DIVISION 2

SITE WORK

SECTION 02110

SITE CLEARING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Clear site within construction limits of plant life.

B. Remove grass and topsoil in area of access road and foundation.

C. Remove root system of trees and shrubs.

D. Remove surface debris

1.02 RELATED WORK

A. Section 02228 - Rock Removal.

B. Section 02211 - Rough Grading.

C. Section 02222 - Excavation.

1.03 REGULATORY REQUIREMENTS

Conform to applicable local codes and ordinances for disposal of debris.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 CLEARING

A. Clear areas required for access to site and execution of work.

B. Remove trees, shrubs, brush, and other vegetable matter such as snags, bark, and refuse.

3.02 PROTECTION

The Contractor shall not cut or injure any trees or other vegetation outside the easement lines and outside the areas to be cleared, as indicated on the Drawings, without written permission from the Engineer. The Contractor shall be responsible for all damage done outside these lines.

3.03 GRUBBING

From areas to be grubbed, the Contractor shall remove completely all stumps, remove to a depth of at least 24 inches below subgrade elevation all roots larger than 1 1/2 in. in diameter, and remove to a depth of 12 in. all roots larger than 1/2 in. in diameter. Such depths shall be measured from the existing ground surface, the proposed finished grade or subgrade, whichever is lower.

3.04 STRIPPING

All stumps, roots, foreign matter, topsoil, loam, and unsuitable earth shall be stripped from the ground surface. The topsoil and loam shall be utilized insofar as possible, for finished surfacing. Loam shall not be taken from the site.

3.05 DISPOSAL

A. All material resulting from clearing and grubbing and not scheduled for reuse or stockpiling shall become the property of the Contractor and shall be suitably disposed of off site, unless otherwise directed by the Engineer, in accordance with all applicable laws, ordinances, rules and regulations.

B. Such disposal shall be performed as promptly as possible after removal of the material and shall not be left until the final period of cleaning up.

3.06 FENCES

Wherever fences need to be removed to provide access to the work or are damaged during the progress of work, they shall be restored or repaired to as good a condition as existed prior to construction at the Contractor's expense.

- END OF SECTION -

SECTION 02211

ROUGH GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Remove topsoil and stockpile for later reuse.

B. Excavate subsoil and stockpile for later reuse as directed.

C. Grade and rough contour site.

1.02 RELATED WORK

B. Section 02202 - Rock Removal.

C. Section 02222 - Excavation.

D. Section 02220 – Earthwork.

1.03 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01720.

B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 PROTECTION

A. Protect trees and other features remaining as portion of final landscaping.

B. Protect bench marks, existing structures, fences, roads, sidewalks and other features not designated for demolition.

C. Protect above or below grade utilities which are to remain.

D. Contractor shall be responsible for repairing any damage to those items not designated for demolition or removal in a manner satisfactory to the Owner at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Excavated material, graded free of roots, rocks larger than one inch, subsoil, debris, and large weeds.

B. Subsoil: Excavated material, graded free of lumps larger than 12 inches, rocks larger than 12 inches, and debris.

PART 3 - EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known below grade utilities. Stake and flag locations.

C. Identify and flag above grade utilities.

D. Maintain and protect existing utilities remaining which pass through work area.

E. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Engineer.

3.02 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, and stockpile in area designated on site by the Engineer.

B. Do not excavate wet topsoil.

C. Stockpile topsoil to depth not exceeding 8 feet.

3.03 SUBSOIL EXCAVATION

A. Excavate subsoil from indicated areas and stockpile in area designated on site. Excess subsoil may be reused..

B. Do not excavate wet subsoil.

C. Stockpile subsoil to depth not exceeding 8 feet.

D. When excavation through roots is necessary, perform work by hand and cut roots with a sharp axe.

3.04 TOLERANCES

Top Surface of Subgrade: Plus or minus three inches.

- END OF SECTION -

SECTION 02220

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes excavation and backfilling including the loosening, removing, refilling, transporting, storage and disposal of all materials classified as "earth" necessary to be removed for the construction and completion of all work under the Contract, and as shown on the Contract Drawings, specified or directed.

1.02 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)

a. A328 Specification for Steel Sheet Piling

b. D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3)

c. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

d. D1760 Specification for Pressure Treatment of Timber Products

e. D2922 Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

1.03 DEFINITIONS

A. Excavation (or Trenching)

1. Grubbing, stripping, removing, storing and rehandling of all materials of every name and nature necessary to be removed for all purposes incidental to the construction and completion of all the work under construction.

2. All sheeting, sheetpiling, bracing and shoring, and the placing, driving, cutting off and removing of the same.

3. All diking, ditching, fluming, cofferdamming, pumping, bailing, draining, well pointing, or otherwise disposing of water.

4. The removing and disposing of all surplus materials from the excavations in the manner specified.

5. The maintenance, accommodation and protection of travel and the temporary paving of highways, roads and driveways.

6. The supporting and protecting of all tracks, rails, buildings, curbs, sidewalks, pavements, overhead wires, poles, trees, vines, shrubbery, pipes, sewers, conduits or other structures or property in the vicinity of the work, whether over- or underground or which appear within or adjacent to the excavations, and the restoration of the same in case of settlement or other injury.

7. All temporary bridging and fencing and the removing of same.

B. Earth

1. All materials such as sand, gravel, clay, loam, ashes, cinders, pavements, muck, roots or pieces of timber, soft or disintegrated rock, not requiring blasting, barring, or wedging from their original beds, and specifically excluding all ledge or bedrock and individual boulders or masonry larger than one-half cubic yard in volume.

C. Backfill

1. The refilling of excavation and trenches to the line of filling indicated on the Contract Drawings or as directed using materials suitable for refilling of excavations and trenches; and the compacting of all materials used in filling or refilling by rolling, ramming, watering, puddling, etc., as may be required.

D. Spoil

1. Surplus excavated materials not required or not suitable for backfills or embankments.

E. Embankments

1. Fills constructed above the original surface of the ground or such other elevation as specified or directed.

F. Limiting Subgrade

1. The underside of the pipe barrel for pipelines
2. The underside of footing lines for structures

G. Excavation Below Subgrade

1. Excavation below the limiting subgrades of structures or pipelines.

2. Where materials encountered at the limiting subgrades are not suitable for proper support of structures or pipelines, the Contractor shall excavate to such new lines and grades as required.

PART 2 PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. Wood Sheeting and Bracing

1. Shall be sound and straight; free from cracks, shakes and large or loose knots; and shall have dressed edges where directed.

2. Shall conform to National Design Specifications for Stress Grade Lumber having a minimum fiber stress of 1200 pounds per square inch.

3. Sheeting and bracing to be left-in-place shall be pressure treated in accordance with ASTM D1760 for the type of lumber used and with a preservative approved by the Engineer.

B. Steel Sheeting and Bracing

1. Shall be sound

2. Shall conform to ASTM A328 with a minimum thickness of 3/8 inch.

PART 3 EXECUTION

3.01 UNAUTHORIZED EXCAVATION

A. Whenever excavations are carried beyond or below the lines and grades shown on the Contract Drawings, or as given or directed by the Engineer, all such excavated space shall be refilled with special granular materials, concrete or other materials as the Engineer may direct. All refilling of unauthorized excavations shall be at the Contractor's expense.

B. All material which slides, falls or caves into the established limits of excavations due to any cause whatsoever, shall be removed and disposed of at the Contractor's expense and no extra compensation will be paid the Contractor for any materials ordered for refilling the void areas left by the slide, fall or cave-in.

3.02 REMOVAL OF WATER

A. General

1. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the excavations, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work or the proper placing of pipes, structures, or other work.

2. Unless otherwise specified, all excavations which extend down to or below the static groundwater elevations shall be dewatered by lowering and maintaining the groundwater beneath such excavations at all times when work thereon is in progress, during subgrade preparation and the placing of the structure or pipe thereon.

3. Water shall not be allowed to rise over or come in contact with any masonry, concrete or mortar, until at least 24 hours after placement, and no stream of water shall be allowed to flow over such work until such time as the Engineer may permit.

4. Where the presence of fine grained subsurface materials and a high groundwater table may cause the upward flow of water into the excavation with a resulting quick or unstable condition, the Contractor shall install and operate a well point system to prevent the upward flow of water during construction.

5. Water pumped or drained from excavations, or any sewers, drains or water courses encountered in the work, shall be disposed of in a suitable manner without injury to adjacent property, the work under construction, or to pavements, roads, drives, and water courses. No water shall be discharged to sanitary sewers. Sanitary sewage shall be pumped to sanitary sewers or shall be disposed of by an approved method.

6. Any damage caused by or resulting from dewatering operations shall be the sole responsibility of the Contractor.

B. Work Included

1. The construction and removal of cofferdams, sheeting and bracing, and the furnishing of materials and labor necessary therefor.

2. The excavation and maintenance of ditches and sluiceways.

3. The furnishing and operation of pumps, well points, and appliances needed to maintain thorough drainage of the work in a satisfactory manner.

C. Well Point Systems

1. Installation

a. The well point system shall be designed and installed by or under the supervision of an organization whose principal business is well pointing and which has at least five consecutive years of similar experience and can furnish a representative list of satisfactory similar operations.

b. Well point headers, points and other pertinent equipment shall not be placed within the limits of the excavation in such a manner or location as to interfere with the laying of pipe or trenching operations or with the excavation and construction of other structures.

c. Detached observation wells of similar construction to the well points shall be installed at intervals of not less than 50 feet along the opposite side of the excavation from the header pipe and line of well points, to a depth of at least 5 feet below the proposed excavation. In addition, one well point in every 50 feet shall be fitted with a tee, plug and valve so that the well point can be converted for use as an observation well. Observation wells shall be not less than 1-½ inches in diameter.

d. Standby gasoline or diesel powered equipment shall be provided so that in the event of failure of the operating equipment, the standby equipment can be readily connected to the system. The standby equipment shall be maintained in good order and actuated regularly not less than twice a week.

2. Operation

a. Where well points are used, the groundwater shall be lowered and maintained continuously (day and night) at a level not less than 2 feet below the bottom of the excavation. Excavation will not be permitted at a

level lower than 2 feet above the water level as indicated by the observation wells.

b. The effluent pumped from the well points shall be examined periodically by qualified personnel to determine if the system is operating satisfactorily without the removal of fines.

c. The water level shall not be permitted to rise until construction in the immediate area is completed and the excavation backfilled.

3.03 STORAGE OF MATERIALS

A. Sod

1. Any sod cut during excavation shall be removed and stored during construction so as to preserve the grass growth. Sod damaged while in storage shall be replaced in like kind at the sole expense of the Contractor.

B. Topsoil

1. Topsoil suitable for final grading shall be removed and stored separately from other excavated material.

C. Excavated Materials

1. All excavated materials shall be stored in locations so as not to endanger the work, and so that easy access may be had at all times to all parts of the excavation. Stored materials shall be kept neatly piled and trimmed, so as to cause as little inconvenience as possible to public travel or to adjoining property holders.

2. Special precautions must be taken to permit access at all times to fire hydrants, fire alarm boxes, police and fire department driveways, and other points where access may involve the safety and welfare of the general public.

3.

3.04 DISPOSAL OF MATERIALS

A. Spoil Material

1. All spoil materials shall be disposed of as required by the local, state or federal regulations pertaining to the area or as described in the Special Provisions or on the Contract Drawings.

2. The surface of all spoil areas shall be graded and dressed and no unsightly mounds or heaps shall be left on completion of the work.

3.05 SHEETING AND BRACING

A. Installation

1. The Contractor shall furnish, place and maintain such sheeting, bracing and shoring as may be required to support the sides and ends of excavations in such manner as to prevent any movement which could, in any way, injure the pipe, structures, or other work; diminish the width necessary for construction; otherwise damage or delay the work of the Contract; endanger existing structures, pipes or pavements; or cause the excavation limits to exceed the right-of-way limits.

2. In no case will bracing be permitted against pipes or structures in trenches or other excavations.

3. Sheeting shall be driven as the excavation progresses, and in such manner as to maintain pressure against the original ground at all times. The sheeting shall be driven vertically with the edges tight together, and all bracing shall be of such design and strength as to maintain the sheeting in its proper position. Seepage which carries fines through the sheeting shall be plugged to retain the fines.

4. Where breast boards are used between soldier pile, the boards shall be back packed with soil to maintain support.

5. The Contractor shall be solely responsible for the adequacy of all sheeting and bracing.

B. Removal

1. In general, all sheeting and bracing, whether of steel, wood or other material, used to support the sides of trenches or other open excavations, shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a pipe or structural foundation shall not be withdrawn, unless otherwise directed, before more than 6 inches of earth is placed above the top of the pipe or structural foundation and before any bracing is removed. The voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

2. The Contractor shall not remove sheeting and bracing until the work has attained the necessary strength to permit placing of backfill.

C. Left in Place

1. If, to serve any purpose of his own, the Contractor files a written request for permission to leave sheeting or bracing in the trench or excavation, the Engineer may grant such permission, in writing, on condition that the cost of such sheeting and bracing be assumed and paid by the Contractor.

2. The Contractor shall leave in place all sheeting, shoring and bracing which are shown on the Contract Drawings or specified to be left in place or which the Engineer may order, in writing, to be left in place. All shoring, sheeting and bracing shown or ordered to be left in place will be paid for under the appropriate item of the Contract. No payment allowance will be made for wasted ends or for portions above the proposed cutoff level which are driven down instead of cut-off.

3. In case sheeting is left in place, it shall be cut off or driven down as directed so that no portion of the same shall remain within 12 inches of the street subgrade or finished ground surface.

3.06 BACKFILLING

A. General

1. All excavations shall be backfilled to the original surface of the ground or to such other grades as may be shown, specified or directed.

2. Backfilling shall be done with suitable excavated materials which can be satisfactorily compacted during refilling of the excavation. In the event the excavated materials are not suitable, Special Backfill as specified or ordered by the Engineer shall be used for backfilling.

4. Any settlement occurring in the backfilled excavations shall be refilled and compacted.

B. Unsuitable Materials

1. Stones, pieces of rock or pieces of pavement greater than 1 cubic foot in volume or greater than 1.5 feet in any single dimension shall not be used in any portion of the backfill.

2. All stones, pieces of rock or pavement shall be distributed through the backfill and alternated with earth backfill in such a manner that all interstices between them shall be filled with earth.

3. Frozen earth shall not be used for backfilling.

C. Compaction and Density Control

1. The compaction shall be as specified for the type of earthwork, i.e., structural, trenching or embankment.

a. The compaction specified shall be the percent of maximum dry density.

b. The compaction equipment shall be suitable for the material encountered.

2. Where required, to assure adequate compaction, in-place density test shall at the expense of the Contractor be made by an approved testing laboratory.

a. The moisture-density relationship of the backfill material shall be determined by ASTM D698, Method D.

1) Compaction curves for the full range of materials used shall be developed.

b. In-place density shall be determined by the methods of ASTM D1556 or ASTM D2922 and shall be expressed as a percentage of maximum dry density.

3. Where required, to obtain the optimum moisture content, the Contractor shall add, at his expense, sufficient water during compaction to assure the specified maximum density of the backfill. If, due to rain or other causes, the material exceeds the optimum moisture content, it shall be allowed to dry, assisted if necessary, before resuming compaction or filling efforts.

4. The Contractor shall be responsible for all damage or injury done to pipes, structures, property or persons due to improper placing or compacting of backfill.

3.07 OTHER REQUIREMENTS

A. Drainage

1. All material deposited in roadway ditches or other water courses shall be removed immediately after backfilling is completed and the section, grades and contours of

such ditches or water courses restored to their original condition, in order that surface drainage will be obstructed no longer than necessary.

B. Unfinished Work

1. When, for any reason, the work is to be left unfinished, all trenches and excavations shall be filled and all roadways, sidewalks and watercourses left unobstructed with their surfaces in a safe and satisfactory condition. The surface of all roadways and sidewalks shall have a temporary pavement.

C. Hauling Material on Streets

1. When it is necessary to haul material over the streets or pavements, the Contractor shall provide suitable tight vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same as often as required to keep the crosswalks, streets and pavements clean and free from dirt, mud, stone and other hauled material.

D. Dust Control

1. It shall be the sole responsibility of the Contractor to control the dust created by any and all of his operations to such a degree that it will not endanger the safety and welfare of the general public.

2. Calcium chloride and petroleum products shall not to be used for dust control.

E. Test Pits

1. For the purpose of obtaining detail locations of underground obstructions, the Contractor shall make excavations in advance of the work. Payment for the excavations ordered by the Engineer will be made under an appropriate item of the Contract and shall include sheeting, bracing, pumping, excavation and backfilling.

- END OF SECTION -

SECTION 02222

EXCAVATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Structure excavation.

B. Shoring excavations.

1.02 RELATED WORK

A. Geotechnical available upon request.

B. Section 01450 - Quality Control.

C. Section 02228 - Rock Removal.

D. Section 02211 - Rough Grading.

E. Section 02220 - Backfilling and Embankments.

F. Section 02226 - Trenching.

1.03 REGULATORY REQUIREMENTS

A. Protect excavations by shoring, bracing, sheet piling, underpining, or other methods required to prevent cave-in or loose soil from falling into excavation.

B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

C. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

E. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Subsoil: Excavated material, graded free of lumps larger than 12 inches, rocks larger than 12 inches, and debris.

B. # 57's or # 9's: Mineral aggregate graded 1/4 inch to 5/8 inch, free of soil, subsoil, clay, shale, or foreign matter.

PART 3 - EXECUTION

3.01 PREPARATION

Identify required liens, levels, contours, and datum.

3.02 EXCAVATION

A. Excavate subsoil required for structure foundations, construction operations, and other work. All excavation shall be unclassified excavation.

B. Contractor is responsible to adequately brace open cuts and protect workmen and equipment from cave-in.

C. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume. Remove larger material under Section 02228.

D. Correct unauthorized excavation at no cost to Owner.

E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Engineer.

F. Stockpile excavated material in area designated on site.

3.03 FIELD QUALITY CONTROL

Provide for visual inspection of rock surfaces under provisions of Section 01450.

- END OF SECTION -

SECTION 02226

TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes excavation and backfill as required for pipe installation or other construction in the trench, and removal and disposal of water, in accordance with the applicable provisions of the Section entitled "Earthwork" unless modified herein.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXCAVATION

A. The trench excavation shall be located as shown on the Contract Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Contract Documents.

B. Trenches shall be excavated to maintain the depths as shown on the Contract Drawings or as specified for the type of pipe to be installed.

C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.

D. The minimum width of trench excavation shall be 6-inches on each side of the pipe hub for 21-inch diameter pipe and smaller and 12-inches on each side of the pipe hub for 24-inch diameter pipe and larger.

E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required.

F. Bridging across open trenches shall be constructed and maintained where required.

3.02 SUBGRADE PREPARATION FOR PIPE

A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.

B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.

C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.

D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

3.03 STORAGE OF MATERIALS

A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits. Where no Highway Permit is required at least one-half of the street must be kept open for traffic.

B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.

1. The Contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.

C. If directed by the Engineer, the Contractor shall refill trenches with select fill or other suitable materials and excess excavated materials shall be disposed of as spoil.

3.04 REMOVAL OF WATER AND DRAINAGE

A. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the trench, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work.

B. The removal of water shall be in accordance with the Section entitled "Earthwork".

3.05 PIPE EMBEDMENT

A. All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe as laid.

B. Concrete cradle and encasement of the class specified shall be installed where and as shown on the Contract Drawings or ordered by the Engineer. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or flotation. The concrete cradle or encasement shall extend the full width of the trench as excavated unless otherwise authorized by the Engineer. Where concrete is to be placed in a sheeted trench it shall be

poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

C. Embedment materials placed above the centerline of the pipe or above the concrete cradle to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

3.06 BACKFILL ABOVE EMBEDMENT

A. The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified.

1. Where trenches are within the ditch-to-ditch limits of any street or road or within a driveway or sidewalk, or shall be under a structure, the trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted to obtain 95% maximum density, and determined as set forth in the Section entitled "Earthwork".

2. Where trenches are in open fields or unimproved areas outside of the ditch limits of roads, the backfilling may be by placing the material in the trench and mounding the surface.

3. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment.

B. Backfilling of trenches beneath, across or adjacent to drainage ditches and water courses shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches and the backfill shall be protected from surface erosion by adequate means.

1. Where trenches cross waterways, the backfill surface exposed on the bottom and slopes thereof shall be protected by means of stone or concrete rip-rap or pavement.

C. All settlement of the backfill shall be refilled and compacted as it occurs.

D. Temporary pavement shall be placed as specified in the Section entitled "Restoration of Surfaces".

-END OF SECTION-

SECTION 02228

ROCK REMOVAL

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes removal to the widths and depths shown on the Contract Drawings or as directed by the Engineer, including the loosening, removing, transporting, storing and disposal of all materials requiring blasting, barring, or wedging for removal from their original beds, and backfill of rock excavations with acceptable materials

B. Use of explosives for rock removal shall be used only with prior permission from both the Engineer and Owner.

C. Rock removal is part of and incidental to unclassified excavation. No separate payment shall be made for rock removal.

1.02 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Before any blasting operations begin the Contractor shall obtain all permits and licenses required.

1.03 DEFINITIONS

A. Rock

1. All pieces of ledge or bedrock, boulders or masonry larger than one-half cubic yard in volume.

2. Any material requiring blasting, barring, or wedging for removal from its original bed.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 BLASTING (Use of explosives for rock removal shall be used only with prior permission from both the Engineer and Owner.)

A. General

1. Handling of explosives and blasting shall be done only by experienced persons.

2. Handling and blasting shall be in accordance with all Federal, State and local laws, rules and regulations relating to the possession, handling, storage and transportation and use of explosives.

3. All blasts in open cut shall be properly covered and protected with approved blasting mats.

4. Charges shall be of such size that the excavation will not be unduly large and shall be so arranged and timed that adjacent rock, upon or against which pipelines or structures are to be built, will not be shattered.

5. Blasting will not be permitted within 25 feet of pipelines or structures.

6. All existing pipes or structures exposed during excavation shall be adequately protected from damage before proceeding with the blasting.

7. NFPA 495 - Code for Manufacture, Transportation, Storage and Use of Explosive Materials.

8. Commonwealth of Kentucky Department of Mines and Minerals, Laws and Regulations Governing Explosives and Blasting.

B. Repair of Damages Due to Blasting

1. Any injury or damage to the work or to existing pipes or structures shall be repaired or rebuilt by the Contractor at his expense.

2. Whenever blasting may damage adjacent rock, pipes or structures, blasting shall be discontinued and the rock removed by drilling, barring, wedging or other methods.

C. Explosives

1. At no time shall an excessive amount of explosives be kept at the site of the work. Such explosives shall be stored, handled and used in conformity with all applicable laws and regulations.

2. Accurate daily records shall be kept showing the amounts of explosives on hand, both at the site and at any storage magazine, the quantities received and issued, and the purpose for which issued.

3. The Contractor shall be responsible for any damage or injury to any persons, property or structures as a result of his handling, storage or use of explosives.

D. Rock Clearance in Trenches

1. Ledge rock, boulders and large stones shall be removed from the sides and bottom of the trench to provide clearance for the specified embedment of each pipe section, joint or appurtenance; but in no instance shall the clearance be less than 6 inches. Additional clearance at the pipe bell or joint shall be provided to allow for the proper make-up of the joint.

2. At the transition from an earth bottom to a rock bottom the minimum bottom clearance shall be 12 inches for a distance of not less than 5 feet.

E. Rock Clearance at Structures

1. Concrete for structures shall be placed directly on the rock and the excavation shall be only to the elevations and grades shown on the Contract Drawings.

3.02 EXCAVATION AND BACKFILL

A. Rock removal and backfilling shall be performed in accordance with the applicable provisions of the Section entitled "Earthwork".

B. The rock excavated which cannot be incorporated into the backfill material, as specified, shall be disposed of as spoil and shall be replaced with the quantity of acceptable material required for backfilling.

-END OF SECTION-

SECTION 02230

TRENCH BEDDING AND BACKFILLING

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish, place and compact all bedding and backfill materials specified herein or denoted on the Drawings. The materials, equipment, labor, etc. required herein are to be considered as part of the requirements and costs for installing the various pipes, structures and other items they are incidental to.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed stone material shall conform with the requirements of applicable sections of the Kentucky Bureau of Highways Standard Specifications and shall consist of clean, hard, and durable particles or fragments, free from dirt, vegetation or objectional materials.

B. Two classes of crushed stone material are used in this Section for pipe bedding and backfill. The type of material in each class is as follows:

1. Class I - No. 9 Aggregate.

2. Class II - Dense Graded Aggregate (DGA).

C. Subbase material for structures shall be naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed stone.

D. Backfill materials at structures shall be satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.

PART 3 - EXECUTION

3.01 EXCAVATION

A. The trench excavation shall be located as shown on the Contract Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Contract Documents.

B. Trenches shall be excavated to maintain the depths as shown on the Contract Drawings or as specified for the type of pipe to be installed.

C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.

D. The minimum width of trench excavation shall be 6-inches on each side of the pipe hub for 21-inch diameter pipe and smaller and 12-inches on each side of the pipe hub for 24-inch diameter pipe and larger.

E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required.

F. Bridging across open trenches shall be constructed and maintained where required.

3.02 PIPE BEDDING

A. Piping for gravity sewers and force mains shall be supported as follows:

1. All gravity sewer piping shall be laid on a bed of granular material except when a concrete encasement situation occurs. All pipe bedding material shall be Class I (No. 9 crushed stone aggregate) and shall be placed to a depth of 4" in an earth trench and 6" in a rock trench. Aggregate bedding shall be graded to provide for a uniform and continuous support beneath the pipe at all points.

2. The trench bottom for force main piping shall be stable, continuous, relatively smooth and free of frozen material, clodded dirt, foreign material larger than 1/2-inch in diameter. The foundation for force main piping shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. Any uneven areas in the trench bottom shall be shaved off or filled in with Class I granular bedding. When the trench is made through rock, the bottom shall be lowered to provide 6 inches of clearance around the pipe. Class I granular bedding shall be used to bring the trench bottom to grade.

B. After each pipe has been brought to grade, aligned, and placed in final position, Class I material for gravity sewer piping and earth material for force main piping shall be deposited and densified under the pipe haunches and on each side of the pipe up to the spring line of the pipe to prevent lateral displacement and hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations.

C. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective.

D. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate.

E. The depth of the foundation is dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required Class I bedding material can be placed.

F. It should be noted that no pipe shall be laid on solid or blasted rock.

G. Pipe bedding as required in Paragraphs A, B and D of this article is <u>not</u> considered a separate pay item.

3.03 SUBGRADE PREPARATION FOR PIPE

A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.

B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.

C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.

D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

3.04 BACKFILL FOR PIPING

A. Initial Backfill

1. This backfill is defined as that material which is placed over the pipe from the spring line to a point 6 inches above the top of the pipe. For gravity sewer piping the material shall be Class I (No. 9 crushed stone aggregate) and may be machine placed without compaction. Uneven places in the backfill shall be leveled by hand. For force main piping, initial backfill material shall be earth material free of rocks, acceptable to the Engineer or with Class I material when a condition exists mentioned in Paragraph A, 3. below.

2. Material used, whether earth or Class I, in the initial backfilling is NOT a separate pay item. Payment for the material is included in the unit price per linear foot of gravity sewer or force main.

3. In areas where large quantities of rock are excavated and the available excavated earth in the immediate vicinity is insufficient for placing the required amount of backfill over the top of the pipe as set forth in Paragraph A.1., the Contractor shall either haul in earth or order Class I material for backfilling over the pipe. Neither the hauling and placement of earth nor the ordering and placement of Class I material to fulfill the backfill requirements set forth herein is considered a separate pay item.

B. Final Backfill

1. There are two cases where the method of final backfilling varies. The various cases and their trench situations are as follows:

   a. Case I - Areas not subject to vehicular traffic.

   b. Case II - Paved areas including streets, drives and walks.

2. In all cases, walking or working on the completed pipelines, except as may be necessary in backfilling, will not be permitted until the trench has been backfilled to a point six (6) inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:

   a. Case I - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 8 inches below the surface of the ground with earth material free from large rock (over one-half cubic foot in volume), acceptable to the

Engineer. The remainder of the trench shall be backfilled with earth material free of any rocks.

b. Case II - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 12 inches below the existing pavement surface with Class I (No. 9 crushed stone aggregate) material. The backfill shall be mechanically tamped in approximately 6-inch layers to obtain the maximum possible compaction. The remaining backfill shall be Class II (dense graded aggregate) material mechanically tamped to maximum possible compaction. The trench may be left with a slight mound if permitted by the Engineer.

3. Earth and Class I material used in final backfill is not a separate pay item. Payment shall be included in the unit price per linear foot of gravity sewer and force main.

4. Class II material used in final backfill shall be included in the unit price per linear foot of bituminous pavement replacement.

C. A sufficient amount of Class II material shall be stockpiled to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling in of settled or washed areas by the Contractor.

D. Excavated materials from trenches, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. It shall be the responsibility of the Contractor to obtain location or permits for its disposal, unless specific waste areas have been designated on the Drawings or noted in these specifications. Unit prices for the various pipe sizes shall include the cost of disposal of excess excavated materials, as set forth herein, not additional compensation being allowed for hauling or overhaul.

3.05 BACKFILL AND FILL AT STRUCTURES

A. Place No. 57 stone fill material in maximum 6" lifts (loose thickness to required subgrade elevations).

B. With the exception of the organic debris, existing fill material, and topsoil, the on-site soil removed from the excavations could be used as fill or backfill material provided the moisture content of the soil is adjusted.

C. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

D. All materials used for backfill around structures shall be of a quality acceptable to the Engineer and shall be free from large or frozen lumps, wood and other extraneous material. All spaces excavated and not occupied by footings, foundations, walls or other permanent work shall be refilled with earth up to the surface of the surrounding ground, unless otherwise specified, with sufficient allowance for settlement. In making the fills and terraces around the structures, the fill shall be placed in layers not exceeding 12 inches in depth and shall be kept smooth as the work progresses. Each layer of the fill shall be rolled with an approved type roller and/or be compacted. When it is not practicable to compact sections of the fill immediately adjacent to the buildings or structures by rolling,then such sections shall be thoroughly compacted by means of mechanical tamping or hand tamping as may be required by the conditions encountered. All fills shall be placed so as to load symmetrically.

E. Grade areas adjacent to building lines to drain away from structures to prevent ponding.

F. Control soil compaction during construction providing minimum compaction to 95% of Standard Proctor density at a moisture content of ± 2% of optimum.

G. All excess excavated material shall become the property of the Contractor and shall be disposed of by him outside the project limits. It is the Contractor's responsibility to locate a suitable waste area off-site, obtain necessary permits for use of the waste area and be in compliance with applicable laws and regulations. The Contractor shall place and compact all excess excavated material at the waste area, with the cost of hauling, placing, compacting, and grading included in the Contractor's bid. Acceptable excavated material includes suitable demolition materials.

3.06 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.07 SHORING, SHEETING, AND BRACING OF EXCAVATION

A. Where unstable material is encountered or where the depth of excavation in earth exceeds five (5) feet, the sides of the trench or excavation shall be supported by substantial sheeting, bracing, and shoring, or the sides sloped to the angle of repose. Sloping the sides of the ditch to the angle will not be permitted in streets, roads, narrow rights-of-way or other constricted areas unless otherwise specified. The design and installation of all sheeting, sheet piling, bracing, and shoring shall be based on computations of pressure exerted by the materials to be retained under obtaining conditions. Adequate and proper shoring of all excavations shall be the entire responsibility of the Contractor; however, the Engineer may require the submission of shoring plans (accompanied by supporting computations) for approval prior to the Contractor undertaking any portion of the work. The standards of the Federal Occupational Safety and Health Act and the Kentucky Labor Cabinet shall be followed.

B. Foundations, adjacent to where the excavation is to be made below the depth of the existing foundation, shall be supported by shoring, bracing or underpinning as long as the excavation shall remain open, or thereafter if required to insure the stability of the structure supported by the foundation, and the Contractor shall be held strictly responsible for any damage to said foundations.

C. Solid sheeting will be required for wet or unstable material. It shall consist of continuous vertical sheet piling of timber or steel with suitable wales and braces.

D. Care shall be taken to avoid excessive backfill loads on the completed pipelines and the trench width requirements at the level of the crown of the pipe and at the level of a road or street be strictly observed.

E. Trench sheeting shall not be removed until sufficient backfill has been placed to protect the pipe.

F. All sheeting, planking, timbering, bracing and bridging shall be placed, renewed and maintained as long as is necessary.

3.08 STORAGE OF MATERIALS

A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits. Where no Highway Permit is required, at least one-half of the street must be kept open for traffic.

B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.

1. The Contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.

C. If directed by the Engineer, the Contractor shall refill trenches with select fill or other suitable materials and excess excavated materials shall be disposed of as spoil.

3.09 REMOVAL OF WATER AND DRAINAGE

A. The Contractor, at his own expense, shall provide adequate facilities for promptly and continuously removing water from all excavation.

B. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to remove promptly and dispose properly of all water entering trenches and other excavations. Such excavation shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.

C. All water pumped or drained from the work shall be disposed of in s suitable manner without undue interference with other work, damage to pavements, other surfaces, or property. Suitable temporary pipes, flumes, or channels shall be provided for water that may flow along or across the site of the work.

D. If necessary, the Contractor shall dewater the excavations by means of an efficient drainage wellpoint system which will drain the soil and prevent saturated soil from flowing into the excavation. The wellpoints shall be designed especially for this type of service. The pumping unit shall be designed for use with the wellpoints, and shall be capable of maintaining a high vacuum and of handling large volumes of air and water at the same time.

E. The installation of the wellpoints and pump shall be done under the supervision of a competent representative of the manufacturer. The Contractor shall do all special work such as surrounding the wellpoints with sand or gravel or other work which is necessary for the wellpoint system to operate for the successful dewatering of the excavation.

3.10 UNAUTHORIZED EXCAVATION

Whenever the excavation is carried beyond or below the required lines and grades, the Contractor, at his own expense, shall refill said excavated space with suitable material in a manner approved by the Engineer.

3.11 EXISTING UTILITIES AND OTHER OBSTRUCTIONS

Prior to the commencement of construction on the project, the Contractor shall contact the utility companies whose lines, above and below ground, may be affected during construction and verify the locations of the utilities as shown on the Contract Drawings. The Contractor shall ascertain from said companies if he will be allowed to displace or alter, by necessity, those lines encountered or replace those lines disturbed by accident during construction, or if the companies themselves are only permitted by policy to perform such work. If the Contractor is permitted to perform such work, he shall leave the lines in as good condition as were originally encountered and complete the work as quickly as possible. All such lines or underground structures damaged or molested in the construction shall be replaced at the Contractor's expense, unless, in the opinion of the Engineer, such damage was caused through no fault of the Contractor.

3.12 FINAL CLEANUP AND RESTORATION

Unless specifically approved by the Owner and Engineer, **cleanup of disturbed areas shall be kept current with construction** and restoration efforts by the contractor initiated no longer than seven (7) days after the trench excavation work has started. All excavated material not required for backfilling of the trench and any large rocks, stones or debris shall be removed from the site, and shall not be a burden to the property owner(s) and/or adjacent properties. The contractor may windrow or track-in the excavated material over the trench prior to final cleanup to allow for and to assist in the initial settlement of the trench. All disturbed areas must be seeded at least with a temporary seed mix if for some reason the area cannot be permanently seeded within two (2) weeks.

3.13 MEASURMENT

A. All trench excavation, backfill and compaction are not considered pay items. Payment for these items shall be included in the unit price laid for each size of pipe at their respective depths. This unit price shall be full remuneration for performing the trench and backfill complete including grading, bell holes, sheeting, dewatering, and tamping; and including the furnishing of sewer pipe, all equipment, labor, materials, power, tools, and transportation necessary or incidental thereto.

- END OF SECTION -

SECTION 02255

CRUSHED STONE AND DENSE GRADED AGGREGATE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish and install crushed stone for miscellaneous uses as shown on the Drawings, as called for in the Specifications.

B. Sizes, types, and quality of crushed stone are specified in this Section, but its use for replacement of unsuitable material, pavement base, and similar uses is specified in detail elsewhere in the Specifications. The Engineer may order the use of crushed stone for purposes other than those specified in other Sections, if, in his opinion, such use is advisable. Payment for same will be subject to negotiation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. When referred to in these Specifications, crushed stone shall be Number 57 graded in accordance with the Kentucky Department of Highways, Standard Specifications, latest edition, unless otherwise noted.

B. When referred to in these Specifications, dense graded aggregate (DGA) shall be crushed stone classified by the Kentucky Department of Highways, Standard Specifications, latest edition, and conforming to the following requirements:

Sieve Size	Percent Passing
1 Inch	100
3/4 Inch	70 - 100
1/2 Inch	50 - 80
#4	30 - 65
#10	17 - 50
#40	8 - 30
#200	2 - 10

PART 3 - EXECUTION

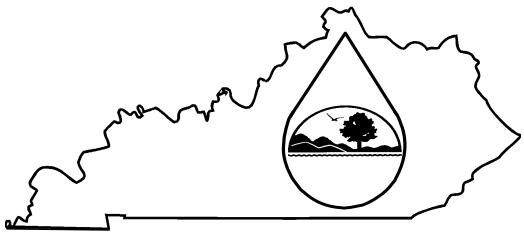
3.01 INSTALLATION

A. Crushed stone shall be placed and compacted in accordance with the Kentucky Department of Highways, Standard Specifications.

B. Crushed stone shall be placed in those areas as shown on the Drawings.

-- END OF SECTION --

KPDES FORM NOI-SW



Kentucky Pollutant Discharge Elimination System (KPDES)

Notice of Intent (NOI)
for Storm Water Discharges
Associated with Industrial Activity Under the KPDES General Permit

Submission of this Notice of Intent constitutes notice that the party identified in Section I of this form intends to be authorized by a KPDES permit issued for storm water discharges associated with industrial activity. Becoming a permittee obligates such discharger to comply with the terms and conditions of the permit.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM (See Instructions on back)

I. Facility Operator Information

Name:		**Phone:**	
Address:		**Status of Owner/Operator:**	
City, State, Zip Code:			

II. Facility/Site Location Information

Name:			
Address:			
City, State, Zip Code:			
County:			
Site Latitude: (degrees/minutes/seconds)		**Site Longitude: (degrees/minutes/seconds)**	

III. Site Activity Information

MS4 Operator Name:							
Receiving Water Body:							
Are there existing quantitative data?	**Yes** ☐ **If Yes, submit with this form.** **No** ☐						
SIC or Designated Activity Code Primary		**2nd**		**3rd**		**4th**	
If this facility is a member of a Group Application, enter Group Application Number:							
If you have other existing KPDES Permits, enter Permit Numbers:							

IV. Additional Information Required FOR CONSTRUCTION ACTIVITIES ONLY

Project Start Date:		**Completion Date:**	
Estimated Area to be disturbed (in acres):			
Is the Storm Water Pollution Prevention Plan in Compliance with State and/or Local Sediment and Erosion Plans?		**Yes** ☐ **No** ☐	

V. Certification: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed or Typed Name:			
Signature:		**Date:**	

Kentucky Pollutant Discharge Elimination System (KPDES)
Instructions
Notice of Intent (NOI) for Storm Water Discharges Associated with Industrial Activity
To Be Covered Under The KPDES General Permit

WHO MUST FILE A NOTICE OF INTENT (NOI) FORM

Federal law at 40 CFR Part 122 prohibits point source discharges of stormwater associated with industrial activity to a water body of the Commonwealth of Kentucky without a Kentucky Pollutant Discharge Elimination System (KPDES) permit. The operator of an industrial activity that has such a storm water discharge must submit a NOI to obtain coverage under the KPDES Storm Water General Permit. If you have questions about whether you need a permit under the KPDES Storm Water program, or if you need information as to whether a particular program is administered by the state agency, call the Storm Water Contact, Industrial Section, Kentucky Division of Water at (502) 564-3410.

WHERE TO FILE NOI FORM

NOIs must be sent to the following address:

Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
Frankfort Office Park
14 Reilly Road
Frankfort, KY 40601

COMPLETING THE FORM

Type or print legibly in the appropriate areas only. If you have any questions regarding the completion of this form call the Storm Water Contact, Industrial Section, at (502) 564-3410.

SECTION I - FACILITY OPERATOR INFORMATION

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same as the name of the facility. The responsible party is the legal entity that controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Enter the appropriate letter to indicate the legal status of the operator of the facility.

F = Federal M = Public (other than federal or state)
S = State P = Private

SECTION II - FACILITY/SITE LOCATION INFORMATION

Enter the facility's or site's official or legal name and complete street address, including city, state, and ZIP code.

SECTION III - SITE ACTIVITY INFORMATION

If the storm water discharges to a municipal separate storm sewer system (MS4), enter the name of the operator of the MS4 (e.g., municipality name, county name) and the receiving water of the discharge from the MS4. (A MS4 is defined as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by a state, city, town, borough, county, parish, district, association, or other public body which is designed or used for collecting or conveying storm water.)

If the facility discharges storm water directly to receiving water(s), enter the name of the receiving water.

Indicate whether or not the owner or operator of the facility has existing quantitative data that represent the characteristics and concentration of pollutants in storm water discharges. If data is available submit with this form.

List, in descending order of significance, up to four 4-digit standard industrial classification (SIC) codes that best describe the principal products or services provided at the facility or site identified in Section II of this application.

If the facility listed in Section II has participated in Part 1 of an approved storm water group application and a group number has been assigned, enter the group application number in the space provided.

If there are other KPDES permits presently issued for the facility or site listed in Section II, list the permit numbers.

SECTION IV - ADDITIONAL INFORMATION REQUIRED FOR CONSTRUCTION ACTIVITIES ONLY

Construction activities must complete Section IV in addition of Sections I through III. Only construction activities need to complete Section IV.

Enter the project start date and the estimated completion date for the entire development plan.

Provide an estimate of the total number of acres of the site on which soil will be disturbed (round to the nearest acre).

Indicate whether the storm water pollution prevention plan for the site is in compliance with approved state and/or local sediment and erosion plans, permits, or storm water management plans.

SECTION V - CERTIFICATION

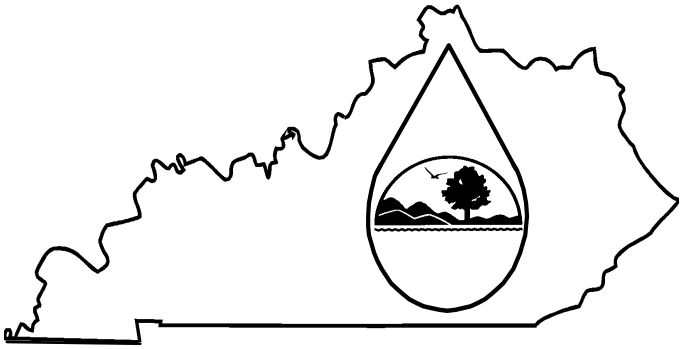
Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer,which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authroity to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, state, Federal, or other public facility: by either a principal executive officer or ranking elected official.

KPDES FORM NOT-SW



Kentucky Pollutant Discharge Elimination System (KPDES)

NOTICE OF TERMINATION (NOT)
of Coverage Under the KPDES General Permit for Storm Water Discharges Associated with Industrial Activity

Submission of this Notice of Termination constitutes notice that the party identified in Section II of this form is no longer authorized to discharge storm water associated with industrial activity under the KPDES program.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.
(Please see instructions on back before completing this form.)

I. PERMIT INFORMATION
KPDES Storm Water General Permit Number:
Check here if you are no longer the Operator of the Facility: ☐
Check here if the Storm Water Discharge is Being Terminated: ☐
II. FACILITY OPERATOR INFORMATION
Name:
Address:
City/State/Zip Code:
Telephone Number:
III. FACILITY/SITE LOCATION INFORMATION
Name:
Address:
City/State/Zip Code:

Certification: I certify under penalty of law that all storm water discharges associated with industrial activity from the identified facility that are authorized by a KPDES general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity of waters of the Commonwealth is unlawful under the Clean Water Act and Kentucky Regulations where the discharge is not authorized by a KPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Kentucky Revised Statutes.

NAME (Print or Type)	TITLE
SIGNATURE	DATE

INSTRUCTIONS
NOTICE OF TERMINATION (NOT) OF COVERAGE UNDER THE KPDES GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY

Who May File a Notice of Termination (NOT) Form
Permittees who are presently covered under the Kentucky Pollutant Discharge Elimination System (KPDES) General Permit for Storm Water Discharges Associated with Industrial Activity may submit a Notice of Termination (NOT) form when their facilities no longer have any storm water discharges associated with industrial activity as defined in the storm water regulations at 40 CFR 122.26 (b)(14), or when they are no longer the operator of the facilities.

For construction activities, elimination of all storm water discharges associated with industrial activity occurs when disturbed soils at the construction site have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all storm water discharges associated with industrial activity from the construction site that are authorized by a KPDES general permit have otherwise been eliminated. Final stabilization means that all soil-disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles have been employed.

Where to File NOT Form
Send this form to the following address:

Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
14 Reilly Road, Frankfort Office Park
Frankfort, KY 40601

Completing the Form
Type or print legibly in the appropriate areas and according to the instructions given for each section. If you have questions about this form, call the Storm Water Contact, Industrial Section, at (502) 564-3410.

Section I - Permit Information
Enter the existing KPDES Storm Water General Permit number assigned to the facility or site identified in Section III. If you do not know the permit number, **call the Storm Water Contact, Industrial Section at (502) 564-3410.**

Indicate your reason for submitting this Notice of Termination by checking the appropriate box:

If there has been a change of operator and you are no longer the operator of the facility or site identified in Section III, check the corresponding box.

If all storm water discharges at the facility or site identified in Section III have been terminated, check the corresponding box.

Section II - Facility Operator Information
Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Section III - Facility/Site Location Information
Enter the facility's or site's official or legal name and complete address, including city, state and ZIP code. If the facility lacks a street address, indicate the state, the latitude and longitude of the facility to the nearest 15 seconds, or the quater, section, township, and range (to the nearest quarter section) of the approximate center of the site.

Section IV - Certification
Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, State, Federal, or other public facility: by either a principal executive

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall do all work and take all measures necessary to control soil erosion resulting from construction operations, shall prevent the flow of sediment from the construction site, and shall contain construction materials (including excavation and backfill) within his protected working area so as to prevent damage to adjacent property.

B. The Contractor shall not employ any construction method that violates a rule, regulation, guideline or procedure established by Federal, State or local agencies having jurisdiction over the environmental effects of construction. The Contractor shall be responsible for obtaining all associated permits.

C. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall not be discharged into or alongside of any body of water or into natural or man-made channels leading thereto.

D. Permits:

1. The Contractor shall apply for a permit (if applicable) for stormwater runoff from the construction site for the project. It shall be the Contractor's responsibility to determine if the proposed construction activities will require a permit from the federal, state and local regulatory agencies.

2. For this project, the stormwater permitting process falls under the Kentucky Pollutant Discharge Elimination System (KPDES) permit program administered by the Kentucky Division of Water, Frankfort, Kentucky.

3. See attached for permits form.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Temporary Slope Protection and Erosion Control:

Bales may be hay or straw, and shall be reasonably clean and free of noxious weeds and deleterious materials. Filter fabric for sediment traps shall be of suitable materials acceptable to the Engineer.

B. Permanent Slope Protection and Erosion Control:

On slopes 2H:1V and steeper, and where shown on the drawings place Type A Dumped Rock Fill with a 24-inch minimum thickness over non-woven geotextile filter fabric.

PART 3 - EXECUTION

3.01 METHODS OF CONSTRUCTION

A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches and settling basins.

B. Construction operations shall be restricted to the areas of work indicated on the Drawings and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

C. Excavated soil material shall not be placed adjacent to the wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If for any reason construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer.

D. For work within easements, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of the easements.

E. The Contractor shall not pump silt-laden water from trenches or other excavations into the wetlands, or adjacent watercourses. Instead, silt-laden water from his excavations shall be discharged within areas surrounded by baled hay or into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.

F. Prohibited construction procedures include, but are not limited to, the following:

1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.

2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.

3. Pumping of silt-laden water from trenches or excavations into surface waters, or wetlands.

4. Damaging vegetation adjacent to or outside of the construction area limits.

5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.

6. Permanent or unauthorized alteration of the flow line of any stream.

7. Open burning of debris from the construction work.

G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the Contractor shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

3.02 EROSION CHECKS

The Contractor shall furnish and install baled hay or straw erosion checks in all locations indicated on the Drawings, surrounding the base of all deposits of stored excavated material outside of the disturbed area, and where indicated by the Engineer. Checks, where indicated on the Drawings, shall be installed immediately after the site is cleared and before trench excavation is begun at the location indicated. Checks located surrounding stored material shall be located approximately 6 ft. from that material. Bales shall be held in place with two 2 in. by 2 in. by 3 ft. wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude short circuiting of the erosion check.

- END OF SECTION -

SECTION 02302

RAILROAD OR HIGHWAY CROSSINGS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes railroad or highway crossings including casing pipes for pipelines installed by (jacking), (tunneling) or (boring) method, and installation of the carrier pipe within the casing in the location(s) and to the limits as shown on the Contract Drawings.

B. All work shall be performed in accordance with the applicable rules and regulations of the State and Federal Codes and with the terms and conditions of the permit issued by the railroad or highway having jurisdiction.

C. All permits have been obtained by the Owner and are available at the request of the Contractor. Contractor is responsible for completing work in accordance with these permits.

1.02 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Method of Installation

   a. Following the award of the Contract, the Contractor shall submit a description of the method and equipment which is proposed to be employed in installing the casing.

   b. A Professional Engineer licensed in the State of Kentucky shall design all sheeting and bracing at the Contractor's expense. The seal of the Professional Engineer shall appear on all drawings and design sheets submitted for review.

2. Materials

   a. Drawings and manufacturer's data of the casing materials showing compliance with this specification.

3. Contractor's Data

   a. The Contractor shall submit such data as may be required as conditions of the Railroad or Highway Permit.

1.03 QUALITY ASSURANCE

A. Contractor's Qualifications

1. The casing shall be installed by a contractor who has experience in this field of construction and can furnish a record of satisfactory performance on at least three projects for work of comparable type.

PART 2 PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. Casings

1. The casing shall be of the size and type as shown on the Contract Drawings.

   a. Steel pipe of the thickness specified shall have a minimum yield strength of 35,000 psi and a minimum ultimate strength of 60,000 psi. Steel casing pipe shall be uncoated .

   b. Liner plate of the gauge specified shall be pressed steel, galvanized and bituminous coated.

   c. Concrete pipe shall be designed for the purpose of jacking and shall be tongue and grooved.

   d. All joints in the encasement pipe shall be of continuous solid weld.

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE

Minimum Thickness Inches	Normal Diameter Inches
0.250	4 thru 12
0.312	14 thru 18
0.375	20 thru 24
0.500	26 thru 42

B. The steel casing pipe for all highway crossings shall be as follows:

Carrier Pipe Size	Casing Pipe Size
2"	6"
3"	8"
4"	12"
6"	14"
8"	16"
10"	18"
12"	20
14"	24"
16"	26"
20"	30"
24"	34"
30"	40"

B. Carrier Pipes

1. The carrier pipe shall be as specified on the Contract Drawings and in accordance with the Section for the type of pipe.

C. Signs

1. Signs shall be weatherproof.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Unless otherwise shown or specified, the Contractor may employ any one of jacking, tunneling or boring methods within the limits shown for the installation of the casing.

a. The remaining portion of the casing may be constructed by open cut method in a sheeted trench.

2. Installation of the casing pipe shall be carried out without disturbance of the embankment, pavement, tracks or other railroad or highway facilities and without obstructing the passage of traffic at any time.

3. Once the jacking, tunneling or boring operation is started, it shall proceed on a 24-hour basis without interruption until completed.

4. The casing pipe shall be maintained accurately to line and grade during the installation operation.

5. The casing shall be advanced from the lower end.

6. The use of water or other liquid, except bentonite slurry with prior approval of the Engineer, to facilitate casing placement or spoil removal is prohibited.

7. Dewatering shall be in accordance with the Section entitled "Earthwork".

B. Jacking

1. The jacking force shall be properly distributed through the jacking frame to the casing and parallel with the axis.

2. The soil shall be trimmed with care and shall not precede the jacking operation, to insure a minimum disturbance to the natural soils adjacent to the casing.

a. No augering will be allowed.

C. Tunneling

1. Excavation shall be in such a manner that voids behind the liner plates shall be held to a minimum.

2. Poling plates shall be used as necessary to prevent caving of material above the tunnel prior to liner plate installation.

a. Poling plates shall not be driven into the unexcavated material.

3. Liner plates shall be installed as soon as excavation proceeds the necessary distance for the next set of plates.

4. Grout plugs shall be placed on approximately 4-foot centers, at the top, bottom and on the spring line.

   a. Grout holes shall be not less than 1-inch diameter.

   b. Voids between the liner plates and the excavation shall be filled with a 1:6 cement grout placed under pressure.

   c. Not more than 6 lineal feet of tunnel shall progress beyond the grouting.

5. Tunneled casings shall have a foundation of Class "C" concrete placed for the entire length of the interior of the casing.

   a. The leveling course shall be at such an elevation that the carrier pipe, when installed, shall be at the grade specified.

D. Boring

1. Boring shall consist of pushing the casing with an augur rotating within to remove the spoil.

2. The auger or cutting head shall not lead the casing and shall be removable from within the casing.

3. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor materials.

E. Pressure Carrier Pipe

1. No contact shall be permitted between the casing and the carrier pipe.

   a. Casing spacers shall be used between the casing pipe and carrier pipe. Spacers shall be manufactured by Pipeline Seal & Insulator, Inc. (PSI) of Houston Texas, or equal and be of the type to separate dissimilar metals and keep the carrier pipe centered within the casing. The spacers shall be installed within the casing in the quantity and at the locations recommended by the manufacturer.

   b. Both ends of the casing pipe shall be sealed with rubber boot “End Seals” by PSI or equal, held in place by stainless steel bands/clamps.

F. Non-Pressure Carrier Pipe

1. No contact shall be permitted between the casing and the carrier pipe.

   a. Casing spacers shall be used between the casing pipe and carrier pipe. Spacers shall be manufactured by Pipeline Seal & Insulator, Inc. (PSI) of Houston Texas, or equal and be of the type to separate dissimilar metals and keep the carrier pipe centered within the casing. The spacers shall be installed within the casing in the quantity and at the locations recommended by the manufacturer.

e. Both ends of the casing pipe shall be sealed with rubber boot “End Seals” by PSI or equal, held in place by stainless steel bands/clamps.

-END OF SECTION-

SECTION 02502

RESTORATION OF SURFACES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes restoration and maintenance of all types of surfaces, sidewalks, curbs, gutters, culverts and other features disturbed, damaged or destroyed during the performance of the work under or as a result of the operations of the Contract.

B. The quality of materials and the performance of work used in the restoration shall produce a surface or feature equal to the condition of each before the work began.

1.02 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)

a. D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3)

1.03 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. A schedule of restoration operations. After an accepted schedule has been agreed upon it shall be adhered to unless otherwise revised with the approval of the Engineer.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 GENERAL

A. In general, permanent restoration of paved surfaces will not be permitted until one months' time has elapsed after excavations have been completely backfilled as specified. A greater length of time, but not more than nine months may be allowed to elapse before permanent restoration of street surfaces is undertaken, if additional time is required for shrinkage and settlement of the backfill.

B. The replacement of surfaces at any time, as scheduled or as directed, shall not relieve the Contractor of responsibility to repair damages by settlement or other failures.

3.02 TEMPORARY PAVEMENT

A. Immediately upon completion of refilling of the trench or excavation, the Contractor shall place a temporary pavement over all disturbed areas of streets, driveways, sidewalks, and other traveled places where the original surface has been disturbed as a result of his operations.

B. Unless otherwise specified or directed the temporary pavement shall consist of compacted run-of-crusher limestone to such a depth as required to withstand the traffic to which it will be subjected.

C. Where concrete pavements are removed, the temporary pavement shall be surfaced with "cold patch". The surface of the temporary pavement shall conform to the slope and grade of the area being restored.

D. For dust prevention, the Contractor shall treat all surfaces, not covered with cold patch, as frequently as may be required.

E. The temporary pavement shall be maintained by the Contractor in a safe and satisfactory condition until such time as the permanent paving is completed. The Contractor shall immediately remove and restore all pavement as shall become unsatisfactory.

3.03 PERMANENT PAVEMENT REPLACEMENT

A. The permanent and final repaving of all streets, driveways and similar surfaces where pavement has been removed, disturbed, settled or damaged by or as a result of performance of the Contract shall be repaired and replaced by the Contractor, by a new and similar pavement.

1. The top surface shall conform with the grade of existing adjacent pavement and the entire replacement shall meet the current specifications of the local community for the particular types of pavement.

2. Where the local community has no specification for the type of pavement, the work shall be done in conformity with the State Department of Transportation Standard which conforms the closest to the type of surfacing being replaced, as determined by the Engineer.

3.04 PREPARATION FOR PERMANENT PAVEMENT

A. When scheduled and within the time specified, the temporary pavement shall be removed and a base prepared, at the depth required by the local community or Highway Permit, to receive the permanent pavement.

1. The base shall be brought to the required grade and cross-section and thoroughly compacted before placing the permanent pavement.

2. Any base material which has become unstable for any reason shall be removed and replaced with compacted base materials.

B. Prior to placing the permanent pavement all service boxes, manhole frames and covers and similar structures within the area shall be adjusted to the established grade and cross-section.

C. The edges of existing asphalt pavement shall be cut a minimum of 1 foot beyond the excavation or disturbed base whichever is greater.

1. All cuts shall be parallel or perpendicular to the centerline of the street.

3.05 ASPHALT PAVEMENT

A. The permanent asphalt pavement replacement for streets, driveways and parking area surfaces shall be replaced with bituminous materials of the same depth and kind as the existing unless otherwise specified.

B. Prior to placing of any bituminous pavement a sealer shall be applied to the edges of the existing pavement and other features.

C. The furnishing, handling and compaction of all bituminous materials shall be in accordance with the State Department of Transportation Standards.

3.06 CONCRETE PAVEMENT AND PAVEMENT BASE

A. Concrete pavements and concrete bases for asphalt, brick or other pavement surfaces shall be replaced with Class "B" Concrete, air-entrained.

B. Paving slabs or concrete bases shall be constructed to extend 1 foot beyond each side of the trench and be supported on undisturbed soil. Where such extension of the pavement will leave less than 2 feet of original pavement slab or base, the repair of the pavement slab or base shall be extended to replace the slab to the original edge of the pavement or base unless otherwise indicated on the Contract Drawings.

C. Where the edge of the pavement slab or concrete base slab falls within the excavation, the excavation shall be backfilled with Special Backfill compacted to 95% maximum dry density as determined by ASTM D 698 up to the base of the concrete.

D. The new concrete shall be of the same thickness as the slab being replaced and shall contain reinforcement equal to the old pavement.

1. New concrete shall be placed and cured in accordance with the applicable provisions of the State Department of Transportation Standards.

3.07 STONE OR GRAVEL PAVEMENT

A. All pavement and other areas surfaced with stone or gravel shall be replaced with material to match the existing surface unless otherwise specified.

1. The depth of the stone or gravel shall be at least equal to the existing.

2. After compaction the surface shall conform to the slope and grade of the area being replaced.

3.08 CONCRETE WALKS, CURBS AND GUTTER REPLACEMENT

A. Concrete walks, curbs and gutters removed or damaged in connection with or as a result of the construction operations shall be replaced with new construction.

1. The minimum replacement will be a flag or block of sidewalk and 5 feet of curb or gutter.

B. Walks shall be constructed of Class "B" concrete, air-entrained with KY-DOT #2 stone aggregate on a 4-inch base of compacted gravel or stone.

1. The walk shall be not less than 4 inches in thickness or the thickness of the replaced walk where greater than 4 inches, shall have construction joints spaced not more than 25 feet apart, shall have expansion joints spaced not more than 50 feet apart and shall be sloped at right angles to the longitudinal centerline approximately inch per foot of width.

C. 1/2-inch expansion joint material shall be placed around all objects within the sidewalk area as well as objects to which the new concrete will abut, such as valve boxes, manhole frames, curbs, buildings and others.

D. Walks shall be hand-floated and broom-finished, edged and grooved at construction joints and at intermediate intervals matching those intervals of the walk being replaced.

1. The intermediate grooves shall be scored a minimum of 1/4 of the depth of the walk.

2. The lengths of blocks formed by the grooving tool, and distances between construction and expansion joints shall be uniform throughout the length of the walk in any one location.

E. The minimum length of curb or gutter to be left in place or replaced shall be 5 feet. Where a full section is not being replaced, the existing curb or gutter shall be saw cut to provide a true edge.

1. The restored curb or gutter shall be the same shape, thickness and finish as being replaced and shall be built of the same concrete and have construction and expansion joints as stated above for sidewalks.

F. All concrete shall be placed and cured as specified in the Section for concrete.

3.09 LAWNS AND IMPROVED AREAS

A. The area to receive topsoil shall be graded to a depth of not less than 4 inches or as specified, below the proposed finished surface.

1. If the depth of existing topsoil prior to construction was greater than 4 inches, topsoil shall be replaced to that depth.

B. The furnishing and placing of topsoil, seed and mulch shall be in accordance with the Section entitled "Topsoil and Seeding".

C. When required to obtain germination, the seeded areas shall be watered in such a manner as to prevent washing out of the seed.

D. Any washout or damage which occurs shall be regraded and reseeded until a good sod is established.

E. The Contractor shall maintain the newly seeded areas, including regrading, reseeding, watering and mowing, in good condition.

3.10 CULTIVATED AREA REPLACEMENT

A. Areas of cultivated lands shall be graded to a depth to receive topsoil of not less than the depth of the topsoil before being disturbed. All debris and inorganic material shall be removed prior to the placing of the topsoil.

B. The furnishing and placing of topsoil shall be in accordance with the Section entitled "Topsoil and Seeding".

C. After the topsoil has been placed and graded, the entire area disturbed during construction shall be cultivated to a minimum depth of 12-inches with normal farm equipment.

1. Any debris or inorganic materials appearing shall be removed.

2. The removal of stones shall be governed by the adjacent undisturbed cultivated area.

D. Grass areas shall be reseeded using a mixture equal to that of the area before being disturbed, unless otherwise specified.

3.11 OTHER TYPES OF RESTORATION

A. Trees, shrubs and landscape items damaged or destroyed as a result of the construction operations shall be replaced in like species and size.

1. All planting and care thereof shall meet the standards of the American Association of Nurserymen.

B. Water courses shall be reshaped to the original grade and cross-section and all debris removed. Where required to prevent erosion, the bottom and sides of the water course shall be protected.

C. Culverts destroyed or removed as a result of the construction operations shall be replaced in like size and material and shall be replaced at the original location and grade. When there is minor damage to a culvert and with the consent of the Engineer, a repair may be undertaken, if satisfactory results can be obtained.

D. Should brick pavements be encountered in the work, the restoration shall be as set forth in the Special Provisions or as directed.

3.12 MAINTENANCE

A. The finished products of restoration shall be maintained in an acceptable condition for and during a period of one year following the date of Substantial Completion or other such date as set forth elsewhere in the Contract Documents.

-END OF SECTION-

SECTION 02610

PIPE AND FITTINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

Provide all labor, materials, equipment and services required for furnishing and installing all exterior piping specified herein. Piping herein specified includes, water, sanitary process and storm sewer. Replace all existing piping that interferes with installation of new pipe or that is damaged by new pipe installation in a manner approved by the Engineer.

1.02 RELATED WORK

A. Division 2 – SITE WORK

B. Division 11 - EQUIPMENT

1.03 REFERENCES

A. AWWA C104.

B. AWWA C111.

C. AWWA C151.

D. ASTM C443.

E. ASTM C478.

F. ASTM D1785 and D1784.

G. ASTM D2467

H. ASTM D2564

I. AWWA C900

J. AWWA C905

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE

A. All ductile iron pipe shall conform to ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51. Ductile iron pipe pressure class 350 shall be the minimum pressure class for that particular pipe size, unless otherwise noted on the Plans.

B. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or word "DUCTILE." Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

C. The cleaning assembly of pipe and fitting joints shall be in accordance with the manufacturer's recommendations.

D. Lining and Coating Ductile Iron Pipe and Fittings:

1. The interior of the pipe shall be cement mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4. Thicknesses of the lining shall be set forth in the aforementioned specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.

2. All buried ductile iron pipe shall have manufacturer's outside coal tar or asphaltic base coating and a cement lining and bituminous seal coat on the inside.

3. All lining and coatings for DI fittings shall match the pipe lining and coatings of same size.

2.02 PIPE JOINTING FOR DUCTILE IRON PIPE

A. Mechanical and Socket Joint Pipe and Fittings

1. Mechanical joint, push-in socket joint, and restraint joint fittings shall be used for buried pipe applications. All buried DI fittings shall match the pipe lining and coatings of same size as specified in Paragraph 2.01.

2. Mechanical joints shall be ductile iron conforming to ANSI/AWWA C110/A21.10 and are to be furnished according to ANSI/AWWA C111/A21.11. All pipe joints must be furnished complete with all accessories. Ductile iron mechanical joints shall be used for ductile iron pipe. Rubber gaskets shall be made of plain first grade rubber, free of imperfections and porosity. Hardness shall be 70 to 75 durometer.

3. Push-in socket joints shall be equal to manufacturer's specifications for "Tyton," "Bell-Tite," or "Fastite." The joints shall consist of a rubber ring gasket compressed in groove in bell of pipe with beveled spigot end of pipe for initial centering into rubber gasket in bell and conform to ANSI/AWWA C111/A21.11.

4. Restrained joints shall be "Flex-Ring" or "Lok-Ring" restrained joints as manufactured by American Ductile Iron Pipe or pre-approved equal. Field-adaptable restraint shall be provided through the use of "Fast-Grip" or "Field Flex-Ring" as manufactured by American Ductile Iron Pipe or other pre-approved and bolt-less, push-on restrained devices. When restrained joints require factory welding, the MANUFACTURER shall qualify all welding procedures and welders used to produce the product per the requirements of a documented quality assurance system based on ANSI/AWS D11.2. Unless otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR). Restrained joints and restrained joint pipe shall be rated for the minimum pressure shown in below or the specified pressure rating of the pipe, whichever is less. The PIPE MANUFACTURER shall furnish test results showing that restrained joints in the sizes specified have been successfully tested to at least twice the specified pressure rating of the joint without leakage or failure. Tests shall be performed on pipe with nominal metal thickness less than or equal to that specified for the project. Torque-activated restrained joint devices that rely on threaded bolts or set-screws for joint restraint shall not be used.

RESTRAINED JOINT PRESSURE RATINGS, (psi) & ALLOWABLE JOINT DEFLECTIONS (Limited to the pressure rating of the pipe)				
JOINT SIZE	FAST-GRIP	FIELD FLEX-RING	FLEX-RING	LOK-RING
4"	350 / 5°		350 / 5°	
6"	350 / 5°		350 / 5°	
8"	350 / 5°		350 / 5°	
10"	350 / 5°		350 / 5°	
12"	350 / 5°		350 / 5°	
14"	250 / 4°	350 / 4°	350 / 4°	
16"	250 / 3°	350 / 3.75°	350 / 3.75°	
18"	250 / 3°	350 / 3.75°	350 / 3.75°	
20"	250 / 3°	350 / 3.5°	350 / 3.5°	
24"	250 / 3°	350 / 3°	350 / 3°	
30"	150 / 2.5°	250 / 2.5°	250 / 2.5°	
36"		250 / 2°	250 / 2°	
42"				250 / 0.5°
48"				250 / 0.5°
54"				250 / 0.5°
60"				250 / 0.5°
64"				250 / 0.5°

5. All ductile iron fittings shall be rated at 350 psi WWP for 3 to 24 inch and 250 psi for 30 to 48 inch size and shall be ductile cast iron grade per ASTM A536-84 with same interior and exterior coating as the pipe.

6. All items used for jointing pipe shall be furnished with the pipe and tested before shipment. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. If requested, three (3) copies of such instructions shall be delivered to the Engineer at start of construction.

7. Reaction Anchorage and Blocking:

   a. All unplugged bell and spigot or all bell tees, Y-branches, bends deflecting 11-1/4 degrees or more, and plugs which are installed in buried piping shall be provided with reaction blocking, anchors, joint harness, or other acceptable means for preventing movement of the pipe and joints caused by the internal test pressure.

   b. Concrete blocking shall extend from the fittings to solid undisturbed earth and shall be installed so that all joints are accessible for repair. The bearing area of concrete reaction blocking shall be as shown on the drawings or as directed by the Engineer. If adequate support against undisturbed ground cannot be obtained, metal harness anchorages consisting of steel rods across the joint and securely anchored to pipe and fitting or other adequate facilities shall be installed to provide the necessary support. Should the lack of a solid vertical excavation face occur due to improper trench excavation, the entire cost of furnishing and installing metal harness anchorages in excess of the Contract

value of the contract blocking replaced by such anchorages shall be borne by the Contractor.

c. Reaction blocking, anchorage, or other supports for fittings installed in fills or other unstable ground or above grade shall be provided as shown on the drawings or as directed by the Engineer.

d. Reaction Anchorage and blocking is required on all pressure lines (pumped) but not on gravity process lines.

B. Flanged Pipe and Fittings:

1. Unless otherwise noted on the Drawings, flanged joints shall be used for housed pipe applications.

2. Flanged fittings shall be ductile iron conforming to ANSI/AWWA C110/A21.10 with respect to dimensions and shall be furnished according to ANSI/AWWA C111/A21.11.

3. Ductile iron flanges for pipe and fittings are to have dimensions, facing, and drilling to correspond with Class 125 with WWP of 250 psi, unless otherwise noted on the Drawings.

4. Where flanges are pit cast integrally with pipe in vertical position in dry sand molds, flanged pipe shall be latest revision of ANSI Specifications A21.2 for Class 150 or Class 250 pipe. Where flanged pipe is made up by threading plain end, centrifugally cast pipe, screwing on specially designed long hub flanges, and refacing across both face of flange and end of pipe, flange shall be per ANSI Specification B16.1 and pipe shall be ANSI Specification A21.6, Class 125. Either method of manufacture of flanged pipe will be acceptable; except when plain ends fit into mechanical joint bells, then centrifugally cast pipe shall be used.

5. Flanged coupling adapters shall be installed as shown on the plans. The flanged coupling adapters shall be as manufactured by Smith-Blair, Dresser "Style 128", or equal. Flange coupling adapters shall be installed in strict accordance with the coupling manufacturer's recommendations. All flanged coupling adapters shall be restrained. The tie rods shall be of sufficient number and strength to restrain the coupling at the test pressure as listed in the pipe schedule and piping detail plan. Use a minimum of two (2) 5/8-in. diameter tie rods at all connections.

C. Threaded Joints: Threaded joints shall have red or white lead painting on male threads. Teflon tape may be used on male threads in lieu of paint.

D. Hot Poured Joints: Compound for cast iron bell and spigot pipe joints shall be caulking lead not less than 99.73% lead meeting AWWA Specifications for jointing water pipes. This method shall be used only when replacing an existing joint.

E. Grooved Pipe and Fittings: Unless specifically otherwise called for on the contract drawings, grooved joints may be an approved substitute for flanged joints. Grooved pipe and groove joints shall be in accordance with AWWA C606. Rigid radius groove dimensions shall be utilized. Flexible grooves shall be provided as necessary for settlement or expansion as determined and approved by the ENGINEER and as specifically shown on the contract drawings. Gasket material shall be Grade "M" halogenated butyl. Bolts shall be heat-treated plated carbon steel, track head, conforming to the physical properties of ASTM A-183, minimum tensile strength 110,000 psi. Grooved ductile iron pipe shall be Special Thickness Class 53 for 4" – 16", Class 54 for 18", Class 55 for 20", and Class 56 for 24" – 36". Couplings and fittings shall be as manufactured by Victaulic Company, or equal.

F. Compact Fittings: Compact fittings may be used in lieu of standard fittings and shall conform to ANSI/AWWA C153/A21.53 for piping 12 inches and smaller. Compact fittings shall not be used for piping larger than 12 inches.

G. Dismantling Joint:

1. Flange Spool: AWWA Class D Flange compatible with ANSI class 125 and 150 bolt circles. For 3" - 12" sizes, pipe is Sch 40 ASTM A53. For 14" - 24" pipe material is ASTM A36.

2. Body: ASTM A536 ductile (nodular) iron meeting or exceeding Grade 65-45-12, with ANSI Class 125 and 150 bolt circles.

3. Gaskets: Compounded for water and sewer service in accordance with ASTM D 2000 (Sizes 3 - 12" have flange O-Ring gasket). Other compounds available for petroleum, chemical, or high temperature service.

4. Gland: Romac RomaGrip™.

5. Restraining Bolts: 7/8 –9 roll thread, Ductile (nodular) iron, meeting or exceeding ASTM A 536.

6. Restraining Lugs: Ductile (nodular) iron, meeting or exceeding ASTM A 536. Heat treated using a proprietary process.

7. Lug Locators: Polyurethane, a thermal plastic.

8. T-bolts and Nuts: High strength low alloy steel T-head bolt. National coarse rolled thread and heavy hex nut. Steel meets AWWA C111 composition specifications. Stainless steel bolts and nuts available on request.

9. Coatings: Fusion bonded epoxy, NSF 61 certified.

2.03 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Polyvinyl chloride (PVC) pipe and fittings, 4 to 24 inch in diameter, for gravity sewers shall conform to the requirements of ASTM specification D-3034 (SDR 35), current approval, "Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings."

B. Large (21"-48") diameter PVC pipe and fittings shall meet the requirements of ASTM F 794, Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter for closed profile (CP) pipe.

C. All pipe and fittings shall be inspected at the factory and on the job site. Testing of PVC pipe and fittings shall be accomplished in conformance with the latest revision of ASTM D3034, ASTM D2444, ASTM D2412, and ASTM D2152. The manufacturer shall submit 5 copies of certification of test for each lot of material represented by shipment to the job site.

D. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform in color as commercially practical. PVC pipe shall have a ring painted around spigot ends in such a manner as to allow field checking of setting depth of pipe in the socket.

E. Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by

crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe shall not be stored outside where subject to sunlight.

F. The PVC pipe manufacturer shall provide special fittings, acceptable to the Engineer to make watertight connections to manholes.

G. Fittings for service connections shall be of the factory made inline type conforming with the requirements of ASTM specification D-3034, current approval. Saddle type fittings shall not be used.

H. PVC sewer pipe shall be supplied in standard lengths of at least 12'6". Longer lengths are permitted.

I. PVC sewer pipe shall be marked with the manufacturer's name, production lot number, ASTM designation, PVC, and the nominal diameter.

J. All underground placed piping shall have a metallic tape laid 2 foot above the pipe. The tape shall have the word "Caution" printed on it and shall identify the pipe use. Product shall be Seton Name Plate Corp., New Haven, CT, No. 210, or equal.

K. Five copies of directions for handling and installing shall be furnished to the Contractor from the manufacturer at the first delivery of the pipe to the job.

2.04 POLYVINYL CHLORIDE (PVC) PIPE - C.I. PIPE SIZE (DR 18) (DR14)

A. Pipe shall meet the requirements of AWWA C-900 or AWWA C-905 for Polyvinyl Chlorine (PVC) Pressure Pipe. All Class 200 pipe shall meet the requirements of DR 14 and all Class 150 pipe shall meet the requirements of DR 18 for AWWA C-900 and all Class 235 pipe shall meet the requirements of DR 18 for AWWA C-905. Joints shall be integral bell or twin gasket joints with rubber O-ring seals.

B. All pipe shall be suitable for use as a pressure conduit. Provisions must be made for expansion and contractions at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which meets the requirements of ASTM D-1869 and F-477. The bell section shall be designed to be at least as strong as the pipe wall. Sizes and dimensions shall be as shown in this specification.

C. Gaskets and lubricants intended for use with PVC pipe and couplings shall be made from materials that are compatible with the plastic material and with each other when used together, will not support the growth of bacteria, and will not adversely affect the potable qualities of the water that is to be transported. Gaskets and lubricants shall be supplied by the pipe manufacturer.

D. Physical Requirements:

1. Standard Laying Lengths - Standard laying lengths shall be 20 ft. (plus or minus 1") for all sizes. The total footage of pipe of any class and size shall be furnished in standard lengths. Each length of pipe shall be tested to four times the class pressure of the pipe for minimum of 5 second. The integral bell shall be tested with the pipe.

2. Pipe Stiffness - The pipe stiffness (PSI) using F/y for PVC AWWA C-900 class water pipe shall be as follows:

Class	DR	F/y (PSI)
150	18	364
200	14	815

3. Quick Burst Test: Randomly selected tested in accordance with ASTM D-1599 shall withstand without failure pressures listed below when applied in 60 - 70 seconds. Class 150 shall have a minimum burst pressure of 755 psi and Class 200 shall have a minimum burst pressure of 986 psi at 73 degrees F. for all sizes.

4. Drop Impact Test: Pipe shall withstand without failure at 73 degrees F. an impact of 120 ft/lbs created by a falling 12 lb missile with a 2" radius nose without visible evidence of shattering or splitting.

E. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner that will not reduce the strength of the pipe or coupling or otherwise damage them. Pipe and coupling markings shall include the nominal size and OD base, material code designation, dimension ratio number, AWWA Pressure Class, AWWA designation number for this standard, manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 5 feet for the pipe and shall be marked on each coupling.

F. Tapping C 905: C-905 shall not be direct tapped. Cutting should be done only with a full circle shell cutter tool. The shell cutter must have sharp teeth and clean teeth. A full circle tapping sleeve should be used. Hole cut must be circular. See 4.6.12 Referenced retrievable coupon. Holes cut into PVC C-905 pipes in any method other than above are not acceptable to PVC pipe manufacturers and will void pipe warranty. Hole cutting by any method other than described above could induce stresses into the pipe wall and even hairline cracks which could cause failure of the pipe under pressure.

2.05 POLYVINYL CHLORIDE (PVC) PIPE (SDR 21 OR SDR 17)

A. Polyvinyl chloride (PVC) pipe for water mains shall be Class 200 (SDR 21) or Class 250 (SDR 17) pressure rated pipe as shown on the Drawings or indicated in the proposal form with either twin gasket joints or integral bell joints with rubber O-ring seals.

B. All PVC pipe shall conform to the latest revisions of ASTM D-1784 (PVC Compounds), ASTM D-2241 (PVC Plastic Pipe, SDR) and ASTM D-2672 (Bell-End PVC Pipe). Rubber gasketed joints shall conform to ASTM D-3139. The gaskets for the PVC pipe joint shall conform to ASTM F-477 and D-1869.

C. Couplings shall be furnished by the pipe manufacturer and shall accommodate the pipe for which they are used. Rubber gasket joints shall provide adequate expansion to allow for a 10°C (50°F) change in temperature on one length of pipe. Lubrication for rubber connected couplings shall be water soluble, non-toxic, be non-objectionable in taste and odor and have no deteriorating affect on the PVC or rubber gaskets and shall be as supplied by the pipe manufacturer. Couplings shall conform to ASTM D-3139.

D. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner that will not reduce the strength of the pipe or coupling or otherwise damage them. Pipe and coupling markings shall include the nominal size and OD base, material code designation, dimension ratio number, ASTM Pressure Class, ASTM designation number for this standard manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 1.5 meters (5 feet) for the pipe and shall be marked on each coupling.

2.06 PVC SCHEDULE 40 & SCHEDULE 80 PVC PIPING

A. General -This specification sheet covers the manufacturer's requirements for PVC Schedule 40 and Schedule 80 pipe and fittings. The pipe and fittings shall meet or exceed the industry standards set forth by the American Society for Testing and Materials and NSF International, Standards 14/61.

B. MATERIALS - PVC materials used in Schedule 40 and Schedule 80 pipe shall comply with the

ASTM Standard D-1784 and are a Type I Grade I compound. The raw material has only additives that are approved by NSF International for potable water use to the Standards 14/61 for Material Testing requirements.

C. PIPE - Physical dimensions and tolerances of Schedule 40 and Schedule 80 pipe shall meet the requirements of one or more of the following ASTM Standards D-1785 and/or D-2665 and NSF International Standards 14/61 for Physical Testing requirements to ASTM standards.

D. MARKING - Schedule 40 and Schedule 80 pipe shall be marked as prescribed in ASTM Standard D-1785 i.e., nominal pipe size, type of plastic material, schedule size, pressure rating, ASTM Specification designation number, manufacturer's name and code and the NSF International seal.

E. PVC Schedule 40 Fittings

1. PVC Materials - Rigid PVC (polyvinyl chloride) used in the manufacture of Schedule 40 fittings is of Type I, Grade 1 compound as stated in ASTM D-1784. Raw material used in molding shall contain the specified amounts of color pigment, stabilizers, and other additives approved by NSF International.

2. All PVC Schedule 40 fittings shall conform to ASTM D-2466

3. Dimensions - Physical dimensions and tolerances of PVC Schedule 40 fittings meet the requirements of ASTM standard D-2466.

4. Marking - PVC Schedule 40 IPS fittings are marked as prescribed in ASTM D-2466 to indicate the manufacturer's name or trademark, material designation, the NSF mark, size of fitting, and ASTM designation.

F. PVC Schedule 80 Fittings

1. PVC Materials - Rigid PVC (polyvinyl chloride) used in the manufacture of Schedule 80 fittings is of Type I, Grade 1 compound as stated in ASTM D-1784. Raw material used in molding shall contain the specified amounts of color pigment, stabilizers, and other additives approved by NSF International.

2. All PVC Schedule 80 socket fittings shall conform to ASTM D-2467 and ASTM D-2464 for threaded fittings

3. Dimensions - Physical dimensions and tolerances of PVC Schedule 80 IPS fittings meet the requirements of ASTM standard specification D-2467 for socket-type fittings and ASTM D-2464 for threaded fittings. Threaded fittings have Taper Pipe Threads in accordance with ANSI/ASME B1.20.1.

4. Marking - PVC Schedule 80 fittings are marked as prescribed in ASTM D-2464 and D-2467 to indicate the manufacturer's name or trademark, material designation, the NSF mark, size of fitting, and ASTM designation D-6424 (threaded) or D-2467 (socket).

G. Flange Fittings for PVC Pipe

1. Molded Class 150 Flange fittings are coupling devices designed for joining PVC plastic piping systems, where frequent disassembly may be required, and can be used as a transitional fitting for joining plastic to metal piping systems.

2. Pressure Rating shall be 150 psi, water at 73°F.

3. Flange types shall be one piece socket configuration, sizes 1/2" through 4"; sizes 6" through 12" shall be Van Stone Style, two-piece socket configuration design with special reinforced rotating flange ring. A steel backer ring shall be used with blind closed rings for capping off a mating flange, flanged fitting or flanged valve.

4. Materials - All injection molded flanges shall be produced from either PVC or CPVC materials approved for potable water use by the National Sanitation Foundation (NSF). All flanges larger than 6 inches shall be made of glass-filled PVC or CPVC materials for all Van Stone style flange rings and large diameter blind flanges where additional reinforcement is deemed necessary.

5. Conformance Standards –
    a. Socket & Spigot — ASTM D 2467 (PVC); ASTM F 439 (CPVC), as applicable.
    b. Threads — ASTM F 1498.
    c. Bolt Hole Pattern — ANSI B16.5; ASTM D 4024.
    d. Material — ASTM D 1784 (PVC Cell Classification 12454-B, CPVC Cell Classification 23447-B).

2.07 PIPE JOINTING FOR PVC PIPE

A. Polyvinyl Chloride (PVC) Pipe Joints: Jointing of PVC pipe shall be of the elastomeric gasket type inserted in the belled end of the pipe or double hub joints, mechanical joint, or as specified in Paragraph 2.04. Ring shall be corrosion resistant for specific service of piping.

B. Joints for PVC pipe shall be installed per the manufacturer's recommendations. Pipe that has been field cut must be beveled for insertion into gasketed joints. Bevel can be made with hand or power tool. In either case, the finished bevel should be the same as the factory bevel. All pipe shall be provided with home marks to insure proper gasket seating. Gasket material shall comply with the physical requirements specified in A.S.T.M. D-1869, C-361, C-433, current approval.

C. For all buried PVC piping, DI mechanical joints fittings shall be ductile iron conforming to ANSI/AWWA C110/A21.10 and are to be furnished according to ANSI/AWWA C111/A21.11. All DI mechanical fittings must be furnished complete with all accessories. Ductile iron mechanical joints shall be used for ductile iron pipe and buried PVC pipe. Rubber gaskets shall be made of plain first grade rubber, free of imperfections and porosity. Hardness shall be 70 to 75 durometer.

2.08 HIGH-DENSITY POLYETHYLENE - AWWA APPROVED POTABLE WATER PIPE

A. General: This section is for High-density Polyethylene AWWA C906 and NSF 14 Approved Pipe for Potable Water Service in Sizes 4” to 24” DIPS (Ductile Iron Pipe Size) and defines the characteristics and properties of high-density polyethylene pipe. This specification governs the material, pipe, fittings, butt fusion, and general construction practice for HDPE piping systems.

Pipe shall have a hydrostatic design stress rating of 800 psi based on a material with a 1,600 psi at 23^{o} hydrostatic design basis as determined in accordance with ASTM D-2837.

Fittings shall be molded or fabricated from material meeting the same standards as the pipe.

Joints shall be made by the thermal butt fusion system. All joints shall be completely watertight, airtight and as strong as or stronger than the pipe wall, in strict accordance with the manufacturer's recommendations.

Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures shall be capable of meeting all

conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400°F, alignment, and 150 psi interfacial fusion pressure.

Heat fusion joining shall be 100% efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used.

B. References: Where all or part of a Federal, ASTM, ANSI, AWWA, etc., standard specification is incorporated by reference in these Specifications, the reference standard shall be the latest edition and revision and considered a part of these specifications.

C. Material: Materials used for the manufacture of polyethylene pipe and fittings shall be extra high molecular weight, high density PE 3408 polyethylene resin. The material shall be listed by PPI (Plastics Pipe Institute, a division of the Society of the Plastics Industry) in PPI TR-4 with a 73°F hydrostatic design basis of 1,600 psi and a 140°F hydrostatic design basis of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D 2837 testing.

D. Pipe and Fittings: Qualification of Manufacturers. The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Owner or his Authorized Representative.

1. Pipe: Pipe supplied under this specification shall have a nominal DIPS (Ductile Iron Pipe Size) OD unless otherwise specified. The DR (Dimension Ratio) and the pressure rating of the pipe supplied shall be as shown on the drawings. The pipe shall be produced from approved HDPE pipe grade resin with the nominal physical properties as specified in the appropriate ASTM specifications for the sizes indicated. Pipe having a diameter 3" and larger will be made to the dimensions and tolerances specified in ASTM F 714.

   The pipe shall contain no recycled compound except that generated in the manufacturer's own plant. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

2. Pipe Performance: The pipe will be extruded from resin meeting the specifications of ASTM D 3350 with a minimum cell classification of 345464C.

3. Fittings: HDPE fittings shall be in accordance with ASTM D 3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this specification. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor. The fittings shall be manufactured from the same base resin type and cell classification as the pipe itself. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.

4. Molded Fittings. Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

5. X-Ray Inspection. The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection.

6. Fabricated Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Fabricated fittings shall be tested in accordance with AWWA C906.

7. Polyethylene Flange Adapters. Flange adapters shall be made with sufficient throughbore length

to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasketless sealing, or restrain the gasket against blowout.

E. Joining - Butt Fusion: Sections of polyethylene pipe shall be joined by the butt fusion process into continuous lengths at the job site. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer. Properly executed electrofusion fittings may be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications or fabrications where shear or structural strength is important. Mechanical joint adapters, flanges, unions, grooved-couplers, transition fittings, and some mechanical couplings may be used to mechanically connect HDPE pipe. Refer to the manufacturer's recommendations.

F. Joining - Other Means: Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

ID Stiffener and Restraint. A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where an MJ Adapter is used.

G. Quality and Workmanship: The pipe and/or fitting manufacturer's production facilities shall be open for inspection by the owner or his designated agents with a reasonable advanced notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and/or fittings to standards required by this specification. Pipe which has been tested by the manufacturer and falls outside of the appropriate limits set forth in this specification will be cause for rejection.

H. QA Records: QA/QC records shall be maintained intact for a minimum of one year from the date of production.

I. Pipe Marking: During extrusion production, the HDPE pipe shall be continuously marked with durable printing including the following in formation:

Nominal Size
Dimension Ratio
Pressure Class, psi
Manufacturer's Name and Product Series
Cell Class
ASTM Basis
"NSF-PW"
Pipe Test Category
Plant Code & Extruder
Production Date
Operator Number (Shift Letter optional)
Resin Supplier Code

J. Pipe Packaging, Handling, & Storage: The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner

that it is not pulled over sharp objects or cut by chokers or lifting equipment. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method. Fused segments of pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

K. Testing:

- Fusion Quality. The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

- Hydro-Test: Pipelines shall be tested to the requirements and specifications of the engineer of record. HDPE pressure pipe shall be tested in accordance with the specifications and requirements of the engineer of record and/or with the manufacturer's recommendations. The pressure rating of the pipe is a function of temperature at the time of hydro-test. Refer to the manufacturer's temperature related pressure ratings. At a minimum and if not specified elsewhere, hydro-test the piping system at 1.5 times the pressure rating of the pipe for 2 to 3 hours per Driscopipe Technical Note #35. If a system component such as a fabricated or mechanical fitting has a pressure rating less than that of the pipe, the piping system should be pressure tested to manufacturer's guidelines on that component.

PART 3 - EXECUTION

3.01 LAYING DEPTHS FOR WATER MAINS

In general, water mains shall be laid with a minimum cover of 36" above the top of the main, unless otherwise noted on the Drawings , i.e. for minimum separation between water main and other utilities, connections to existing mains, valve locations, or when required by Kentucky Department of Highways, i.e. ditch lines and borings shall be 42" minimum cover.

3.02 PIPE BEDDING

A. The foundation for pipes laid in trenches shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. Pipe bells shall not carry any of the load of the backfill.

B. The Contractor shall use the "Undercutting Method" of pipe bedding.

C. When the "Undercutting Method" is used in rock bottom trenches, Class I granular bedding (No.9 crushed stone aggregate) or earth shall be of such depth that the bottom of the barrel of the pipe will be at least 6" above the bottom of the trench as excavated. Pipe bedding required in this paragraph is NOT considered a separate pay item.

D. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, the pipe must be weighted or secured permanently in place by such means as will prove effective. In areas where a high water table exists, the Contractor is cautioned to exercise extreme care in the placement of the backfill material to prevent flotation of the pipe at any time.

E. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade

with a foundation of crushed stone aggregate. The depth of the foundations dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required Class I bedding can be placed. The amount of crushed stone aggregate required to bring the top of the foundation to the trench bottom prior to the removal of the unstable material will be considered a separate pay item following negotiation between the Contractor and Owner and constitute a change order item. No compensation will be made if the instability of the trench bottom is caused by the Contractor's neglect.

F. The Contractor shall use compacted earth material or Class I granular bedding (No.9 crushed stone aggregate) when the pipe is to be placed in the rock bottom trenches or in trenches with excavated rock present. This type of bedding material shall be placed 12" above and 6" below the pipe as shown on the Contract Drawings as "Class C Bedding Detail".

G. It should be noted that no pipe shall be laid on solid or blasted rock. No rock shall be allowed to rest against the pipe once it is placed in the trench.

H. Pipe bedding as required in Paragraphs C and D of this Article is NOT considered a separate pay item.

PART 3 - EXECUTION

3.01 YARD PIPING INSTALLATION - GENERAL

A. Excavation for Pipeline Trenches: Trenches in which pipes are to be laid shall be excavated to the depths shown on the Drawings or as specified by the Engineer. Minimum cover for all pipelines shall be 36 inches unless otherwise shown on the Drawings or approved by the Engineer.

B. Jointing: The types of joints described hereinbefore shall be made in accordance with the manufacturer's recommendations.

C. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction.

D. Where shown on the Drawings, the Contractor shall install encasement pipe by the boring method. Two methods of boring will be permitted. In the first, the encasement pipe is pushed or jacked into the hole as the auger cuts out the material. The second method consists of drilling the hole completely through the fill and pushing or jacking the encasement pipe into the hole after the auger has completed the bore. The pipe shall be installed in a manner that will not disrupt traffic.

E. Fittings shall be firmly blocked to original earth or rock to prevent water pressure from springing pipe sideward or upward. Concrete or other blocking material shall be placed such that it does not cover the pipe joints, nuts, and bolts.

F. Pipes shall be free of all structures other than those planned. Openings and joints to concrete walls shall be constructed as shown on the Drawings.

G. Ductile iron or steel pressure pipe, 4 inch diameter or larger, entering a structure below original earth level, unsupported by original earth for a distance of more than 6 feet shall be supported by Class "2500" concrete, where depth of such support does not exceed 3 feet, and by Class "4000" concrete piers each 6 feet, where depth exceeds feet. All other pressure pipe entering buildings or basins below original earth and having a cover of more than 24 inches of earth, or under roadway, shall be supported as shown in detail on the Drawings. Class "2500" concrete required in order to discourage excessive excavation outside the limits of structures. Pipes entering structures shall have flexible joint within 18 inches of exterior of structure, and also from point of leaving concrete support to original earth or crushed stone bedding.

H. Non-pressure pipes entering structures underground and unsupported by original earth for a distance of more than 3', shall be supported by Class "B" concrete, where depth of such support does not exceed 3'. All pipes entering buildings or basins, below original ground, which are higher than 3' depth above subgrade, span more than 3' between wall and original earth, and with more than 24" of cover or under a roadway, shall be supported by concrete beams with piers at 6' intervals between structural wall and edge of excavation for the structure, in order to prevent breakage from settlement of backfill about the structure. Concrete and reinforcing steel for those supports shall be in the lump sum portion of the contract; and no extra payment will be allowed. Pipe entering structures shall have flexible joint within 18" of exterior of structure or from point of leaving concrete support.

I. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain ten foot separation, the State of Kentucky may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

J Water mains crossing sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

K. There shall be at least a 10 foot horizontal separation between water mains and sanitary sewer force mains. There shall be an 18 inch vertical separation at crossings as required above.

L. No water pipe shall pass through or come in contact with any part of a sewer manhole.

3.02 PIPE LAYING

A. The pipe shall be protected during handling against impact shocks and free fall. Care shall be taken to avoid dragging the spigot ring on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects.

B. After being delivered alongside the trench, the pipe shall be carefully examined for soundness or damage. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. Before each piece of pipe is lowered into the trench, it shall be thoroughly cleaned out. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.

C. The bell and spigot of the joint shall be cleaned of dirt and foreign matter immediately prior to joining. The contact surfaces shall be coated with a lubricant, primer or adhesive recommended by the pipe manufacturer, and pushed together until the joint snaps distinctly in place. The pushing together of the pipe may be done by hand or by the use of a bar.

D. All pipe shall be laid straight between changes in alignment and at uniform grade between changes in grade. When jointed in the trench the pipe shall form a true and smooth line.

E. Trenches shall be kept dry during pipe laying. Before pipe laying is started, all water that may have collected in the trench shall be removed.

F. All pipe shall be laid starting at the lowest point and installed so that the spigot ends point in the direction of the flow.

3.03 PIPE BACKFILLING

A. Initial Backfill:

1. This backfill is defined as that material which is placed over the water main from the spring line in an earth trench to a point 6" above the top of the pipe or from the trench bottom in a rock trench to a point 12" above the top of the pipe. The initial backfill for Case I situations shall be earth material free of rocks, acceptable to the Engineer or Class I material (No. 9 crushed stone aggregate). The initial backfill for Case II, Case III and Class IV situations shall be Class I material (No. 9 crushed stone aggregate).

2. In areas where large quantities of rock are excavated, and the excavated earth is insufficient, then the Contractor must either haul in earth or order crushed stone aggregate for backfilling over the top of the pipe. The earth nor crushed stone aggregate used to fulfill the backfill requirements is not considered a pay item.

B. Final Backfill: There are four cases where the method of final backfilling varies. The various cases and trench situations are as follows:

1. Case I: Areas not subject to vehicular traffic.

2. Case II: Gravel areas subject to light vehicular traffic such as residential driveways; church and commercial parking lots and entrances; and farm drives.

3. Case III: City and County gravel roads; gravel and bituminous road shoulders; all bituminous surface areas such as City and County streets, residential driveways, church and commercial parking lots, and entrances; City and County road shoulders.

4. Case IV: State maintained streets and road; road shoulders for State roads and streets.

C. In all cases, walking or working on the completed pipeline, except as may be necessary in backfilling, will not be permitted until the trench has been backfield to a point 12 inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:

1. Case I - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of the pipe to a point 8" below the surface of the ground with earth material free from large rock over 0.3 cubic feet, acceptable to the Engineer. The remainder of the trench to existing grade shall be backfilled with earth material reasonably free of any rocks.

   Earth backfill used in this Case is not a separate pay item and is considered incidental to the work for the pay item "Water Main."

2. Case II - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of the pipe to a point 12" below the surface of the ground with Class I (No. 9 crushed stone aggregate) material. The trench shall be tamped to assure maximum possible compaction (approximately 80 to 85 percent of Standard Proctor density). Extreme care shall be exercised to prevent damage to the pipe during tamping operation. The remainder of the trench to existing grade shall be backfilled with Class II (dense graded aggregate) material with the material being mounded over the trench. The trench shall be tamped again to assure additional compaction. The trench may be left with a slight mound if permitted by the Engineer.

Class I material used and method of backfilling used in this case is not a separate pay item and is considered incidental to the work for the item "Water Main."

Class II material used in this method of backfill is not a separate pay item and is considered incidental to the work for the item "Water Main."

Sufficient stockpiles of Class II material shall be placed throughout the project area to insure immediate replacement by the Contractor of any settled areas. The Contractor shall maintain the trench and replace or fill any settled areas until the section of main is accepted by the Owner. No extra payment will be made for the filling in of settled areas by the Contractor. Earth material shall not be used in this Case for backfill material.

3. Case III - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of pipe to the height indicated in the "City and County Maintained Streets, Roads and Driveway Pavement Replacement" detail with Class I (No. 9 crushed stone aggregate) material. Said material shall be tamped as described for Case II. A 12-inch layer of Class II (dense graded aggregate) material shall be placed over the compacted backfill before bituminous or concrete surface is placed as shown in the previously mentioned details. The 12-inch layer of Class II material is NOT a separate pay item but such expense will be borne by the Contractor and is considered incidental to the bid items "Bituminous or Concrete Surface Replacement". Also considered incidental is all temporary stone required for a temporary surface between backfilling and pavement replacement.

   Sufficient stockpiles of Class II material shall be placed throughout the project area to insure immediate replacement by the Contractor of any settled areas. The Contractor shall maintain the trench and replace or fill any settled areas with crushed stone until the section of main is accepted by the Owner or until the final bituminous or concrete surface is placed over the trench. No extra payment will be made for the filling in of settled areas by the Contractor. Class II material used in this method of backfill is considered incidental and as a support item under the item "Bituminous Surface Replacement" or "Concrete Surface Replacement" at its unit price.

   Class I material used for backfilling is not a separate pay item and is considered incidental to the bid item "Water Main."

4. Class IV- The trench shall be backfilled from the spring line to a point 1 foot above the top of the pipe with earth material free from rock and acceptable to the Engineer, it shall be carefully and solidly tamped by approved mechanical methods. The remainder of the trench shall be backfilled to the height indicated in the "State Maintained Streets and Roads Pavement Replacement Detail" in the Contract Drawings, with material free from rock and acceptable to the Engineer; said material shall be mechanically tamped in approximately 6 inch layers to obtain the maximum possible compaction. The backfilling method is NOT a separate pay item. A 12 inch layer of dense graded aggregate shall be placed over the compacted earth backfill when a bituminous or concrete surface street or road has been trenched. The 12 inch layer of stone is not a separate pay item but such expense will be borne by the Contractor.

D. Excavated materials from trenches and tunnels, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. The Contractor may contact the Owner regarding the location of a suitable disposal site; however, if the Owner cannot recommend a site, it shall be the responsibility of the Contractor to obtain locations or permits for the disposal of the waste material. Unit prices for the various pipe sizes shall include the cost of disposing of excess excavated materials, as set forth herein, no additional compensation being allowed for hauling or overhaul.

3.04 INTERIOR PIPING INSTALLATION

A. It shall be the Contractor's responsibility to furnish a complete system of pipe supports, to provide expansion joints and to anchor all piping. The pipe support system shall be installed complete with all necessary inserts, bolts, nuts, rods, washers, miscellaneous steel, and other accessories. The Contractor shall submit shop drawings on the pipe supporting system, including type and size of supports, details on thrust anchorage and all their locations.

B. In some instances, expansion joints have been shown on the drawings, but no attempt has been made to indicate every expansion joint for piping included under this portion of the specifications. Portions of the piping are shown on the detail drawings. Some of the piping, however, is shown only on the schematics.

C. Reaction Anchorage and Blocking: All piping exposed in interior locations and subject to internal pressure in which flexible connectors are used shall be blocked, anchored, or harnessed, as shown on the drawings, or as directed by the Engineer to preclude separation of joints.

D. Pipe Hangers:

1. Unless otherwise shown or specified, hangers for 2-1/2 inch and smaller pipe shall be split ring, adjustable swivel type, Elcen 92, Fee and Mason 199, or Grinnell 104.1, Clevis, Elcen 12, Fee & Mason 239, Grinnell 260, or equal; or J-style; hangers for 3 in. pipe or greater shall be clevis type. Strap hangers will not be acceptable. Hangers for use with spring supports shall be split ring or clamp type, Grinnell 212, Elcen, or equal. Hangers for fiber glass reinforced pipe shall be saddle type.

2. Each hanger shall be designed to permit at least 1-1/2 inch of vertical adjustment after installation.

E. Concrete Inserts:

1. Concrete inserts shall be provided at locations to support piping where structural steel supports are not readily available. Inserts shall be located so that the total load on any insert does not exceed the manufacturer's recommended maximum load. The location of all inserts shall be approved by the Engineer.

2. Where it is necessary to anchor supports to hardened concrete or complete masonry, expansion anchors of the type described in the anchor bolt and expansion anchors section shall be used. All expansion anchors shall be sized as required for the service with minimum safety factor of five.

3. Individual concrete inserts shall be Grinnell "Fig. 282", Unistrut M26, or equal. Continuous concrete inserts shall be Unistrut "P-3200 Series", Fee and Mason, or equal.

F. Brackets and Anchors:

1. For suspended piping, anchors shall be centered, as closely as possible, between expansion joints, and between elbows and expansion joints. Anchors shall hold the pipe securely and shall be sufficiently rigid to force expansion and contraction movement to take place at expansion joints and elbows.

2. Thrust Anchors: Anchorage shall be provided as required to resist thrust due to changes in diameter or direction, or dead ending of pipelines. Anchorage shall be required wherever bending stresses exceed the allowable for the pipe.

3. Brackets and anchors shall be installed as required. They shall be Unistrut "P-1000 Series" with all parts galvanized, Grinnell "Fig 199" painted with rust inhibitive primer, or equal, or fabricated steel meeting A.S.T.M. A36 and be painted with a rust inhibitive primer.

G. Guides: Pipe guides shall be provided adjacent to sliding expansion joints in accordance with the recommendations of the National Association of Expansion Joint Manufacturers.

H. Wall Sleeves: Wall sleeve seals for pipes passing through structure walls below grade shall be compression type units consisting of molded rubber links with bolt holes, elongated backup washers, nuts and bolts, or a sleeve capable of being bolted directly to the formwork. Compression type units when assembled around the pipe and inserted in the wall sleeve, tightening the bolts shall expand the rubber against the pipe and sleeve. Sleeve seals bolted directly to the formwork to seal the annular space between the carrier pipe and the sleeve, shall be sealed by means of a confined rubber gasket and capable of withstanding 350 psi. This type of sleeve shall be manufactured from ductile iron with an integrally cast waterstop of 1/2-inch minimum thickness and 2-1/2-inch minimum height. Compression type units shall be Link-Seal or equal. Directly bolted units shall be Omni Sleeve or equal.

I. Anti-Seize Compounds: An anti-seize compound shall be applied to all nuts and bolts.

J. Contact between dissimilar metals shall be prevented.

K. In all cases where piping is in contact with a concrete or metal pipe support, a 1/8 inch thick teflon, neoprene rubber or plastic strip
shall be placed under all piping at the point of bearing. Each strip shall be cut to fit the entire area of contact between pipe and support and shall be neat.

L. Location:

1. In general, the piping work under this Contract shall be done in accordance with the arrangements shown on the plans. The runs of piping are, in part, diagrammatic and the Contractor shall without extra cost run the piping as directed by the Engineer at the time of installation, so as to best fit the conditions in the building, and so that no piping shall pass through beams or other structural members in such a way as to impair their strength.

2. Special care shall be exercised to keep all piping in the building in locations as shown on the plans and to install the risers and horizontal runs so as to occupy a minimum space.

3. Changes in runs and location to meter field conditions shall be done with extra cost to the Owner.

4. All horizontal lines carrying liquids shall be pitched to facilitate draining and all low points shall be provided with 3/4 inch hose bids suitable for the material being handled, located so that the entire system can be drained.

5. Expansion joint locations shall coincide with building control joints and as shown on the plans.

6. Pipe supports and expansions joints shall satisfy the following conditions:

Type of Pipe	Max. Pipe Support Spacing Feet	Liquid Piping Max. Length of Straight Run Without Bend or Expansion Joint Feet	Air Piping Max. Length of Straight Run Without Bend or Expansion Joint Feet
Ductile Iron	14	80	40
Steel			
6" and over	20	80	40
5" to 2-1/2"	14	50	25
2" to 1"	10	50	25
Under 1"	8	50	25
Copper			
2" to 3/4"	7	50	
Under 3/4"	7	NA	
Plastic and Fiberglass Reinforced Plastic			
Over 3"	9	30	
3" to 1-1/2"	7	30	
Under 1-1/2"	5	30	

Unless otherwise shown or authorized by the Engineer, piping running parallel to walls shall be placed approximately 1-1/2 in. out from the face of the wall and at least 3 in. below ceilings.

3.05 GENERAL TESTING REQUIREMENTS

A. During the final inspection, the Engineer will inspect each individual line, either by use of lights or other means at his disposal to determine whether the completed lines are true to line and grade as laid out or as shown on the Drawings.

B. All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced at the Contractor's expense.

C. After the piping systems have been brought to completion, and prior to final inspection, the Contractor shall rod out the entire system by pushing through each individual line in the system appropriate tools for the removal from the lines of any and all dirt, debris and trash.

D. All apparatus and equipment required for testing shall be furnished by the Contractor at no expense to the Owner.

3.06 TESTING OF LINES

A. Upon completion of the construction of water mains but prior to FINAL INSPECTION, all water mains and appurtenances shall be tested for leaks as specified herein. The OWNER shall be notified at least 24 hours in advanced of the scheduled test time and, at its own discretion, have an inspector present during the performance of the test.

B. Where practicable, pipelines shall be tested between line valves, temporary valves or temporary plugs in lengths of not more than 1,500 feet or between isolation valves. The CONTRACTOR may request, in writing, the testing of a section of line greater than 1,500 feet with the Engineer's approval. Testing shall proceed from the source of water toward the termination of the line. The line shall be tested upon the completion of the first 1,500 feet or the first isolation valve. After the completion of the first test without failure, the CONTRACTOR, at his option and with the Engineer's approval, may discontinue testing until the system is complete. The CONTRACTOR shall provide a recording pressure gauge which shall be used for the continuous measurement and recording of test pressures and test times.

C. Water mains shall be tested at a minimum of 150 pounds per square inch in compliance with AWWA C651 but not less than the pressure specified in the sub-paragraphs below. The CONTRACTOR shall furnish a recording pressure gauge which shall be used for the continuous measurement and recording of test pressures and test time.

1. Test pressure shall not be less than 1.5 times the working pressure at the highest point along the test section. Test pressure shall not exceed pipe or thrust-restraint design pressures. The hydrostatic test shall be at least a 2-hour duration. Test pressure shall not vary by more than ±5 psi for the duration of the test.

2. Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate pendent of the valve. For test pressures, the test setup should include provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.

3. Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

4. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing. Each valved section of pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

5. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the Owner.

6. Any exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Owner.

7. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

D. Loss of water pressure during the test shall not exceed 10 psi in a 24 hour time period or 5 psi in a two (2) hour time period. Duration of test shall be not less than two (2) hours.

E. Where leaks are visible at exposed joints and/or evident on the surface where joints are covered, the joints shall be recaulked, repoured, bolts retightened or relaid, and leakage minimized, regardless of total pressure drop shown by the test.

F. When hydrants are in the test section, the test shall be made against closed hydrant valves.

3.07 LEAKAGE TESTS

A. Only after the line has passed the hydrostatic test, shall the leakage test be used to determine if the line has passed. The leakage shall be defined as the quantity of water that must be supplied to the tested section to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

B. The Contractor shall test all pipelines and appurtenances at normal operating pressure for at least a 24-hour period. Normal operating pressure shall be determined by averaging six (6) pressure readings taken at a point in the test pipe over a minimum period of three hours.

C. The test pipe section shall be considered acceptable if the amount of liquid added to the system at the end of the test period to restore the test pressure does not exceed that allowed by the following formula:

$$L = \frac{ND\,(P)^{1/2}}{7400}$$

Where L = allowable leakage in gallons per hour.
N = number of joints in length of pipe tested.
D = nominal diameter of pipe (inches).
P = test pressure (psig).

D. If loss exceeds L, the Contractor shall locate and repair to the Engineer's satisfaction all leaks until the pipe section will pass another leakage test.

E. For the pipe line to be accepted, the following will be required:

1. Pass the pressure test.

2. Pass the leakage test, unless waived under the pressure test.

3. All evidence of leakage identified and repaired.

F. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation.

G. If in the judgment of the Engineer, it is impracticable to follow the foregoing procedures for any reason, modifications in the procedures shall be made as required and as acceptable to the Engineer, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

3.08 LOW PRESSURE AIR TESTS

A. Low pressure air test shall be made using equipment specifically designed and manufactured for the purpose of testing sewer lines using low pressure air. The equipment shall be provided with an air regulator valve or air safety valve so set that the internal pressure in the pipeline cannot exceed 8 psig.

1. The test shall be made on each manhole-to-manhole section of pipeline after placement of the backfill. The Engineer or his designated representative must be present to witness each satisfactory air test before it will be accepted as fulfilling the requirements of these specifications.

2. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.

3. Low pressure air passing through a single control panel, shall be introduced into the sealed line until the internal air pressure reaches 4 psig greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe at the time of test. However, the internal air pressure in the sealed line shall not be allowed to exceed 8 psig. When the maximum pressure exerted by the groundwater is greater than 4 psig, the Contractor shall conduct only an infiltration test.

4. At least two minutes shall be allowed for the air pressure to stabilize in the section under test. After the stabilization period the low-pressure air supply hose shall be quickly disconnected from the control panel. The time required in minutes for the pressure in the section under test to decrease from 3.5 to 2.5 psig (greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe) shall not be less than that shown in the following table:

Pipe in Diameter in Inches	**Minutes**	**Pipe in Diameter in Inches**	**Minutes**
4	2	15	9.5
6	4	18	11
8	5	21	13
10	6.5	24	15
12	7.5	30	19

5. When the sewer section to be tested contains more than one size of pipe, the minimum allowable time shall be based on the largest diameter pipe in the section, and shall be the time shown in the table reduced by 0.5 minutes.

3.09 DISINFECTION OF WATER LINES

A. New potable water lines shall not be placed into service, either temporarily or permanently, until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the OWNER and in accordance with AWWA 651 (latest revision).

B. After pressure testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 parts per million (PPM) in the entire water main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a chlorine concentration of at least 50 PPM has been obtained throughout the complete water main. Open and close all valves and cocks while chlorinating agent is in the piping system. The

chlorinated water shall remain in the pipe for 24 hours. Disinfection shall be repeated until a minimum chlorine residual of 25 PPM is measured after 24 hours. Once a chlorine residual of 25 PPM is obtained after 24 hours, the water main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 PPM.

C. The CONTRACTOR shall slowly fill the water main being disinfected to allow for full contact of the pipe with the chlorinated water to ensure full contact and proper disinfection per AWWA C-651.

D. Following disinfection of the line, bacteriological samples shall be collected and analyzed in accordance with the requirements of Kentucky Department of Natural Resources and Environmental Protection. When the samples have been tested and reported safe from contamination, the water line may be connected to the system. The Contractor shall provide to OWNER written documentation that the water sample passed the bacteriological test and is safe.

E. Bacteriological samples shall be taken in the following manner:

1. Two samples for the first one-half mile of water main and then one sample per mile thereafter.

2. Two samples when disconnecting or reconnecting a branch line or service line when two or more customers are affected.

F. All bacteriological sampling and testing shall be paid for by the Contractor and included in the unit price for the bid item "water main".

G. The CONTRACTOR shall provide its own chlorine residual analyzer test kit for sampling the chlorine concentration during the disinfection test period.

3.10 DECHLORINATION OF HEAVILY CHLORINATED WATER

A. Dechlorination of heavily chlorinated water shall be in accordance with AWWA C651 and shall be accomplished using sodium bisulfite, sodium thiosulfate, sodium sulfite, or calcium thiosulfate solution of a concentration sufficient to remove all chlorine to a level not to exceed 0.019 mg/l. The solution shall be applied by a metering pump directly into the chlorinated water flow stream by injection into a discharge line or into the free discharge from a hydrant. The treated water may then be conveyed to the nearest sanitary sewer, storm sewer, or local stream.

B. The feed rate (gpm) of solution shall be governed by the chlorine (ppm) concentration of the water to be dechlorinated and the rate (gpm) at which it can be discharged. Constant monitoring of the chlorine residual concentration shall be made using the colorimetric method to ensure the optimum solution feed rate.

C. Feed System: The dechlorinating agent shall be fed from prepared carboys utilizing a metering pump equipped with a suitable meter and valve to adjust/monitor the feed rate.

3.11 CLEAN-UP

A. Upon completion of the installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

B. Unless specifically approved by the Owner or Engineer, cleanup of all disturbed areas shall be kept current with construction activities and restoration efforts shall be initiated by the Contractor no longer than a period of two (2) weeks after the trench excavation work has started. All excavated material not required for backfilling of the trench and any large rocks, stones or debris shall be removed from the site within reasonable time and shall not be an undue burden to the property owner(s) and/or adjacent properties. The Contractor may

windrow or track-in the excavated material over the trench prior to final cleanup to allow for and to assist in the initial settlement of the trench. All disturbed areas must be seeded, at least with a temporary seed mix, if for some reason the area cannot be permanently seeded within the two (2) week period.

- END OF SECTION -

SECTION 02626

CUSTOMER METER SERVICE AND SERVICE TUBING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes service pipelines constructed of seamless copper tube as shown on the Contract Drawings, complete with fittings and accessories.

B. Certain features of copper tubing shall be as scheduled.

C. The Contractor shall furnish all labor, tools, equipment, and materials necessary to complete the meter service connections as shown on the Contract Drawings and herein specified.

1.02 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)
2. American Water Works Association (AWWA)

1.03 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Manufacturer's certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification.

2. Layout drawings showing the location of copper tube including details of the support system, sleeves, unions and appurtenances.

PART 2 PRODUCTS

2.01 SERVICE CLAMPS

All service connections of all sizes shall be made through the use of service clamps or saddles. Service saddles shall have ductile iron body, double strapped with O-ring resilient gasket, suitable for use on ductile iron pipe or PVC pipe, and tapped with same threads as the corporation stops. Saddles for all mains shall be double strap type saddles and have a maximum working pressure of 350 psi *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

2.02 CORPORATION STOPS

Corporation stops for use in service clamps shall be equal for 3/4", 1" and 2" service tubing and have a maximum working pressure of 300 psi. Corporation stops shall have iron pipe threads with compression coupling connection for copper tubing outlets. A rigid stainless steel insert stiffener shall be used inside the PE tubing, when encountered. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

2.03 SERVICE TUBING 3/4", 1" AND 2" POLYETHYLENE TUBING (CTS SERVICE TUBING)

A. Pipe shall be made from virgin, ultra-high molecular weight polyethylene resin meeting the requirements of Type III, Class C, Category P34 polyethylene as defined by ASTM D-1248, latest revision, "Polyethylene Plastics Molding and Extrusion Materials".

B. Dimensions and tolerances shall meet the values as listed in AWWA C-901, latest revision, "Polyethylene (PE) Pressure Pipe Tubing and Fittings". Standard dimension ratio shall be DR-7.3 (OD base), Pressure Class 200 psi.

C. Pipe shall be rated for use with water at 73.4 degrees F. at a hydrostatic design stress of 630 psi and a maximum working pressure of 200 psi. The pipe shall sustain a water pressure as defined in ASTM D 1598 for 1000 hours with water at 73.4 degrees F.

D. Surface shall be homogeneous inside and out and completely free of irregularity. Random testing shall be performed at intervals during all production runs to assure uniformity in all respects. The tubing shall carry the National Sanitation Foundation seal of approval for drinking water.

E. Pipe shall be marked in lettering at intervals of not more than five (5) feet and such marking shall include nominal size; manufacturer's name or trademark; pressure rating for water at 73.4 degrees F., 200 psi; applicable ASTM specification,; ASTM material specification, PE 3406; standard dimension ratio, DR-7.3; the National Sanitation Foundation Seal of Approval (NSF mark) and production code.

F. Pipe shall be guaranteed in writing against rot, corrosion and defects for 50 years from date of installation, with pipe replacement and labor cost warranted in writing for 25 years from date of installation.

2.04 COPPER SERVICE TUBING

A. Buried, Exterior - Copper Pipe: Type K hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass. Joints: Lead free, tin-silver solder.

B. Buried, Below Slab: Copper Pipe, 2" and Smaller: Type K soft drawn copper per ASTM B-88. Fittings and joints shall not be permitted below slab.

C. Buried: Copper Pipe, 2" and Smaller: Type K soft drawn copper per ASTM B-88. Fittings and joints shall not be permitted in the service tubing.

D. All solder joints shall be soldered with an approved, lead free tin-silver solder. Acid core solder shall not be used.

E. Copper tube shall be as specified herein unless otherwise shown on the Contract Drawings or in the pipe schedule.

F. Copper tube shall conform to the following standards:

	ASTM
Seamless Copper Water Tube	B88
Copper Drainage Tube (DWV)	B306
Seamless Copper Tube, Bright Annealed	B68

1. Seamless copper water tube shall be used for hot and cold water and compressed air.

   a. Type K where installed in concrete, underground or when immersed in liquids.

   b. Type L where exposed and in concealed locations inside structures.

   c. Soft temper when installed in concrete or underground.

   d. Hard temper when installed in exposed and concealed locations.

2. Copper drainage tube will be permitted only for sanitary waste, drain and vent piping above ground and inside structures.

3. Bright annealed seamless copper tube shall be used for liquid fuel and refrigerant and all small (3/8 inch and smaller) tubing unless otherwise specified.

G. Wall thickness shall be at least equal to Type K seamless copper water tube unless heavier walls are specified.

2.05 METER SETTING EQUIPMENT

A. Meters shall be placed inside meter boxes using coppersetters with 3/4" or 1" saddle nut connection for the meter. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER. All coppersetters shall have a ball angle meter valve (lockable) stop at the meter inlet and dual check valve on the outlet. Coppersetters shall be 12 inches in height with connections for the appropriate service tubing and have a maximum working pressure of 300 psi.

B. For larger meters (1-1/2" and 2") the meters shall be installed with ball meter valves on inlet side and the meter outlet side. Meters shall be placed on concrete block or equivalent support inside the meter box.

C. For individual meter with pressure reducing valves or more than one meter the coppersetters shall be the Tandem type coppersetters as manufactured by Ford, Mueller or Engineer approved equal and 12 inches in height and placed in meter boxes with 18" I.D.

D. A rigid stainless steel insert stiffener shall be used inside the PE tubing at all connections to the coppersetters.

2.06 SERVICE METERS

The service meter main body shall be of high grade bronze, with hinges, single lid cover and raised characters cast on the body indicating the direction of flow. Meter shall have a working pressure rating of 150 psi. The register shall be straight reading gallon type. The register unit shall be hermetically sealed, and

driven by permanent magnets. The register shall have a center sweep hand and a test circle shall be divided into 100 equal parts and include a flow finder. The register shall carry a minimum 10-year warranty.

The meters shall be "BADGER ORION" radio read equipment with data profiling feature. Model 25 for 3/4-inch services, Model 70 for 1-inch services and Model 170 for 2" services. Meter shall include Data Profiling Feature. The entire unit is to be pre-assembled in a workmanlike manner with all components fitted snugly into the box and fastened to prevent movement. All joints shall be sealed with Teflon tape. The inlet and outlet is to be equipped with compression couplings.

2.07 METER BOXES

Meter boxes shall be plastic rectangular with solid plastic lid and cast iron reading lid. The meter box, cover and meter setting shall be constructed as shown on the drawings or as directed by the Owner or Engineer. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

2.08 ACCESSORIES

A. Fittings and Couplings

1. Fittings for copper tube shall be wrought copper or cast bronze for soldered joints and brass for flared joints.

2. Flexible couplings as shown or required for copper tube shall be flexible metal hose couplings.

B. Joints

1. Joints for seamless copper water tube to be installed in concrete and underground shall be flared type and shall have threads in accordance with AWWA C 800.

2. Joints for seamless copper water tube and copper drainage tube installed exposed and inside structures shall be soldered.

   a. Solder and flux used in joints of water lines, shall contain no more than 0.2% lead.

   b. Solder shall be Tin-Silver or approved equal.

   c. Solder flux shall be as recommended by the solder manufacturer.

3. Joints for bright annealed seamless copper tube used in liquid fuel lines shall have flared joints, approved by Underwriter's Laboratories.

4. Joints for small tubing (3/8 inch and smaller) shall be of the locking type compression fittings or soldered as shown in the piping schedule and as directed.

PART 3 - EXECUTION

3.01 INSTALLATION OF METER SERVICES

All customer meter services shall be installed as shown on the Contract Drawings and shall be set near the property owner's property line and outside of the highway right-of-way. The Owner reserves the right to change the location of the meter services prior to installation for ease of daily operation of the system and reading the individual meters. Existing customer services must be connected on customer side of meter.

3.02 INSTALLATION OF SERVICE TUBING

A. All service tubing installed beneath bituminous or concrete roads shall be jacked under the roads. When State maintained roads are being jacked and rock is encountered, permission to open cut the road shall be obtained by the Contractor from the Department of Transportation's District Permit Engineer. If permission is refused, the Contractor shall attempt to jack at another location and shall continue to do so until a successful crossing is obtained.

B. Minimum cover for all service lines shall be 36 inches (at all locations) when within the proposed and existing highway right-of-way and construction easements. Additional cover may be required at proposed drainage ditch, storm sewer, or other noted locations.

3.03 BACKFILLING SERVICE TUBING

When service tubing is laid in an open cut across a road of any type surface (crushed stone, bituminous or concrete), the backfill shall consist of Class II granular material (dense graded aggregate) and shall be placed full depth. Payment for Class II material used will not be paid as a separate pay item, but will be included in the price for installing the service tubing.

3.04 INSTALLATION OF COPPER TUBING

A. Install copper tubing, fittings, specials, and accessories in accordance with the applicable configuration shown on the Contract Drawings and the provisions of the Sections entitled "Trenching, Backfilling and Compacting" and "Pipeline Installation".

B. Exposed copper tube shall be carefully erected and neatly arranged.

1. Copper tube shall be run parallel with walls inside structures and shall be pitched to drain.

2. Drain valves shall be installed at the low points of liquid filled systems.

3. Valved fill connections shall be provided for closed systems.

C. Copper tube installed for a compressed air or gas system shall be pitched in the direction of flow.

1. Connections shall be at the top of the main.

2. Low points of the system shall have drip pipes not less than 12 inches long and drain pet-cocks unless automatic moisture traps are shown.

D. Unions shall be provided on copper tube systems with soldered joints.

1. Unions shall be located at control valves, solenoid valves, moisture and steam traps, other items of connected equipment and as shown on Contract Drawings.

2. Unions shall be of cast bronze or brass construction.

3. Dielectric unions shall be used when connecting copper tube to ferrous metals.

E. Copper tubing shall be supported and anchored in place by the use of copper or brass units spaced not greater than 10 feet on center and each side of each change of direction.

3.05 FIELD TESTING AND CHLORINATION

A. Perform hydrostatic and leakage tests in accordance with the applicable provisions of the Section entitled "Leakage Tests", at the test pressure specified or scheduled.

B. Disinfect piping and appurtenances in accordance with the Section entitled "Chlorination", where specified or scheduled.

-END OF SECTION-

SECTION 02630

TAPPED CONNECTIONS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes tapping and installing of corporation stops and valves on existing or newly installed pipes without interruption of service, as shown on the Contract Drawings, complete with connections and accessories.

B. Installing of curb stops and boxes where specified or directed.

1.02 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Water Works Association (AWWA)

1.03 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall be submitted:

1. Detail drawings for each size corporation stop, curb stop, tapping sleeve and valve, and service box.

PART 2 PRODUCTS

2.01 CORPORATION STOPS

A. Corporation stops shall be threaded to conform to AWWA C800 with standard corporation stop thread at the inlet. The outlet shall be fitted with coupling nut for flared tube service unless otherwise specified.

SEE SECTION 01600 MATERIAL AND EQUIPMENT for APPROVED MANUFACTURER.

2.02 CURB STOPS

A. Curb stops shall be threaded to conform to AWWA C 800 with coupling nuts for flared tube service.

1. ¾-inch shall be of the inverted new type.

2. 1-inch to 2-inch shall be of the plug-type with "O" ring seals to withstand a minimum working pressure of 175 psi.

3. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

2.03 SERVICE CLAMPS

A. Service clamps shall be designed for use on the type of pipe to which the connection is being made.

1. Ductile iron and asbestos-cement service clamps shall be the double strap type with neoprene gaskets.

2. Polyvinyl chloride pipe service clamps shall be of a full circle design with a minimum width of 2 inches.

3. Prestressed concrete pipe service clamps shall be made by or approved for use by the pipe manufacturer.

4. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

2.04 SERVICE BOXES

A. Service boxes shall be constructed of cast iron and sized for the curb stop upon which it is being installed.

1. Stationary shut-off rod shall be provided unless otherwise specified.

2. Boxes shall be telescopic with a minimum of 1-foot adjustment.

3. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

2.05 TAPPING SLEEVES AND VALVES

A. Tapping sleeves and valves shall be used for connections larger than 2 inches.

1. Tapping sleeves shall be designed and sized in accordance with the recommendations of the manufacturer.

2. Working pressure shall be 200 psi unless higher pressures are scheduled.

3. The seal of the tapping sleeve shall be mechanical joint or low lead 2.5% or less. Low lead as conforming to current regulations.

4. Valves for tapping sleeves shall be designed for the intended service and shall conform to the requirements of the Section entitled "Valves".

5. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install connections and accessories under the direction of personnel who have performed at least ten similar connections in accordance with the configuration shown on the Contract Drawings and the applicable provisions of the referenced Standards.

1. Threaded taps shall be made using a machine designed for cutting, threading and inserting the corporation without interruption of service.

    a. Teflon tape may be used on corporation threads.

2. Tapping sleeve connections shall be made using a machine to cut and remove the segment through the valve without interruption of service.

B. Service boxes shall be set plumb and shall be independently supported on two bricks so no weight will be transmitted to the curb stop or carrier pipe.

C. Service clamps and tapping sleeves installed on prestressed concrete pipe shall be encased in a minimum of 2 inches of concrete mortar after installation.

-END OF SECTION-

SECTION 02640

VALVES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install valves, gates, hydrants, miscellaneous piping appurtenances and filter control valves as indicated on the Drawings and as herein specified.

B. The Drawings and Specifications direct attention to certain features of the equipment, but do not purport to cover all the details of their design. The equipment furnished shall be designed and constructed equal to the high quality equipment manufactured by such firms as are mentioned hereinafter, or as permitted by the Engineer. The Contractor shall furnish and install the equipment complete in all details and ready for operation.

C. Valves for use in the following services are specified under their appropriate sections:

1. Plumbing
2. HVAC
3. Chemical Piping Valves and Appurtenances
4. Plant Process

D. Electrical work and equipment specified herein shall conform to the requirements of the applicable electrical sections.

E. Enclosures shall be of a suitable type for the atmospheres in which they are installed.

F. Sizes and capacities not specified herein are indicated on the Drawings.

PART 2 - PRODUCTS

2.01 BUTTERFLY VALVES FLANGED OR MECHANICAL JOINT

A. Provide and install butterfly valves as shown on the contract drawings having the following features:

1. Full accordance with AWWA C504.
2. Minimum temperature rating of 250 degrees F.
3. Rated at 150 psi for raw water and 300 psi for high service piping
4. Cast iron body and disc.
5. 304 stainless steel shaft.
6. Teflon stainless bearing.
7. Packing self-adjusting.

8. Leak-tight with dependable flow characteristics.

9. Packing removable without disconnecting and removing valves.

10. Each actuator assembly per AWWA C-504.

11. Flanged or mechanical joint connections.

B. Valve Operators: The actuator manufacturer shall supply and integrally mount all operators to valves at the actuator manufacturer facility. The valves and operators shall then be shipped as a unit to the project site.

C. Pneumatic actuators shall be Vane type design with only one moving part. Seal construction shall be molded polyurethane with stainless spring expander to ensure long-term lip seal to case. Actuator housing shall be made of a corrosion resistant Zinc alloy with a stove baked epoxy finish. There shall be no O-Ring seals on the vane. All open/close actuators are to have two limit switches SPDT. Modulating actuators to have 0-1000 ΩOHM feedback signal.

D. Supply air pressure to the actuator shall range between 80 and 100 psi.

E. All new Open/Close valves shall be shipped as plane stem to the actuator manufacturer for mounting, testing and calibrating of actuators.

F. All actuators shall be warranted for three years or Two Million (2,000,000) Cycles.

2.02 BUTTERFLY VALVES LUG WAFER FILTER VALVES

Provide and install filter butterfly valves as shown on the contract drawings having the following features:

A. Bi-directional, drop tight service to 50 psi.

B. Seat shall be EPDM housed in the body and be field replaceable.

C. Aluminum bronze disc symmetrical in style. Offset disc are not acceptable.

D. Bearings shall be Teflon impregnated stainless steel.

E. Stem shall be 316 stainless steel.

F. Bushing shall be bi-directional self-adjusting.

G. Threaded lug style body that meet the ANSI class 125/150 standard.

H. Valves shall be Keystone Figure No. AR-2.

I. Filter Valve Operators: The actuator manufacturer shall supply and integrally mount all operators to valves at the actuator manufacturer facility. The valves and operators shall then be shipped as a unit to the project site.

2.03 PVC BUTTERFLY VALVES LUG WAFER

Provide and install PVC butterfly valves as shown on the contract drawings having the following features:

A. Butterfly valves shall be wafer style. Valve body shall be manufactured of PVC conforming to

ASTM D1487 cell classification 12454-A. Valve disc shall be manufactured of PVC of an equal grade to the body material or of Polypropylene conforming to ASTM D4101 cell classification PP0210B67272. Valve shall have a PTFE resilient seat. Valve stem shall be 316 stainless steel with EPDM seals.

B. Operator: 6" and below – Lever, 8" and above – Handwheel, over 6' above floor level – Chainwheel.

C. Pressure Rating: 150 psi.

D. Service: Water or Air

E. ASAHI/America Type 56, George Fischer Type 570 or approved equal.

2.04 GATE VALVES

A. Unless otherwise specified or permitted, gate valves larger than 3-in. in size shall be iron-body, resilient seat gate valves, with bell, mechanical joint, or flanged ends as indicated on the Drawings or herein specified. Valves shall be designed for working water pressures of 175 psi for 3 to 12 inch.

B. Gate valves for use on potable water lines shall conform to AWWA Standard Specification for Gate Valves 3 in. through 48 in. for Water and Other Liquids, Designation C509. They may be double-disk type.

C. Gate valves shall, in addition, meet the following requirements as applicable:

1. Buried valves or others, where indicated on the Drawings, shall be inside-screw having bell or mechanical joint ends and 2-in. square operating nuts.

2. Exposed valves shall be OS&Y flanged valves.

3. Face-to-face dimensions of flanged valves shall conform to the ANSI Standard Face-to-Face and End-to-End Dimensions of Ferrous Valves (B16.10-1973).

4. Bronze gate rings shall be fitted into grooves of dovetail or similar shape in the gates. For grooves of other shapes, the rings shall be firmly attached to the gates with bronze rivets.

5. Handwheels or operating nuts shall be turned to the left (counterclockwise) to open all valves. Handwheels shall be of ample size for ease of operation and shall have an arrow and the word OPEN cast thereon to indicate the direction of opening.

6. Stuffing box follower bolts shall be of steel and the nuts shall be of bronze.

7. O-ring stuffing boxes may be used.

8. Valves shall be capable of being repacked under line pressure.

9. Buried valves shall be provided with gate boxes and operating wrenches as hereinafter specified. Where necessary, valves shall be furnished with steel extension stems or universal joint operating rods with 2 in. square operating nuts at the upper end and a suitable coupling to connect to the valve stem.

10. Where indicated on the Drawings or necessary due to size or location, valves shall be provided with chain operators and, where required, angle drives with chains extending to within 3 ft. of the floor or operating platform. Chains shall be galvanized. Sprocket

wheels shall be provided with chain guides. Valves handwheel centerlines located more than 6 ft. 6 in. above the floor or operating platforms shall be considered as being inaccessible and shall be provided with chain operators as described above.

D. Gate valves 3 in. and smaller shall be 200 lb. WOG minimum bronze valves with screwed ends to suit the piping in which they are installed. Body material shall conform to ASTM Standard Specification for Composition Bronze or Ounce Metal Castings, Designation B62-80. Valves shall have union bonnet, rising stem, inside screw, and solid wedge gate.

E. Stem material shall be silicon bronze or an acceptable equivalent having high resistance to dezincification.

F. Buried valves shall be inside screw valves provided with operating nut and extension stem, where necessary, in lieu of handwheel.

G. Quick opening valves shall conform with the above except that they shall be provided with a quick opening lever and cam or other acceptable positive action operators in lieu of the stem and hand wheel.

2.05 BALL VALVES

A. Ball valves shall have double union ends to permit removal of the valve without disconnecting the pipeline and shall be of the type, which will not leak when the downstream union end is disconnected.

B. Viton "O" ring seals shall be used with Teflon seats. Ball valves shall be installed with the flow arrow pointed in the direction of flow to permit disconnection of downstream piping.

C. During installation, the valve handle shall be oriented for ease of operation by rotating the valve body about its axis prior to tightening the ends.

D. Where indicated on the Drawings, the valve shall be equipped with a pointer and scale plate, which will indicate the position of the valve at all times.

2.06 SOLENOID VALVES

A. Solenoid valves shall be bronze body, screwed-end, single integral seat, full pipe area, globe type valves, with renewable composition disk seats.

B. Solenoid enclosures shall meet NEMA Type 4X requirements with coils epoxy encapsulated and suitable for high ambient temperatures (140 degrees F).

C. Valves shall be suitable for operation on 120 volt, single-phase, 60 Hz current, and designed to open when energized.

D. The solenoid valves shall be manufactured by ASCO Valve, Automatic Valve Co., Inc., J.D. Gould Co., or approved equal.

2.07 PLUG VALVES

A. Plug valves shall be of the non-lubricating, eccentric type and shall be designed for a working pressure of 175 psi for valves 12” and smaller, 150 psi for valves 14” and larger. Valves shall provide tight shut-off at rated pressure. Valve shall be the Pratt Ballcentric Plug Valve as manufactured by the Henry Pratt Company, Milliken Valve, or approved equal.

B. Valves 12” and smaller shall have round port design. 14” and larger valves shall have rectangular port design.

C. The plug valve body shall be cast iron ASTM A126 Class B with welded-in overlay of 90% nickel alloy content on all surfaces contacting the face of the plug. Sprayed, plated, nickel welded rings or seats screwed into the body are not acceptable.

D. The valve plug shall be cast iron ASTM A126 Class B, with Buna N resilient seating surface to mate with the body seat.

E. Valve flanges shall be in strict accordance with ANSI B16.1, Class 125.

F. Plug valve shall be furnished with permanently lubricated sleeve type bearings conforming to AWWA C517. Bearings shall be of sintered, oil impregnated type 316 stainless steel ASTM A-743 Grade CF-8M or bronze ASTM B-127.

G. Valves shaft seals shall be of the "U" cup type, in accordance with AWWA C517. Seals shall be self adjusting and repackable without moving the bonnet from the valve.

H. 6" and smaller exposed valves shall be provided with wrench actuators. 8" and larger exposed valves shall be provided with worm gear type manual actuators. All buried valves shall be provided with worm and gear actuators suited for the intended service. Valve actuators shall be fully grease packed and have stops in the open/close position. The actuator shall have a mechanical stop which will withstand an input torque of 450 lbs. against the stop. The actuator shall be able to provide 1.25 times the required operating torque under full rated line pressure combined with a flow velocity of 8 feet per second.

2.08 VALVE BOXES

A. Each buried stop and valve shall be provided with a suitable valve box. Boxes shall be of the adjustable, telescoping, heavy-pattern type with the lower part of cast iron and the upper part of steel or cast iron. They shall be so designed and constructed as to prevent the direct transmission of traffic loads to the pipe or valve.

B. The upper or sliding section of the box shall be provided with a flange having sufficient bearing area to prevent undue settlement. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and rest on the valve bonnet. For PVC piping, valve box shall be supported by brick or block and not by the valve bonnet.

C. The boxes shall be adjustable through at least 6 in. vertically without reduction of the lap between sections to less than 4 in.

D. The inside diameter of boxes for valves shall be at least 4-1/2 in., and the lengths shall be as necessary for the depths of the valves or stops with which the boxes are to be used.

E. Covers for valves shall be close fitting and substantially dirt-tight.

F. The top of the cover shall be flush with the top of the box rim. An arrow and the word OPEN to indicate the direction of turning to open the valve shall be cast in the top of the valve covers.

2.09 FLOORSTANDS

A. Floorstands shall be handwheel or crank operated as indicated on the Drawings or as required to suit the application.

B. Handwheel operated type shall be without gear reduction and crank-operated type will have either single or double gear reduction depending upon the lifting capacity required. Each type shall be provided with a threaded cast bronze lift nut to engage the operating stem. Tapered roller bearings shall be provided above

and below a flange on the operating nut to support both opening and closing thrusts. Floorstands shall develop their maximum capacity with not greater than a 40-lb. pull on the crank or handwheel. Gears, where required, shall be steel with machined cut teeth designed for smooth operation. The pinion shafts on crank-operated floorstands, either single or double ratio, shall be supported on tapered roller bearings or other approved bearings. All components shall be totally enclosed in a cast iron case and cover. Positive mechanical seals will be provided on the operating nut and the pinion shafts to exclude moisture and dirt and prevent leakage of lubricant out of the hoist. Lubricating fittings shall be provided for the lubrication of all gears and bearings. Floorstands shall include a cast iron pedestal with the input shaft or handwheel approximately 36 in. above the operating floor. An arrow with the word OPEN shall be cast on the floorstand or handwheel indicating the direction of rotation to open.

C. Floorstands for rising stem sluice gates shall have clear, transparent, rigid, plastic stem covers.

D. Floorstands for nonrising stem sluice gates shall have stem indicators.

E. Floorstands shall be provided by the valve or gate manufacturer with each valve or gate requiring floorstands.

2.10 T-HANDLE OPERATING WRENCHES

T-handle operating wrenches shall be provided in the number and lengths necessary to permit operation of all valves by operators of average height working in normal positions.

2.11 FLOOR BOXES

A. The floor boxes shall be cast iron with a bronze bushing of the size necessary to accommodate the extension stem. The boxes shall be suitable for installation in a concrete floor of the thickness indicated on the Drawings.

B. They shall be similar to those made by Mueller Co., Decatur, Ill.; Clow Corporation, Chicago, Ill.; Coldwell-Wilcox Co., Fairfield, Conn.; or be acceptable equivalent products.

2.12 CORPORATION STOPS

Corporation stops for use in service clamps or direct taps shall be as manufactured by Ford, Mueller, or approved equal for 3/4", 1" and 2" service and have a maximum working pressure of 300 psi. Corporation stops shall have iron pipe threads for use with service clamps and tapered threads for direct taps and shall have compression coupling connection for copper tubing outlets. A rigid stainless steel insert stiffener shall be used inside the PE tubing, when encountered.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Valves shall be installed as nearly as possible in the positions indicated on the Drawings consistent with conveniences of operating the handwheel or wrench. All valves shall be carefully erected and supported in their respective positions free from all distortion and strain on appurtenances during handling and installation.

B. All material shall be carefully inspected for defects in workmanship and material, all debris, and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness.

C. Valves and other equipment, which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense.

D. Valves shall not be installed with stems below the horizontal.

E. Valves shall be set plumb and supported adequately in conformance with the instructions of the manufacturer. Valves mounted on the face of concrete shall be shimmed vertically and grouted in place. Valves in the control piping shall be installed so as to be easily accessible.

F. Where chain wheels are provided for remote operation of valves, two S-shaped hooks shall be provided for each valve to enable the chains to be hooked so as not to interfere with personnel traffic.

G. Valves shall be provided with extension stems where required for convenience of operation. Extension stems shall be provided for valves installed underground and elsewhere so that the operating wrench does not exceed 8 ft. in length.

H. A permanent type gasket of uniform thickness shall be provided between flanges of valves and sluice gates and their wall thimble.

I. Wall thimbles shall be accurately set in the concrete walls so that the gates can be mounted in their respective positions without distortion or strain.

J. Plug valves in horizontal sewage and sludge piping shall be installed with the shaft horizontal such that when in the open position, the plug is located in the upper part of the valve body. Valves shall be oriented so that in the closed position, the plug is at the upstream end of the valve.

K. Floorstand operators and stem guides shall be set so that the stems shall run smoothly in true alignment. Guides shall be anchored firmly to the walls. Distances from the centerlines of gates to the operating level or base of floorstand shall be checked by the Contractor and adjusted if necessary to suit the actual conditions of installation.

- END OF SECTION -

SECTION 02645

HYDRANT ASSEMBLY

PART 1 - GENERAL

1.01 SCOPE

The Contractor shall furnish and install, where shown on the plans and additional locations as directed by the Owner, hydrant assemblies and blow-hydrants manufactured and equipped as described below.

PART 2 - PRODUCTS

2.01 FLUSHING HYDRANT ASSEMBLY

A. Hydrants shall conform in all respects to the requirements of AWWA C502. All hydrants shall have 6-inch mechanical joint shoe connection, two (2) 2-1/2" hose outlets, one (1) 4-1/2" pumper nozzle with caps. Connection threads and operation nuts shall conform to National Standard Specifications as adopted by National Board of Fire Underwriters. The hydrant shall be equipped with safety flanges designed to prevent barrel breakage when struck by a vehicle and an auxiliary gate valve.

B. Each hydrant shall be fully bronze mounted with the main valve having a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust or corrosion.

C. Operating stems shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stops shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.

D. Hydrants shall be designed for 250 psi working pressure and shop tested to 1250 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet. Hydrants shall have a UL/FM approved rating.

E. Each hydrant shall be installed with an auxiliary shut-off valve and valve box; valve box cover shall be marked "WATER" as required. Hydrants shall be secured to the shut-off valve by AWWA approved restraint joints, rodding with four (4) equally spaced all thread rods and "Duc-Lugs", or other equally approved method.

F. Inlet cover depth shall be 36" and the minimum dimension from ground to centerline of lowest opening shall be 18". Hydrants shall be supported on a poured-in-place concrete thrust block and provided with a drainage pit as indicated on Standard Detail Sheet.

G. All hydrants shall receive two (2) field coats of Koppers Company, Inc. Glamortex enamel (red). The Owner shall be furnished with two (2) hydrant barrel wrenches, four (4) spanner wrenches and two (2) operating nut wrenches.

H. Below ground hydrants shall be flush type with the upper barrel and nozzles contained in a cast iron box with a non locking lid.

I. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER

J. Hydrant assemblies shall include the isolation valve and both valve and hydrant shall have a UL/FM approved rating.

2.02 UNDERGROUND BLOW-OFF ASSEMBLY

A. Blow-off hydrants shall be of non-freezing, self-draining type, with an overall length of 30". Set underground in a 30" meter box, these hydrants will be furnished with a 2⅛ " Main Valve Opening inlet, a non-turning operating rod, 7/16 inch square operating nut, and shall open to the left. All of the working parts shall be of bronze-to-bronze design, and be serviceable from above grade with no digging. The outlet shall also be bronze and be 2-1/2" NST. Hydrants shall be lockable to prevent unauthorized use. *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

B. The Contractor shall furnish two (2) T-operating wrenches in the lengths necessary to operate the blow-off hydrants for an operator of average height in a normal working position.

2.03 BLOWOFF HYDRANT ASSEMBLY

A. 3-inch Hydrants shall be self-draining, non-freezing, compression type with 2⅛" main valve opening. Inlet connection shall be MJ. Outlet shall be 2" IP. Hydrants shall be post type *SEE SECTION 01600 MATERIAL AND EQUIPMENT* for APPROVED MANUFACTURER.

B. Hydrants shall have a ductile iron pipe riser with a cast iron stock top, and non-turning operating rod. Principal interior operating parts shall be brass and removable from the hydrant for servicing without excavating the hydrant.

C. Flushing assembly installation shall also include all excavation, backfill, thrust blocking, and #9 crushed stone.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Hydrants shall be located as shown on the drawings unless otherwise specified by the Owner. Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway and the cast-iron valve box set flush with the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. All hydrants shall be provided with a shut-off valve in the hydrant lateral as shown. All hydrants shall be installed in accordance with the manufacturer's directions and as detailed on the Contract Drawings.

B. Blow-off hydrants shall be located as shown on the drawings unless otherwise specified by the Utility. Each blow-off hydrant shall be connected to the main with at least as much cover as the distribution main. Blow-off hydrants shall be set plumb with nozzle facing the roadway and with the box cover set flush with the finished surrounding grade. The backfill around each hydrant shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. All blow-off hydrants shall be provided with a shut-off valve in the lateral as shown.

- END OF SECTION -

SECTION 02700

SITE RESTORATION

PART 1 - GENERAL

1.01 CLEAN-UP

Upon completion of the installation of the water main and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from his work. The Contractor shall grade the ground along each side of the pipe trench and/or structure in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

PART 2 - PRODUCTS

2.01 SEEDING

A. All graded areas shall be seeded at the rate of six (6) pounds of seed per 1,000 square feet. The mixture shall consist of:

Kentucky 31 Fescue	60%
Creeping Red Fescue	20%
Annual Rye Grass	20%

B. After seed has been distributed, the Contractor shall cover areas with straw to a depth of 1-1/2". Any necessary re-seeding or repairing shall be accomplished by the Contractor before final acceptance. Seeding is not a pay item.

PART 3 - EXECUTION

3.01 SITE RESTORATION

A. After installation of water lines, the construction site will be restored to its original condition or better. All paved streets, roads, sidewalks, curbs, etc. removed or disturbed during construction shall be replaced, and all materials and workmanship shall conform to standard practices and specifications of the Owner, and/or to the Kentucky Department of Highways requirements, and specifications, whichever applies. Gravel, cinder or dirt streets, drives and shoulders shall be replaced and sufficiently compacted to provide a surface suitable for carrying the type of traffic normally imposed at the location.

B. All seeded areas shall be watered daily during the germination period, unless rain supplies the required moisture. The Contractor shall replace, at his own expense, trees, shrubs, etc. disturbed during construction.

C. The Contractor shall remove from the site all equipment, unused materials and other items at his expense. The construction site shall be left in a neat, orderly condition, clear of all unsightly items, before the Work is finally accepted.

- END OF SECTION -

SECTION 02830

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and erect the chain link fence and gates as indicated on the drawings and as herein specified.

B. The chain link fence shall have a top rail and bottom tension wire.

C. The chain link fence materials and installation shall meet or exceed the standards of the Chain Link Fence Manufacturers Institute, New York, N.Y., except as otherwise specified in this section; also fence materials shall meet or exceed Fed. Spec. RR-F-191H/GEN for Fencing, Wire and Post Metal (and Gates, Chain Link Fence Fabric, and Accessories), and shall conform to the ASTM Standard Specifications hereinafter noted.

D. Fence framework, fabric, and accessories.

E. Excavation for post bases.

F. Concrete anchorage for posts.

G. Manual gates and related hardware.

1.02 RELATED WORK

Section 03310 - Structural Concrete.

1.03 REFERENCES

A. ANSI/ASTM A123 - Zinc (Hot Galvanized) Coatings of Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips.

B. ANSI/ASTM F567 - Installation of Chain Link Fence.

C. ASTM A120 - Pipe, Steel, Black and Hot-dipped Zinc-coated (Galvanized) Welded and Seamless, for Ordinary Uses.

D. ASTM C94 - Ready-mixed Concrete.

E. FS RR-F-191 - Fencing, Wire and Post, Metal, Type I or Type II.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in commercial quality chain link fencing with 2 years experience.

B. Installation: ANSI/ASTM F567.

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01300.

B. Include plan layout, grid, spacing of components, accessories, fittings, hardware, anchorages, and schedule of components.

C. Submit manufacturer's installation instructions under provisions of Section 01300.

D. Submit samples under provisions of Section 01300.

E. Submit the following samples illustrating each fence material and fabric finish.

1. A 2" length of each type of post.

2. A 2" length of each type of brace and railing.

3. A 2" length of framework for gates.

4. A 2" length of diagonal truss brace.

5. A 2" length of tension wire.

6. Each type of fitting used at terminal posts.

7. Fittings used at line posts.

8. Fittings for the gate leaf frame.

9. Gate hinge.

10. Gate latch.

11. Stretcher bar, 2" length.

12. Bolt and nut fastener.

13. Fence fabric, 2 weaves, 2 meshes long.

14. Tie.

F. Accompanying the samples, the Contractor shall submit two statements, one on his and one on his subcontractor's letterhead that the samples submitted comply with the requirements of these Contract Documents. Samples shall be submitted for review at least 30 days before fence erection.

PART 2 - PRODUCTS

2.01 MATERIALS

Framework: ASTM A120; Schedule 40 steel pipe, standard weight, one piece without joints.

2.02 CONCRETE MIX

A. Concrete: As specified in Section 03000.

B. Concrete: ASTM C94; Portland Cement; 2500 min. psi at 38 days; 3" slump/1" maximum sized aggregate.

2.03 MATERIALS

A. Type I metal fittings, posts, fence and gate framework, and all accessories shall be galvanized with a heavy coating of 1.8 oz. pure zinc spelter per sq. ft. of surface area to be coated using the hot-dip process. Type II shall be triple coated with 102 zinc, 15 MG of chromate and .3 mils cross link polyurethane.

B. All fabrication and welding shall be done before hot-dip galvanizing. All welding shall conform to the American Welding Society standards.

C. The chain link fence fabric shall be galvanized steel chain link fabric conforming to ASTM Standard Specification for Zinc-Coated Steel Chain Link Fence Fabric, Designation A392-74, with Class 2 zinc coating (2.0 oz. of zinc per sq. ft. of uncoated wire surface). The fabric shall be woven in 2" mesh from No. 9 gauge wire in a 6-foot width with barbed selvages top and bottom.

D. The barbed wire shall be galvanized steel barbed wire consisting of two strands of twisted No. 12 1/2-gage wires with 4-point barbs spaced 3" apart and conforming to ASTM Standard Specification of Zinc-Coated (Galvanized) Steel Barbed Wire, Designation A121-77, with Class 3 zinc coating (minimum of 0.80 oz. of zinc per sq. ft. of uncoated wire surface for No. 12 1/2-gauge wire).

E. The tension wire shall be No. 7-gauge coil spring steel wire with galvanized finish having minimum of 0.80 oz. of zinc coating per sq. ft. of uncoated wire surface.

F. Tie wires for fastening fence fabric to line posts and rails shall be not less than No. 6 gauge aluminum wire.

G. Line posts shall be 2-3/8" (2.375") outside diameter steel pipe weighing not less than 3.65 lb. per ft. for Type I or 3.117 lb. per ft. for Type II, or 1-7/8" high carbon steel H-beams weighing not less than 2.70 lb. per ft.

H. End, corner, and pull posts shall be 2-7/8" (2.875) outside diameter steel pipe weighing not less than 5.79 lb. per ft. for Type I or 4.64 lb. per ft. for Type II, or 2 1/2" square steel tube weighing not less than 5.14 lb. per ft., or 3 1/2" by 3 1/2 roll-formed, steel corner section weighing not less than 5.14 lb. per ft.

I. Gate posts for gate leaves up to and including 6 ft., wide shall be 2-7/8" outside diameter steel pipe weighing not less than 5.79 lb. per ft., or 2 1/2" square steel tube weighing not less than 5.14 lb. per ft., or 3 1/2" by 3 1/2" roll-formed, steel corner section weighing not less than 5.14 lb. per ft.

J. Gate posts for gate leaves over 6 ft. wide and up to an including 13 ft. wide shall be 4" outside diameter steel pipe weighing not less than 9.10 lb. per ft. for Type I or 3 1/2" Type II at 5.71 lb. per ft.

K. Top railings and railings for top, middle and bottom braces between terminal posts and adjacent line posts shall be 1-5/8" outside diameter steel pipe weighing not less than 2.27 lb. per ft., or 1-5/8" by 1 1/4", 14- gauge roll-form section.

L. Diagonal truss braces between terminal and adjacent line posts and for gate framework shall be 3/8" diameter steel rod.

M. Barbed wire support arms shall project outward from the top of the posts at 45 degrees and shall be capable of withstanding a 200 lb. downward pull on the outermost end of the arm, without failure. The arms shall have provision for the attachment of three strands of evenly spaced barbed wire. Arms shall be integral with post top weather caps having holes for the passage of the top rail at intermediate posts.

N. Fittings shall be heavy duty malleable iron or pressed steel of suitable size to produce strong construction.

O. Stretcher bars for attaching fabric to terminal posts such as end, corner, pull, or gate posts and gate frames shall be flat bars with minimum cross-section dimensions of not less than 1/4" by 3/4". The stretcher bars shall be the full height of the fabric and shall be secured with bar bands of not less than 11-gauge sheet steel, spaced approximately 15" on centers and bolted with 3/8" diameter bolts.

P. Gate leave framework shall be 1-7/8" outside diameter steel pipe weighing not less than 2.72 lb. per ft. for Type I or 2.28 lb. per ft. for Type II.

Q. If bolted or riveted corner fittings are not used, the gate frame shall be hot-dip galvanized after welding.

R. Gate hinges shall be of heavy pattern of adequate strength for the gate size, with large bearing surfaces for clamping or bolting in position.

S. The gates shall be provided with a suitable latch accessible from both sides and with provision for padlocking.

T. Double leaf swing gates shall have a center bolt, center stop, and automatic backstops to hold leaves in open position.

U. Gate padlocks shall have solid brass cases, hardened steel shackles, removable core cylinders, and galvanized steel chains attached to the shackle by a clevis. Padlocks shall be manufactured by Eaton Corp. Lock & Hardware Div., of Emhart Corp., Berlin, Conn.; Best Universal Lock Co., Inc., Indianapolis, Ind.; or be an acceptable equivalent product. The padlocks shall be furnished with two keys each.

2.04 FINISHES

A. Galvanized: ANSI/ASTM A120; 1.8 oz./sq. ft. coating.

B. Accessories: Same finish as framing and fabric.

PART 3 - EXECUTION

3.01 INSTALLATION - ERECTION OF CHAIN LINK FENCE

A. The fence and gates shall be erected by skilled mechanics.

B. Post spacing shall be uniform with maximum spacing of 10 ft. in fences erected along straight lines. All posts shall be placed plumb and centered in the concrete foundations.

C. Post foundations in earth shall be concrete cylinders with a minimum diameter of 12", crowned at grade to shed water, and shall not be less than 36" deep in the ground. Posts shall be set in the full depth of the foundations except for 6" of concrete under the posts.

D. If foundation holes are excavated in peat or other unstable soil, the Engineer shall be notified for determination of suitable construction precautions.

E. If solid ledge is encountered without overburden of soil, posts shall be set into the rock a minimum depth of 12" for line posts and 18" for terminal posts. Post holes shall be at least 1" greater in diameter than the post and the grout shall be thoroughly worked into the hole so as not to leave voids, and shall be crowned at the top to shed water. Where solid rock is covered by an overburden, the total setting depths shall not exceed the depths required for setting in earth, and the posts shall be grouted into the rock as described.

F. Any change in direction of the fence line of 30 degrees or more shall be considered corners. Pull posts shall be used at any abrupt change in grade.

G. Maximum area of unbraced fence shall not exceed 1,500 square feet.

H. Terminal posts shall be braced to adjacent posts with horizontal brace rails and diagonal truss rods brought to proper tension so that posts are plumb.

I. There shall be no loose connections or sloppy fits in the fence framework. The fence framework shall withstand all wind and other forces due to the weather.

J. Fabric shall be stretched taut and tied to posts, rails and tension wires with the bottom edge following the finished grade not more than 2" above the grade. The fabric shall be installed on the security side of the fence and shall be anchored to the framework so that the fabric remains in tension after pulling force is released. The fabric shall be attached to line posts with ties spaced at not more than 15" intervals and to rails and braces at not more than 24" intervals. The fabric shall be attached to the tension wire with hog ring ties on 24" centers.

K. Three strands of barbed wire shall be installed on each extension arm of the line fence and at the top of each gate. The wires shall be pulled taut and fastened at each support.

L. Gates shall be installed plumb, level, and secure for the full width of the opening and the hardware adjusted for smooth operation. Provide concrete center drop to foundation depth and drop rod retainers at center of double gate openings.

- END OF SECTION -

SECTION 02936

SEEDING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Preparation of subgrade to receive topsoil.

B. Spreading topsoil.

C. Seeding and fertilizing.

D. Seed protection on slopes.

E. Hydroseeding.

F. Maintaining seeded areas until acceptance.

1.02 RELATED WORK

Section 01450 - Quality Control.

1.03 QUALITY ASSURANCE

Test top soil under provisions of Section 01450.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, new weight, date of packaging and location of packaging. Damaged packages are not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.05 EXISTING CONDITIONS

Beginning work of this Section means acceptance of existing conditions.

PART 2 - PRODUCTS

2.01 GROWING MEDIA

A. Existing Topsoil: Natural, fertile agricultural soil capable of sustaining vigorous plant growth, not in frozen or muddy condition, containing not less than 6 percent organic matter, and corrected to pH value of 5.9 to 7.0. Free from subsoil, slag, clay, stones, lumps, live plants, roots, sticks, crabgrass, couchgrass, noxious weeds, and foreign matter.

B. Fertilizer: 10-10-10 commercial type with 50 percent of the elements derived from organic sources.

2.02 SEED

Seed shall be proportioned by weight as follows: Kentucky 31 Fescue, 60%; Creeping Red Fescue, 20%, Annual Rye Grass, 20%.

2.03 ACCESSORIES

A. Mulching Material: Straw from oat, wheat, rye or barley, reasonably free from seeds, foreign matter detrimental to plant life, and in dry condition.

B. Mulching Material: Wood or wood cellulose fiber free of growth or germination inhibiting ingredients.

C. Establishment Blanket: Uniform, open weave jute matting.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect existing underground improvements from damage.

B. Remove foreign materials, plants, roots, stones, and debris, from site. Do not bury foreign material.

C. Remove contaminated subsoil.

D. Cultivate to depth of 3 inches, area to receive topsoil. Repeat cultivation areas where equipment has compacted subgrade.

3.02 SPREADING TOPSOIL

A. Spread topsoil to depth of 6 inches over area to be seeded. Place during dry weather, and on dry unfrozen subgrade.

B. Cultivate topsoil to depth of 6 inches with mechanical tiller. Cultivate inaccessible areas by hand. Rake until surface is smooth.

C. Remove from site, foreign materials collected during cultivation.

D. Grade to eliminate rough spots and low areas where ponding may occur. Maintain smooth, uniform grade.

E. Assure positive drainage away from buildings.

F. Finish ground level firm and sufficient to prevent sinkage pockets when irrigation is applied.

3.03 FERTILIZING

A. Apply fertilizer, at a rate of 15 lbs. per 1,000 sq. ft.

B. Do not apply grass seed and fertilizer at same time in same machine.

C. Lightly water to aid breakdown of fertilizer and to provide moist soil for seed.

3.04 SEED

A. Apply seed at a rate of 6 lbs. per 1,000 sq. ft. evenly in two intersecting directions. Rake in lightly.

B. Do not sow immediately following rain, when ground is too dry, or during windy periods.

C. Roll seeded area with roller not exceeding 112 lbs.

D. Apply water with fine spray immediately after each area has been sown.

E. Seed shall be sown from March 15 to April 15 or from August 25 to September 25.

3.05 HYDROSEEDING

A. Apply slurry at rate of 6 lbs., per 1,000 sq. ft. evenly in two intersecting direction and with hydraulic seeder.

B. Immediately following hydroseeding, mulch areas by means of mulch blower at rate of 1,200 pounds per acre on level grades, 2,000 lbs. on slopes.

C. Do not seed area in excess of that which can be mulched on the same day.

3.06 SEED PROTECTION ON SLOPES

A. Cover seeded slopes where grade is 3:1 or greater with jute matting. Roll matting down over slopes without stretching or pulling.

B. Lay matting smoothly on soil surface, boring top end of each section in narrow 6-inch trench. Leave 12-inch overlap from top roll over bottom roll. Leave 4-inch overlap over adjacent section.

C. Staple outside edges and overlaps at 36-inch intervals.

D. Lightly dress slopes with topsoil to ensure close contact between matting and soil.

E. In ditches, unroll matting in direction of flow. Overlap ends of strips 6 inches with upstream section on top.

3.07 MAINTENANCE PERIOD

Maintenance Period: Until final acceptance.

3.08 MAINTENANCE

A. Maintain surfaces and supply additional topsoil where necessary, including areas affected by erosion.

B. Water to ensure uniform seed germination and to keep surface of soil damp.

C. Apply water slowly so that surface of soil will not puddle and crust.

D. Cut grass first time when it reaches height of 2-1/2 inches (60 mm) and maintain to minimum height of 2 inches. Do not cut more than 1/3 of blade at any one mowing. Remove clippings.

E. After first mowing, water grass sufficiently to moisten soil from 3 inches to 5 inches (76 to 127 mm) deep.

F. Apply approved weed killer when weeds start developing during calm weather when air temperature is above 50 degrees F.

G. Replant damaged grass areas showing root growth failure, deterioration, bare or thin spots, and eroded areas.

3.09 RESTORATION

Restore grassed areas damaged during execution of work of this Section.

3.10 ACCEPTANCE

Seeded areas will be accepted at end of maintenance period when seeded areas are properly established and otherwise acceptable.

- END OF SECTION -