STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov
P.O. Box 176, Jefferson City, MO 65102
573/751-5331

CI
Monett, MO
Review No. 53889-06
PWS ID# MO 5010537

June 29, 2006

Mr. Peter Rauch, General Manager
City of Monett
P.O. Box 110
Monett, Missouri 65708

Dear Mr. Rauch:

We have completed our review of the standard specifications for waterline distribution system extensions for the City of Monett, Missouri. These specifications generally comply with our design standards for waterline construction. You may consider this letter an approval for the proposed standard specifications. The specifications will be filed and will be used for future reference of water distribution system construction.

Sincerely,

WATER PROTECTION PROGRAM

Breck E. Summerford, P.E., Chief
Public Drinking Water Infrastructure
Permits and Engineering Section

BES:rme

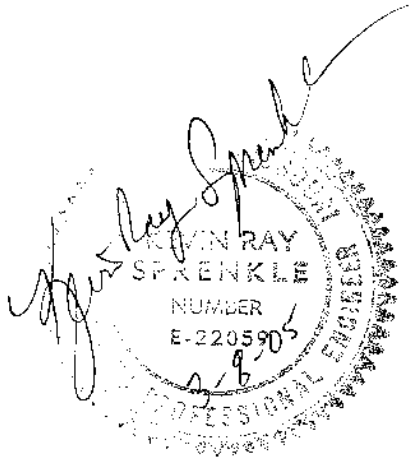
Enclosure

c: Sprenkle and Associates, Inc.
Southwest Regional Office

STANDARD SPECIFICATIONS
FOR
WATER MAIN CONSTRUCTION

Presented by

The City of Monett
Monett, Missouri



Prepared by

Sprenkle and Associates, Inc.
CONSULTING ENGINEERS & SURVEYORS

218 5th Street, Monett, Missouri
1745 South Garrison, Carthage, Missouri

January 2005

INDEX

WATER LINES

STRUCTURE EXCAVATION02220

1. GENERAL

1.1 Description: The work in this section consists of excavation, filling, compacting, and satisfactory disposal of all materials within the limits of the work required to complete structures in conformity with the dimensions as shown on the drawings and with established elevations and contours. there will be no distinction made between wet or dry materials below the surface of the earth. Structure excavation shall be considered as unclassified, which shall consist of all materials of whatever character encountered in the work, including soil, solid rock, fragmented rock, water, or other.

2. COMMON EXCAVATION

2.1 Excavation: The Contractor shall excavate to the lines, grades, and elevations shown on the drawings all materials within the work area and place and/or dispose of the excavated materials as specified herein, as called for on the drawings or as directed by the Owner.

2.1.1 Foundations: All footings shall be founded on firm undisturbed soil or fill concrete.

2.1.2 Slabs on Grade: Where the drawings show compacted granular backfill under basement slabs or other slabs on grade, the excavation shall be carried deep enough to permit the minimum thickness of compacted granular material to be placed.

2.1.3 Over-Excavation: In no case shall any footings be founded above those elevations shown on the drawings. If soft or unsuitable soil is encountered at elevations where footings are to be founded, the excavation shall be taken through unsuitable material and brought back up to grade with fill concrete. Contractor shall notify the Owner when such conditions are encountered and prior to over-excavation of the unsuitable material, in order to be compensated. Compensation for the extra work shall be negotiated by the Owner and Contractor. Excavations carried below depths shown on the drawings, without prior notification being given the Owner, shall be brought to grade with fill concrete at the Contractor's expense.

2.2 Side Forms: Unless the utilization of earth as a side form for footings is requested by the contractor in writing and approved by the Owner, side forms shall be required for all footings, grade beams, walls, and base slabs below grade. The excavation shall be large enough to allow for installation and removal of forms. In the cases where earth side forms are allowed, additional concrete thickness shall be utilized as directed by the Owner.

2.3 Excavation Bottom: Special care shall be taken to prevent disturbance of the bottom of excavations where the soil is to provide bearing for slabs, footings, etc. If surface water or other conditions which may decrease the bearing capacity of the foundation subgrade are present, then soil adequate to protect the foundation subgrade shall not be excavated until just before reinforcing steel and concrete are to be placed. The bottom of all excavations shall be inspected and approved by the Owner before the placement of any granular material, reinforcing steel, or concrete.

2.4 Borrow Excavation: When required, borrow excavation shall be the responsibility of the Contractor.

2.4.1 Borrow Characteristics: The soil to be utilized in construction of the earthen fill or backfill shall be an inorganic, low-plasticity clay containing from a trace to thirty percent chert fragments, and generally containing rocks no larger than 4-inches in its largest dimension.

2.5 Removal of Water: The Contractor shall at all times during the construction of the work provide and maintain ample equipment to remove and dispose of all water entering the excavations or other parts of the work, and keep said excavations dry until the structures to be built therein are completed. No reinforcing steel shall be placed in water, and no water shall be allowed to rise over any reinforcing steel

before the concrete has been placed. No water shall be allowed to come in contact with any concrete within 24 hours after placing unless specifically required by the drawings, or specified herein. The Contractor shall be held responsible for the conditions of any sewers, drains, or other conduits, or pipelines which may be used for drainage purposes, and such pipes or conduits shall be clean and free from all sediment before acceptance by the Owner.

2.6 Sheeting, Shoring, or Bracing: Sheeting, shoring, or bracing shall be placed by the Contractor wherever necessary for the proper preservation of any excavation, embankment, or structure. Where the ground is of such a character or other conditions are such as to render it necessary, the sheeting shall be closely driven and shall be to such depth below the lowest point of the final excavation as may be directed. The Contractor shall be held responsible for the sufficiency of all sheeting and bracing used, and for any and all persons injured or property damaged as the result of improper quality, strength, placement, maintenance, or removal of the same. No extra compensation will be made for his own expense, shore up, protect, and insure from injury all buildings, retaining fences, curbs, trees, or other property liable to be injured during the process of the work, and he will be held responsible for all damage which may occur by reason of prosecution of the work. Sheeting, shoring, and bracing shall be provided, installed, and maintained to protect the excavation and insure the safety of workman and shall be as required by applicable federal, state, and local laws, rules, and regulations.

3. BACKFILL AND COMPACTION

3.1 Cuts: When required on the drawings, the soil below grade in cut sections shall be scarified, broken up, adjusted to a moisture content within the designated moisture range and compacted to 95% maximum density as determined by Section 02250 - COMPACTION CONTROL AND TESTING. When the depth of compaction in cut sections is shown on the drawings to be more than six inches, all material shall be removed to within six inches of the lower limit of the compaction. The layer of material left in place shall be scarified, broken up, adjusted to a moisture content within the designated moisture range, and compacted to 95% maximum density as determined by Section 02250 - COMPACTION CONTROL AND TESTING. This process shall be repeated until the cut section has been compacted to the grade shown on the drawings. Compaction of low plasticity or non-plastic fine grained materials shall be considered adequate when additional passes of the roller do not bring the tamping feet closer to the surface of the lift, provided the entire weight of the roller is supported on the tamping feet and none by material directly in contact with the drum. Sand and gravel which cannot be compacted satisfactorily with a sheepsfoot roller shall be rolled with a pneumatic-tired roller or other approved types. Each lift shall be rolled until no further consolidation is visually evident.

3.2 Around and Beneath Structures - General:

3.2.1 Prior to placing fill material, all topsoil and soft material shall be removed to a depth necessary to establish good bearing of the fill material. The surface of the ground shall be scarified to a depth of six inches and the moisture content of the loosened material shall be such that it will readily bond with the first layer of fill material.

3.2.2 When the drawings require the placement of fill beneath a proposed structure, the floor or footing subgrade shall be made with finely divided material sufficiently moist to compact readily when tamped. Fine grained material used as backfill shall be placed in six-inch compacted lifts and compacted to 95% maximum density as determined by Section in eight-inch lifts (compacted) and compacted to 100% of the maximum density as determined by Section 02250 - COMPACTION CONTROL AND TESTING.

3.2.3 Fill around and between structures shall be constructed, to as great an extent as possible, with earth obtained from the excavations for structures. The fill shall be compacted to Range "C" requirements as determined by Section 02250 - COMPACTION CONTROL AND TESTING.

TRENCHING, BACKFILLING, AND COMPACTING ..... .02221

1. GENERAL

1.1 Description: The work of this section consists of excavation for trenches relating to the construction of underground piping. There will be no distinction made in any definition or classification of excavation covered by this section between wet or dry materials below the surface of the earth. Trench excavation shall be considered as unclassified, which shall consist of all materials of whatever character encountered in the work, including soil, solid rock, fragmented rock, water, or other. Work under this section shall also include:

1.1.1 All sheeting, shoring, bracing, protection of adjacent property, preparation of all subgrades, storage of excavated materials, backfilling, tamping, grading, and surfacing.

1.1.2 Diversion of surface water, and all pumping, draining, or other means of dewatering excavations.

1.1.3 All subsequent handling and disposal of excavated material, together with the preparation of all trench subgrade.

1.2 Protection of Adjacent Property: The Contractor shall protect all excavations and trenches from settlement or displacement by approved means of bracing and shoring. All existing underground utilities and structures as well as all surface improvements and structures shall be protected and their functional purpose preserved.

2. CLASSIFICATION OF EXCAVATION

2.1 All excavation shall be considered as unclassified.

3. TRENCHING

3.1 Lines and Grades: The Contractor shall furnish and set all stakes for the lines and grades as shown on the drawings including all grade boards, uprights, and accessory materials required. Grade boards shall be installed across the trench at t intervals not to exceed 25 feet. The Contractor shall be held responsible for verification of lines and grades as established and shown on the drawings. The Owner may check the line and grade at any given point before backfilling has been started, and if there is a variation of more than two-hundredths (0.02) of a foot from the true grade, the same shall be raised or lowered as required.

3.1.1 In the event a laser beam is used to set line and grade for the pipe laying operation, grade stakes shall be set at each manhole and at 25 feet, 50 feet, 100 feet, and then 100-foot increments thereafter, upgrade of the manhole. The laser must be checked at the beginning of each day and at each grade stake to insure the proper line and grade of the pipe.

3.2 Excavation: All excavation for trenches shall be made with a sufficient working space to permit the placement, inspection, and completion of all work contemplated in the contract. Excavated material that is unsuitable for backfill, and all boulders exposed by grading shall be removed from the work area. Trenches shall be excavated in accordance with the drawings for trench width relative to trench depths.

3.2.1 Trenches shall be excavated to six inches below the bottom of the pipe when set to established flow lines. Should the trench be excavated more than six inches below the bottom of the pipe, the Contractor shall use only granular stone bedding material to establish flow line grade.

3.2.2 Trench excavation shall, in all cases, be made continuous from the ground surface to the established trench depth. Materials excavated shall be stockpiled at the sides of the trench and within established area limits so as to minimize inconvenience to the public, and damage to vegetation and structures in the area.

3.2.3 Trenching, shoring, bracing, and shields shall be placed by the Contractor whenever necessary for the proper preservation of any excavation, embankment, or structure. Where the ground is of such a character or other conditions are such as to render it necessary, the sheeting shall be closely driven and to such depth below the lowest point of the final excavation as may be directed. The Contractor shall be held responsible for the sufficiency of all sheeting and bracing used, and for any and all persons injured, or property damaged as the result of improper quality, strength, placement, maintenance, or removal of the same. No extra compensation will be made for sheeting and bracing, whether left in place or not. The Contractor shall, at his own expense, shore up, protect, and insure from injury all building, retaining walls, piers, and footing, storm sewers, sanitary sewers, gas lines, water lines, fences, curbs, trees, or other property liable to be injured during the process of the work, and he will be held responsible for all damage which may occur by reason of prosecution of the work. Sheeting, shoring, and bracing shall be provided, installed, and maintained to protect the excavation, insure the safety of workmen, and as required by applicable federal, state, and local laws, rules, and regulations.

3.2.4 Trench width from six inches below the bottom the pipe to six inches above the pipe bell shall be held to 1.4 times the outside diameter of the pipe plus twelve inches. Trench width above these levels may be wider to accommodate shoring, bracing, and shields, but shall be kept within practical limits. Contractor shall not receive additional payment for extra trench width.

3.3 Removal of Water: The Contractor shall furnish and operate sufficient pumps and appliances, and shall provide all material, labor, etc. required to prevent interference with any work by water, ice, or snow. Damage of any kind resulting from insufficient pumping facilities or similar lack of proper conduct of the work shall be made good by the Contractor at his own expense. No structure and pipes shall be placed in water and water shall not be allowed to run into or cover any concrete work or pipe, or into or through any pipe, unless by special permission given by the Owner in writing.

3.4 Record Drawings: Even though all excavation shall be considered unclassified for pay purposes, the Contractor shall clearly indicated on the Record Drawings (which he shall submit to the Owner) the elevations and extent of all solid rock encountered during construction of the project.

4. BACKFILLING AND COMPACTING

4.1 Material used for backfilling of trenches shall be free from perishable matter and from other material liable to become unstable when saturated with water after having been compacted. No frozen material shall be used in backfill. No large stones or organic matter shall be placed within two feet of the top of the water main. Care shall be taken to prevent damage to the pipe and structures. Special precautions shall be taken in backfilling over pipes. No backfill shall be placed over any portion of pipes and/or joints not inspected by the Owner. The select material or granular stone bedding material shall be brought to a depth of at least six inches over the top of the pipe bell, with this material carefully deposited in uniform layers not exceeding six inches in depth, and each layer carefully and solidly tamped with mechanical tampers in such a manner as to avoid damage to pipe or disturbing completed work. Unless noted otherwise on the drawings, backfilling for the remainder of the trench shall be previously excavated gravel, sand, or earth, and shall contain no stone over three inches in its largest dimensions. Stones smaller than that size may be used in proportion not exceeding one part of stone and three parts of earth in any place. This backfilling shall be deposited and spread in layers and solidly tamped. As the trenches are backfilled, the Contractor shall remove all surplus material and regrade the surface leaving it in good order. The trenches shall be filled to the ground surface elevation which previously existed, unless shown otherwise on the drawings.

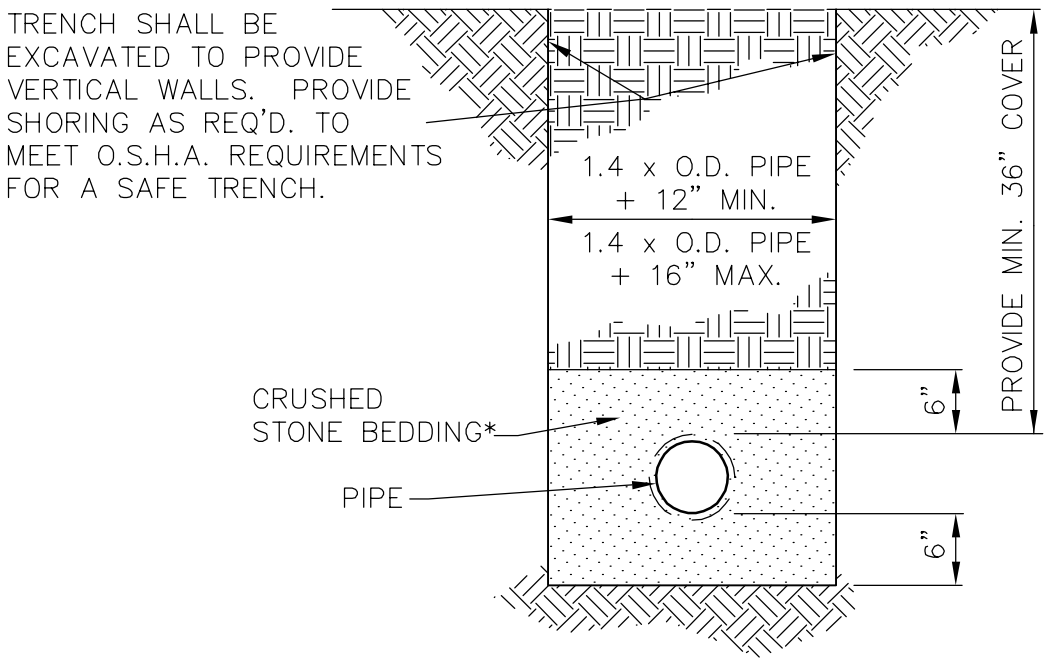
4.1.1 The Contractor may be required to settle certain backfill material with water, in addition to other backfilling procedures. The water will be furnished by the Contractor without cost to the Owner. Methods and procedures in using the water shall be approved by the Owner prior to carrying out the operation.

4.1.2 Whenever, in the opinion of the Owner, the excavated material is not suitable for backfilling the trench, or there is a deficiency of material, the Contractor shall, as his own expense, provide suitable material.

4.1.3 All excess excavation materials shall be cleaned up by the Contractor as directed. All backfilled trenches shall be maintained by the Contractor for a period of one year after Final Acceptance of the work by the Owner.

4.2 Roadway Crossings: At all open-cut roadway crossing, and as noted elsewhere, the trench shall be backfilled to grade with granular stone meeting the requirements of Section 0222 - GRANULAR STONE BEDDING AND BACKFILL. For roadway surface replacement, see Section 02575 - ROADWAY SURFACE REPLACEMENT.

4.3 Private Drives, Field Entrances, etc.: At all open-cut crossings of private drives, field entrances, and the like, the trench backfill shall be deposited and spread in layers and solidly tamped to Range "B" compaction requirements set forth in Section 02250 - COMPACTION CONTROL AND TESTING. Private drives, etc. shall be backfilled "immediately" upon completion of the pipe laying across the drive. The driving surface shall be restored to its original condition immediately following proper compaction of the backfill.



*NOTE: NOT REQUIRED WITH D.I.P. UNLESS SOLID ROCK

City of Monett, MO
Std. Spec. WATERLINE TRENCH & BEDDING

GRANULAR STONE BEDDING AND BACKFILL..... 02222

1. GENERAL

1.1 Description: The work of this section shall consist of furnishing, hauling, placing, and compacting select material or granular stone for bedding underground utility piping, and for granular stone backfill along streets, at street crossings and other locations shown on the drawings.

2. MATERIALS

2.1 Pipe Bedding: Aggregate shall be well-graded crushed stone conforming to ASTM Designation C33, Gradation 67, 1-inch to No. 8 as follows. Sand or chat may be allowed.

Laboratory Sieve	Amounts Finer than Weight %
1"	100
3/4"	90 - 100
3/8"	20 - 55
No. 4	0 - 10
No. 8	0 – 5

2.2 Select Material Bedding: Select material bedding consisting of native soil excavated from the trench, free of rocks, foreign material and frozen earth may be utilized for pipe bedding in areas outside of the street pavement and curb and guttering. The select material bedding shall be performed in accordance with AWWA C150, Type 3, Standard laying Conditions, or as approved by the city.

2.3 Pipe Backfill: When granular stone backfill is required, the aggregate shall be identical to the pipe bedding material specified in paragraph 2.1.

3. EXECUTION

3.1 Pipe Bedding: Granular stone bedding shall be utilized for all street crossings. Granular stone shall be placed in the trench and shaped so as to provide uniform support for the bottom quadrant of the pipe barrel. The bedding shall be not less than six (6) inches in thickness. Following the placement of the pipe, the trench shall be filled with granular stone bedding material to a minimum compacted depth of six (6) inches above the pipe bell. Bedding installation in trench shall be to the widths and depths as shown on the drawings.

3.2 Pipe Backfill: When granular stone backfill is required, it shall be of the specified graduation and shall be placed in the trench in maximum 24-inch thick layers and compacted to 80% of maximum density.

GRANULAR STONE BASE 02223

1. GENERAL

1.1 The work shall consist of furnishing and placing one or more courses of aggregate on a prepared subgrade as a part of roadway surface replacement in accordance with these specifications and in conformity with the lines, grades, thicknesses, and typical details shown on the plans.

2. MATERIALS

2.1 Granular Stone Base: Crushed stone shall conform to material specified as Type 1 aggregate by the Missouri Highway Department and produced by an approved source. Aggregate shall be mechanically crushed limestone or dolomite, graded to the following gradation ranges:

Amount by Weight Passing On:

1 Inch Sieve	100%
1/2 Inch Sieve	60-90%
No. 4	40-60%
No. 40	15-35%

Plasticity Index, not greater than 6 for material passing No. 40 sieve.

Material shall be delivered with sufficient moisture content to provide specified densities when compacted.

3. METHODS

3.1 Subgrade: All work on that portion of the subgrade on which the base is to be constructed shall be completed in accordance with the requirements of these specifications prior to the placing of any base material on that portion. Aggregate base shall not be placed on a frozen subgrade.

3.2 Placing: The maximum compacted thickness of any one layer shall not exceed six (6) inches. When the specified compacted depth of the base course exceeds six (6) inches, the base shall be constructed in two or more layers of approximately equal thickness. The compacted depth of a single layer of the base course may be increased to eight (8) inches for shoulders and lightly traveled areas. Preliminary compaction shall be performed by means of pneumatic-tired rollers. After preliminary compaction has been secured, finish compaction shall be carried to completion by means of self-propelled steel-wheeled rollers weighing not less than ten (10) tons. Shaping and compacting shall be carried on until a true, even, uniform base course of proper grade, cross section and density is obtained. Proper moisture content shall be maintained by wetting the surface or allowing it to dry as required during shaping and compacting operations. The use of excess water, resulting in run-off or in the formation of a slurry on the surface shall be avoided. The stone base shall be compacted to not less than ninety-five (95%) percent of the maximum density at optimum moisture content.

3.3 Testing: The compacted base shall be tested as outlined in Section 02250 - COMPACTION CONTROL AND TESTING.

EXPLOSIVES 02225

1. GENERAL

1.1 Description: The work in this section consists of undertaking all phases of work which relate to explosives and blasting, including, but not necessarily limited to, receiving, handling, transporting, storing, distributing, priming, loading, firing, and disposal of explosives. The Contractor shall exercise the utmost care at all times not to endanger life or property.

1.2 Legal Requirement: The Contractor shall comply with all applicable Federal, State and local laws and regulations pertaining to the use, storage, and handling of explosives, and shall secure all required permits for their use. It is the intent of these specifications to comply with all such laws and regulations. In the event of inconsistencies between these specifications and the laws and regulations, the laws and regulations take precedence.

1.3 Personnel: One competent, experienced person shall be specifically designated as being in charge of explosives at all times. The designated person shall be required to present certification to the Owner that he has successfully completed a course in the handling and use of explosives, given by an accredited institution such as the U.S. Bureau of Mines, DuPont or other explosive manufacturing company. He shall exercise careful supervision of all work related to the use, storage, and handling of explosives. Only an absolute minimum number of competent, experienced men, consistent with efficient operation, shall be permitted to handle explosives. Anyone exhibiting carelessness, incompetence, or inexperience shall be immediately excluded from further handling of explosives.

2. EXECUTION

2.1 Protection of Site: The Contractor shall make proper use of blasting mats and other protective devices and shall adopt whatever additional precautions are deemed necessary to prevent damage to trees, shrubs and other landscape features, as well as to buildings, utilities, monuments, and other structures. All materials lifted by the blasting shall be confined within the limits of the trench or other excavation. Every reasonable effort shall be made to prevent injury to life and damage to the natural and the constructed surroundings. The Contractor shall take special precautions to prevent damage to surface structures, water supply mains, sewers, storm drains, other buried structures, and the basin dikes and basin floor. In the event that damage does occur, the contractor shall be responsible for restoring the damaged property to a condition at least as good as before the damage was incurred or shall make a damage payment to the Owner equal to the cost of restoration.

2.2 General Requirements: The Contractor shall at all times be bound by the National Fire Protection Association Code No. 495, Code for the Manufacture, Transportation, Storage, and Use of Explosives and Blasting Agents (latest edition), except when this code is in conflict with existing Federal, State, and local laws and regulations. If there is conflict between the code and the laws and regulations, the most stringent requirement among them shall take precedence over the others. Safety rules, safeguards, and recommendations contained in the Manual of Accident Prevention in Construction (latest edition) of the Associated General Contractors of America shall supplement the above codes and existing laws and regulations. The Contractor shall give special attention to the following specific rules:

2.2.1 Magazines shall be located in accordance with the American Table of Distances for Storage of Explosives.

2.2.2 Magazines shall be bulletproof, fireproof, burglarproof, weather-resistant, and constructed with adequate screened ventilation and dry wooden floors. All nails exposed to the interior of magazines shall be well countersunk. Magazines shall be of such physical weight to preclude movement without heavy equipment (frontend loader, etc.). Magazines shall not be provided with artificial heat or lights, and shall be kept securely locked.

2.2.3 Detonators shall not be stored with other explosives but shall be stored in separate magazines.

2.2.4 Magazines and roads to them shall be clearly marked with appropriate caution and danger signs arranged to minimize the possibility of a bullet hitting the magazine should the signs be shot at by vandals.

2.2.5 The blast area shall be cleared of all unnecessary personnel and equipment prior to the delivery of any explosives to the site.

2.2.6 No more than one day's supply of explosives shall be kept at or near the work site and these explosives shall be kept in approved portable magazines.

2.2.7 Wooden tamping bars only shall be used for charging explosives into drill holes.

2.2.8 Electricity from light or power circuits shall not be used for firing shots unless the electrical connection to the circuit is made within an enclosed switch box which shall be kept securely locked with switch in open position.

2.2.9 A positive warning system shall be provided to give adequate warning in every direction immediately prior to the firing of explosives. The Contractor shall advise the Owner in advance of any detonating of charges. All access points to the blast area shall be guarded by responsible employees of the Contractor, stationed to halt personnel and vehicles a safe distance from the blast. Intercommunication between guards and the person firing the blast shall be maintained to determine that the danger area is positively clear prior to firing.

2.2.10 The contractor shall also provide special signs or signals at all access points. Signs shall include a warning to turn off radio transmitters whenever electric detonators are used.

2.2.11 A properly sized "Hell Box" shall be used for electrically detonated shots. The use of equipment starting batteries is prohibited.

2.3 Removal of Materials: After a blast is fired, the Contractor shall cause the excavation to be thoroughly scaled and all loose and shattered rock or other loose material which may be dangerous to workmen, pipes, or structures shall be removed and the excavation made safe before proceeding with the work. The fact that the removal of loose or shattered rock or other loose material may enlarge the excavation beyond the required limits shall not relieve the Contractor from the necessity for making such removal. All excavated rock which cannot be removed similar to earth shall be kept separate from other excavated materials and shall not be mixed with other backfill material except as directed by the Owner.

2.4 Insurance: An insurance certificate covering blasting shall be furnished to the Owner by the Contractor or subcontractors, before any blasting is performed.

2.5 Seismograph: If any question arises as to the effect of blasting on adjacent utilities, structures, etc., the Contractor shall be responsible for providing a seismograph to record the shock resulting from blasting activities.

COMPACTION CONTROL AND TESTING 02250

1. GENERAL

1.1 Description: The work of this section shall consist of furnishing all equipment, labor, materials, and incidentals to compact the various backfills. The Contractor shall be responsible for providing all necessary on-site testing facilities and equipment.

2. EXECUTION

2.1 Maximum Density: The maximum density of the fill material shall be determined according to ASTM D698, "Standard Proctor Method". If more than one type of fill material is used, the maximum density for each type shall be determined. Determination of the maximum densities shall be the Contractor's responsibility. The Owner shall be provided with one copy of each maximum density test result, which shall include the maximum density and the optimum moisture content.

2.2 Compaction Operations: See Section 02221 - TRENCHING, BACKFILLING, AND COMPACTING.

2.3 Compaction Requirements: Compaction requirements for soils as controlled by methods of testing described herein shall be as follows:

Range A -In-place compacted density of soil shall be equal to or greater than one hundred (100) percent of maximum density at optimum moisture content.

Range B -In-place compacted density shall be equal to or greater than ninety (90) percent of the maximum density at optimum moisture content.

Range C -In-place compacted density shall be equal to or greater than eighty (80) percent of the maximum density at optimum moisture content.

Density range shall be Range B or as stated on the drawings. Compaction requirements for granular stone or sand, as controlled by methods of testing described herein, shall be to a density of not less that eight (80) percent of maximum density.

2.4 Moisture Content Requirements: The moisture content requirements as determined under the methods of testing described herein shall be as follows:

The moisture content of the soil at the time of compaction shall be uniform and shall be not higher than five (5) percentage points above the optimum nor lower than the optimum of the soil involved.

2.5 Moisture Content Control:

2.5.1 Water Application: The moisture content of the soil at the time of compaction shall be within the moisture range designated. When the natural moisture content of the embankment soil does not fall within the required moisture range, water shall be added or the material shall be aerated, whichever is needed to adjust the soil to the proper moisture content. Water may be transported or distributed from calibrated tank truck or the water may be added to the soil in the borrow and cut areas before hauling, as long as the moisture content of the soil at the time of compaction is uniform and within the designated moisture range.

2.5.2 Visual Control: From other than the results of the moisture content test, the moisture content of the soil being compacted shall be considered as being too high to insure compaction when, after repeated rollings with the sheepsfoot roller, the roller continues to pick up excessive amounts of soil and refuses to "build up" so that the tamping feet eventually ride on the compacted surface.

3. SOIL TESTING

3.1 Scope of Tests:

3.1.1 Borrow Areas: All areas selected to supply backfill and area fill materials requiring a specified compaction shall have moisture-density relationships determined by ASTM D698, latest revision, when the soil is initially excavated. In place density of compacted soil shall be tested in accordance with ASTM D2167, latest revision, to determine compliance with specifications. Specific testing locations will be determined by the Owner.

3.1.2 Granular Stone and Sand: Granular stone and sand shall have moisture-density relationships determined by ASTM D2049, latest revision. In place density shall be determined by ASTM D2167 OR ASTM D1556, latest revision.

3.1.3 Compacted Soil Sub-Base Supporting Concrete, Steel, or Masonry Structures: The number of density tests shall be a minimum of three per structure, or two per 100 ft2 of area for each two lifts of fill. In place density shall be as determined by ASTM D2167, latest revision.

3.1.4 Compacted Soil Sub-Base Supporting Rigid and Flexible Pavements and Crushed Stone Surfacing: The number of density tests shall be a minimum of three, or two per 300 S.Y. of area and for each 12 inches of fill, whichever is greatest.

3.1.5 Compacted Granular Stone or Sand Supporting Concrete, Steel, Masonry Structures, Rigid and Flexible Pavements: The number of density tests shall be a minimum of three per structure, or two per 300 S.Y. of area.

3.1.6 Compacted Trench Backfill over Granular Base: The Owner shall reserve the right to conduct density testing at a rate of one test per 100 L.F. of trench for each two lifts of fill. Density tests shall be performed as specified by ASTM D2167, latest revision. The costs of the initial density testing shall be borne by the Owner. Any retesting which is required as a result of a failure of the compacted backfill to meet the specified compaction requirements shall be paid for by the Contractor. Any area which fails to meet the specified compaction requirements shall be recompacted and retested until it meets the specified requirements.

FINISH GRADING 02260

1. GENERAL

1.1 Description: The work of this section consists of bringing to finish grade all areas on the site and furnishing all labor, materials, tools, and equipment necessary to complete this section.

2. EXECUTION

2.1 The Contractor shall grade the earth as indicated on the drawings.

2.2 In those areas noted on the drawings to receive seeding and mulching, the top six inches of all excavated areas shall consist of topsoil. Topsoil shall not be placed until the area has been shaped, trimmed, and smoothed, and, if the existing surface has become hardened or crusted, it shall be disked or raked so as to provide a bond with the layer of topsoil. The surface of the topsoil shall be free from lumps, clods, rocks, and shall conform to the lines and grades shown on the drawings.

2.3 Areas within the construction limits, regardless of whether or not they are to be seeded and mulched, shall be graded smooth and left with a neat and sightly appearance. The final grade around all structures shall be pitched to drain water away from the structures, and toward the roadside ditches, and natural drainageway. The finished grade shall be free of any and all projections which could interfere with mowing of the site.

PIPE BORING AND JACKING 02300

1. GENERAL

1.1 Description: The work defined by this section consists of furnishing all labor, equipment, tools, supervision, and materials for underground excavation. Materials excavated are unclassified and shall have no differentiation made for earth, rock, solid rock, sand, water, or other materials encountered.

2. MATERIALS

2.1 Welded Steel Encasement Pipe: Shall be smooth wall, welded steel pipe with a minimum wall thickness as specified in American Petroleum Institute Code No. 1102. The provision of this code is listed as follows:

Nominal Diameter	Nominal Wall Thickness (Uncoated)
Under 12-3/4"	0.188" Min.
12-3/4"	0.282" Min.
14" and 16"	0.313" Min.
18"	0.344" Min.
20"	0.375" Min.
22"	0.407" Min.
24" and 26"	0.438" Min.
28"	0.469" Min.
30"	0.501" Min.
32" and 34"	0.563" Min.
36", 38" and 40"	0.626" Min.
42"	0.688" Min.

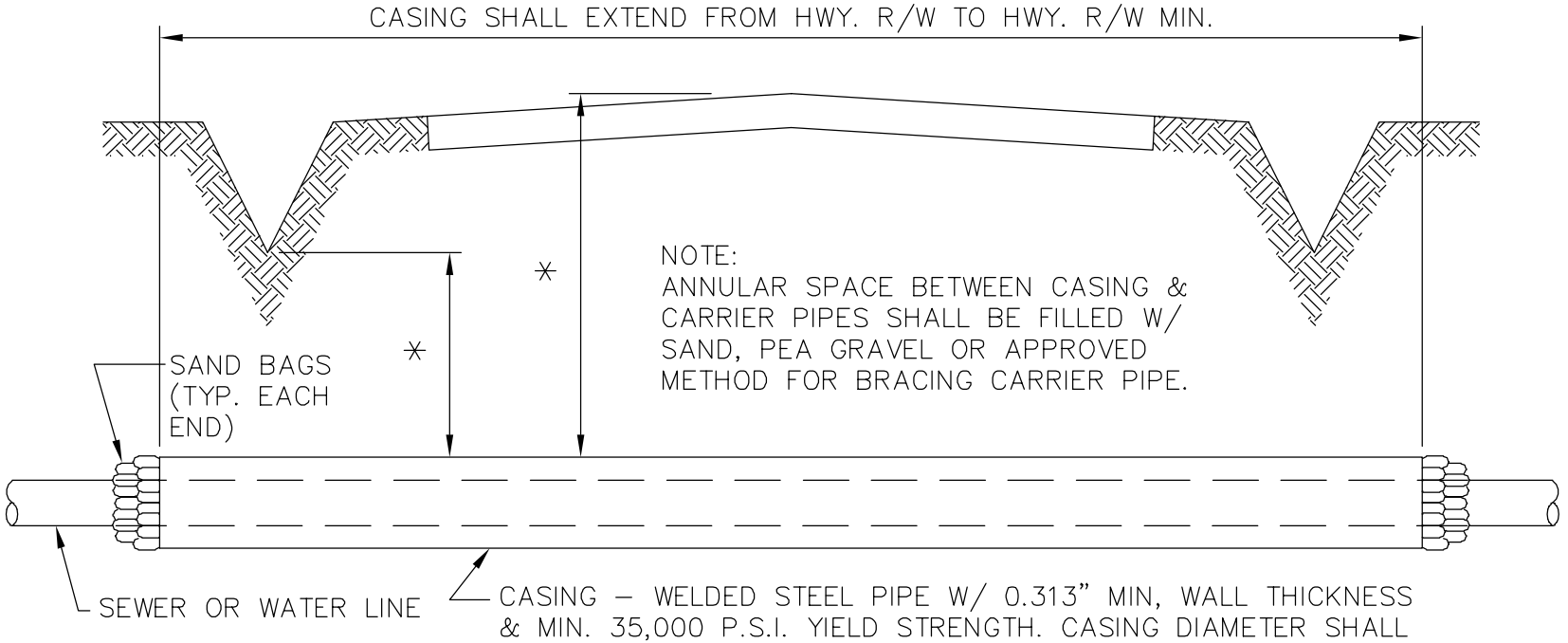
3. EXECUTION

3.1 Where designated on the plans, the Contractor shall carry out underground excavation for installation of pipe. Underground excavation shall be accomplished by tunneling, boring, or jacking methods. Each method shall provide for removal of earth and rock coinciding with the installation of a primary liner or encasement pipe. Where jacking or tunneling is utilized, the annular space between the casing and earth shall be pressure grouted with sand cement grout.

The Contractor shall insure that traffic interruptions are minimized during the underground excavation operations. After the operation is completed, the Contractor shall slide the pipe into place. All pipe joints shall be completed outside of the tunnel and inspected by the Owner before the pipe is pushed into the tunnel. After the pipe is in place, the ends of the tunnel shall be sealed with sandbags prior to necessary backfilling. Pipe spacers shall be used on carrier pipe.

3.2 Any excavation required to provide equipment or personnel access to the tunnel work shall be considered incidental to the tunneling operation.

3.3 The Contractor shall make highway and railroad crossings where shown on the plans and shall obtain the permits and pay the necessary fees to make all crossings on the project. The Contractor shall comply with all requirements of the Highway Department and acquire necessary permits and bonds. Where the Highway Department or railroad company requires encasement, tunneling, boring, timbering, shoring, bracing, rock excavation, cutting, and replacing pavement and base, and any other labor and material required. The Contractor shall receive no additional payment for any extra items involved.



City of Monett, Missouri
Std. Spec.
BORED OR TUNNEL
HIGHWAY CROSSING

SHORING 02400

1. GENERAL

1.1 Description: The work of this section shall consist of furnishing all equipment, labor, materials, tools, and incidentals necessary to provide for the safety of the employees and to protect the excavations for both structural and trenching and existing structures; and as required by the applicable federal and state laws and regulations.

2. METHODS

2.1 Responsibilities: The Contractor is solely and totally responsible for the design, installation, maintenance, and safety of any shoring and/or bracing that may be required.

2.2 Type of Shoring & Bracing: The type of shoring and bracing shall be that which is removable following the installation of the buried pipe or structure. No permanent type of shoring or sheeting shall be used which must remain within the limits of the excavation. The shoring or bracing shall be removed following the excavation, installation of the buried pipe or structures and installation of required backfill material.

SURFACE RESTORATION..... 02480

1. GENERAL

1.1 Description: The work of this section consists of furnishing all labor, materials, tools, and incidentals necessary to restore the surface of all areas affected by construction, including landscaping as required herein, replacement of fences, stone-lined ditches, walls and embankments, and restoration of miscellaneous structures (mailboxes, street signs, etc.).

1.1.1 Type A Surface Restoration: Regardless of the site's previous condition, restoration consists of furnishing and placing topsoil (which may need to be hauled in), liming, seeding, mulching, laying netting as required, and otherwise preparing and establishing a uniformly grassed area as specified herein. Areas requiring Type A surface restoration shall be so designated on the drawings.

1.1.2 Type B Surface Restoration: Consists of furnishing and placing al the necessary materials to restore areas affected by construction to a condition equal to that which existed prior to construction. Areas requiring Type B surface restoration shall be so designated on the drawings.

1.1.3 Pavement Repair and Replacement shall conform to Section 02575 - ROADWAY SURFACE REPLACEMENT.

2. MATERIALS

2.1 Topsoil Stripped and Stored: Topsoil stripped, stored, and placed shall be fertile, friable, with liberal content of humus, and capable of sustaining vigorous plant growth.

2.2 Topsoil to be Furnished: If the stripped topsoil is not adequate to complete the work, sufficient topsoil shall be furnished and shall be a natural, fertile, friable soil, possessing characteristics representative of productive soils in the vicinity. It shall be obtained from naturally well-drained areas. It shall not be excessively acid or alkaline (except for those planes requiring acid soil) nor contain toxic admixture of subsoil and shall be cleaned and reasonably free from clay lumps, stumps, roots, or similar substances, debris, or other objects which might be a hindrance to planting operations.

2.3 Lime: Lime shall be ground limestone containing not less than 85% of total carbonates and shall be ground to such a fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve. Coarser material will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing the 100 mesh sieve.

2.4 Fertilizer: Commercial fertilizer shall be formula 12-12-12, and shall conform to the applicable state fertilizer laws. It shall be uniform in composition, dry, and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

2.5 Herbicide: Herbicide shall be a pre-emergence type for mixing with soil designed to eliminate noxious weeds without harming landscaped plants.

2.6 Lawn Materials: Grass seed shall be mixed and certified by the dealer and shall be a blend of K-31 fescue and Lespedeza, acceptable to the landowner. The seed shall be uniformly sown.

2.7 Water: The Contractor shall make, at his expense, whatever arrangements may be necessary to insure an adequate supply of water to meet the needs of this contract. He shall also furnish all necessary hose, equipment, attachments, and accessories for the adequate watering of plants as may be require to complete the work as specified.

2.8 Netting: Netting shall be a uniform, open, plain weave mesh of single jute yarn or 25 to 35 pound natural, unbleached kraft paper. Minimum width of netting fabric shall be 42 inches. Jute netting shall have 76 warp ends per 48 inch width and 41 weft ends per yard, minimum. Kraft paper netting shall have 5.5 warp yarns by 3.5 filling yarns per inch. Staples for anchoring netting shall be No. 11 gauge steel wire, six (6) inches long.

2.9 Mulch: Vegetative mulch shall be the shredded cereal straw form stalks of oats, rye, wheat, or barley. The straw shall be free of prohibited weed seeds as stated in the State Seed Law; shall be relatively free of all other noxious and undesirable seeds; and shall be clean, bright, and dry enough to spread properly. A binder emulsion shall be applied to prevent straw from blowing.

3. EXECUTION

3.1 All areas within the limits of fine grading not required to be developed otherwise shall be planted with grass.

3.2 Soils Test: The Contractor shall, at his own expense, contact the County Extension Agent and secure a soil test of the topsoil. If recommended by this test, the topsoil shall be limed in quantity recommended by the Extension Agent. (Generally a soil pH of 6.0 to 6.5 is desirable.) Three copies of the soil test shall be sent to the Owner along with recommendations on lime use. Estimates of lime requirements are as follows:

POUNDS OF GROUND LIMESTONE PER 1,000 SQUARE FEET

pH	Light Sandy Soil-Pounds	Medium Sandy Soil-Pounds	Loam & Silty Loam-Pounds	Clay Loam Pounds
4.0	90	120	172	217
4.5	82	112	157	202
5.0	67	90	127	150
5.5	52	67	97	120
6.0	None	None	None	None

3.3 Time of Planting for Lawns: The Contractor shall coordinate the work so that lawn areas will be topsoiled and graded to meet the planting schedule as follows:

3.3.1 Preferred Time of Planting: February 1 to April 20.

3.3.2 Alternative time of Planting: September 1 to October 30. For this time of planting, the Contractor shall keep the lawn well watered through the summer, or until the project is accepted by the Owner.

3.4 The Owner is aware that in some cases, it would create a hardship to maintain the above schedule. If the Contractor wishes to make recommendations on other times when seeding could be done, the Owner will consider these recommendations. However, methods or time of planting shall be agreed to, in writing, before commencing this portion of the work or the above schedule shall be followed.

3.5 Preparation of Topsoil: The topsoil shall be graded and uniformly compacted according to Section 02260 - FINISH GRADING.

3.6 Sulphur: If the addition of sulphur is necessary, it shall be applied at a rate of two pounds per 1000 square feet.

3.7 Applying Fertilizer: Commercial fertilizer shall be applied at the rate of 20 pounds per 1,000 square feet to the lawn areas being prepared for planting. Fertilizer may be applied with seed, however, application

after sprouting of the lawn seed is preferred.

3.8 Sowing of Seed: Immediately before any seed is to be sown, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable, and of uniformly fine texture. Lawn areas shall be seeded evenly at the rate of 100 pounds per acre, lightly raked, and watered with a fine spray. The method of seeding may be varied at the discretion of the Contractor on his own responsibility to establish a smooth, uniformly grassed lawn.

3.9 Mulching: Within 24 hours after seeding, mulch with binder emulsion shall be spread evenly over the entire area at the rate of 2 1/2 tons per acre.

3.10 Optional Establishment of Lawns: At the option of the Contractor, sod may be used for establishing all or part of grass lawn areas. Sod on slopes shall be held in place by wooden pins about one inch square and six inches long driven through the sod into the soil until they are flush with the top of the sod. Before any sod is laid, all soft spots and inequalities in ground shall be corrected. Fertilizer spread shall be raked in. sod shall be laid so that no voids occur and shall be tamped or rolled. The complete sodded surface shall be true to finish grade, even, and firm at all points. Sod shall be placed so that the surface of the compacted sod will be slightly below the surrounding surface soil. All soils tests and pH adjustment specified previously shall be undertaken prior to sodding.

3.11 Clean-up: Any soil, manure, peat or similar material which has been brought onto paved areas by hauling operations, or otherwise, shall be removed promptly, keeping these areas clean at all times. Upon completion of the planting, all excess soil, stones, and debris which has not previously been cleaned up shall be removed from the site or disposed of. All lawns and planting areas shall be prepared for final inspection.

3.12 Maintenance: Maintenance shall begin immediately after planting and shall continue in accordance with the following requirements:

3.12.1 Repairs: Repairs to lawns or replacement of plants necessary during the maintenance period due to removal, vandalism, or acts of neglect on the part of others may be done on request by the Owner and will be done at the expense of the Owner.

3.12.2 Maintenance: Lawns shall be protected and maintained by the Contractor by water, mowing, and replanting as necessary for at least thirty (30) days and as much longer as is necessary to establish a uniform stand of the specified grasses, and until acceptance by the Owner.

3.13 Inspection: Inspections of the work to determine completion of contract work exclusive of possible replacement, will be made by the Owner at the conclusion of the maintenance period upon written notice requesting such inspection submitted by the Contractor at least 10 days prior to the anticipated date. The condition of lawns will be noted and determination made by the Owner as to whether maintenance shall continue in any part. After inspection, the Contractor will be notified in writing by the Owner of acceptance of seeding work exclusive of the possible replacement.

3.14 Guaranty and Replacement: Lawns and planting shall be guaranteed for a maximum of one year after the conclusion of the maintenance period, or for the duration of one full growing season, after planting, whichever is longer, and shall be alive, and in satisfactory growth at the end of the guaranty period, subject to normal care as recommended by this Contractor after acceptance of the work. At the end of the guaranty period, inspection will be made by the Owner upon written notice requesting such inspection submitted under this contract that is dead or not in satisfactory growth, as determined by the Owner, shall be removed from the site. These shall be replaced as soon as conditions permit, but during the normal planting season.

DEWATERING 02530

1. GENERAL

1.1 Description: The work of this section consists of completing all dewatering work necessary for the initiation and prosecution of elements of work specified elsewhere.

2. EXECUTION

2.1 Workmanship: Maintain all excavations and trenches free from water at all times while construction is in progress using pump. Prevent surface runoff water from collecting in excavations or trenches or running down the faces of excavated cut or fill slopes, causing sloughing or caving, ponding in excavated areas or saturating the soils below foundations of structures by adjusting grades to provide temporary drainage facilities. The Contractor shall furnish and operate sufficient pumps and appliances, and provide all materials, labor, et., required to prevent interference with any work by water, ice or snow. Damage of any kind of resulting from insufficient pumping facilities or similar lack of proper conduct of the work shall be made good by the Contractor at his own expense. No structure or pipes shall be laid in water, and water shall not be allowed to run into or over any concrete work or pipe, or into or through any pipe.

ROADWAY SURFACE AND SIDEWALK REPLACEMENT.....02575

1. GENERAL

1.1 Description: The work of this section shall consist of furnishing all labor, materials, tools, equipment, and incidentals necessary to replace all roadway surfaces and sidewalks removed during utility construction. This section shall include, but not be limited to, vehicular and pedestrian pavements, and surfacings of stone, gravel, asphalt, and Portland cement concrete, in addition to parking areas.

2. MATERIALS

2.1 Portland Cement Concrete: Shall conform to Section 03300 - CAST-IN-PLACE CONCRETE.

2.2 Hot-Mix Asphaltic Concrete: Shall conform to Missouri Highway and Transportation Commission Standard Specifications for type BP-1 Plant Mix Bituminous Pavement as set forth in Section 401 of the Standard Specifications.

2.3 Crushed Stone Surfacing: Crushed stone base shall conform to material specified and shall be produced by an approved source. Aggregate shall be mechanically crushed limestone or dolomite. It shall not contain more than 15 percent deleterious rock and shale. Sand may be added only for the purpose of reducing the plasticity index of the fraction passing the No. 40 sieve in the finished product. Any sand, silt, and clay, and any deleterious rock and shale shall be uniformly distributed throughout the mass. The aggregates shall conform to the following gradation requirements when tested utilizing wet preparation techniques:

Percentage by Weight Passing Each Sieve:

1 inch Sieve.....100%
1/2 Inch Sieve ..... 60 - 90%
No. 4 ..... 40 - 60%
No. 40..... 15 - 35%

Plasticity Index of the fraction passing the No. 40 sieve shall not exceed 6. The crushed stone base shall be compacted to not less than 95% of maximum density at optimum moisture content as determined by Mod. AASHTO T-99.

2.4 Chip and Seal Pavement Repair:

2.4.1 Aggregate: For aggregate seal asphalt paving, the aggregate shall consist of a combination of crushed stone and/or crushed gravel, well-graded within the following limits:

Sieve Size	Percent Paving by Weight
1/2"	90-100%
3/8"	48-80%
#4	0-15%
#6	0-5%

2.4.2 Liquid Asphalt: The liquid asphalt shall be grade CRS-2. Should the Contractor desire, (because of climatic conditions or otherwise) he may request a change in the liquid asphalt grade. No change shall be made until the Contractor receives written approval from the Owner.

3. EXECUTION

3.1 General: Existing paving shall be cut vertically and horizontally to straight lines. The trench shall be backfilled with granular stone bedding or controlled backfill material compacted to Range compaction requirements (see Section 02250 - COMPACTION CONTROL AND TESTING) to within eight inches of the final roadway surface. The top eight inches shall be backfilled with crushed stone base compacted level with the existing riding surface of the roadway. This level shall be maintained by the Contractor until all secondary settling has occurred. Any crushed stone required to maintain the trenches in a suitable condition for traffic during this period shall be furnished at the Contractor's expense. When the trench has been properly backfilled and has settled sufficiently to permit final repairs, roadway surfacing shall be applied according to this specification. At the time of final repairs, the Contractor shall remove sufficient material to allow placement of roadway surfacing to the thicknesses specified as follows.

3.2 Roadway Surface Replacement:

3.2.1 Portland Cement Concrete: Edges of existing pavement at the trench shall be trimmed vertically to produce a neat even edge. A minimum 8-inch thick concrete slab shall be placed to match the elevation of the existing pavement, as shown on the drawings.

3.2.2 Hot-Mix Asphaltic Concrete: Edges of existing pavement at the trench shall be trimmed vertically to produce a neat, even edge. A minimum of 4-inches of hot-mix asphaltic shall be placed in two lifts to match the elevation of the existing pavement, as shown on the drawings.

3.2.2.1 The surface to receive the asphalt concrete shall be cleaned of all loose material, dust, and foreign matter prior to the application. The primer or tack coat, as required, shall be applied upon a dry surface only at a rate of 0.15 gallons per square yard. Forms may be of any material or design provided they secure the designed grade control. It shall be the responsibility of the Contractor to set and maintain necessary grade staked and forms, and execute the work to the lines, grades, cross sections, and dimensions shown on the plans.

3.2.2.2 After spreading, the mixture shall be thoroughly and uniformly compressed by a three-wheel or tandem power-driven roller or rollers, weighing not less than 200 pounds per inch of tread width, as soon after being spread as it will bear the roller without undue displacement. Delays in rolling freshly spread mixture will not be tolerated. Rolling shall start longitudinally at the sides and proceed toward the center of the pavement overlapping on successive trips by at least one-half the width of a read wheel. Alternate trips of the roller shall be of slightly different lengths.

3.2.2.3 After final compression, the finished course shall at not point have a density less than ninety-five (95) percent of the laboratory compacted density. At least two (2) in-place density samples shall be taken and tested.

3.2.2.4 No traffic shall be permitted on the finished pavement until it has cooled to atmospheric temperature.

3.2.3 Chip and Seal Pavement Repair: For this type repair, a double layer of chip and seal resurfacing over the entire roadway width will be utilized.

3.2.3.1 The existing roadway shall be bladed to eliminate minor depressions and humps. Following the blading operation, the surface shall be thoroughly cleaned and swept to remove all mud, matted earth, dust, and other foreign material.

3.2.3.2 A prime coat of liquid asphalt shall be applied at the rate of 0.30 gallons per square yard at a minimum temperature of 120 degrees fahrenheit for asphalt grade CRS-2. On the primed base, a course of aggregate shall be spread at the rate of twenty-five (25) pounds per square yard.

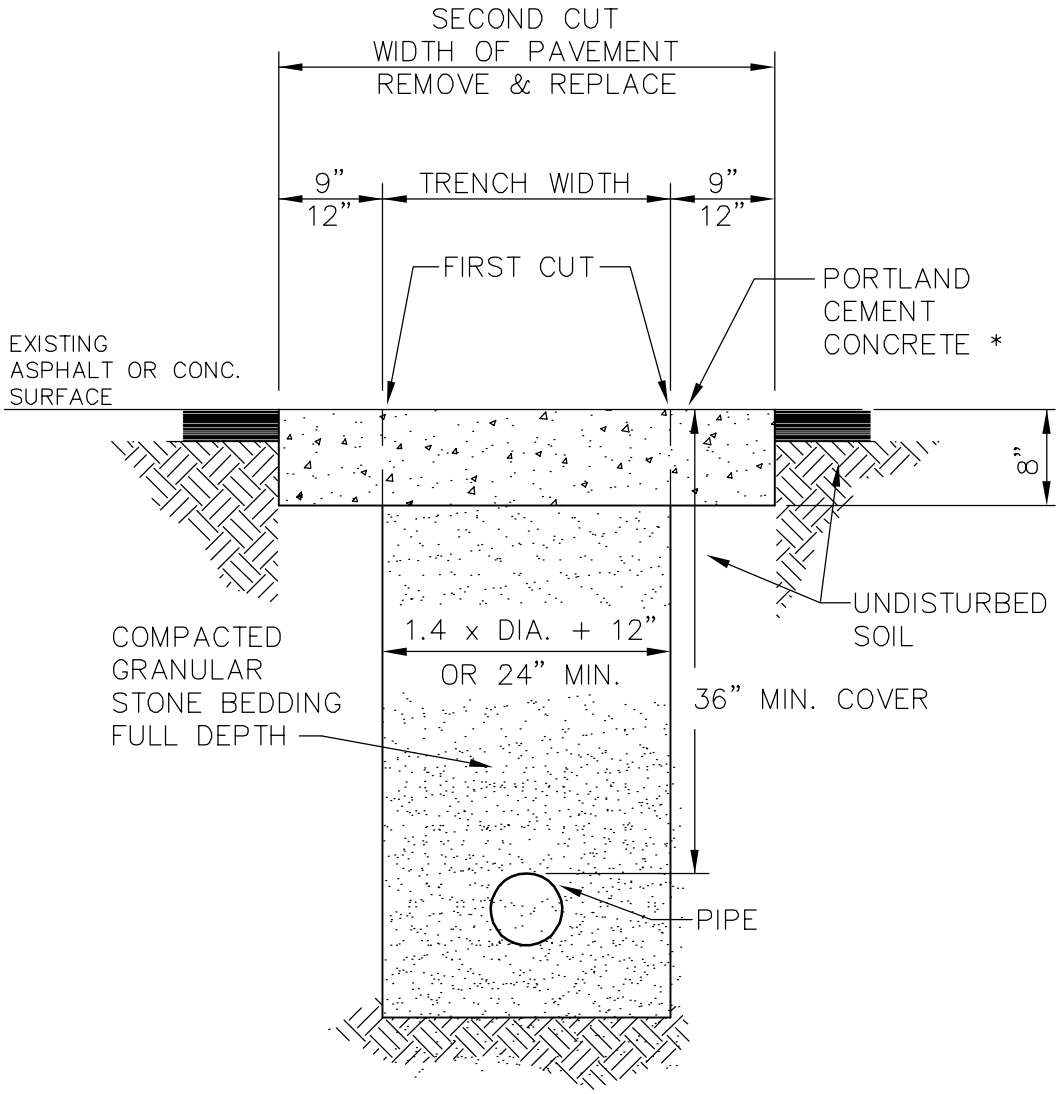
This stone shall be roller compacted from the sides to center with a steel wheeled roller weighing a minimum of five tons.

3.2.3.3 Immediately following the compaction of the first course of asphalt and aggregate, a second course, identical to the first, shall be applied. The finish surface shall be swept to remove any loose stones.

3.2.3.4 No traffic shall be allowed on the finished surface until it has cooled to atmospheric temperature.

3.2.4 Crushed Stone: Trenches along or across unpaved roadways, including country roads, and city streets, as well as on dirt, or gravel shoulders of paved streets, roads, or highways, shall be backfilled in compliance with these specifications. The trench shall be backfilled to a level with the existing riding surface of the roadway. When the trench has been properly backfilled and has settled sufficiently to permit final repairs, the backfill shall be removed as necessary for crushed stone surfacing. The crushed stone shall be rolled and thoroughly compacted in layers to a minimum finished thickness of six-inches.

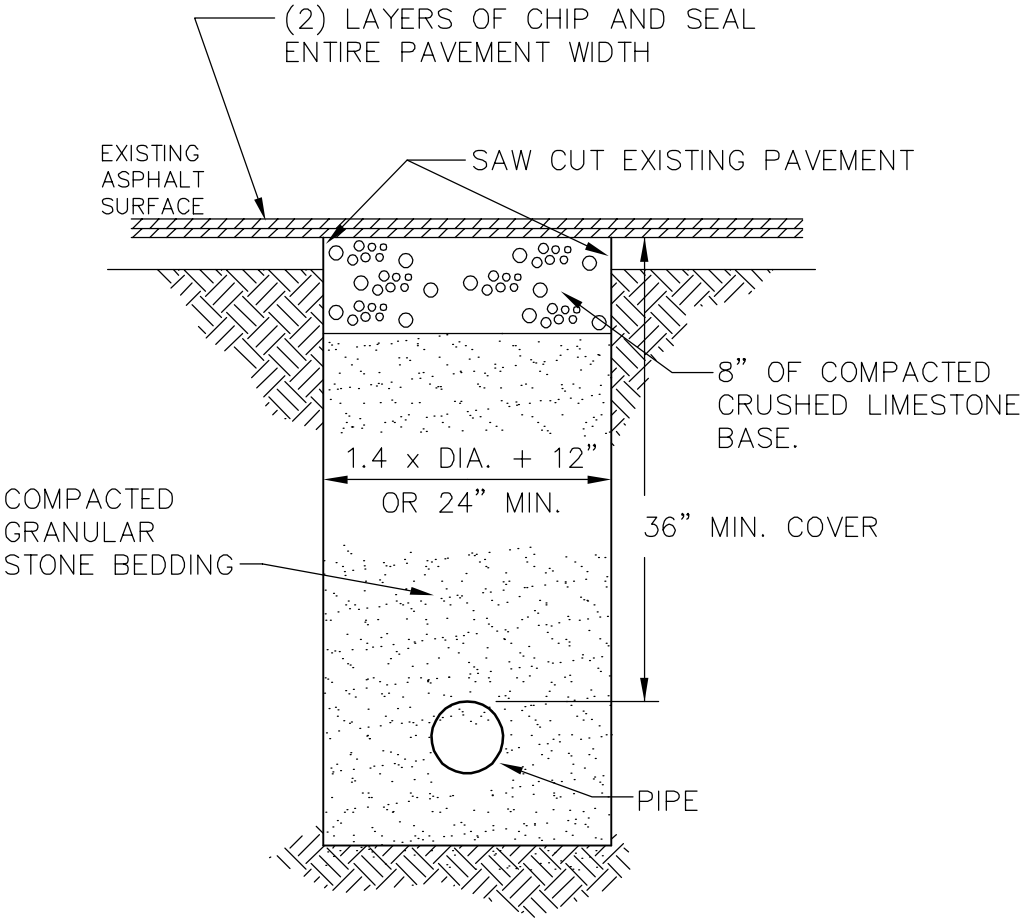
3.3 Sidewalk Replacement: The existing concrete sidewalk and base material shall be removed for a distance equal to the trench width plus two feet as shown on the drawings. The trench shall be backfilled to a height that will allow the placement of four inches of crushed stone and a four-inch thick concrete walk above. The elevation of the top of the new sidewalk section shall match that of the existing walk.



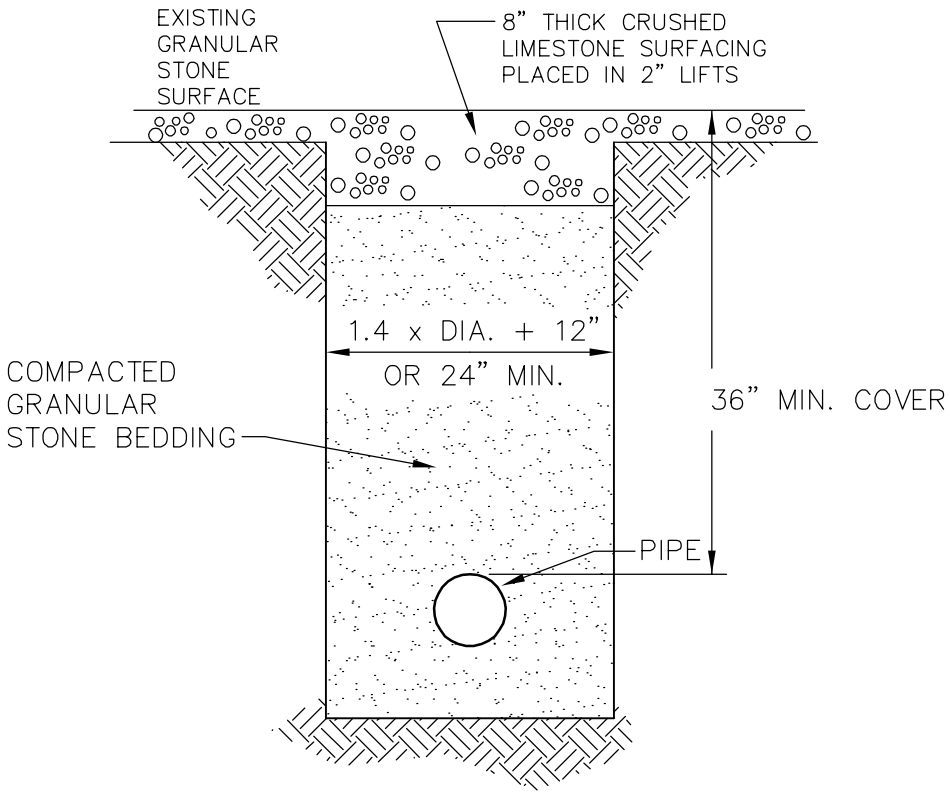
NOTE:
FIRST & SECOND CUTS OF EXISTING PAVEMENT SHALL BE SAW CUT FULL DEPTH.

* FOR SIDEWALK REPAIR, CONCRETE SHALL BE 4" THICK.

City of Monett, Missouri
Std. Spec. PAVEMENT REPAIR PORTLAND CEMENT CONCRETE



City of Monett, MO
Std. Spec. PAVEMENT REPAIR CHIP & SEAL



City of Monett, MO
Std. Spec. PAVEMENT REPAIR CRUSHED STONE

DUCTILE IRON PIPE AND FITTINGS 02615

1. GENERAL

1.1 Description: The work in this section consists of furnishing, hauling, placing, and backfilling as necessary the ductile iron pipe, fittings, and fitting restraints in the designated locations and to the lines and grades as shown on the drawings.

2. MATERIALS

2.1 Ductile Iron Pipe: Unless otherwise specified or shown on the drawings, ductile iron pipe shall be Wall Thickness Class 350 and shall conform to the latest revision of ANSI A21.51 – (AWWA C151) Standard for Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water or Other Liquids. The pipe shall be standard asphaltic varnish coated on the outside. Pipe shall be cement mortar lined in conformance with ANSI A21.4 – (AWWA C104) unless specified otherwise.

2.2 Fittings: The fittings to be used with ductile iron pipe may be with gray iron or ductile iron, and shall conform to the requirements of ANSI/AWWA C110/A21.10. All fittings shall be coated and lined in the same manner as the pipe. All fittings up to and including 12 inches shall be Class 350, with all larger fittings of Class 250. Flanged fittings shall be Class 350 unless noted otherwise on the drawings. Mechanical joint and push-on joint fittings shall meet all applicable requirements of ANSI/AWWA C111/A21.11.

2.3 Joints: Unless specifically noted otherwise, joints for ductile iron pipe that is to be buried shall be either a push-on type or a mechanical joint. Unless noted otherwise, joints for pipe used inside buildings or structures shall be either flanged or a lock coupling for grooved-end pipe.

2.3.1 Push-on Type Joint: The push-on type joints consisting of a single neoprene gasket which are acceptable are “Tyton” as manufactured and licensed by the U.S. Pipe and Foundry Company; “Fastite” as manufactured and licensed by the American Cast Iron Pipe Company and “Bell-Tite” as manufactured and licensed by James B. Clow and Son, Inc. All required joint materials including the neoprene gasket and the lubricant shall be furnished with the pipe.

2.3.2 Mechanical Joint: Mechanical joint ends shall comply with the requirements of ANSI A21.11 - (AWWA C111). All required joint materials including neoprene gasket, gland, bolts, and nuts shall be included with the pipe.

2.3.3 Flanged Joint: The flanged joint shall be integrally cast and shall conform to the requirements of ANSI Specification B16.1 for Class 250. Screw-on flanges will be acceptable, but any required threading of pipe barrel shall be done by the factory in conformance with AWWA C115 utilizing Class 350 pipe. Flanges shall be ductile iron. The pipe barrel and flange shall not be field assembled. The flanges shall be furnished with factory purchased full face gaskets 1/8-inch thick of SBR rubber per ANSI/AWWA C111/A21.11.

2.3.4 Restrained Joint: The restrained joint for pipes 14-inch diameter and larger shall be a boltless connection type that utilizes a square, alloy steel, welded-on retained ring in conjunction with a split ring and socket groove to provide the means of restraint. The joint shall be disassembleable using a closure-spreader mechanism integral to the split ring. The split ring, retainer ring, and all parts associated with the closure-spreader mechanism shall be corrosion-resistant, high strength, low alloy (HSLA) steel conforming to ANSI/AWWA C111/A21.11. All required joint materials including neoprene gasket and lubricant shall be supplied with the pipe. Restrained joint shall be “Lok-Ring Joint Pipe” as manufactured by American Ductile Iron Pipe. As an alternate to the preceding, the restained joint may be TR-FLEX or TR-FLEX GRIPPER as manufactured by U.S. Pipe and Foundry Co., SUPER-LOCK as manufactured by Clow Corporation, or approved equal.

3. EXECUTION

3.1 Cutting, Cleaning, and Inspecting: All cutting of ductile iron pipe shall be done by a means of mechanical cutter. Wheel cutters shall be used whenever practical. After cutting, the interior of the pipe shall be thoroughly swabbed or cleaned of all foreign matter before being installed into the system and shall be kept clean during and after installation. Before installation of any pipe or fitting, each piece shall be inspected for defects and shall be rung with a light hammer to detect any cracks. All defective, damaged, or unsound pipe or fittings shall be rejected.

3.2 Installation:

3.2.1 Mechanical Joint: The last eight inches outside of the spigot and the inside of the bell of the mechanical joint of push-on fittings shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter from the joint, and then coated with a soap solution. The ductile iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket or bell end. The rubber gasket shall be coated with soap solution and placed on the spigot end in the bell. The gasket shall then be pressed into place with the bell. Care shall be taken to locate the gasket evenly around the entire joint. The ductile iron gland shall be moved into position for bolting. Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland.

3.2.2 Flanged Joint: When assembling the flange joint, the Contractor shall insure that the ring gasket is properly located and placed flat against the face of the flange. Flanges shall be assembled by alternately tightening bolts spaced 180 degrees apart in order to produce an equal pressure on all parts of the gland.

3.2.3 Restrained Joint: Installation of restrained joint fittings shall be in strict accordance with the manufacturer's printed literature.

GATE VALVES AND BOXES 02641

1. GENERAL

1.1 Description: The work in this section consists of furnishing, hauling, and placing the gate valves as shown on the plans and herein specified, and all labor, tools, and equipment necessary to install the valves.

2. MATERIALS

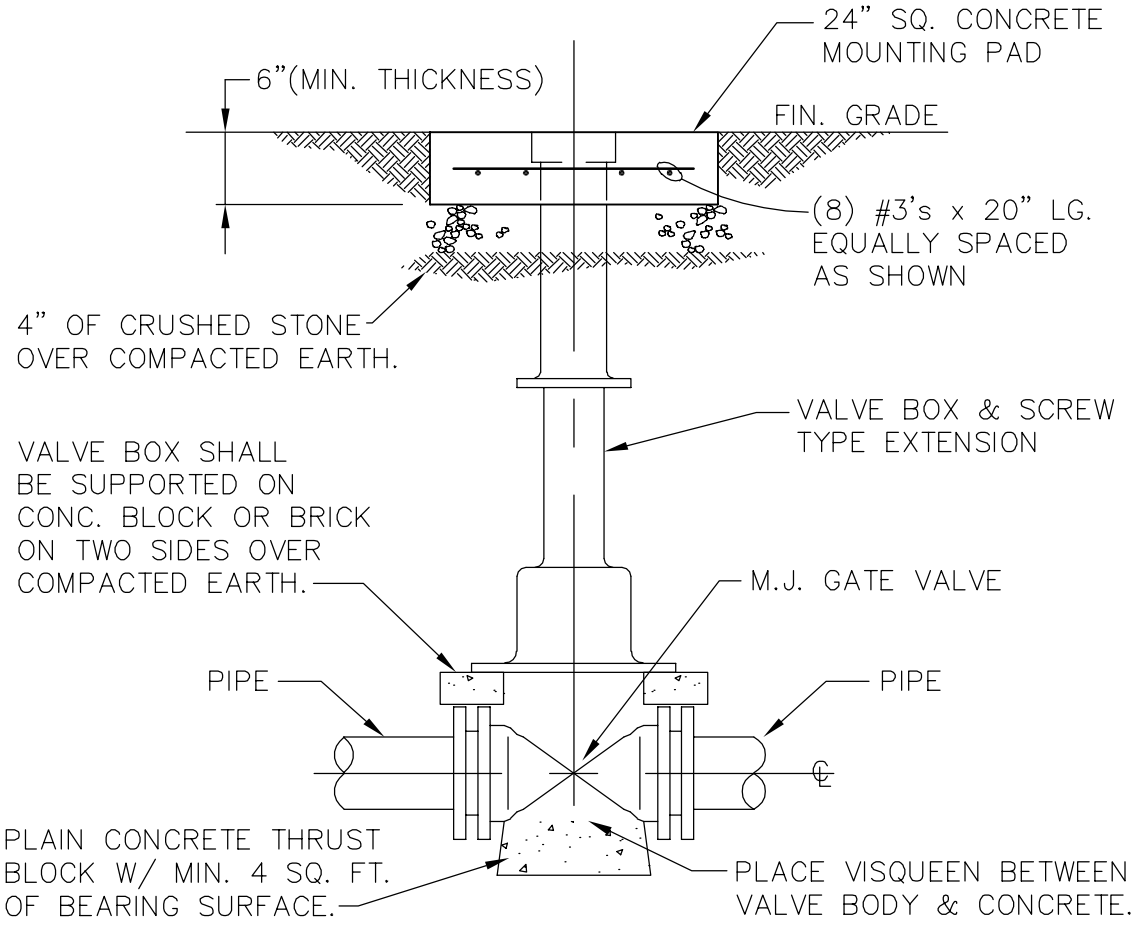
2.1 Valves: Gate valves shall be non-rising stem equipped with either handwheel operator or a two-inch square operating nut as indicated on the drawings.

2.2 End Connections: Shall be as indicated on the drawings.

2.3 Valve Boxes: Valve boxes shall be located as shown on the drawings. The valve box shall have a round top with open base and shall be provided with a top cover. The valve box shall be of a two-piece type with top piece capable of adjustment to final grade. Valve boxes for buried pipe shall be provided with a reinforced concrete pad at ground level.

3. EXECUTION

3.1 Installation: Each gate valve shall be installed at the locations and grades as shown on the plans. The Contractor shall insure that the valve is operating freely and that the valve box, if required, is properly placed to allow the use of the necessary tools for the operation of the valve and is plumb and centered over the operating nut on the valve. When buried, the tops of the valve boxes shall be level with the finish elevation of the ground. Valve storage, shipment, and installation shall strictly comply with ANSI/AWWA Standard C500.



City of Monett, Missouri
Std. Spec.
GATE VALVE

FIRE HYDRANTS AND APPURTENANCES 02644

1. GENERAL

1.1 Description: The work in this section consists of furnishing and installing the fire hydrants in the designated locations and to the lines and grades as shown on the plans and herein specified, and all tools, labor, equipment, materials, and incidentals necessary to complete this section.

2. MATERIALS

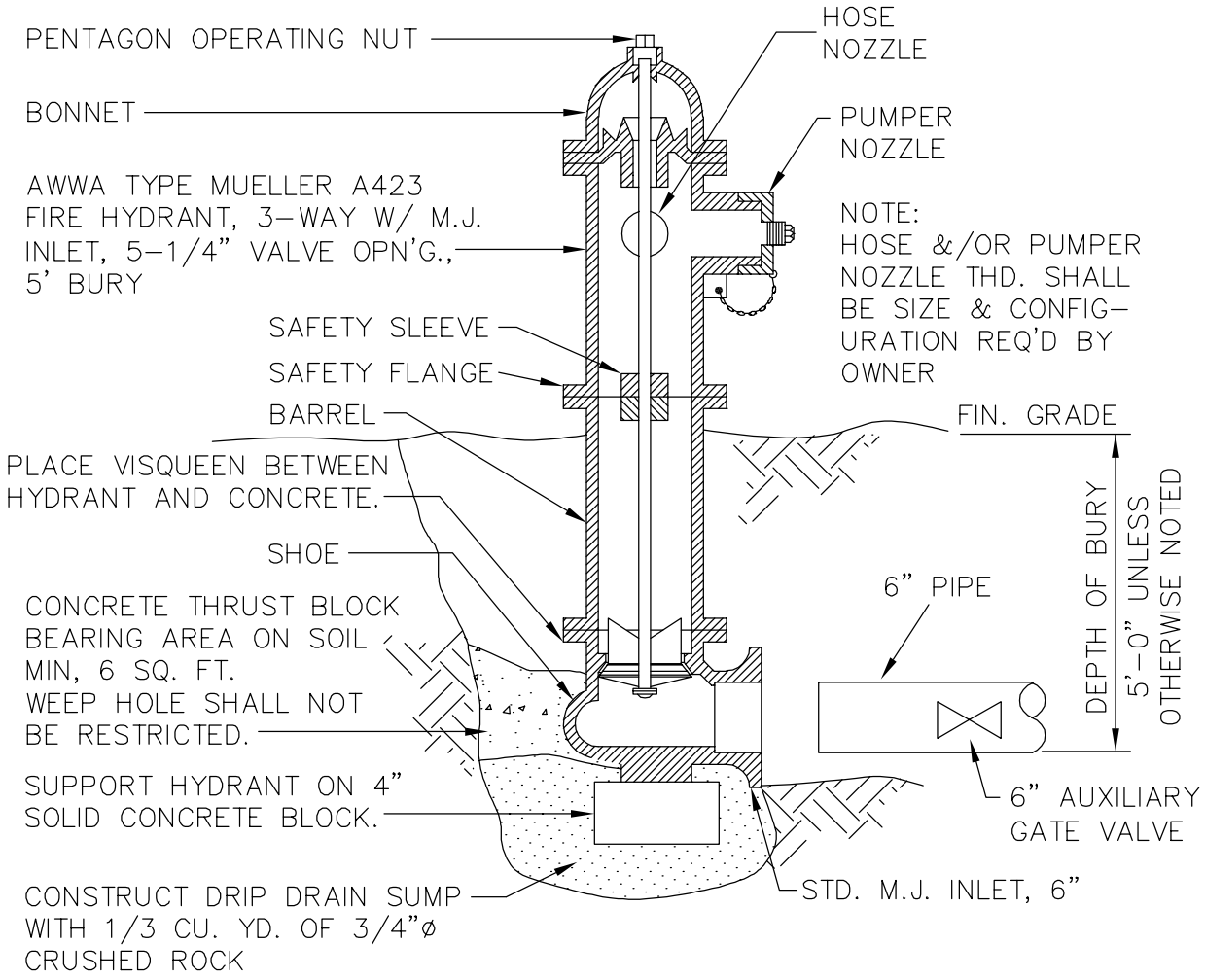
2.1 Fire Hydrant: Shall meet or exceed requirements set forth in AWWA Standard C502, latest revision. Fire hydrants where shown shall be 3-way, 6 inch traffic model fire hydrants with non-freezing, cast iron bodies, full bronze mounted, suitable for a working pressure of 200 PSI. Hydrants shall be Mueller No. A-423 with 5-inch steamer nozzle, 5 ¼ inch valve opening, 60-inch bury, and 6-inch MJ or approval equal. Each hydrant shall be given a 300 PSI hydrostatic test in the shop.

Hydrants are to be installed with thrust blocking to provide “blow-off” protection and prevent undue strain of the ductile iron pipe water main as shown on the plans.

The owner shall be furnished one (1) key wrench for each ten (10) hydrants.

3. EXECUTION

3.1 Installation: The fire hydrant shall be set plumb with the break off flange set at the finished surface. The fire hydrant shall have adequate blocking and drain materials installed. The Contractor shall insure that the fire hydrant drain valve is in proper working condition. The fire hydrant shall be disinfected.



City of Monett, MO
Std. Spec.
FIRE HYDRANT

Rev. 03/09/05

WATER SUPPLY PIPING SYSTEM 02713

1. GENERAL

1.1 Description: The work in this section consists of furnishing and installing all underground water supply piping, in the designated locations and to the lines and grades as shown on the plans and herein specified, and all tools, labor, equipment, materials, and incidentals necessary to complete this section.

1.2 All applicable work shall be done in accordance with the latest AWWA Specifications.

1.3 Where conflict may occur, the following specifications shall apply.

1.4 All water main extension or replacement projects shall be constructed in accordance with this specification and shall be a minimum of eight inches (8") in diameter.

2. MATERIALS

2.1 Ductile Iron Pipe: All ductile iron water line piping and fittings six inches in diameter and larger shall be cement mortar lined ductile iron pipe with mechanical or push-on joints, meeting the specifications given in Section 02615 - DUCTILE IRON PIPE AND FITTINGS.

2.2 Service connection between water main and meter shall be "K" copper tubing.

3. EXECUTION

3.1 General: Only competent workmen shall be employed on this phase of the work and equipment suitable for the execution of the work shall be utilized. Installation of ductile iron pipe shall conform to ANSI/AWWA Standard C600, and to the drawings.

3.2 Delivery of Materials to Job:

3.2.1 All materials shipped by rail shall be carefully inspected for damage in transit in the cars, and if such be found, same shall not be unloaded, except upon the instructions from the official freight agent. In the event of damaged pipe, same may be lifted out of the cars, and placed along the switch site, but must not be removed from the railroad company's property.

3.2.2 All materials delivered by truck shall be inspected as they are unloaded. Damaged pipe or materials shall not be left at the storage yard or taken to the job site, but shall be removed as soon as possible in order that rejected material will not be mistakenly used on construction.

3.2.3 All pipe fittings, valves, and other accessories shall be unloaded by the use of hoists or skidways. Same shall be handled in such manner as to avoid damage due to shock. Under no circumstances shall pipe be dropped to the ground from cars or trucks. Special precaution shall be taken to prevent the rolling of pipe to strike another forcefully.

3.3 Trench Excavation:

3.3.1 Machine-excavated trenches, as well as hand-excavated trenches, shall be cut to the alignment and configuration as shown on the drawings. Unless noted otherwise on the drawings, trenches shall be cut as deep as necessary on either side of natural depressions, ditches, waterways, etc. to provide minimum 48 inches of cover over the pipe. Excessive change in gradient will not be allowed. Line shall be constructed to a grade which prevents high spots which could pocket air and cause air binding of the line.

3.3.2 Trenches over four feet deep shall be braced and safety maintained until after laying operations have been completed. Trenches shall not be cut too far ahead of laying operations.

3.3.3 The maximum degree of deflection, either vertical or horizontal, shall not cause a pipe joint's annular clearance in the bell to be less than one-fourth inch (1/4") at its closest point. In case any portion of the trench is excavated below grade due to unsuitable soil conditions, further depth shall be refilled to the proper grade with crushed stone or other approved material.

3.3.4 Special care shall be taken to remove all rocks or boulders or ledge rock encountered so as to provide a clearance under the pipe of at least four inches, and this space shall be refilled with approved material and firmly compacted before laying the pipe.

3.4 Installation

3.4.1 The pipe shall be lowered in the trench piece by piece by means of derricks, ropes, or other suitable equipment. Under no circumstances shall pipe or other materials be dropped or dumped into the trench. Before lowering or while suspended over the trench, pipe shall be inspected for defects. Ductile iron pipe shall be rung with a light hammer to detect cracks. Any defective, damaged, or unsound pipe shall be rejected. A suitable swab shall be pushed through the pipe to insure that all foreign matter is removed from the pipe prior to laying.

3.4.2 To avoid improperly sized or spaced bell holes impairing the pipe length bearing on the trench bottom, bell holes shall be dug by hand and only far enough ahead that accuracy of their proper location can be assured. They shall be of minimum size, yet providing ample room that the joint may be properly and efficiently made. Machine-cut bell holes shall not be permitted.

3.4.3 Water mains must be laid at least 10 feet horizontally from any existing or proposed sewer. The distance must be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, the department 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 and on either case, at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. All installations shall fulfill the requirements of the Missouri Department of Natural Resources, Design Guide for Community Public Water Supplies, section 8.6, Separation of Water Mains, Sanitary Sewers, and Storm Sewers.

3.4.4 Any connection to a backflow Hazard shall be provided with a backflow prevention assembly as specified in the Missouri Department of Natural resources, Public Drinking Water Program Design Guide, Section 8.8, backflow Prevention.

3.4.5 Each service meter shall be individually metered and construction in accordance with included Water Meter Installation Detail and Service Tap Detail.

3.4.6 Valves shall be provided at intervals not more that 500 feet in commercial districts and not more than one block or 800 feet in other districts or as shown on approved drawings.

3.5 Backfill and Compaction: Pipe shall be laid in a bed of select soil or granular stone as shown on the drawings and as specified in Section 02222- GRANULAR STONE BEDDING AND BACKFILL. In all cases, full length joints of pipe shall be used except in making closures. Pipe embedment material and trench backfill and compaction shall be as specified in Section 02221 - TRENCHING, BACKFILLING, AND COMPACTING, as detailed on the drawings.

3.6 Anchorage of Bends, Tees, and Plugs: On all pipe lines four inches (4") in diameter and larger, all tees, plugs, and caps, and bends exceeding 22-1/2 degrees shall be squarely anchored by suitable thrust concrete backing. Such concrete backing shall be so placed that the pipe or fitting joints will be accessible for

repair. The concrete shall be 1:3:5 mix and shall be placed between solid ground and the fitting to be anchored. The area of the bearing on the pipe and the ground is each instance shall be a minimum of four square feet or as noted on the drawings.

3.6.1 Pipe joints immediately outside of buildings shall be properly and adequately restrained so as to prevent any movement due to internal pressures that would result in piping inside the building being subjected to an external force. Said restraint shall be provided by mechanical joint retained glands, restrainer glands, restrainer fittings, or other means approved by the Owner. Restraint shall be provided at the exterior pipe joints and not at joint or fittings located within the building.

3.7 Testing: Installed water lines shall be hydrostatically tested as follows. Testing shall include both a "pressure test" of at least two hours duration for the purpose of blowing defective joints, and a "leakage test" to determine actual loss of water from the system. The use of compressed air for testing pipe will not be permitted. Contractor shall be responsible for properly restraining the end sections of water pipe to insure that the pipe does not move during testing (provide thrust blocks, etc.).

3.7.1 Pressure Test: After the pipe has been laid, all newly laid pipe shall be subjected to a hydrostatic pressure of at least 150 psi at the lowest point in the system.

3.7.1.1 Test pressure restrictions: Test pressures shall 1) be of at least 2-hour duration; 2) not vary by more than ± 5 psi; 3) not exceed twice the rated pressure of the valves of hydrants when the pressure boundary of the test section includes closed gate valves or hydrants.

3.7.1.2 Pressurization: Each valved or isolated section of pipe shall be filled with water slowly 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.

3.7.1.3 Air Removal: Before applying the specified test pressure, air shall be expelled completely from the pipe. After all the air has been expelled, the test pressure shall be applied.

3.7.1.4 Examination: All exposed pipe, fittings, valves, and joints shall be examined fully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replace with sound material and the test shall be repeated until it is satisfactory to the Owner.

3.7.2 Leakage Test: A leakage test shall be conducted concurrent with the pressure test.

3.7.2.1 Leakage Defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

3.7.2.2 Allowable Leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following:

$$\underline{L = (N)(D)(P^{1/2})}$$
$$7400$$

in which L is the allowable leakage in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in of nominal valve size shall be allowed. When hydrants are in the test section, the test shall be made against the closed hydrant.

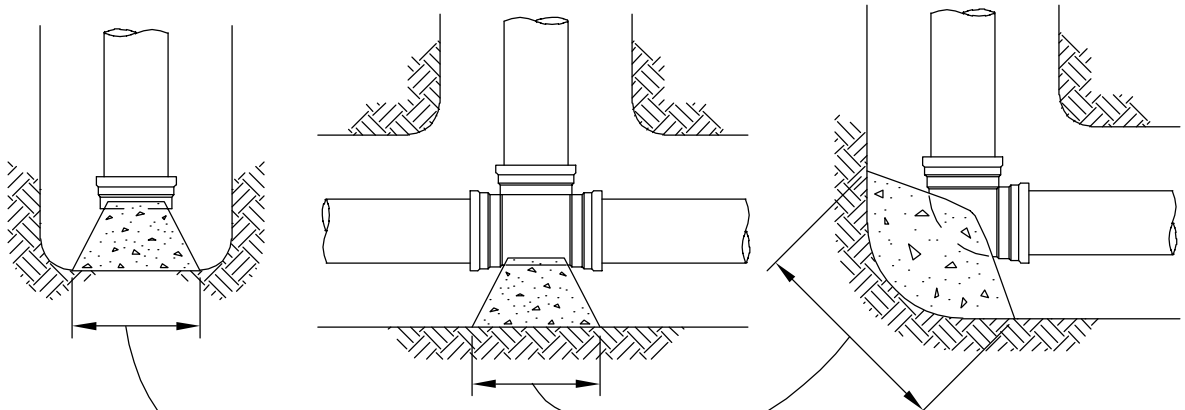
3.7.2.3 Acceptance of Installation: Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid disclosed leakage greater than that specified above, the Contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

3.8 Flushing and Disinfecting Lines: Before placing the lines in service, all water mains shall be systematically and thoroughly flushed at a minimum velocity of 2.5 fps for the purpose of removing any remaining dirt or foreign matter, and then shall be disinfected by chlorination to a completely sterile condition to the satisfaction of the Owner and Missouri Department of Natural Resources. Chlorination shall produce a chlorine residual of not less than 25 ppm in the water at any and all points in the line after standing twenty-four hours in the pipe. After the 24-hour retention period, the heavily chlorinated water shall be flushed from the mains until the chlorine concentration in the water leaving the main falls to below 1mg/1. Chlorine residual determinations shall be made by the Contractor in the presence of the Owner's Representative to ascertain that the heavily chlorinated water has been removed from the piping.

3.8.1 Microbiological Quality: Within 48 hours after the flushing and disinfecting of all lines has been satisfactorily completed, the Contractor shall take two water samples from the line spaced 24 hours apart. The samples shall be taken by an independent laboratory satisfactory to the reviewing authority. The results shall be submitted to the reviewing authority for review. The test results of the two samples shall have satisfactory results in accordance with 10 CSR60-4.010 before placing the lines into the water system.

3.9 Repairs: In the event of leaks or breaks or other malfunctions of material within one year from the date of acceptance, the Contractor shall repair such defects at his expense or arrange with the Owner for expenses incurred in such repairs.

NOTE: ALL BURIED FITTINGS SHALL HAVE PLAIN CONCRETE THRUST BLOCKING, MINIMUM 3000 P.S.I. CONCRETE.

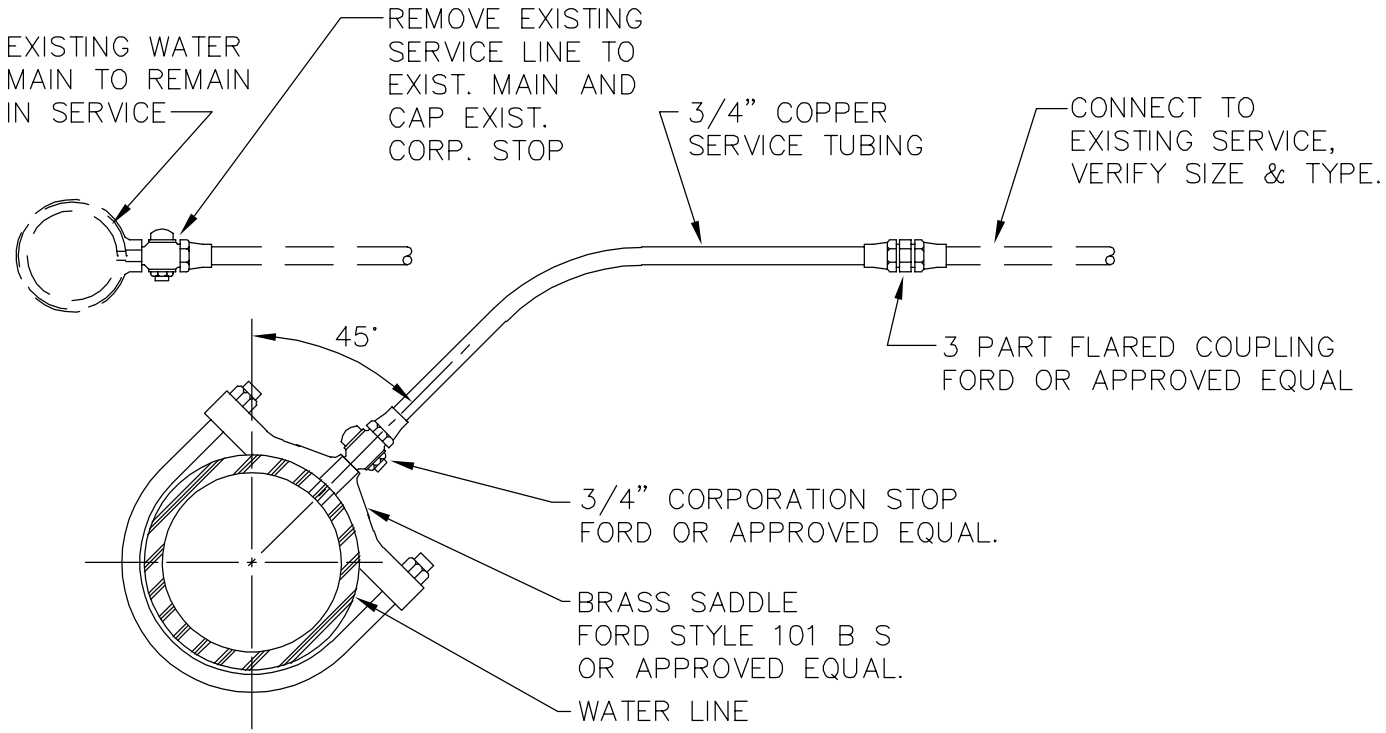


CONCRETE THRUST BLOCK SHALL HAVE A MINIMUM BEARING AREA OF 4 SQ. FT. ON UNDISTURBED SOIL.

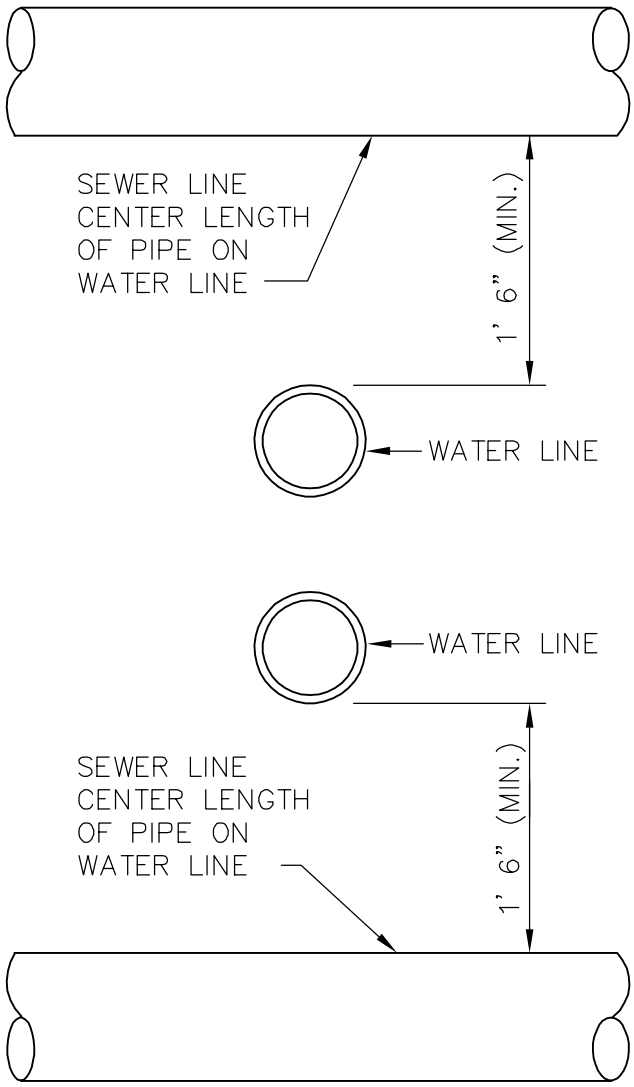
City of Monett, Missouri

Std. Spec.

TYPICAL THRUST BLOCKING



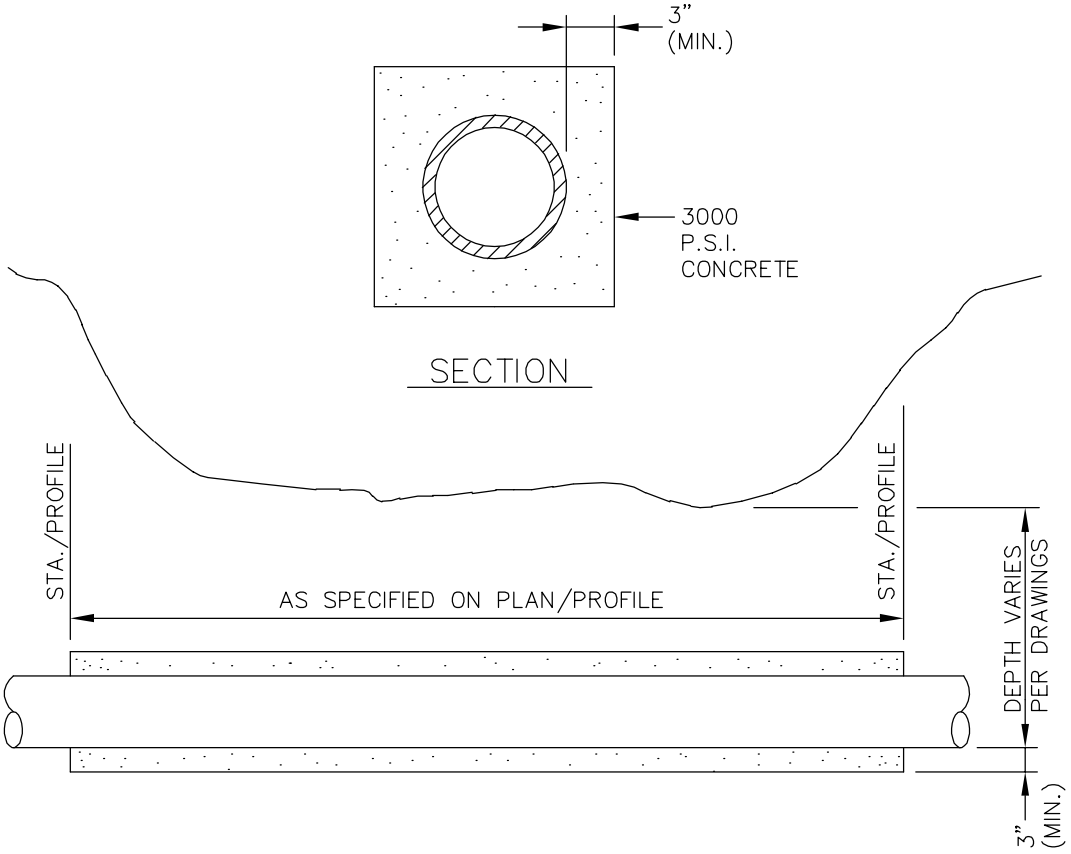
City of Monett, Missouri
Std. Spec. SERVICE TAP & CONNECTION



City of Monett, Missouri

Std. Spec.

WATER / SEWER CROSSING



City of Monett, Missouri

Std. Spec.

CONCRETE ENCASEMENT

CONCRETE REINFORCEMENT.....03200

1. GENERAL

1.1 Description: The work of this section consists of furnishing, hauling all reinforcement materials and all tools, labor, equipment and incidentals necessary to complete this section.

2. MATERIALS

2.1 Reinforcing Steel: Reinforcing bars shall conform to the "Standard Specifications for Deformed Billet-Steel Bars for Concrete Reinforcement", ASTM A615 or to the "Standard Specifications for Axle-Steel Deformed Bars for Concrete Reinforcement", ASTM A617 and shall be Grade 40, as designated on the plans.

2.2 Welded Wire Fabric: Welded wire fabric shall conform to "Standard Specifications for Welded Steel Sire Fabric for Concrete Reinforcement", ASTM A185.

3. EXECUTION

3.1 General: Unless otherwise indicated on the Plans or specified herein, all cutting and bending or reinforcement bars shall be done at the mill or ship prior to shipment. Cutting and bending in the field will be permitted only where shown on the plans or to correct errors, damage by handling and shipping, and minor omissions in shop bending when authorized by the Resident Project Representative.

3.2 Storing and Cleaning:

3.2.1. All reinforcement shall be stored above ground on skids, pallets or other supports and shall be protected from mechanical injury and from deterioration by exposure.

3.2.2 When placed in the work, reinforcement shall be free from dirt, detrimental scale, concrete, paint, oil or other foreign materials. Tight, thin rust is not considered detrimental and will not require cleaning.

3.3 Placing: Except as shown on the Plans or specified herein, all placement of reinforcing bars, welded wire fabric and bar supports shall conform to the latest editions of "Placing Reinforcing Bars, CRSI-WCRSI Recommended Practices", published by the Concrete Reinforcing Steel Institute. Bars may be moved as necessary to avoid interference with other reinforcing steel, pipes and other embedded items. If bars are moved more than the specified placing tolerances, the resulting arrangement shall be approved by the Resident Project Representative.

3.4 Splices: When splices other than those shown on the plans become necessary, they shall be located at areas of low stress and shall be subject to approval by the Resident Project Representative.

CAST-IN-PLACE CONCRETE.....03300

1. GENERAL

1.1 Description: The work of this section shall include the furnishing, hauling, placing, curing, and testing of all Portland Cement Concrete required by the Construction Drawings and herein specified.

2. MATERIALS

2.1 Portland Cement: Portland cement shall conform to "Standard Specifications for Portland Cement: ASTM C150 Type 1 or Type 1A when specified. One sack of cement shall be considered as one cubic foot of volume or 94 pounds by weight.

2.2 Aggregates: Fine and coarse aggregates shall conform to "Standard Specifications for Concrete Aggregates", ASTM C33. The nominal maximum size of the coarse aggregate shall not be larger than one-fifth of the narrowest dimension between sides of forms, one-third the depth of the labs, nor three-fourths of the minimum clear distance between reinforcing bars or between bars and forms, whichever is lest. Coarse aggregate gradation shall conform to ASTM C33 Size 67 for class B.

2.3 Admixtures: Air-entrained admixtures shall conform to "Standard Specifications for Air-Entraining Admixtures for Concrete", ASTM C260. The Contractor shall submit a manufacturer's certification and guarantee to the Engineer showing the brand name and designation, the composition or description of the air-entraining agent will conform the requirements of these specifications. Water-reducing, retarding, or accelerating admixtures, if permitted by the Resident Project Representative, shall conform to "Standard Specifications for Chemical Admixtures for Concrete", ASTM 494. The use of calcium chloride in concrete mixtures will not be permitted.

2.4 Mixing Water: Mixing water for concrete shall be fresh, clean and potable. Non-potable water may be used only if it produces mortar cubes having 7- and 28- day strengths equal to the strength of similar specimens made with distilled water, when tested in accordance with "Method of Test for Compressive Strength of Hydraulic Cement Mortars", ASTM C109.

2.5 Water Stops:

2.5.1 Water stops shall be provided for construction joints where noted on the Plans. Water stops shall be manufactured in accordance with ASTM D-471 and shall made of thermoplastic elastomeric rubber, specifically designed for aggressive chemicals including liquid nitrogen.

2.5.2 The thermoplastic elastomeric rubber water stops shall be WESTEC, Style #618 or #637 water stops, as manufactured by WESTEC Barrier Technologies, or approved equal.

2.6 Curing Compounds: All curing compounds shall conform to specifications for liquid membrane forming compounds for curing concrete ASTM C309 for Type 1-D clear or translucent with fugitive dye or Type 2 white pigmented, and shall be applied in accordance with manufacturer's recommendations.

2.7 Reinforcement: Reinforcing steel shall conform with Section 03200.

3. PROPORTIONING CONCRETE

3.1 General: Proportions of aggregate to cement and water shall be such to provide a concrete mix which will work readily into corners and angles for forms and around reinforcement and other embedded items without causing segregation of materials.

3.2 Proportioning Ingredients: All ingredients shall be proportioned in order to obtain the following:

Class of Concrete	Type of Concrete	Min. 28-Day Com. Strength	Water-Cement Ration (maximum)	Maximum Slump (inches)
B-1	Structural	3,500 psi	5.25 gal/sack	4

Air Entrainment

4% to 7% by volume of air-entrainment for all classes of concrete.

3.2.1 In no case shall be amount of fine aggregate be more than the amount of coarse aggregate (measured by weight) nor shall the amount of coarse aggregate be such as to produce honeycombing.

3.2.2 Portland cement concrete shall be proportioned and placed to provide an average compressive strength sufficiently high to minimize the number of compressive strength tests falling below the specified compressive strength for the concrete structure. Portions of concrete ingredients, including water-cement ratios, shall be established on the basis of laboratory trial batches to provide conformance with compressive strength requirements, workability, and consistency. When different materials are used for difference portions of the project, each combination shall be evaluated separately. Strength tests shall be conducted on test specimens in accordance with ASTM C39 and ASTM C192, from the trial batches using different water-cement ratios. Tabular data showing the compressive strength of the concrete proportions with various water-cement ratios shall be provided to the Engineer prior to placing of concrete on the jobsite.

3.2.3 Concrete shall be provided to develop a minimum 28-day compressive strength for field cured cylinders for each class of concrete indicated. Concrete that, after curing, will be subjected to freezing temperatures while wet shall contain entrained air from 4.0 to 7.0 percent by volume. Concrete that is intended to be water-tight shall have a maximum water-cement ratio of 0.48 by weight.

3.3 Moisture: Moisture in the aggregate shall be measured and the quantity must be included in the water-cement ration specified above.

3.4 Air-Entrainment: Air-entrainment shall be accomplished by the use of Type 1 Portland Cement with the addition of an approved air-entrainment admixture or by the use of Type 1A Portland Cement, as specified herein.

3.5 Trial Batches: Full sized trial batches shall be made in the laboratory using the aggregates selected for the job to establish the correct proportions to give proper workability, strength, and texture with the water-cement ration specified. The combinations of fine and coarse aggregates shall be adjusted within limits specified in ASTM C33 until the mix meets approval of the Engineer.

3.6 Water-Reducing, Retarding & Accelerating Admixtures: Such admixtures may be used when such use is requested by the Contractor subject to review and approval by the Engineer. For certain uses the Engineer reserves the right to require the use of a retardant or other admixtures for specific uses such as a retardant in extensive wall pours to assure elimination of cold joints or for other such purposes. No additional compensation will be allowed when such admixtures are used either at the Contractor's request or at the request of the Engineer. However, when certain such admixtures are used, it will be allowable to reduce the cement content of the mix to a minimum of 5 ½ bags of cement per cubic yard of concrete subject to the following conditions: A trial batch and test cylinders taken therefrom demonstrate that the mix will meet the strength, workability, slump and durability requirements of the specified mix previously herein stated. The strength shall be determined from seven-day test cylinders from a trial batch utilizing the admixture and made using the aggregates selected from the job, to establish the correct proportions to give proper workability with the water-cement ratio specified. The combination of fine and coarse aggregates shall be adjusted within limits specified to equal 95 percent of the specified minimum 28-day strength.

4. MIXING CONCRETE

4.1 Ready-Mixed Concrete: Ready-mixed concrete will be permitted provided it conforms to the "Standard Specification for Ready-Mixed Concrete", ASTM C94 and to the applicable portions of these Specifications. The Contractor shall make all arrangements to satisfy the Engineer that materials used comply with specification requirements.

4.1.1 The Engineer shall have free access to the mixing plant at all times when work is performed for this project for sampling and testing materials. Such privilege shall not relieve the Contractor of his responsibility for compliance with contract requirements.

4.2 Batch Mixing at Site:

4.2.1 The concrete shall be mixed in a batch mixer, conforming to the requirements of the Mixer Manufacturer's Bureau of the Associated General Contractors of America. The mixer shall bear a manufacturer's rating plate indicating the rated capacity and the recommended revolution per minute and shall be operated in accordance with these recommendations. It shall be equipped with a suitable charging hopper, water storage tank, and a water-measuring device and shall be capable of thoroughly mixing aggregates, cement and water into a uniform mass within the specified mixing time and discharging the mix without segregation.

4.2.2 The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue to flow for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to insure that the batch cannot be discharged until the required mixing time has elapsed. Controls shall be provided to insure that no additional water may be added during mixing. The entire batch shall be discharged before the mixer is recharged.

4.2.3 Each batch of two cubic yards or less shall be mixed for not less than 1 ½ minutes. The minimum mixing time shall be increased 15 seconds for each additional cubic yard or fraction thereof.

4.3 The mixer shall be clean, and the pick-up and throw-over blades shall be replaced when they have lost 10 percent of their original depth.

4.4 Admixtures:

4.4.1 Air-entraining and chemical admixtures shall be charged into the mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powered admixtures shall be weighted or measured by an admixture shall be with +/- three percent.

4.4.2 Two or more admixtures may be used in the same concrete, provided such admixtures are added separately during the batching sequence and provided further that the admixtures used in that combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

4.4.3 Addition of retarding admixtures shall not be significantly delayed after the addition of the cement.

4.5 Retempering: Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall not be retempered, but shall be discarded.

4.6 Indiscriminate addition of water to increase slump or workability shall be prohibited. When concrete arrives at the project with slump below that suitable for placing, water may be added only if neither the maximum permissible water-cement ration nor the maximum slump is exceeded. The water must be incorporated by additional mixing equal to at least half of the total mixing required. Any addition of water above that permitted by the limitation on water-cement ration must be accompanied by a quantity of cement sufficient to maintain the proper water-cement ration. Such addition must be approved by the Engineer.

4.7 Weather Conditions:

4.7.1 Cold Weather: To maintain the temperature of the concrete above the minimum placing temperature required herein, the as-mixed temperature shall not be less than 55°F. when the mean temperature falls below 40°F.

4.7.2 If the water or aggregate has been heated, the water shall be combined with the aggregate in the mixer before cement is added. Cement shall not be added to the mixtures of water and aggregate when the temperature of the mixture is greater than 100°F.

4.7.3 Hot Weather: The ingredients shall be cooled before mixing if necessary to maintain the temperature of the concrete below the maximum placing temperature required herein.

5. CONCRETE PLACEMENT

5.1 Preparation Before Placing: Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.

5.2 Formwork shall be completed; reinforcement shall be secured in place; expansion joint material, waterstops, anchors, pipe sleeves, and other embedded items shall be positioned; and the entire preparation shall be approved by the Resident Project Representative before any concrete is placed. Subgrades shall be sprinkled sufficiently to eliminate absorption of water from the concrete before any concrete is placed.

5.3 Conveying: Concrete shall be handles from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and is a manner which will assure that the required quality of the concrete is obtained.

5.4 Conveying equipment shall be of size and design to insure a continuous flow of concrete at the delivery end and shall be approved by the Resident Project Representative. Conveying equipment and operations shall conform to the following requirements:

5.4.1 Truck mixers, agitators, and nonagitating units and their manner of operation shall conform to the applicable requirements of “Specifications for Ready-Mixed Concrete”, ASTM C94.

5.4.2 Belt conveyors shall be horizontal or at a slope which will not cause segregation or loss. An approved arrangement shall be used at the discharge end to prevent separation. Long runs shall be discharged without separation into a hopper.

5.4.3 Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

5.4.4 Pumping or pneumatic conveying equipment shall be without “Y” sections, and with adequate pumping capacity. The equipment shall be cleaned at the end of each operation. Pneumatic placement shall be controlled so that separation is not apparent in the discharged concrete. The maximum loss of slump in pumping or pneumatic conveying equipment shall be 1 ½ inches.

5.5 Depositing: Concrete shall be deposited continuously or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or plans of weakness within the section. If a section cannot be placed continuously, construction joints shall be located at points as provided for in the drawings or as approved by the Resident Project Representative. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior approval has been obtained.

5.5.1 Placing of concrete in supported elements shall not be started until the concrete previously placed in columns and walls is not longer plastic.

5.5.2 Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to flowing or rehandling and shall drop vertically into the center of the forms. In no case shall concrete be allowed to fall more than five feet or at other times when required by the Resident Project Representative drop chutes or other approved devices shall be used.

5.6 Where surface mortar is to be the basis of the finish, the coarse aggregate shall be worked back from the forms with a suitable tool so as to bring a full surface of mortar against the form without the formation of excessive surface voids. All concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting or plans of weakness. Mechanical vibrators shall have a minimum frequency of 7,000 revolutions per minute and shall be operated by competent workmen. Overvibrating and use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at many points, from 18 to 30 inches apart. At each insertion the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 seconds duration. A spare vibrator shall be kept on the job site during all concrete placing operation.

5.7 Weather Conditions:

5.7.1 Unless adequate protection is provided and approved by the Engineer, concrete shall not be placed in rain, sleet, or snow. Rain water shall not be allowed to increase the mixing water nor to damage the surface finish.

5.7.2 When the mean daily temperature falls below 40°F., the minimum temperature of concrete as place shall be 50°F.

5.7.3 Concrete deposited in hot weather shall have a placing temperature which will not cause difficulty from loss of slump, flash set or cold joints (usually somewhat less than 90°F.).

5.8 Concreting Under Water: No concrete shall be placed under water without the approval of the Engineer.

6. JOINTS

6.1 Construction Joints: Construction joints shown on the plans are recommended and any deviation from these shall be approved by the Engineer. When joints not shown on the plans are required, they shall be placed so as to least impair the strength of the structure.

6.1.1 All reinforcing bars and welded wire fabric shall continue across construction joints. Construction joints shall conform to the details shown on the plans and shall be keyed as shown. Construction joints shall be thoroughly wetted and coated with a mixture of 1:2 mortar immediately before the new concrete is placed.

6.1.2 The surface of the concrete at all joints shall be thoroughly cleaned and all laitance shall be removed. Immediately before placing fresh concrete, the surface of the existing concrete at the joint shall be dampened but not saturated. The edges of all joints which are exposed to view shall be carefully finished true to line and elevation.

6.2 Expansion Joints:

6.2.1 Reinforcement or other embedded metal items bonded to the concrete shall not be permitted to extend through any expansion joint.

6.2.2 Premolded expansion joint filler shall be of the size shown on the plans and shall conform to “Specifications for Preformed Expansion Joint Filler for Concrete (Standard Cork, Type II)”, ASTM. The joint shall be sealed with two component non-staining gray sealing

compound with polysulfide liquid polymers, gun grade with primer, installed in accordance with the manufacturer's recommendations.

6.3 Water Stops: Each piece of thermoplastic elastomeric rubber waterstop shall be of maximum practicable length in order that the number of splices be held to a minimum. Joints at intersections and at ends of pieces shall be made according to the manufacturer's recommendations and shall develop watertightness fully equal to that of the continuous waterstop material. Care shall be taken during installation of the waterstops so that no leakage will occur across the joint.

7. FINISHES

7.1 General: After removal of forms the concrete shall be given one or more of the finishes specified herein.

7.2 All necessary patching shall have been done immediately after forms have been removed and rubbing shall be completed not later than the following day. Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until a uniform color and texture are produced. No cement grout or slush shall be used other than the cement paste drawn from the green concrete itself during the rubbing process.

7.3 Related Uniformed Surfaces: Tops of walls and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the formed surfaces. Final treatment on formed surfaces shall continue uniformly across the unformed surfaces.

7.4 Sidewalk slabs shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface. This operation shall follow immediately after floating.

8. PATCHING

8.1 General: All tie holes and all repairable defective areas shall be patched immediately after form removal.

8.2 Defective Areas: All honeycombed and other defective concrete shall be removed down to sound concrete. The area to be patched and an area at least six inches wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using a mix of approximately one part cement to one part fine sand passing a No. 30 mesh sieve, shall be mixed to the consistency of thick cream and shall then be well brushed into the surface.

8.3 The patching mixture shall be made of the same material and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 1 ½ parts sand by damp loose volume. White portland cement shall be substituted for a part of the gray portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete as determined by a trial patch.

8.4 The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel without addition of water until it has reached the stiffest consistency that will permit placing.

8.5 After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least one hour before being finally finished. The patched area shall be kept damp for seven days. Metal tools shall not be used in finishing a patch in a formed wall which will be exposed.

8.6 Tie Holes: After being cleaned and thoroughly dampened, the tie holds shall be filled solid with patching mortar.

8.7 Proprietary Materials: If desired by the Contractor, proprietary compound for adhesion or as patching ingredients may be used in lieu of or in addition to the foregoing patching procedures. Such compounds shall be used in accordance with the manufacturer's recommendations and shall be Standard Dry Wall products, or approved equal.

9. CURING AND PROTECTION

9.1 General: Exposed surfaces of concrete shall be protected from premature drying and excessively hot or cold temperatures for the period of time necessary for the hydration of the cement and proper hardening of the concrete.

9.2 Curing: Initial curing shall immediately follow the finishing operation. Concrete shall be kept continuously moist at least for 24 hours by one of the following materials or methods:

9.2.1 Ponding or continuously sprinkling.

9.2.2 Absorptive mat or fabric kept continuously wet.

9.2.3 Sand or other covering kept continuously wet.

Whichever of the above materials or methods is chosen shall be approved by the Engineer.

9.3 Immediately following the initial curing and before the concrete has dried, final curing shall be accomplished by one of the following materials or methods:

9.3.1 Continuation of method used for initial curing.

9.3.2 Waterproof paper conforming to "Specifications for Waterproof Paper for Curing Concrete", ASTM C171.

9.3.3 Other moisture retaining coverings as approved by the Engineer.

9.4 The final curing shall continue for a cumulative number of seven days, not necessarily consecutive, during which the temperature of air in contact with the concrete is above 50°F. If high-early-strength cement has been used, the final curing shall continue for a total of three days. When the mean daily temperature of the atmosphere is less than 40°F., the temperature of the concrete shall be maintained between 50°F. and 70°F. for the required curing period. When necessary, arrangements for heating, covering, insulating or housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature and moisture conditions without injury due to concentration of heat or carbon dioxide build up.

9.5 During hot weather, arrangements for installation of windbreaks, shading, spraying, sprinkling, ponding or wet covering shall be made in advance of placement and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.

9.6 Changes in temperature of the concrete shall be as uniform as possible and shall not exceed 5°F. in any one hour or 50°F. in any 24-hour period.

9.7 Protection From Mechanical Injury: During curing the concrete shall be protected from damaging mechanical disturbance, heavy shock or excessive vibration. All finished surfaces shall be protected from damage caused by construction equipment, materials or methods and rain or running water.

9.8 Temperature & Shrinkage Cracks: Temperature and shrinkage cracks which develop prior to the final acceptance of the plant by the Owner shall be repaired and waterproofed as specified herein and other applicable parts of the Specifications.

10. TESTING

10.1 General: The Contractor shall keep a log identifying the exact locations of poured concrete represented by each test cylinder and shall furnish two copies of the test reports and logs to the Engineer as they become available.

10.2 All strength tests shall be performed by a reputable testing laboratory hired by the Contractor at his expense and approved by the Engineer. The costs of performing all strength tests as specified herein shall be borne by the Contractor and no extra compensation will be allowed.

10.3 Slump Tests: Slump tests will be performed when requested by the Resident Project Representative and shall conform to "Standard Method of Test for Slump of Portland Cement Concrete", ASTM C143.

10.4 Strength Tests: Test cylinders shall be taken by the Contractor as directed by the Resident Project Representative and shall be cured and tested in accordance with the "Standard Method of Making and Curing Concrete Compressive and Flexural Strength Test Specimens in the Field", ASTM C31. Not less than three specimens shall be made for each 20 cubic yards of concrete or fraction thereof in each day's pour, except that in no case shall a given mix design be represented by less than five tests. In the event that three test cylinders are not considered sufficient to represent the work done, the Engineer may direct that extra cylinders be made. The standard age of test shall be 28 days, but 7-day tests and 14-day tests may be used provided that the relation between the 7-day, 14-day and 28-day strengths of the concrete is established in advance by test for the materials and proportions used and approved by the Engineer. If the Contractor desires, extra cylinders may be made and tested for the purpose of indicating sufficient concrete strength for form removal or other purposes. If the average of the strengths of the test cylinders fail to obtain the specified strength so as to justify doubt as to the quality of the conrete, further tests shall be made at the Contractor's expense, of the concrete in place to determine its fitness to remain in the structure. These test shall be performed in accordance with the "Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete", ASTM C42. The strength level of the concrete will be considered acceptable if the average of three, 28-day test strength results equal or exceed the specified compressive strength and no individual tests fall below the specified compressive strength by more than 200 psi.

10.5 Air Content Tests: Air content tests may be requested by the Resident Project Representative at his discretion and shall conform to the "Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method", ASTM C173 or the "Standard Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method", ASTM C231. The Contractor shall provide all necessary equipment, materials, sampling, and testing.

11. FORMS

11.1 Forms shall be true and rigid and built to the line, shape, and grade shown on the plans. They shall be made of sound and reasonable smooth lumber, plywood, or steel. Joints shall be mortar tight and forms shall be tied and braced to prevent any bulging or deflection during concreting. Cut cleanouts at bottom as required for removal of sawdust and debris. The Engineer's approval of the forms is required before placing concrete.

11.2 Before reusing forms, or when using second-hand lumber for forms, they shall be cleaned and all nails removed therefrom. Immediately before pouring, all forms shall be thoroughly cleaned of all dirt, debris, and foreign matter.

11.3 Forms for exposed concrete beams, girders, columns, pilasters and walls shall provide for a one (1) inch radius or flat bevel on external corners.

CONCRETE ADMIXTURES 03301

1. GENERAL

1.1 Description: The work of this section consists of furnishing and using materials and procedures for air-entrainment of and/or addition of chemical admixtures to concrete.

2. MATERIALS

2.1 Air-entrainment Admixtures: Air-entrainment shall be accomplished by the use of Type 1 Portland cement with the addition of an approved air-entrainment admixture or by the use of Type 1A Portland cement. Air-entrainment admixtures shall conform to "Standard Specifications for Air-Entraining Admixtures for Concrete", ASTM C260.

2.2 Water Reducing, Retarding, and Accelerating Admixtures: Water reducing, retarding, or accelerating admixtures, if permitted by the Owner, shall conform to "Standard Specifications for Chemical Admixtures for Concrete", ASTM C494.

2.3 Fly Ash: Fly ash may be allowed as an admixture in the concrete mix concrete mix provided the following requirements are satisfactorily addressed.

2.3.1 Its use is in strict accordance with ASTM C618, latest revision;

2.3.2 Fly ash shall be sampled and tested in accordance with ASTM C311, latest revision;

2.3.3 Prior to being approved for use, fly ash shall be tested in combination with the cement and aggregates proposed for use to ascertain its suitability with regard to water requirements, strength development, shrinkage, heat of hydration, and durability.

3. EXECUTION

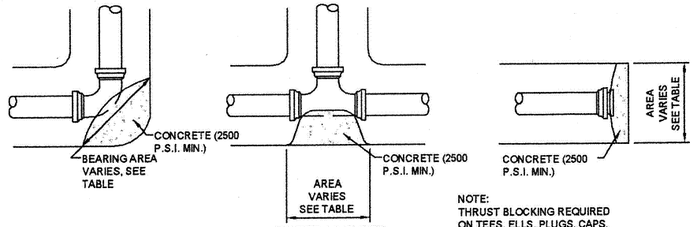
3.1 Water Reducing, Retarding, and Accelerating Admixtures: Such admixtures may be used when such use is requested by the Contractor subject to review and approval by the Owner. For certain uses, the Owner reserves the right to require the use of a retardant or other admixtures for specific uses such as a retardant in extensive wall pours to assure elimination of cold joints or for other such purposes. No additional compensation will be allowed when such admixtures are used. However, when certain such admixtures are used, it will be allowable to reduce the cement content of the mix to a minimum of 5 ½ bags of cement per cubic yard of concrete, subject to the following conditions: A trial batch and test cylinders taken therefrom demonstrate that the mix will meet the strength, workability, slump, and durability requirements of the specified mix previously herein stated. The strength shall be determined from seven-day test cylinders from a trial batch utilizing the admixture and made using the aggregates selected for the job, to establish the correct proportions to give proper workability with the water-cement ratio specified. The seven-day test strength shall equal 95 percent of the specified minimum 28-day strength.

3.2 Air-entraining and chemical admixtures shall be charged into the mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by the manufacturer. The accuracy of measurement by any admixture shall be within ± three percent.

3.3 Two or more admixtures may be used in the same concrete, provided such admixtures are added separately during the batching sequence and provided further that the admixtures used in that combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

3.4 Addition of retarding admixtures shall not be significantly delayed after the addition of the cement.

3.5 The addition of calcium chloride to the mix will not be allowed.

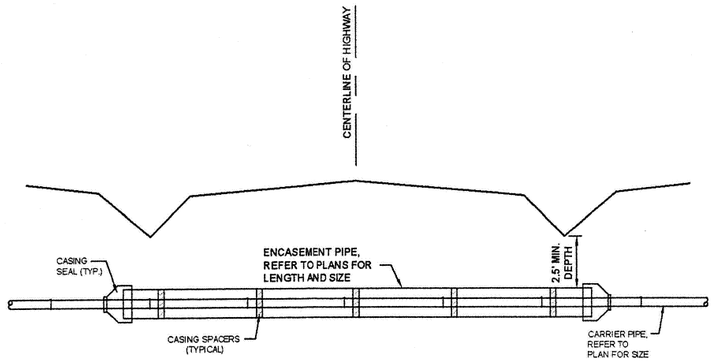


WATER LINE SIZE
MIN. THRUST BLOCKING AREA

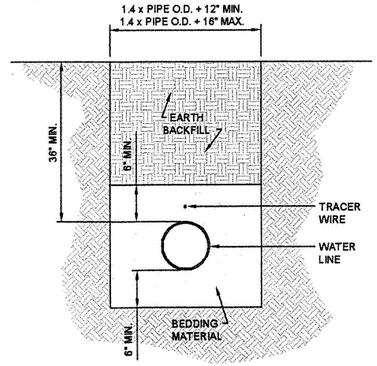
6" LINE OR SMALLER	4 SQUARE FEET
8" LINE	5 SQUARE FEET
12" LINE	8 SQUARE FEET

NOTE:
THRUST BLOCKING REQUIRED ON TEES, ELLS, PLUGS, CAPS, VALVES, ETC.

THRUST BLOCK DETAIL
N.T.S.

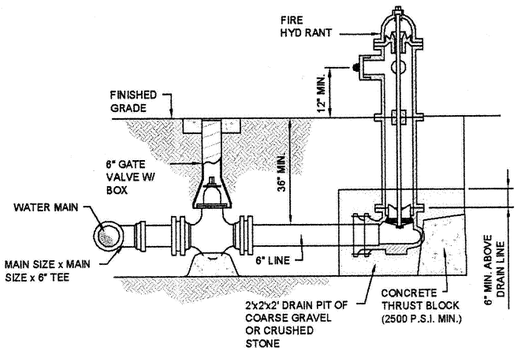


ENCASEMENT PIPE AND BORE DETAIL
N.T.S.

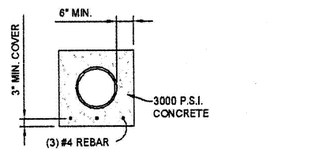


TRENCH & BEDDING DETAIL
N.T.S.

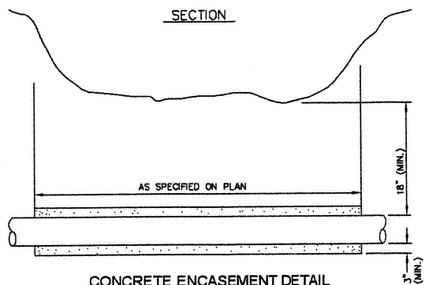
ALL TRENCHES ACROSS STREETS, ALLEYS, AND PUBLIC DRIVEWAYS SHALL BE BACK FILLED TO NATURAL OR FINISHED GRADE WITH APPROVED GRANULAR MATERIAL AS SOON AS CONDITIONS PERMIT. THE GRADE IS TO BE MAINTAINED UNTIL COMPACTED OR APPROVED BY THE ENGINEER. AFTER COMPACTION A FOUR-INCH THICK ASPHALTIC CONCRETE PATCH SHALL BE PLACED.



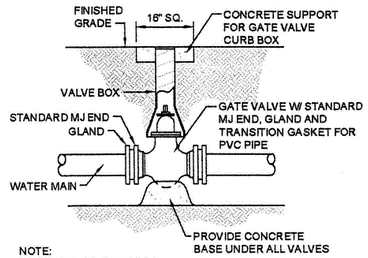
FIRE HYDRANT DETAIL
N.T.S.



SECTION

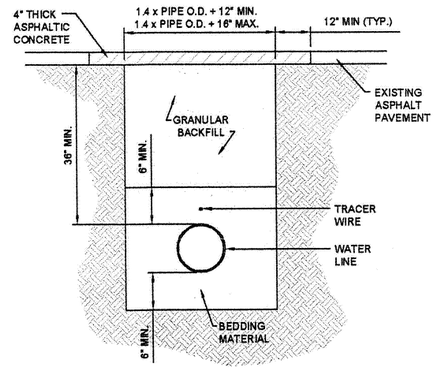


CONCRETE ENCASEMENT DETAIL
N.T.S.

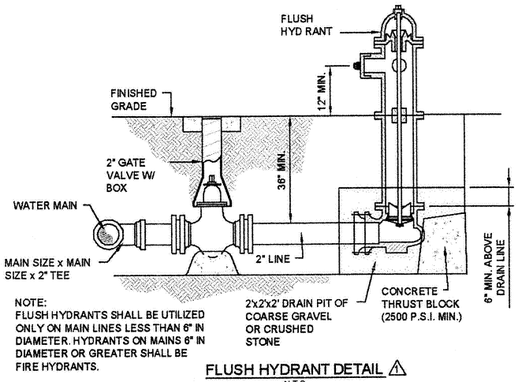


NOTE:
WHEN G.V. IS INSTALLED IN EXISTING DUCTILE OR C.I. PIPE, REPLACE TRANSITION GASKET W/ STANDARD MJ GASKET.

GATE VALVE INSTALLATION DETAIL
N.T.S.

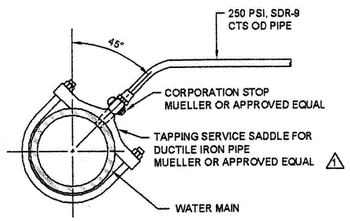


STREET CROSSING DETAIL
N.T.S.

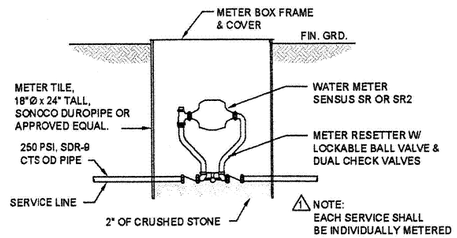


NOTE:
FLUSH HYDRANTS SHALL BE UTILIZED ONLY ON MAIN LINES LESS THAN 6" IN DIAMETER. HYDRANTS ON MAINS 6" IN DIAMETER OR GREATER SHALL BE FIRE HYDRANTS.

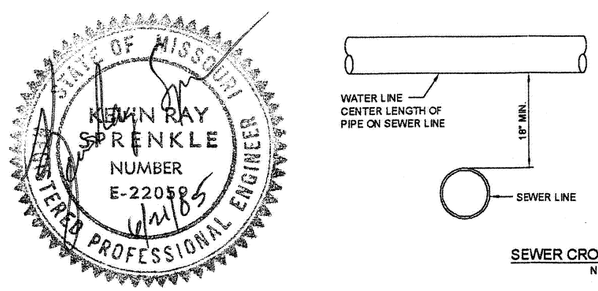
FLUSH HYDRANT DETAIL ⚠1
N.T.S.

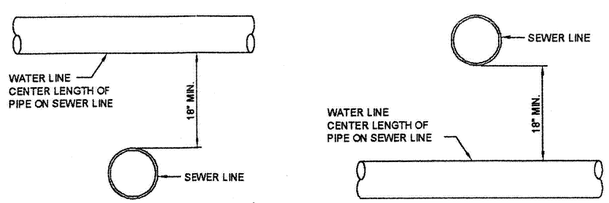


SERVICE TAP DETAIL
N.T.S.



WATER METER INSTALLATION DETAIL
N.T.S.





SEWER CROSSING DETAIL
N.T.S.

WATER CONSTRUCTION NOTES

1. THE WATER LINE SHALL HAVE A MINIMUM COVER OF 36".

2. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES AND FIELD VERIFY LOCATIONS OF ALL UTILITIES BEFORE BEGINNING EXCAVATION.

3. THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL REMOVE MARKERS, MAILBOXES AND THE LIKE WITHIN THE LIMITS OF THE PROPOSED IMPROVEMENTS.

4. THERE SHALL BE A MINIMUM 10' HORIZONTAL SEPARATION BETWEEN THE WATER LINE AND ANY SANITARY SEWER.

5. ALL TRENCHES UNDER DRIVES AND STREETS MUST BE BACK FILLED WITH GRANULAR MATERIAL AND COMPACTED TO 95 % DENSITY.

6. ASPHALT AND CONCRETE STREETS AND CURB AND GUTTER SHALL BE RESTORED TO MATCH ORIGINAL CONDITIONS.

SW: STAFF
DWN: RLW
CHKD: JJE
APPD:
DATE: FEB. 2005
DWG 1 OF 1

DRAWING TITLE: WATER MAIN & SERVICES
PROJECT DESCRIPTION: STANDARD CONSTRUCTION DETAILS
CLIENT: CITY of MONETT
PROJECT LOCATION: MONETT, MO.

NO.	REVISION DESCRIPTION	DATE
1	REVISED PER DNR COMMENTS	JUNE 2005

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