated on the Plans. Blow-off assemblies shall be installed with all appurtenant piping, valves, etc. as indicated on the Plans and/or Standard Drawings. All piping shall be 2 inch diameter brass or galvanized steel as indicated on the Standard Drawings.

6. Tapping Saddles:

    a. Tapping saddles used on PVC pipe for 2 inch and smaller services shall be solid brass Smith Blair or approved equal.

    b. Tapping saddles used on ductile iron pipe for 2 inch and smaller services shall be solid brass Smith Blair or approved equal.

    c. All tapping saddles shall be furnished with AWWA threads.

7. Tapping Sleeves: Tapping sleeve body, flange, bolts, and nuts shall be grade 304 stainless steel; nuts shall be coated to prevent seizing and galling. Tapping sleeves shall be either mechanical joint or flanged for a true tapping valve per MSS-SP60 and shall be provided with a complete full circle rubber gasket permanently attached to the body.

    a. Size on size tapping will not be permitted for mechanical joint tapping sleeves.
    b. All tapping sleeves shall have a ¾" NPT test plug for pressure testing and be capable of withstanding a working pressure of 150 psi.
    c. Tapping sleeves shall be approved by the Public Works Department.

8. Meter Assembly: Meter assemblies shall be removed, reset, reconnected, or replaced as shown on the Plans.

    a. Meter Setter: Meter setter shall be Ford VB-81W for 5/8" meters, Ford VB-84W for 1" meters, VBH76-18-44-66 for 1 ½" meters, and VBH77-18-44-77 for 2" meters or approved equals. Vertical brace eye shall be specified for 1" and smaller meter setters when polyethylene tubing (PE pipe) is specified for use. Meter setters for 2" and smaller meters shall be provided without a by-pass.

    b. Meters larger than 2" shall require individual vault designs. The Design Public Works Supervisor shall submit plans for the vault design to the Public Works Supervisor for review and approval on a case by case basis.

    c. Meter Box: Contractor shall furnish and install 18"x30" meter boxes for 3/4" services, 20"x30" meter boxes for 1" services, and 36"x36" meter boxes for 1 ½" and 2" services. 18" meter boxes shall be ADS 1805AAH (30" cut length) 18050012H (12' uncut length), Hancor MP-NL1-18-002 (30" cut length) MP- PL1-18-012 (12' uncut length), or Oldcastle 00182009. 20" meter boxes shall be Oldcastle 00202013. 36" meter boxes shall be Oldcastle 00362003, ADS or Hancor N-12 HDPE pipe, or Contech A2000 PVC or approved equal.

    c. Meter Box Covers: The Contractor shall furnish and install a meter box cover as specified on the Plans. Meter box covers shall be as follows:

Condition	Meter Pit Size	Meter Box Cover
Unpaved Area	18-inch	Ford C-32 or approved equal
	20-inch	Ford C-53 or approved equal
	36-inch	Ford MC-36 or approved equal
Paved Area	18-inch	Ford A-32 or approved equal
	20-inch	Ford A-53 or approved equal
	36-inch	Ford MC-36H or approved equal

9. Service Line Fittings: Service line fittings shall be Ford Meter Box Company, Inc. or approved equal CTS pack joint fittings. Insert stiffeners for polyethylene tubing (PE pipe) shall be Ford Meter Box Company, Inc. 50 series.

2902.6 Bedding Material:

1. Pipe Embedment: Embedment for pipe shall be in accordance with these specifications.

    a. Pipe embedment shall be sand both above and below the pipe. Sand embedment shall be a minimum of 6 inches and a maximum of 12 inches

both above and below the pipe. Trench width shall conform to the Standard Drawings and Section 2903.1.7 of these specifications.

2902.7 Location Wire and Tape: Location wire and marking tape shall be buried above all waterlines in accordance with the following:

1. Location Wire:

    a. Location wire shall be installed to enable the detection of all plastic, ductile iron, and copper pipe. Location wire shall be 12 AWG annealed soft copper wire (solid) with blue 30mil HDPE jacket for open trench installations or 12 AWG copper clad steel (CCS), minimum break load of 380 lbs. with blue 30 mil HDPE jacket for directional drill installation.

    b. The location wire shall be placed no further than 6 inches to the side or above the waterline.

    c. The location wire shall be accessible at valve box test stations at least every 500 feet. The location wire shall be installed on the outside of the valve box with a 3/16" hole drilled three inches from the top of the valve box for the location wire to pass through.

    d. Splicing of location wire shall be accomplished by the use of Copperhead Industries LLC Locking SnakeBite Wire Connector.

    e. Anodes shall be one pound bare magnesium or zinc. Anodes shall be placed at the beginning and end of the waterline and at every valve box test station and/or at least every 500 feet.

2. Marking Tape:

    a. Underground marker tape shall be installed 18 inches above plastic or ductile iron pipe.

    b. The marking tape shall be at least 3 inches in width, blue in color, and shall have black lettering stating "Caution Buried Waterline Below". Lettering shall be printed on the tape at 20 to 30 inch intervals.

2902.8 Concrete: All concrete shall conform to the requirements of the City of Phillipsburg Technical Specifications Section 2000, Concrete.

2902.9 Flowable Mortar: All flowable mortar shall conform to the requirements of the City of Phillipsburg Technical Specifications Section 1100, Grading.

2902.10 Casing Pipe: Casing pipe for bored, jacked or open cut construction shall be steel pipe conforming to ASTM A 139 with a minimum diameter as shown on the Plans.

1. Minimum wall thickness shall be in accordance with the following table:

Diameter of Casing - Inches	Nominal Wall Thickness - Inches	
	Under Railroads	All other Uses
14 and under	0.188	0.188
16	0.281	0.188
18	0.312	0.250
20	0.344	0.250
24	0.375	0.281

2. Steel shall be a minimum of Grade A unless a higher standard is required by the responsible agency.

3. Steel pipe shall have welded joints in accordance with AWWA C 206.

4. Casing Spacers shall be CCI stainless steel casing spacers or approved equal.

5. The end seals shall be Advance Products & Systems (APS) model AW or approved equal.

6. The annular space between lining and carrier pipe shall be not be filled.

7. Carrier conduit installed in casing pipe shall be restrained joint pipe in accordance with Section 2902.2 of these specifications.

8. Cathodic and corrosion protection shall be provided for all casing conduits. One 32 lb. sacrificial anode package per 100 feet of casing pipe shall be provided at each end of the casing. Sacrificial, magnesium anodes shall be attached to the encasement pipe by a #12 A.W.G. grounding wire at each end of the casing. For casing pipes less than 100 feet in length sacrificial anodes shall be provided at a rate of 0.50lb/ft. of casing with a minimum anode size of 5 lbs. required.

SECTION 2903 CONSTRUCTION DETAILS

2903.1 Grading and Excavation:

1. Scope: Excavation and trenching work shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching as required; the handling, storage, transportation and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades; pumping and dewatering as

necessary of required; protection of adjacent property; and other appurtenant work.

2. General: The terms “excavation” and “trenching” shall mean the removal and subsequent handling of all material required to perform the work.

   a. All pipeline excavation work shall be accomplished under supervision of a person experienced with the materials and procedures, which will provide protection to existing improvements, including utilities and the proposed pipeline. A currently certified competent person shall be present during all excavation operations according to OSHA regulations.

   b. Contractor shall have a trench safety plan for the trench conditions to be encountered on the project. The trench safety plan shall be available on the job site at all times it shall be designed by a licensed professional Public Works Supervisor should conditions warrant.

   c. When pipe is to be installed in embankment or fill, the embankment shall be built up to a plane at least 18 inches above the top of the pipe prior to the excavation of the trench.

   d. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. One block or 400 feet (whichever is the shorter) shall be the maximum length of open trench on any line under construction. All open trenches shall be adequately protected and shall conform with OSHA safety standards.

   e. In the event hazardous wastes as defined by the Resource Conservation and Recovery Act of 1976 (PL94-580) are encountered, work shall be halted and the Public Works Supervisor shall be notified. Work shall be resumed only after the Contractor has notified the proper authorities and permission has been given by the governing authority to resume construction activities. Regulation of removal, handling and disposal of hazardous wastes is the responsibility of Federal and State agencies.

   f. Except where tunneling or boring and jacking is specified and shown on the Plans, all trench excavation shall be open cut from the surface.

3. Unclassified Excavation: Unclassified excavation is defined as the removal of all material encountered regardless of its nature. All material excavated will be considered as Unclassified Excavation.

4. De-Watering: The Contractor shall remove any water that may accumulate or be found in the trenches and other excavations made under the Contract.

The Contractor shall form all dams, flumes or other works necessary to keep the excavation clear of water while the waterlines, and other appurtenant works, are being constructed. All water shall be removed from such excavation in a manner that will not damage property.

5. Blasting: When blasting is permitted by Phillipsburg County Fire and Medical Services, the Contractor shall use the utmost care to protect life and property. The Contractor shall comply with all laws, ordinances, and the applicable safety code requirements and regulations relative to the handling, storage and use of explosives and protection of life and property, and he shall be responsible for all damage thereto caused by his or his subcontractor's operations.

   The Contractor shall provide insurance as required by the General Provisions and Covenants and Special Project Specifications before performing any blasting. The governing agency shall be notified at least 24 hours before blasting operations begin.

6. No Blasting Areas: No blasting of any kind for rock excavations or any other purpose will be allowed within areas noted as such on the Plans.

7. Open-Cut Method (Trenching):

   a. Scope: This item establishes the requirements to be followed for pipeline excavation performed by the open-cut method (trenching).

   b. General: Excavations for pipelines shall be accomplished by the open-cut method (trenching) except as specified or approved by the Public Works Supervisor. Trenching shall be with a minimum inconvenience and disturbance to the general public.

      The Contractor shall sort and stockpile the excavated material so the proper material is available for backfill.

   c. Trench bottoms which become soft, mucky, or otherwise unstable during construction operations shall be stabilized, by and at the expense of the Contractor, with one or more layers of crushed rock or other suitable material, where and as necessary to provide a firm and stable base for granular fill pipe foundation material to be placed thereon. Not more than one-half inch (1/2") depth of mud or muck shall be allowed to remain on the stabilized trench bottom when the granular fill pipe foundation material is installed.

   d. Trench Depths: All trenches shall be excavated to depths required for proper pipe embedment. Over depth excavation shall be required when the subgrade is unstable. Over depth excavations shall be backfilled with pipe embedment material unless otherwise directed by the Public Works Supervisor.

   e. Trench Walls: Undercutting of trench walls is not permitted.

f. Trench Sheeting: Except where banks are cut back on a stable slope, excavation for structures and trenches shall be properly and substantially sheeted, braced and shored, as necessary, to prevent caving or sliding, to provide protection for workmen and the work, and to provide protection for existing structures and facilities. Sheeting, bracing and shoring shall be designed and built to withstand all loads that might be caused by earth movement or pressure and shall be rigid, maintaining shape and position under all circumstances.

Trench sheeting shall not be pulled before backfilling unless the pipe strength is sufficient, in the opinion of the Design Public Works Supervisor, to carry trench loads based on trench width to the back of sheeting; nor shall sheeting be pulled after backfilling. When ordered by the Design Public Works Supervisor, sheeting shall be left permanently in the trench. Payment for such sheeting will be made in accordance with the contract provisions for extra work.

When trench sheeting is left in place, such sheeting shall not be braced against the pipe, but shall be supported in a manner which will preclude concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment has been completed.

g. Limiting Trench Width: Trenches shall be excavated to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, and embedment. However, the limiting trench widths below an elevation 6 inches above the top of the installed pipe shall be as follows:

Limiting Trench Widths

Pipe Size	Minimum Trench Width	Minimum Clearance	Maximum Trench Width
2	14	4	18
4	16	6	20
6	18	6	22
8	20	6	24
12	24	6	36
16	28	6	40

Minimum clearances listed are not minimum average clearances, but are minimum clear distances which will be required.

Where necessary to reduce earth load on trench banks to prevent backsliding and caving, banks may be cut back on slopes which shall not extend lower than one foot above the top of the pipe.

h. Unauthorized Trench Widths: When, for any reason, the width of the lower portion of the trench as excavated at any point exceeds the maximum permitted in the foregoing tables, either pipe of adequate strength, special pipe

embedment, or arch concrete encasement, as required by loading conditions and as determined by the Public Works Supervisor, shall be furnished and installed by and at the expense of the Contractor.

8. Directional Boring: The contractor shall have the option of installing proposed piping by means of directional boring throughout the project at no additional expense to the project.

   a. The City shall have the option to stop directional boring if surface upheaval problems are experienced. The contractor shall attempt to address the problems which caused the stop in construction activity. In the event that the problems cannot be remedied, the contractor shall finish installation activities by conventional open cut trenching and auger bore installation methods as shown in the construction plans.

   b. All pipe installed by directional boring shall be restrained joint pipe. The pipe material shall be as specified in the plans and shall conform to Section 2902.2 of these specifications.

   c. Directional Boring Installation Requirements:

      1. Trenching and backfilling shall be in conformance with Section 2903.1 of these specifications.

      2. All open trenches and excavations shall be backfilled within forty-eight (48) hours after work is completed or as directed by the Public Works Supervisor.

      3. The contractor shall install carrier piping at planned locations at required depth and length as noted on the approved plans, along with any fittings, valves, fire hydrants and tracer wire.

      4. All carrier pipe installed by directional boring shall be pressure tested for integrity by the prescribed method as outlined in section 2903.9 of these specifications.

      5. The contractor shall dispose of drilling fluids in accordance with any local, state or federal regulations. Restoration of damage to any surface or structure caused by escaping drilling fluid, or directional drilling operation, shall be the responsibility of the contractor.

      6. Precautions shall be taken to keep drilling fluid out of streets, manholes, sanitary and storm sewers and other drainage systems, including streams and rivers. The contractor shall make every effort to minimize spills during construction and shall act promptly to clean up any drilling mud overflows or spills if experienced.

7. The contractor shall be responsible for the restoration of all areas uplifted (pavement or sidewalk heaving, etc.) and/or settlement resulting from directional drilling construction activities.

8. The proposed pipe shall not be installed with more than 5 feet (60 inches) of cover unless attaining depth to clear utilities.

9. The contractor shall expose (pothole) all utilities in advance of directional boring activities. Utilities shall remain exposed during drilling activities to prevent damage to existing utilities due to increased soil pressure resulting from construction activities.

9. Minimum and Maximum Cover: Trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of pipe of 42 inches, and with a maximum depth of backfill cover over the top of the pipe of 60 inches, except where connections to existing pipelines are made. Depth of cover shall be measured from the top of pipe to the finished grade or pavement surface elevation. Greater depths of cover may be necessary on vertical curves or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipeline grades. When greater depths of cover are necessary, measures shall be taken to bring the pipe back to the proper depth as quickly as possible utilizing either allowable pipe deflection or pipe fittings in accordance with Section 2902.2 of these specifications.

10. Trench Bottom in Earth: The trench in earth shall have a flat bottom the full width of the trench and shall be excavated to the grade to which the pipe is to be laid. The surface shall be graded to provide uniform bearing and continuous support for each pipe at every point along its entire length.

11. Trench Bottoms in Rock: All rock excavation shall be carried to a minimum of 6 inches below the bottom of the pipe. Pipe embedment material shall be used to restore the trench bottom to the desired elevation and grade and to provide a uniform bearing and continuous support for the pipe along its entire length. Care shall be exercised to prevent any portion of the pipe from coming to bear on solid rock or boulders.

12. Pipe Embedment: Embedment material shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle.

    After each pipe has been graded, aligned, and placed in final position on the bedding material and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during

subsequent pipe jointing and embedment operations. Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

13. Rock Exploration: Unless shown otherwise on the plans or noted in the Special Project Specifications, no rock exploration has been made. On those projects where rock exploration has been made, test holes have been drilled at locations and intervals as shown on the Plans or subsurface information report to determine the approximate location and depth of rock. Resistance to penetration was assumed to be "solid rock". This information is furnished for general reference purposes only.

    The Contractor must form his own opinion as to the character of materials which will be encountered from an inspection in the ground, from his own investigation of the test hole information, or from such other investigations as he may desire.

14. Mechanical Excavation: The use of mechanical equipment will not be permitted in locations where its operations would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, alternate excavating methods shall be used

    Mechanical equipment used for trench excavation shall be of the type, design, and construction and shall be so operated that the rough trench excavation bottom elevation can be controlled, that uniform trench widths and vertical sidewalls are obtained at least from the bottom of the trench, and that trench alignment will be centered in the trench with adequate clearance between the pipe and the sidewalls of the trench. Undercutting the trench to obtain sidewall clearance will not be permitted.

    All mechanical trenching equipment, its operating conditions, and the manner of its operations shall be subject at all times to the approval of the Public Works Supervisor.

15. Stream Crossings: Stream crossings shall be made in accordance with these specifications and as shown on the Plans.

    The trench width shall be as required for proper pipe installation and the trench depth shall be as required to give minimum cover shown on the Plans. Pipe encasement, where required, shall be in accordance with the specifications and placed as indicated on the Plans.

16. Highway and Railroad Crossings: The Contractor shall make highway and railroad crossings in accordance with these specifications, the Special Project Specifications and as shown on the Plans.

All construction or work performed and all operations of the Contractor, his employees, or subcontractors within the limits of highway or railroad right-of-ways shall be in conformance with all the requirements and regulations of the authority having jurisdiction of said right-of-ways.

The Contractor shall pay all fees and obtain all permits to make the crossings unless otherwise directed.

2903.2 Installation:

1. General: Laying of ductile iron pipe and polyvinyl chloride pipe; installation of valves, and hydrants; and embedment and backfill shall conform to the following specifications.

   a. Unless otherwise specified herein or as shown on the plans, the water mains shall be laid to have a minimum cover of 42 inches measured from the top of pipe to the finished grade or top of pavement.

   b. Whenever pipe laying is stopped, the open end of the line shall be sealed with a watertight plug which will prevent trench water from entering the pipe.

2. Polyvinyl Chloride Pipe (PVC)

   a. Handling: Pipe, fittings, and accessories shall be handled in a manner that will insure installation in sound, undamaged condition. Equipment, tools, and methods used in reloading, hauling, and laying pipe and fittings shall be such that the pipe and fittings are not damaged. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces.

   b. Cutting Pipe: All pipe shall be cut with a saw or special cutting tool. Cutting shall be done in a neat manner without damage to the pipe. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed and beveled. Beveling shall be done with a specifically designed beveling tool. Hand beveling will not be allowed. When cutting pipe with couplings, mark the field cut pipe end the same distance in as the mark appeared on the original full length pipe section.

   c. Cleaning: The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter before being installed and shall be kept clean until the work has been accepted.

   d. Inspection: PVC pipe shall be installed in strict accordance with the requirements and instructions of the pipe manufacturer. It shall be protected from lateral displacement and deflection by pipe embedment material installed per Section 2903.8 of these specifications and as shown on the Standard Drawings. No pipe shall be laid under unsuitable trench conditions.

e. Alignment: Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the quantities stipulated in AWWA C600.

f. Laying Pipe: Pipe shall be protected from lateral displacement by pipe embedment material installed as specified. Under no circumstances shall the pipe be laid in water, and no pipe shall be laid under unsuitable trench conditions.

3. Ductile Iron Pipe:

a. Handling: Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in a sound, undamaged condition. Equipment, tools, and methods used in unloading, reloading, hauling, and laying pipe and fittings shall be such that pipe, pipe coating, and fittings are not damaged. Hooks shall not be used. Under no circumstances shall pipe or accessories be dropped or dumped. Pipe and fittings on which the cement lining has been broken or loosened shall be replaced by the Contractor at his sole expense. Where damaged areas are small and readily accessible, the Contractor may be permitted to repair the lining.

All pipe coating which has been damaged shall be repaired by the Contractor prior to installing the pipe.

b. Cutting pipe: Ductile iron pipe shall be cut with either a saw or an abrasive wheel. Cutting of existing cast iron pipe shall be done with either a saw or abrasive wheel, or when there is a free end, with mechanical pipe cutters. The cutting of pipe with a torch will not be permitted.

Cutting shall be done in a neat manner without damage to the pipe, or the cement lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed with a file to remove all roughness and sharp corners.

c. Cleaning. The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter prior to installation and shall be kept clean until the work has been accepted. Such surfaces shall be wire brushed, if necessary, wiped clean, and kept clean until jointing is completed.

d. Inspection: Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. Spigot ends shall be examined with particular care since they are vulnerable to damage from handling. All defective, damage, or unsound pipe and fittings shall be rejected and marked as such and removed from the site of work.

e. Alignment: Pipelines or runs intended to be straight shall be laid straight.

Deflections from a straight line or grade shall not exceed the quantities stipulated in AWWA C600.

f. Laying Pipe: Pipe shall be protected from lateral displacement by pipe embedment material installed per section 2903.8 of these specifications. Under no circumstances shall the pipe be laid in water, and no pipe shall be laid under unsuitable trench conditions.

2903.3 Jointing:

1. Push-on Joints: All instructions and recommendations of the pipe manufacturer, relative to gasket installation and other jointing operations, shall be followed by the Contractor. All joint surfaces shall be lubricated immediately before the joint is completed.

   The lubricant and the gaskets shall be as recommended and supplied by the pipe manufacturer. The lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean.

   Field cut pipe and each spigot end shall be suitably beveled to facilitate installation.

2. Mechanical Joints: Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. If effective sealing is not obtained the joint shall be disassembled, thoroughly cleaned, and reassembled. Under no circumstance will over-tightening of bolts be permitted.

3. Flanged Joints: When bolting flanged joints, care shall be taken to ensure that there is no restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or which would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bell and Spigot joints shall not be packed or assembled until all flanged joints affected thereby have been tightened. Bolts shall be tightened gradually and at a uniform rate so that gasket compression is uniform. All fasteners shall be grade 304 stainless steel or better and shall be coated to prevent seizing and galling.

4. Restrained Joints: Restrained joints and anchoring joints shall be installed in strict accordance with the pipe manufacturer's recommendations.

2903.4 Connection to Existing Mains: The Contractor shall furnish and install all fittings necessary to join the existing and new water mains as shown on the plans.

The Department of Public Works shall be given at least 24 hour notice prior to turning off any water supply mains. The Contractor shall coordinate tie-ins with the Department of Utilities to minimize down time.

Connections shall be made using suitable fittings for the conditions encountered. Each connection with an existing pipe shall be made at a time and under conditions which will minimize any disruption in service. Special care shall be taken to prevent contamination when dewatering, cutting into, and making connections with existing pipe. The interior of all pipe, fittings, and valves installed in such connections shall be thoroughly cleaned and swabbed with, or dipped in, chlorine solution having a chlorine content of 200 ppm.

2903.5 Polyethylene Encasements:

1. General: Polyethylene encasement, minimum 8 mil thickness, shall be installed on all ductile iron pipe and fittings.

2. All ductile iron pipe water mains shall be polyethylene encased and shall conform to ASTM A674.

3. Polyethylene Film. Tubular or sheet form without tears, breaks, or defects, conforming to the following requirements shall be used to encase ductile iron pipe. Linear low-density film manufactured from virgin polyethylene material conforming to ANSI/AWWA C105/A21.5-99.

4. PVC Pipe Wrapping Tape. PVC pipe wrapping tape, minimum 2” width and 10 mil thickness, shall be used to secure all ends, joints, and repairs of polyethylene film. Duct tape shall not be used. Installation shall be as described in detail in ASTM 674-05.

5. Repairs. Repair any cuts, tears, punctures, or damage to polyethylene film with PVC pipe wrapping tape or short length of polyethylene sheet or cut open tube, wrapped around pipe to cover damaged area, and secured in place.

6. Backfill. Prevent damage to film by assuring that backfill material is free from cinders, refuse, boulders, rocks, stones, or other material that could damage the film. Follow AWWA C600 for backfilling.

7. Certification. The Contractor shall provide written certification that he has furnished polyethylene material that meets the ANSI/AWWA C105/A21.5-99 specification and written certification that he has installed this material according to ASTM 674-05. This certification shall be provided in duplicate to the City Inspector.

2903.6 Setting Valves, Fittings, and Hydrants

1. Valves and Fittings: All valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner heretofore specified for cleaning, laying and joining pipe, except that large valves may require special support so that the pipe will not be required to support the valve weight.

Each valve shall be inspected before installation to ensure that all foreign substances have been removed from within the valve body, and shall be opened and closed to see that all parts are in a new working condition. Gate valves shall be set vertical in the horizontal pipeline. Valves and pipe shall be supported in such a manner as to prevent stress in either with no deflection in the valve/pipe joint.

Valve boxes and lids shall be installed at each valve and shall be supported and maintained centered and plumb over the operating nut of the valve. The valve box shaft shall not transmit shock or stress to the valve. Install valve box covers flush with the surface of the finished grade or as directed by the Public Works Supervisor.

All bends and tees shall be provided with thrust blocks as specified. All dead ends on new mains shall be closed with plugs or caps suitably restrained to prevent blowing off under test pressure.

2. Hydrants: All new hydrant installations shall be as shown on the Plans or Standard Drawings and shall include all necessary excavation and backfill to make the installation complete.

   Each hydrant shall be inspected before installation for direction opening, nozzle size and threading, nozzle caps and chains, operating nut, and cap nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow and weep hole openings, and handling damage and cracks. Defective hydrants shall be corrected or replaced.

   All hydrants shall stand plumb. The weep holes of the hydrant shall be kept clear and free to drain and shall be covered with three (3) cubic feet of ¾" wash rock. The areas around each hydrant and hydrant valve shall be thoroughly compacted to prevent settlement of these areas.

   Hydrants shall be set to a grade that allows their proper operation. Traffic hydrants with breakaway joint must be set with the joint above the ground line. Hydrants shall be placed with the hydrant centerline a minimum of four (4) feet and a maximum of twelve (12) feet from the back of curb line. Hydrants shall be rotated so as to have the pumper nozzle facing the street or rotated to face any direction as required by the Public Works Supervisor.

Hydrants shall be repainted upon completion of installation.

2903.7 Thrust Restraint:

1. Hydrants: The back of the base elbow of each hydrant shall be braced against a sufficient area of unexcavated earth or rock with a concrete thrust block and be

restrained by suitable restrained joints as shown on the Plans or Standard Drawings.

2. Fittings: All plugs, caps, tees, bends, and other fittings, unless otherwise specified, shall be provided with reaction blocking or suitable restrained joints as shown on the Plans or Standard Drawings.

3. Thrust Blocks: Vertical and Horizontal reaction blocking shall be concrete conforming with Section 2902.8 of these specifications. Thrust blocks shall be installed between solid ground and the fitting to be restrained. Concrete shall be located to contain the resultant force and permit access to pipe and fitting joints for repairs.

4. Restrained Joints: Restrained push-on or mechanical joints, mechanical joint anchor fittings, and mechanical joints utilizing set screw ductile iron retainer glands may be used in lieu of concrete thrust blocking if so indicated on the plans or approved by the Public Works Supervisor.

2903.8 Embedment and Backfilling: Embedment and backfill shall be accomplished in accordance with the laying condition as specified and as shown on the Plans and Standard Drawings.

1. Pipe Embedment: Embedment for pipe shall be in accordance with Section 2902.6 of these specifications and details of the laying condition as indicated on the Plans.

2. Trench Backfill: Backfill for the entire length of the pipeline shall be compacted full depth of the trench above the embedment.

   a. Compacted backfill shall be finely divided job excavated material free from debris, organic material, frozen materials, and stones larger than three (3) inches in greatest dimension. Masses of moist, stiff clay shall not be used.

   b. Select Backfill Material: Select backfill material shall be equivalent to the Kansas Department of Transportation Standard Specifications for AB-3.

   c. Trench backfill shall be flowable mortar, conforming to Section 2902.9 of these specifications, for all trenches crossing existing or proposed public streets, alleyways or sidewalks to a point two (2) feet beyond the edge of the public pavement, and for all portions of trenches running parallel to and within two (2) feet of the edge of the public pavement. All other trench backfill shall be either flowable mortar or compacted earth as indicated on the drawings and standard details, or as specified in the Special Project Specifications.

d. Earth backfill material to be placed above pipe embedment shall be free of brush, roots more than two (2) inches in diameter, debris, cinders, or other corrosive material, but may contain rubble and detritus from rock excavation, stones, and boulders in certain portions of the trench depth. No backfill material containing rocks, or rock excavation detritus material, shall be placed within two (2) feet of final surface. No rock greater than six (6) inches in its largest axis shall be placed in any trench excavation as backfill.

e. Structure Backfill: Backfill around structures shall be compacted to the extent necessary to prevent future settlement, by tamping or other means acceptable to the Public Works Supervisor.

f. Whenever, in the opinion of the Public Works Supervisor, the material excavated from the trenches is not suitable for backfilling, or there is a deficiency of material suitable for backfilling, the Contractor shall provide suitable material. The Contractor shall remove all excess excavated materials and shall dispose of them at locations provided by the Contractor.

3. Placement and Compaction:

a. Job excavated materials shall be placed in lifts not to exceed 8 inches in depth. Each lift shall be compacted to the required density prior to the next lift being placed. Increased layer thickness may be permitted for noncohesive material if the Contractor demonstrates to the satisfaction of the Public Works Supervisor that the specified compacted density will be obtained. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.

b. Select backfill placement shall be in lifts of not more than 6 inches in compacted thickness, which shall be compacted by means of mechanical tampers to a density of at least 95 percent of maximum as determined from ASTM D698.

c. Flowable mortar shall be discharged from the mixer by a reasonable means into the trench area to be filled. Flowable mortar shall be placed to the bottom of existing or future pavement.

d. Trench backfill, unless otherwise specified, shall be compacted to a minimum of 95% of the standard proctor maximum density for the material used as determined by ASTM D698

4. Testing: All laboratory tests required ensuring compliance of embedment and backfill with specified requirements herein shall be paid for directly by the Contractor. Copies of test results shall be submitted to and approved by the Public Works Supervisor.

2903.9 Disinfection and Testing:

1. General: All water mains constructed shall be disinfected and tested as specified herein.

   a. All hydrostatic testing shall be done in the presence of the Public Works Supervisor, Inspector or authorized representative.

   b. All water sampling shall be performed by the Public Works Supervisor, Inspector or authorized representative.

   c. Bacteriological testing shall be performed by the Kansas Department of Health and Environmental Laboratory.

   d. The Contractor shall notify the Public Works Supervisor 72 hours in advance of the times and places at which testing work is to be done.

   e. Temporary discharge piping shall be provided for disposing of test water. Test water shall be disposed of without damage to public or private property.

2. Disinfection: After installation, the entire main shall be flushed and disinfected by chlorination per AWWA C651-05. The Contractor shall disinfect the main or prepare the main for disinfection by the owning authority when so noted in the Special Project Specifications.

   a. Flushing shall be carried out until water free of visual turbidity is obtained from all points along the main.

   b. Disinfection may be performed concurrently with pressure and leakage testing if acceptable to the Inspector, or after pressure and leakage testing is completed.

   c. Disinfection of newly constructed pipelines shall be accomplished by the introduction of a chlorinated solution of not less than 25mg/L into the lines.

      The contact period shall not be less than 24 hours and the free chlorine residual at the end of the contact period shall not be less than 10mg/L. Following chlorination, all treated water shall be flushed from the system. Treated water to be flushed from the system shall be de-chlorinated as environmental conditions warrant per Section 4.5.2 of AWWA C651-05. Type and application of neutralizing chemicals shall conform to Appendix C, Table C.1 of AWWA C651-05.

d. All existing mains which require a section to be removed for connection work shall be disinfected. The interior of all pipe and fittings used in making the connection shall be swabbed with a 5-10% hypochlorite solution immediately prior to their installation in the system. When the assembly is completed, the existing main shall be thoroughly flushed.

e. Two consecutive sets of acceptable samples taken at least 24 hours apart, shall be collected from the new main. If the initial disinfection fails to produce satisfactory bacteriological results or if other water quality is affected, the new main may be re-flushed and shall be resampled. If check samples also fail to produce acceptable results, the main shall be re-chlorinated until satisfactory results are obtained—that being two consecutive sets of acceptable samples taken 24 hr. apart.

f. Each water main tested shall be allowed two disinfection tests. Should the main fail to produce satisfactory results and additional testing is required, the contractor will be charged a fee of $500 per test for inspection and testing.

3. Hydrostatic Testing: The Contractor shall perform hydrostatic pressure testing in accordance with AWWA C600 procedures. Where practicable, pipelines shall be tested in lengths between line valves or plugs of no more than 1500 feet in length.

a. General:

1. All pipelines shall be subjected to hydrostatic testing. All shutoff valves shall be open during pressure testing. Anchored or blocked test plugs shall be placed as necessary to limit testing length as specified above.

2. The Contractor shall provide all necessary pumping equipment, piping connections, pressure gauges, anchored or blocked test plugs, and all other equipment, materials, and facilities for the testing.

3. The contractor shall replace materials, repair pipelines, and repeat testing as necessary should the initial testing fail to yield satisfactory results. Testing shall be repeated until satisfactory results are obtained.

b. Hydrostatic Pressure Testing:

1. The test pressure at any point in the pipeline shall be 2.5 times the operating pressure not to exceed 200 psi.

2. The test pressure shall be maintained for a minimum of 30 minutes or whatever period is necessary for the Inspector to inspect the pipeline. Under no circumstance shall the Inspector be permitted to leave the project site during pressure testing activities.

3. Any drop in pressure across the tested section of the pipeline shall constitute failure of the pressure test.

4. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective shall be removed immediately and replaced with new and acceptable material, by and at the expense of the Contractor.

5. Pressure testing shall be repeated until the line and all parts thereof withstand the test pressure in a satisfactory manner.

2903.10 Surface Restoration: This section covers restoration of asphalt pavement, gravel surfacing, sidewalks, driveways, curbs, and other surface construction removed or damaged during the progress of the work.

1. All surface restoration work shall comply with City of Phillipsburg Technical Specifications, current edition, and Kansas Department of Transportation Standard Specifications for State Road and Bridge Construction, 1990 edition.

2. All restoration work shall be subject to acceptance by the Public Works Supervisor, owner, and agency having jurisdiction thereof. All materials utilized for surface restoration work shall be new unless otherwise specified on the Plans, Special Project Specifications, or as approved by the Public Works Supervisor.

2903.11 Separation:

1. Horizontal Separation:

a. A minimum of ten (10) feet horizontal separation, as measured from the outside edge to outside edge, shall be required between a potable waterline and a sanitary sewer main or manhole.

b. Under no circumstance shall potable waterline and sanitary sewer be placed in the same trench.

c. Potable waterlines shall meet the minimum separation requirements from all pollution sources as set forth by the appropriate reviewing agency.

d. When waterlines and other utilities are laid parallel to each other the separation distance shall be determined based on geotechnical considerations. A minimum of three (3) feet of undisturbed earth separating the trenches shall be required. Under no circumstance shall waterlines and other utilities be installed in the same trench.

2. Vertical Separation:

   a. A minimum of two (2) feet vertical separation, as measured from the outside walls of the pipe, shall be required between a sanitary sewer main and potable waterline.

   b. In general potable waterlines shall be located above sanitary sewer lines.

   c. Potable waterlines shall maintain a minimum of two (2) feet of vertical separation, as measured from the outside walls of the pipe, and shall always cross above any sewer force main.

3. Protective Measures: When potable waterlines and gravity sanitary sewers cross with less than two (2) feet of vertical clearance, and in all cases where the potable waterline is located below the gravity sanitary sewer, additional measures must be employed to protect the potable waterline.

   Acceptable measures include:

   a. Construction of the sanitary sewer line using one of the following materials:

      1. Ductile iron pipe conforming to ASTM A536 or ANSI/AWWA C151/A21.52 with a minimum thickness class 50, and gasketed, push-on, or mechanical joints in conformance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C111/A21.11.

      2. PVC pipe conforming to ASTM D3034 with minimum wall thickness of SDR41, ASTM F679, or ASTM F794, with gasketed push-on joints in conformance with ASTM D3212.

      3. Reinforced concrete pipe conforming to ASTM C76 with gasketed joints in conformance with ASTM C361 or ASTM C443.

   Install a minimum twenty (20) foot length of sanitary sewer pipe on the crossing to maximize the joint spacing to a minimum of ten (10) feet from the crossing.

b. Provide concrete encasement of the sanitary sewer line a minimum of six (6) inches in thickness for a minimum distance of ten (10) feet either side of the pipeline crossing.

c. Sanitary sewer service lines may be constructed using schedule 40 PVC pipe with solvent welded joints. Pipe joints shall be located a minimum of ten (10) feet either side of the pipeline crossing.

SECTION 2904 MEASUREMENT AND PAYMENT

2904.1 Scope: This section covers the methods of measurement, and the basis of payment, for the furnishing of all labor, equipment, tools and materials and for the performance of all related work necessary to complete any construction covered in Section 2900.

2904.2 General: The methods of measurement and payment shall be in accordance with City of Phillipsburg Technical Specifications Section 0010: General Technical Provisions, as specified herein, and as listed in the Proposal.

2904.3 Items not listed in the Proposal: There will be no measurement or separate payment for any items of work not specifically identified and listed in the Proposal and all costs pertaining thereto will be included in the Lump Sum Proposal or Contract Unit Prices for other items listed in the Proposal.

2904.4 Basis of Payment: Payment will be made of the respective unit at the unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Public Works Supervisor's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Contractor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

2904.5 Standard Bid Items: The following is a list of standard bid items and quantity units for waterline projects. Project-specific or special items shall be added to the list where appropriate. Lack of inclusion of a specific item from the Standard Bid Items List will not be justification for non-performance. All work must meet City Standards.

Bid Item	Quantity Unit
-inch Waterline	LF
-inch Gate Valve	EA
-inch Bend and Block	EA

-inch Fitting (Tee, Cross, Reducer, Sleeves)	EA
Connect to Existing Waterline	EA
Water Meter Removal and Abandonment	EA
Water Meter Installation or Relocation	EA
Fire Hydrant Assembly	EA
Valve Lid Adjustment	EA
Air Release Valves	EA
Seed, Fertilize, and Mulch	LS
Erosion Control	LS
Construction Staking	LS
Traffic Control	LS

SECTION 6000 – STORM SEWERS

6001 SCOPE. This section covers storm sewer pipe embedment, pipe installation, and other appurtenant work.

6002 REFERENCES. Trenching, backfill and flowable fill shall conform to the requirements of Section 1100 - *Grading*.

6003 MATERIALS

A. Bedding. Granular bedding material shall meet the requirements for SB-2 or CA-5 aggregate as specified in Division 1100 of the KDOT specifications. Recycled concrete may be approved if material meets the required gradation and is free of debris.

B. Reinforced Concrete Pipe.

1. Reinforced concrete pipe shall conform to the following ASTM Standards and be of the minimum strength designated herein or such higher strength as may be required by the Contract Drawings or Special Provisions:

   a. Round Pipe: ASTM C 76, Class III, Wall B.
   b. Elliptical Pipe: ASTM C 507, Class HE-III.
   c. Arch Culvert Pipe: ASTM C 506, Class A-III.

2. Joints
   a. Flexible Gasket: Flexible gaskets may be either flat gaskets cemented to the pipe tongue or spigot, O-ring gaskets, or roll-on gaskets. All gaskets shall conform to ASTM C 443.
   b. Plastic Compound: This compound shall be a homogeneous blend of bituminous material, inert filler and suitable solvents or plasticizing compounds roughly mixed at the factory to a uniform consistency suitable for sealing joints of concrete pipe. The compound shall conform to the following requirements:

      Bitumen, soluble in CS,
      Percent by weight, minimum 45%
      Ash, percent by weight 15-50%
      Penetration, standard cone, 15Og, 5 seconds, 2 5” C
      Trowel grade, bulk type 11 O-250mm
      Extruded rope or flat tape type 50-120mm

      The above penetration ranges include test tolerances.

   c. Preformed Plastic Compound: This compound shall be either rope form or flat tape form conforming to ASTM C 990. Primer,

as recommended by the manufacturer, shall be used to maintain the material in position while pipe sections are being joined.

C. Corrugated Steel Pipe. Pipe and coupling bands shall conform to the requirements of ASTM A 760/A 760M. Bituminous and/or other coatings shall be provided when required by the Special Provisions. All helical pipe shall have circumferential re-corrugated ends with a minimum of 4 re-corrugations on each pipe. Bituminous coating, if specified, shall conform to AASHTO M-190. Minimum thickness of the metal after galvanizing shall be as follows:

Circular Pipe					
2-2/3" x ½" corrugations			3" x 1" or 5" x 1" corrugations		
	Minimum			Minimum	
Diameter	Thickness	Gauge	Diameter	Thickness	Gauge
(in.)	(in.)		(in.)	(in.)	
12-21"	0.079	14	36-54"	0.079	14
24-30"	0.079	14	60-84"	0.109	12
36-54"	0.109	12			
60-72"	0.138	10			
84"	0.168	8			

Arch Pipe 2-2/3" x 1/2" corrugations				
Equivalent	Minimum			
Diameter	Thickness	Gauge	Span*	Rise*
(in.)	(in.)		(in.)	(in.)
15"	0.064	16	17"	13"
18"	0.064	16	21"	15"
21"	0.064	16	24"	18"
24"	0.079	14	28"	20"
30"	0.079	14	35"	24"
36"	0.109	121	42"	29"
42"	0.109	12	49"	33"
48"	0.109	12	57"	38"
54"	0.109	12	64"	43"
60"	0.138	10	71"	47"
* Subject to manufacturing tolerances				

D. High Density Polyethylene (HDPE) Pipe

1. High density polyethylene pipe shall conform to AASHTO M294, type S (non-perforated circular cross section with corrugated outer surface and a smooth inner surface) for pipe diameters of 15 inches to 60 inches, inclusive.

2. Joints may be either bell and spigot, gasketed joints or made with external coupling bands. Joint integrity shall conform to the performance requirements of AASHTO M294.

3. Fittings and coupling bands shall be fabricated from the same material as the pipe and conform to AASHTO M294.

4. Coupling bands shall cover at least two full corrugations on each section of pipe and shall prevent the infiltration of soil into the pipe.

6004 INSTALLATION

A. Trenching. Excavation, grading, trenching, backfilling, compaction and density testing shall conform to requirements of Section 1100 of these Specifications.

B. Handling. All pipe and appurtenances shall be protected during installation from cracking, chipping, breaking, bending or other damage to pipe or coating materials. Damaged pipe materials shall be replaced with new materials unless otherwise approved by the Public Works Supervisor.

C. Alignment And Grade. The alignment and grade or elevation of each pipe and appurtenant structure shall be maintained as shown on the drawings.

D. Laying. The laying of pipe in prepared trenches shall commence at the lowest point and continue upstream. Pipe shall be laid carefully centered to form a uniform flow line.

E. Pipe Bedding. Granular bedding material shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints.

Bedding shall be placed on each side of the pipe to the elevations indicated on the standard details. Bedding shall be compacted as necessary to provide firm uniform support for the pipe, and not subject the pipe to settlement or displacement.

F Reinforced Concrete Pipe. Core holes and handling holes in concrete pipe shall be repaired by cementing a properly-shaped concrete plug in place with epoxy cement or by other methods acceptable to the Public Works Supervisor.

G Corrugated Steel Pipe. Before installing corrugated steel pipe, repair any damage to the metallic coating on the pipe. Clean the damaged area to bright metal by blast cleaning, power disk sanding or wire brushing. Apply zinc-rich paint over the cleaned area. Use zinc-rich paint to repair galvanized coatings.

H. HDPE Pipe. HDPE pipe shall be installed in accordance with ASTM Recommended Practice D2321

I. Structure Connections. Pipes connected to structures shall be cut parallel with the inside face of the structure for plane walls and parallel with the spring line of the pipe for curved walls. Projection of the pipe beyond the inside face shall not exceed six (6) inches (measured at the spring line for curved walls).

J. Drainage Maintenance. Backfilling shall be performed so that water will not accumulate in unfilled or partially filled trenches. Surface drainage shall not be obstructed longer than necessary.

K. Protection Of Trench Backfill. Where trenches are constructed in ditches or other water courses, backfill shall be protected from surface erosion. Erosion control methods shall comply with the approved Stormwater Pollution Prevention Plan (SWP3) or as approved by the Public Works Supervisor.

SECTION 7200 – SEEDING

7201 SCOPE. This section covers the furnishings of all labor, equipment, tools and materials, and the performance of all work for seeding, sodding and landscaping as designated on the contract drawings.

7202 GENERAL. The seeding work shall consist of furnishing and drilling in or sowing seed by an experienced seeding contractor having approved equipment manufactured expressly for the purpose, such as a seed drill with fertilizer attachment, mulch chopper and blower for the application of hay or straw mulch, mulch puncher or straight serrated disc for punching mulch into soil and a cultipacker that may be used for final compaction except as otherwise approved by the Public Works Supervisor.

For public improvement projects seeding shall be required at all locations shown on the plans and for all grass covered areas that are disturbed by construction operations, either by grading, parking of equipment, temporary roads, or any other operation that has destroyed the existing grasses of the original site, and that is not designated on the drawings to be replaced with sod.

For all other types of construction, including that work done under a right-of-way permit, seeding shall be required where areas are disturbed by construction within the right-of-way in established yards or as directed by the Public Works Supervisor.

7203 MATERIAL.

Seed shall be the kind and mixture specified herein. Seed shall be free of noxious weed seeds and shall not have more than one (1%) percent of weed seeds. Seed shall be delivered to the site in original containers, each fully labeled, bearing the name, or trademark and a warranty of the producer and a certificate of the percentage of the purity and germination of each kind of seed specified. The tags shall be made available to the Public Works Supervisor for filing.

A. Temporary Seeding Establish fast-growing annual vegetation to provide erosion control for up to twelve (12) months and reduce the amount of sediment moving off the site. Annual plants, which sprout rapidly and survive for only one (1) growing season are suitable for establishing temporary vegetative cover. The Public Works Supervisor may require mowing of temporary vegetation.

   This practice applies where short-lived vegetation can be established before final grading or in a season not suitable for permanent seeding.

Species*	Seeding Rate		Plant Characteristics
	lbs. per Acre	Lbs. per 1,000 ft.2	
Oats	80 lbs	2 lbs.	Not cold tolerant, height up to 2 feet
Cereals: Rye/Wheat	90 / 120	2.0 / 2.5	Cold tolerant, height up to 3 feet, low pH tolerant
Millets, Sudangrass	45 / 60	1.0 / 1.5	Warm season annual, aggressive growth, height up to 5 feet
Annual Ryegrass	75	2	May be added to mix, not heat tolerant, height up to 16 inches
Annual Lespedeza**Plus Tall Fescue	15 plus 45	0.5 plus 1.0	Warm season annual legume, makes own nitrogen, tolerates low pH

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B. Permanent. Permanent seeding shall match the existing grass type in established turf areas or as indicated or specified. In others areas seed shall be one of the following types. A mixture of seed types may be used if approved by the Public Works Supervisor.

Seed Type	Planting Depth (inches)	Seeding Rate.	
		Lbs. PLS/ 1,000 SF	Lbs PLS/ Acre
Bermudagrass	1/8	1.5-3	20
Kentucky Bluegrass	1/8	2-3	50
Tall Fescue	1/8 – ¼	6-8	80
Perennial Rye	1/8 – ¼	6-8	80

Pure Live Seed (PLS) = Amount of Seed Guaranteed to Grow

Use the following equations to determine the amount of seed required.

$$\%PLS = \%Purity \times \%Germination$$

$$\text{Lbs. Bulk Seed Required} = \frac{\text{Lbs. PLS Recommended}}{\%PLS}$$

Nurse crops such as wheat (1 bushel/acre), annual rye (1 bushel/acre), or oats (1 ½ bushels/acres) shall also be used with all seeding mixtures. Small grain nurse crops should be planted about one (1) inch deep if planted separately and grasses and legumes one-half (1/2) inch deep. Nurse seed can be planted at shallower depths if mixed and planted with the permanent seed mix.

Native grass seed blends shall be used where indicated or specified. The seed mixture shall be as specified for the specific project and location.

C. Sod. Sod may be required, in lieu of seeding, if indicated on the plans. The sod shall be of the same type as removed or damaged and shall be of the best grade. If type is not indicated or unknown, sod shall be either Kentucky Blue Grass or tall fescue. The sod shall contain a growth of not more than ten (10%) percent of other grasses and clovers, shall be free from all prohibited and noxious weeds and shall be three-fourths (3/4") inch to one and one-fourth (1-1/4) inch thick. Sod shall be cut in strips not less than 18 inches wide and three (3) feet long.

D. Fertilizer. Commercial fertilizer for seeded areas shall consist of inorganic nitrogen only unless soil tests for the specific site indicate the need for other components.

It shall be uniform in composition, free flowing, and delivered to the site with certification showing weight, analysis, and name of manufacturer. It shall be stored until use in a weatherproof storage place in such a manner that it will be kept dry and its effectiveness will not be impaired.

E. Mulch. Mulch for application to seedbed areas shall include wheat straw, oat straw, smooth brome grass hay, Sudan grass hay or prairie hay. Mulch shall be free of prohibited and noxious weed seeds. Hydro mulching will be allowed at the Contractor's option.

7204 INSTALLATION

A. Time Of Seeding. Seeding and fertilizing shall be performed during periods shown in the following tables unless otherwise approved by the Public Works Supervisor. Seeding and fertilizing shall not be done during periods of such severe drought, high winds, or excessive moisture, as determined by the Public Works Supervisor, that satisfactory results are not likely to be obtained.

Temporary Seeding

Species	Acceptable Dates	Optimum Dates
Oats	Feb, May, Aug 1-15, Sep 16-30	Mar, Apr
Rye/Wheat	Jan thru May, Jul 16-Sep 15, Nov 1-15	Sep 16-Oct 31
Millet, Sudangrass	May 1-15, Jul 1-Aug 15	May 16-Jun 30
Annual Ryegrass	Jan, Feb, May, Jul 16-Aug 15, Sep 15-30	Mar, Apr, Aug 16-Sep 15
Annual Lespedeza	Jan, Feb, May	Mar, Apr

plus Tall Fescue		

Permanent Seeding

Species	Acceptable Dates	Optimum Dates
Bermudagrass	Jun, Jul	Apr 16-May 31
Kentucky Bluegrass, Tall Fescue, Perennial Rye	Feb 1 – Mar15, Apr 15-May 31, Aug 1-15, Sep 16-Oct 31	Mar 16-Apr 15 Aug 16-Sep 15

B. Application Of Fertilizer. Before tilling of the soil for seeded areas, the commercial fertilizer of the type specified shall be uniformly distributed over the entire site at the rate of 60 lbs./acre for quick release type or 90 lbs./acres for slow release type, and incorporated into the soil to a depth of at least two (2) inches by discing or harrowing methods or with a fertilizer drill. The fertilizer may be applied with the seeding operation only if a seed drill with a fertilizer attachment is used. Fertilizer may be broadcast in small areas not accessible to equipment.

The use of fertilizer shall not be allowed with native grass seed.

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C. Preparation Of The Seedbed. The area to be seeded shall be thoroughly tilled to a depth of at least three (3") inches by discing, harrowing or other approved methods until the soil is well pulverized. After completion of the tilling operation, the surface shall be cleared of all stones, stumps, or other objects larger than one and half (1-1/2) inches in thickness or diameter, and of roots, wire, grade stakes, and other objects that might be a hindrance to maintenance operations. Areas tilled shall then be brought to the desired line and grade and maintained until seeding and mulching is complete to ensure a smooth area with no gullies or depressions.

Any objectionable undulations or irregularities in the surface resulting from tillage or other operations shall be removed before planting operations are begun. Seedbed preparation shall be performed only during periods when satisfactory results are likely to be obtained. When results are not satisfactory because of drought, excessive moisture or other causes, the work shall be stopped until such conditions have been corrected to the satisfaction of the Public Works Supervisor.

D. Placement Of Seed. Seeding may be accomplished by means of approved mechanical power-drawn drills followed by packer wheels, or by broadcast-type seeders or hydraulic type seeders in small areas not accessible to machine methods, or as approved by the city Public Works Supervisor.

Mechanical power-drawn drills shall have depth bands set to maintain a planting depth of at least one-quarter (1/4”) inch but not to exceed one-half (1/2”) inch. Seed drills shall be set to space the rows not more than four (4”) inches apart. All seed sown by broadcast-type seeders shall be "raked in" or otherwise covered with soil to a depth of at least one-quarter inch. Water shall be applied when necessary.

Hydraulic seeding equipment shall include a pump capable of being operated at one hundred (100) gallons per minute and at one hundred (100) pounds per square inch pressure, unless otherwise directed. The equipment shall have an acceptable gauge and a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of agitation and a means of estimation of the volume used, or remaining in the tank.

Seed shall not be drilled or sown during windy weather or when the ground is frozen or otherwise untillable.

E. Mulching. Straw or hay mulch shall be applied uniformly to seeded areas at a rate to provide coverage of 75% of the area. Baled straw or hay shall be broken up and loosened sufficiently before being fed into the blower hopper to avoid the placing of matted or unbroken clumps. The use of wet straw or hay is prohibited.

Mulching shall be performed within twenty-four (24) hours after seeding, but not be done during windy or rainy weather or when such weather is imminent. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of steep slopes and shall continue uniformly until each area is covered.

The mulching material shall be disced or punched into the soil so that it is partially covered. Several passes may be required, if a straight disc is used, in order to mix the mulching material with the topsoil sufficiently to ensure protection from erosion by either wind or water. The mulch tilling operation shall be performed parallel to the ground contours.

F. Maintenance. All seeded areas shall be protected against damage by vehicle and pedestrian traffic by the use of barriers and appropriate warning signs. If at any time before completion and acceptance of the seeding work any portion of the seeded area becomes gullied or otherwise damaged, Contractor shall repair such damaged areas with soil to original grade, re-seeding and re-mulching. All costs of repair work shall be borne by the Contractor.

SECTION 7300 - LANDSCAPING

7301 SCOPE Furnish materials, labor and equipment necessary to install landscaping as specified and as indicated on the plans.

7302 QUALITY ASSURANCE

A. Qualifications of Personnel: Provide at lest one (1) person who shall be present at all times during execution of this work that is thoroughly familiar with all materials and installation procedures included in the operations as specified herein.
B. Source Quality Control
   1. Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulation applicable to landscape materials. All plants shall be No. 1 grade. Type, size, and grading standards shall conform to those of the American Standards for Nursery Stock as adopted by the American Association of Nurserymen, unless otherwise specified.
   2. No substitutions shall be accepted before the contract is let and then only with written permission of the Public Works Supervisor.
   3. Within 5 working days after award of contract, and before any materials are delivered to the job site, submit to the City a complete list of all plants including the sizes ordered, the type of equipment to be used on this project along with the sources and suppliers of plant materials and pesticides.

7303 MATERIALS AND PRODUCTS

A. Plant Materials
   1. Nomenclature: Scientific and common names used for plants are generally in conformity with “Standardized Plant Names.” The names of varieties are generally in conformity with the names accepted in nursery trade.
   2. Plant material size and measurements shall conform to the American Standard for Nursery Stock, ANSI Z60. 1-2004.
   3. Plants shall be container grown; vigorous stock, normally shaped, heavy and well branched foliage when in leaf, and shall have healthy, well-developed root systems.
   4. All plants furnished shall be free of any insect infestation, dead wood, bruises, or other root or branch injuries and shall have been grown under climatic conditions with temperature extremes similar to those of the project area for a minimum of two years prior to use on this project. All plants are to be naturalized to zone 5.
   5. Plants shall be measured when branches are in a normal position. The measurements specified are the minimum size acceptable. Plants that

meet the measurements specified, but do not possess a normal balance between height and spread will be rejected. Stock furnished shall be a fair average between the minimum and maximum size specified. All similar plants shall be matched in size and form.

6. All plant materials shall bear a tag providing full and legible identification of plant genus, species and variety.

B. Mulch: Use medium-grade Pine Bark mulch. After planting has been approved apply mulch. The mulch should not come into contact with plants.

C. Pre-emergent treatment: Surflan XL. Provide MSDS sheet and application records. Follow City of Lawrence's policy of posting signs before treatment. Pesticides shall be applied only by a State Certified Applicator.

D. Topsoil. Topsoil shall be soil which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1 1/2" in any dimension, and other extraneous or toxic matter harmful to plant growth.

7304 INSTALLATION

A. Ground Cover Plant Bed Preparation

1. Loosen subgrade of planting bed areas to a minimum depth of 6 inches. Remove stones larger then 1½ inches in any dimension sticks, roots, rubbish, and other extraneous materials.
2. Till soil in beds to a minimum depth of 8 inches, mix with specified soil amendments and fertilizers. Place topsoil as indicated.
3. Apply specified commercial starter fertilizer at rates specified; thoroughly mix into upper 2 inches of topsoil. Delay application of fertilizer if planting will not follow within a few days. Fertilizer shall be of the grade, type, and form specified below and shall comply with the rules of the Kansas Department of Agriculture and the following requirements:

    a. The grade of fertilizer will be identified according to the percent nitrogen (N), percent available phosphoric acid and percent water soluble potassium in that order and approval will be based on that identification.
    b. Fertilizer shall be of a type that can be uniformly distributed either by hand or application equipment.
    c. Fertilizer shall be furnished in a dry form.
    d. Fertilizer may be either homogenized or natural organic with at least 25 percent of the total nitrogen (N) in a slow-release form.
    e. Deliver fertilizer materials in original, unopened and undamaged containers showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

4. Final grade plant beds to smooth, even surface with loose, uniformly, fine texture. Roll, rake, drag bed areas to remove ridges and fill depressions, as required to meet final grades. Limit final grading to areas which can be planted immediately after grading. No grading shall be done when the soil is in a muddy or frozen condition.

B. Planting
   1. Layout: Plantings shall be located where shown on the plan, or where locations have been flagged on site by the Public Works Supervisor, except where overhead or below ground utilities are encountered and plants need to be relocated.
   2. Setting Plants: No planting holes shall be dug until proposed location been staked in the ground. Each plant shall be planted in an individual hole as specified. All plants will be removed from their containers.
   3. Backfilling Planting Beds: Existing topsoil is to be used as backfill. Soil amendments are not to be used. Planting pits shall be backfilled carefully to fill all voids and to avoid root injury. Following complete backfilling of the planting pit, plants shall be thoroughly irrigated by low volume, low pressure garden hose positioned at the bottom of the pit. After filling with water and soil settling has occurred planting mix shall be added to bring the pit to grade.
   4. Shrubs: All shrubs and roses shall be planted in holes at least one foot (1') greater in diameter than their ball of earth or spread of roots. The depth of the hole shall be as is necessary to accommodate the roots so that when the shrub is placed therein it will not be necessary to raise or lower it to bring it to finished grade.
   5. Watering: All plants shall be thoroughly deep watered within 24 hours of Pruning and Repair: planting and on a weekly basis during the growing season.
   6. All plants shall be neatly pruned only to remove broken or badly bruised branches.
   7. Apply pre-emergent chemicals to all areas to be mulched to control weeds and keep beds weed free during the growing season. Apply to the soil prior to mulching in accordance with the manufacturer's recommendations
   8. Apply mulch around plants after planting has been approved. The mulch should not come into contact with plants.

C. Special Utility Instructions: Any existing underground utility locations are to be determined by the contractor prior to any digging. Call "Dig Safe" (1-800-344-7233) prior to any digging. Perform work in a manner, which will avoid possible damage. Hand excavate, as required. Should any buried utilities be encountered during planting, consult the utility owner immediately for further directions. Full cooperation will be required in keeping respective services in operation. Repair for any damaged utilities will be full responsibility of the contractor.

7305 INSPECTION: Inspection of the planting work to determine its completion for beginning of the guarantee period will be made by a Public Works Supervisor representative. The Contractor shall provide request for inspection at least seven (7) days prior to the anticipated date. All plant material must be labeled, alive, healthy and planted properly in order to be considered complete. Excess fill and waste material shall be removed from the site. Roads and walkways shall be swept clean and the site shall be left in a clean condition.

7306 MAINTENANCE, INSPECTION, GUARANTEES AND REPLACEMENTS

A. Warranty on Plant Material, for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond the Landscape contractor's control. The contractor shall be responsible for resetting of any plants to an upright position or to proper grade, and for the removal and replacement of any dead plant material, during the guarantee period.

B. Replacement of Plant Material: The Contractor shall replace once, without cost to the Owner, and as soon as weather conditions permit, and within a specified planting period, all dead plants and all plants not in a vigorous, thriving condition as determined by the Owner during and at the end of the warranty period. The plants shall be free of dead or dying branches and branch tips, and shall bear foliage of a normal density, size and color.

   Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in the Specifications. The contractor shall make all necessary repairs to other site and project features due to plant replacements. Such repairs shall be done at no cost to the Owner.

C. Maintenance: Unless specified otherwise, the contractor shall provide weekly maintenance for landscape services for a period of one year following the completion and acceptance of the original planting.

   New landscape plants should be watered weekly during the growing season or at an optimum rate depending on natural rainfall amounts, temperature, and demands of the plant materials to achieve an average of 1" rainfall per week. The contractor will be responsible for the weekly inspection of the landscape area to monitor watering, weeds, insects, and general plant health care. The landscape beds will be weeded once per week to be kept essentially weed free.

   Roses shall be pruned as needed to remove dead blooms once every month during the growing season. Roses shall be dormant pruned in early spring to reduce growth by 30%.

When significant portions of work are completed, including maintenance, Public Works Supervisor will, upon request, make an observation to determine acceptability for compliance with requirements.

D. Final Inspection: Final inspection to determine acceptance will be made at the conclusion of the guarantee period by the Public Works Supervisor Representative. No plants will be accepted unless they are alive and healthy. The Contractor shall replace any plants which are dead or, in the opinion of the Public Works Supervisor representative, are in an unhealthy or unsightly condition. The cost of such replacement (s) shall be borne by the Contractor and shall be included in his bid price for the project.