PROGRESS CLAUSE

1 of 1

RC/City of Owosso/2018 Street Program (Contract 2) March, 2018

The Contractor shall submit at the pre-construction meeting a complete Progress Schedule to the City Engineer. The Progress Schedule shall include, as a minimum, the controlling work items for the completion of the project and the planned dates that these work items will be the controlling operations; all for each of the project work sites. The street shall be opened to traffic no later than the project completion date.

The Contractor is required to coordinate work with the following criteria for Contract 2:

1. No work shall begin before June 11, 2018.
2. The completion date for all work is August 31, 2018.
3. Sewer and road work shall immediately follow completion of water main installation for each work site. Water main installation will be allowed to proceed from work site to work site.
4. All contract work, except slope restoration and HMA top course must be complete and road open to traffic before beginning sewer and road work on next work site, unless otherwise directed by Engineer.
5. Local traffic must be maintained in accordance with the special provision for Maintaining Traffic.

The contractor must build sufficient work days into the schedule to ensure all necessary work is completed on or before the critical dates. The contract period is based upon 2012 Standard Specifications for Construction Section 108.08D (1) for a standard project.

The approved low bidder for the work covered by this proposal is required to participate in a pre-construction meeting with the city to review and work out a detailed progress schedule. The meeting will occur soon after the low bidder is determined. Any named sub-contractors should also attend the scheduled meeting.

Failure on the part of the Contractor to carry out the provisions of this Progress Schedule may be considered sufficient cause to prevent bidding future projects until a satisfactory rate of progress is again established.

SPECIAL PROVISION
FOR
TECHNICAL SPECIFICATIONS

GENERAL REQUIREMENT

The MDOT 2012 STANDARD SPECIFICATIONS FOR CONSTRUCTION shall govern all technical specifications for this project. The following parts of the Contract will prevail over all other parts in the following order:

1. Special Provisions.
2. Supplemental Specifications.
3. Project Plans and Drawings.
4. MDOT Standard Plans.
5. 2012 Standard Specifications
6. City of Owosso Standard Specifications.

The Contractor shall not take advantage of any apparent error or omission in the contract documents. If any uncertainty, inconsistency, omission, or conflict is discovered within the contract documents, the Engineer will solely decide as to the true intent of the language.

NOTICE TO BIDDERS

UTILITY COORDINATION

CONTRACT 2

The Contractor shall cooperate and coordinate construction activities with the owners of utilities as stated in Section 104.08 of the Michigan Department of Transportation 2012 Standard Specifications for Construction. In addition, for the protection of underground utilities, the contractor shall follow the requirements in Section 107.12 of the Michigan Department of Transportation 2012 Standard Specifications for Construction. Contractor delay claims, resulting from a utility, will be determined based upon Section 108.09 of the Michigan Department of Transportation 2012 Standard Specifications for Construction.

For protection of underground utilities and in conformance with Public Act 53, the Contractor shall dial 1-800-482-7171 (or 811) a minimum of three full working days, excluding Saturdays, Sundays, and holidays prior to beginning each excavation in areas where public utilities have not been previously located. Members will thus be routinely notified. This does not relieve the Contractor of the responsibility of notifying utility owners who may not be a part of the "Miss Dig" alert system.

The following Public Utilities have facilities located in the road right-of-way or project area:

NAME AND ADDRESS OF OWNER	KIND OF UTILITY	PHONE NUMBER
Charter Communication 1480 S. Valley Center Dr Bay City, Michigan 48706	Cable Television	(989) 233-9404 Mark Kelly
Frontier Communications 1943 W. M-21 Owosso, Michigan 48867	Fiber	(989) 723-0373 Mark Stevens
Consumers Energy 530 West Willow Street PO Box 30162 Lansing, Michigan 48909	Gas	(517) 374-2375 Adam Bertram
Consumers Energy 530 West Willow Street PO Box 30162 Lansing, Michigan 48906	Electric	(517) 374-2329 Jacob Chalut
City of Owosso 301 W. Main Street Owosso, Michigan 48867	Water	(989) 725-0555 Glenn Chinavare
City of Owosso 301 W. Main Street Owosso, Michigan 48867	Sanitary Sewer	(989) 725-0555 Glenn Chinavare

Daystarr Communications 307 N. Ball Street Owosso, MI 48867	Fiber	(989) 720-1000 Casey Rose
City Engineer 301 W. Main Street Owosso, Michigan 48867	Road and Storm Drainage	(989) 725-0550 Randy Chesney, P.E.

The owners of existing service facilities that are within grading or structure limits and in conflict will move them to locations designated by the Construction Engineer or will remove them entirely from the highway Right-of-Way. Owners of Public Utilities will not be required by the City of Owosso to move additional poles or structures in order to facilitate the operation of construction equipment unless it is determined by the Construction Engineer that such poles or structures constitute a hazard to the public or are extraordinarily dangerous to the contractor's operations.

The existing utilities shown on the plans represent the best information available as obtained from survey and existing records. This information does not relieve the Contractor of the responsibility of protecting all existing utilities, in case utilities have been constructed or removed since the survey date or if utilities are encountered in different locations or if any utilities are not shown on the plans.

All existing utilities shall be located as to both horizontal and vertical position prior to starting any utility construction or other excavation. Cost shall be included in the new utility or excavation pay item.

The Contractor's attention is directed to the requirements for cooperation with others, as covered in Section 104.08 of the MDOT 2012 Standard Specification for Construction.

UTILITY DAMAGE

The Contractor shall be responsible for the protection of all existing utilities during construction of this project. Any utilities damaged by the Contractor shall be repaired in accordance with the related utilities specifications at the Contractor's expense.

UTILITY REPLACEMENTS

Consumers Energy is completing gas main replacement along Williams Street, Stewart Street, and Summit Street. All work is anticipated to be completed prior to commencement of this project with the exception of Summit Street, which is anticipated to be completed around mid-May 2018.

SPECIAL PROVISION
FOR
MAINTAINING TRAFFIC

General Requirements
All work shall be done in accordance with the requirements of Section 812 of the MDOT 2012 Standard Specifications for Construction and as modified herein. The Contractor is advised that the 2011 Michigan Manual of Uniform Traffic Control Devices, as amended, is hereby established as governing all work in connection with traffic control devices, barricading, signing, etc. as required for the project.

The Contractor shall furnish, erect, maintain, move and adjust, and-upon completion of work-remove all traffic control devices, barricades within the project limits and around the perimeter of the project, as part of the contract pay item Minor Traffic Devices.

Through traffic will be detoured while construction work is performed on the work site, in accordance with the detour plans.

Walks, driveways, and entrances to buildings shall not be unnecessarily blocked. Vehicular access shall be maintained to all commercial properties as directed by the Engineer. Unless otherwise specified herein, construction shall be completed in such a manner as to maintain the required entrance width for traffic at all times. When partial widths of new pavement are available to local traffic, access to driveways shall be provided. Maintenance Gravel shall be placed, maintained, and removed in the roadway and driveways whenever possible, during construction phases.

The Contractor shall identify and coordinate any removal of permanent traffic control signs such as street name, stop, speed, etc. with the Engineer. The Contractor will carefully remove and salvage sign and post for pickup by City DPW crews. DPW crews will install temporary stop signs and install permanent signs after construction. Payment for Contractor to remove and salvage existing permanent signs will not be paid for separately, but will be considered as part of other work items.

Protection for and protection of pedestrian traffic shall be maintained at all times.

For HMA paving, no traffic will be allowed on the surface being placed until rolling is completed and the surface cooled sufficiently to prevent damage from traffic. The Contractor shall provide traffic regulators in sufficient number to maintain traffic as described herein, and to keep traffic off sections being surfaced, and provide for safe travel at all times, as directed by the Engineer. Providing traffic regulators and maintaining traffic are included as part of the pay item Minor Traffic Devices.

Base, surface preparation, manholes, catchbasins, and other structure adjustment or reconstruction, shall be maintained longitudinally in such a manner as to provide the required traffic flow without undue shifting of traffic from lane to lane.

Construction Influence Area (CIA)
The CIA of the project shall include the area within the right-of-ways of the street receiving construction work, 300' either direction on adjacent streets, and to the location of the furthest advance warning signs required for the project.

Specific Requirements
Barricading and detour signing equipment will be moved and adjusted using similar traffic control devices, and adding any devices as required by the project's barricading and detour plans. Payment for Barricade, Type III: Plastic Drum; Sign, Type B, Temporary, etc. will be combined as 'Furnish' and 'Operated' and based upon maximum number of units used at any one time for the entire project. Moving of units from one location to another is considered included as part of the appropriate pay item.

HMA Surface, Remove shall be done in such a manner so as to maintain road and driveway access to adjacent residences. The Contractor shall organize a work plan such that minimal amount of HMA surface is removed until storm sewer and storm structure work is complete.

Aggregate Base, ___ Inch, Modified shall be placed the same workday that earth is excavated and trimmed, in all locations of the project. The Contractor is responsible for coordinating work activities such that opened subgrade is covered the same workday. Any damage occurring to the subgrade from unnecessary exposure to the elements will be undercut, removed, and replaced in accordance with the pay item Subgrade Undercutting, Type II; all at the Contractor's expense.

The Contractor is responsible for coordinating construction activities with all local businesses and residences; keeping them advised before and during construction activities as to their access and potential disruption of access.

The Contractor shall schedule work between the hours of 7:00 am and 7:00 pm, Monday through Saturday. No work is allowed outside these time periods. The Contractor shall coordinate work so that any necessary preliminary or closing operations are also done within these time periods.

No work will be allowed on national holidays Memorial Day, July 4, Labor Day holiday periods commencing 3:00 pm Friday before and 7:00 am workday after the national holiday.

Contractor will be limited to haul routes in accordance with City of Owosso Truck Route system. Any deviation from this requirement must receive advance approval by the City Engineer.

Measurement and Payment
The completed work as measured for the following pay items will be paid for at the Contract Unit Price for the following Contract Items (Pay Item):

Pay Item	Pay Unit
Maintenance Gravel	Ton
Barricade, Type III, High Intensity, Double Sided, Furn & Oper	Each
Pedestrian Type II Barricade, Temp	Each
Plastic Drum, High Intensity, Furn & Oper	Each
Lighted Arrow, Type C, Furn & Oper	Each
Sign, Type B, Temp, Prismatic, Furn & Oper	Square Feet
Minor Traffic Devices	Lump Sum

Individual pay items will be measured in in place by their respective pay unit measure; and will be paid for at the contract unit price per respective pay unit measure, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work.

SECTION 01 22 00

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes, but is not necessarily limited to, descriptions of the method of measurement and basis of payment criteria applicable to the Work. It also includes the form of Application for Payment to be used by CONTRACTOR in requesting payment for Work performed under the Contract.

1.02 SUBMITTALS:

A. Application for Payment: Submit three (3) copies to ENGINEER on the attached form or related format with supporting documentation as required by the Contract Documents.

1.03 MEASUREMENT OF QUANTITIES:

A. Measurement devices:
   1. Weigh scales: Inspected, tested and certified.
   2. Platform scales: Of sufficient size and capacity to accommodate the conveying vehicle.
   3. Metering devices: Inspected, tested and certified.

B. Measurement by weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook weights.

C. Measurement by volume: Measured by cubic dimension using mean length, width and height or thickness.

D. Measurement by area: Measured by square dimension using mean length and width or radius.

E. Linear measurement: Measured by linear dimension, at the item centerline.

1.04 MEASUREMENT AND PAYMENT SCHEDULE:

A. The following schedule outlines the method of measurement and basis of payment to be used on the project. Requirements for materials and methods described under each item are included in the related specification SECTION.

   1. Inspection and testing fees: Payment by OWNER, unless specifically noted otherwise.

   2. General Conditions, Bonds, Insurance and Mobilization: Shall be paid for on a lump sum basis for the CONTRACTOR's costs to provide required bonds and insurances, mobilization and miscellaneous requirements stipulated in Section 00 72 00 – GENERAL CONDITIONS. This quantity shall not exceed 5% of the total contract amount. Fifty percent (50%) will be paid on the first Application for Payment and twenty five percent (25%) will be paid on the second and third Applications for Payment.

3. Shoring: All shoring required for construction, safety and convenience will be considered temporary and included in construction items.

4. Dewatering for Construction: Payment by CONTRACTOR and included in construction items.

5. Temporary soil erosion and sedimentation control: Included in construction items, unless otherwise noted as a pay item.

6. Sawcutting: Measured and paid for by the linear foot in accordance with the special provision.

7. Erosion Control, Inlet Protection, Fabric Drop: Counted and paid for by the unit, installed at locations as directed by the ENGINEER or shown on the plans.

8. Erosion Control, Silt Fence: Measured and paid for by the lineal foot of length installed.

9. Turf Establishment, Performance: Measured and paid for by the square yard in accordance with the special provision. Grading, topsoil surface, seeding, fertilizing and mulch are included as part of this item.

10. Aggregate Base, _ inch, Modified: Measured and paid for by the square yard, placed and compacted, in accordance with the special provision.

11. Maintenance Gravel: Measured and paid for by the ton.

12. Geotextile, Separator: Measured and paid for by the square yard in place, to the limits shown on the plans, in accordance with the special provision.

13. HMA, __C: Measured by tallying load tickets and paid for by the ton, placed and compacted. Submit bituminous load tickets to ENGINEER at time of delivery. The pay item HMA, __C will be used for isolated HMA base repairs and sewer trench repairs where the adjacent HMA pavement is to remain in place.

14. HMA, __E3: Measured by tallying load tickets and paid for by the ton, placed and compacted. Submit bituminous load tickets to ENGINEER at time of delivery.

15. Hand Patching: Measured by tallying load tickets and paid for by the ton, placed and compacted. Use HMA mix designated on plans for hand patching material placed in maximum 4.5 inch layers and compacted. Hand Patching shall be used for replacement of material adjacent to curb and gutter repair areas. The pay item HMA, 2C will be used for isolated HMA base repairs and sewer/water main trench repairs where the adjacent HMA pavement is to remain in place.

16. HMA Approach: Measured by tallying load tickets and paid for by the ton, placed and compacted. Submit bituminous load tickets to ENGINEER at time of delivery. The pay item HMA Approach will be used for residential and commercial drive approaches. Street approaches will be paid for as part of the mainline paving pay items.

17. Driveway, Nonreinf Conc, __ inch: Measured and paid for by the square yard.

18. Conc Pavt, Nonreinf, __ inch: Measured and paid for by the square yard.

19. Curb and Gutter, Conc, Det F4: Measured along the back of curb and paid for by the lineal foot for the type specified in accordance with the MDOT Standard Plan R-30 Series. Replacement of subgrade or base material, or excavation or embankment necessary to achieve proper grade, shall be included in the concrete curb and gutter pay items and will not be paid for separately. All new sections of curb and gutter must be tied to the existing curb and gutter on both ends with epoxy coated #4 bars. Cost for this work, including the drilling into the existing curb, shall be included in this pay item.

20. Curb and Gutter, Conc, Det F4, Modified: Measured along the back of curb and paid for by the lineal foot for the type specified in accordance with the detail shown on the plans. Replacement of subgrade or base material, or excavation or embankment necessary to achieve proper grade, shall be included in the concrete curb and gutter pay items and will not be paid for separately. All new sections of curb and gutter must be tied to the existing curb and gutter on both ends with epoxy coated #4 bars. Cost for this work, including the drilling into the existing curb, shall be included in this pay item.

21. Sidewalk Ramp, Conc, 4 inch: Measured and paid for by the square foot for specified thickness, including the thickened 7 inch edge adjacent to concrete curb and gutter according to the detail shown on the plans.

22. Sidewalk, Conc, __ inch: Measured and paid for by the square foot and in accordance with the notes and details shown on the plans. Concrete sidewalks through driveways shall be of greater thickness as shown and directed by the ENGINEER.

23. Detectable Warning Surface: Measured along the center of the 24 inch wide detectable warning surface and paid for by the lineal foot.

24. Cement: Measured and paid for by the ton.

25. Machine Grading, Modified: Measured along the curb line extended and paid for by the 100 foot station and completed in accordance with the special provision. Each side of the roadway to be measured separately.

26. Subgrade Undercutting, Type __: Measured and paid for by the cubic yard as measured for the material specified.

27. Curb and Gutter, Rem: Measured along the back of curb and paid for by the lineal foot. Base disturbed during removal of curb and gutter shall be recompacted. Sawcutting of existing curb and gutter shall be included in this pay item and will not be paid for separately. Replacement of subgrade or base material, or excavation or embankment necessary to achieve proper grade, shall be included in the concrete curb and gutter pay items and will not be paid for separately.

28. Sidewalk, Rem: Measured and paid for by the square yard.

29. Pavt, Rem: Measured and paid for by the square yard for the full depth removal of existing pavements, regardless of type or thickness. Pavt, Rem shall also

include the preparation, grading, and compacting of subgrade prior to pavement placement as directed by the ENGINEER. Pavt, Rem shall be used for removal of existing drives, pavement repair areas, and adjacent to curb and gutter repair areas. Pavt, Rem will also be used for the removal of pavement for sewer and water main trenches outside of the street rehabilitation limits. Pavement removed within the limits of street rehabilitation (full depth HMA pavement removal and replacement) will be measured and paid for as HMA Surface, Rem.

30. HMA Surface, Rem: Measured and paid for by the square yard for the full depth removal of HMA, regardless of thickness, to the limits shown on the plans or as directed by the ENGINEER.

31. Cold Milling HMA Surface: Measured and paid for by the square yard to the depth, width, grade, and cross section shown on the plans. Surface cleaning shall be included in this pay item.

32. Approach, Cl II, LM: Measured and paid for by the cubic yard.

33. Sanitary Serv Conflict: Counted and paid for by the each in accordance with the special provision.

34. Abandoned Gas Main Conflict: Counted and paid for by the each in accordance with the special provision.

35. Sewer, SDR-26, __ inch, Tr Det B, Modified: Measured horizontally on the surface along the pipe centerline from center to center of structures and paid for by the linear foot by the pipe size, installed and backfilled, in accordance with the Trench Detail B – Modified Detail shown on the plans.

36. Dr Structure Cover, Adj, Case 1: Counted and paid for by the each.

37. Dr Structure Cover, EJ ____: Counted and paid for by the each and in accordance with the special provision.

38. Dr Structure, __ inch dia, Modified: Counted and paid for by the each for the structure diameter, installed and backfilled, and in accordance with the special provision.

39. Dr Structure, Add Depth of ___ inch dia, __ foot to __ foot: Measured and paid for by the vertical foot.

40. Dr Structure, Adj, Add Depth: Measured and paid for by the vertical foot.

41. Dr Structure, Tap, __ inch: Counted and paid for by the each.

42. Dr Structure, Temp Lowering: Counted and paid for by the each.

43. Dr Structure, Rem: Counted and paid for by the each including excavation, backfill and disposal of the structure removed.

44. Sewer, Rem, _____: Measured and paid for by the linear foot removed, including excavation, backfill and disposal of the pipe removed. Removal of sewers with diameters less than 12 inches, within the excavation limits of new

sewer, is included in the unit price for new sewer and will not be paid for separately.

45. Sewer Bulkhead, __ inch: Counted and paid for by the each for bulkheading storm sewers with a diameter larger than 12 inches.

46. Valve Box, Adj: Counted and paid for by the each in accordance with the special provision.

47. Post, Mailbox: Counted and paid for by the each. Existing mailboxes shall only be removed in areas necessary for watermain, storm sewer, or road construction as directed by the ENGINEER. Post, Mailbox pay item shall include, in addition to the requirements of Section 807 of the MDOT 2012 Standard Specifications for Construction, the removal of existing mailboxes and posts, temporarily relocating existing mailboxes during construction, the placement of existing mailboxes on new posts at the end of construction, and disposal of old posts as directed by the ENGINEER. All of the above work shall be included in the pay item Post, Mailbox, and will not be paid for separately. Newspaper receptacles shall be relocated as necessary to maintain delivery service. This work will be included in the pay item for Post, Mailbox and will not be paid for separately. Access to the existing, temporary or new permanent mailbox locations by the property owner and the U.S. Postal Service shall be maintained by the Contractor throughout construction. The Contractor shall coordinate this item with each property owner and the U.S. Postal Service.

48. Sign, Type III, Rem: Counted and paid for by the each. Existing signs and supports shall only be removed as necessary for water main or storm sewer installation as directed by the Engineer.

49. Sign, Type III, Erect, Salv: Counted and paid for by the each. Existing signs shall only be salvaged and reinstalled as necessary for water main or storm sewer installation as directed by the Engineer.

50. Post, Steel, 3 Pound: Measured and paid for by the linear foot.. Existing signs salvaged shall be reinstalled on new 2-3/8” round posts.

51. Minor Traf Devices: Lump sum complete and paid in accordance with Section 812 of the 2012 Michigan Department of Transportation Standard Specifications for Construction. Providing traffic regulators and maintaining traffic is included in this pay item.

52. Construction signing, drums, lighted arrows, and barricades: Measured or counted and paid for by the unit for the maximum number of units required by the Engineer at one time on the project, furnished, installed, maintained, moved and removed.

53. Pavt Mrkg, Waterborne, __ inch, (color): Measured and paid for by the linear foot.

54. Pavement marking, symbols, arrows, legends, stop bars and crosswalks: Measured or counted and paid for by the unit.

55. Connect to Ex. Water Main: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for connecting

new water main to existing watermain and shall include, but is not limited to, all water main pipe, fittings, adapters, all necessary excavation, removal of existing plugs and reducers, sheeting and bracing, shoring, draining, dewatering, laying, jointing, bedding, testing, disinfecting, filling, backfilling with the type or classification of material specified, disposal of excess backfill and fill material, thrust blocks, cleanup, and all other items necessary to complete the work, whether specifically mentioned or implied.

56. 2" Blow-off and Copper Line to Surface: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary to furnish, install, and remove blowoff and copper line to new watermain and shall include, but is not limited to, all, fittings, adapters, all necessary excavation, sheeting and bracing, shoring, draining, dewatering, laying, jointing, bedding, testing, disinfecting, filling, backfilling with the type or classification of material specified, disposal of excess backfill and fill material, thrust blocks, cleanup, and all other items necessary to complete the work, whether specifically mentioned or implied.

57. Existing Valve with Valve Box Abandonment: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for Existing Valve with Valve Box Abandonment and shall include, but is not limited to, closing the existing valve, excavation, removal of the valve box, backfilling of the excavated area, and restoration. The City of Owosso shall have right of first refusal of all valve boxes.. All other material shall be properly disposed of off site by the Contractor. Existing Valve with Valve Box Abandonment shall also include all items necessary to complete the work, whether specifically mentioned or implied.

58. Existing Valve and Valve Box Removal: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for Existing Valve and Valve Box Removal and shall include, but is not limited to, excavation, removal of the valve and valve box, and backfilling of the excavated area. The City of Owosso shall have right of first refusal on all valves and valve boxes. All other material shall be properly disposed of off site by the Contractor. Existing Valve and Valve Box Removal shall also include all items necessary to complete the work, whether specifically mentioned or implied.

59. Existing Hydrant Removal: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for Existing Hydrant Removal and shall include, but is not limited to, excavation, removal of the hydrant, valve, valve box, bends, and piping up to the hydrant tee. Backfilling of the excavated area and restoration shall also be included. The City of Owosso shall have right of first refusal on all hydrants, valves, valve boxes, bends and piping. All other material shall be properly disposed of off site by the Contractor. Existing Hydrant Removal shall also include all items necessary to complete the work, whether specifically mentioned or implied.

60. Water main pipe: Measured horizontally on the surface along the pipe centerline and paid for by the linear foot of the type, diameter, class, and backfill specified, installed, and accepted. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing water main and shall include, but is not limited to, all excavation, sheeting and bracing, shoring, concrete cradles, draining, dewatering, laying, free boring, jointing, deflecting, bedding, testing, disinfecting, backfilling with the type or classification of material

specified, disposal of excess excavated material, anchorage/restraints, final cleanup, maintaining existing utilities, and all other items and operations necessary to complete the work, whether specifically mentioned or implied. Measurement for water main will be by length in feet along the centerline of the pipe and shall include the installation length of valves, fittings, and appurtenances.

61. Reducers, Crosses, Tees, Bends: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing reducers, crosses, tees, and bends and shall include, but is not limited to, all fittings, excavation, sheeting and bracing, shoring, concrete cradles, draining, dewatering, laying, jointing, deflecting, bedding, testing, disinfecting, backfilling with the type or classification of material specified, disposal of excess excavated material, anchorage/restraints, encasement, final cleanup, maintaining existing utilities, and all other items and operations necessary to complete the work, whether specifically mentioned or implied.

62. Plug: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for plugging the existing water main and shall include, but is not limited to, all plugs, fittings, adapters restraint, all necessary excavation, sheeting and bracing, shoring, draining, dewatering, laying, jointing, bedding, testing, disinfecting, filling, backfilling with the type or classification of material specified, disposal of excess backfill and fill material, thrust blocks, cleanup, and all other items necessary to complete the work, whether specifically mentioned or implied.

63. Valve and Valve Box: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing valve and valve box, and shall include, but is not limited to, all necessary excavation, sheeting and bracing, shoring, dewatering, backfilling, anchorage/restraints, disposal of excess excavated material, cleanup, and all other items necessary to complete the work, whether specifically mentioned or implied.

64. 90° Fire Hydrant Assembly: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing fire hydrant assembly, and shall include, but is not limited to, fire hydrant, valves, valve boxes, connecting piping and fittings, bends, all necessary excavation, sheeting and bracing, shoring, dewatering, stone or gravel sub-base, backfilling, disposal of excess excavated material, thrust blocks or joints restraints, cleanup, and all other items necessary to complete the job, whether specifically mentioned or implied.

65. Fire Hydrant Assembly: Counted and paid for by the each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing fire hydrant assembly, and shall include, but is not limited to, fire hydrant, valves, valve boxes, connecting piping and fittings, bends, all necessary excavation, sheeting and bracing, shoring, dewatering, stone or gravel sub-base, backfilling, disposal of excess excavated material, thrust blocks or joints restraints, cleanup, and all other items necessary to complete the job, whether specifically mentioned or implied.

66. New Water Service, Open Cut or Freebore: Counted and paid for by the each. Price paid shall include all labor and materials required to completely install a

new water service from the new main to the existing service at the curb stop box, including corporation, copper service line, new curb stop and box, removing existing curb box and closing existing curb stop, tapping the new main, making connection with the existing service at the curb stop box, and surface restoration. Leads to opposite side of the road of the new watermain will be installed with more length than services installed on the watermain construction side.

Water services on the opposite side of the road of the new watermain shall be paid for as 'New Water Service, Freebore' (EA).

Water services on the same side of the road as the new watermain shall be paid for as 'New Water Service, Open Cut' (EA).

Where the existing curb stop box is located immediately adjacent to concrete sidewalk, a maximum of 12 lineal feet (48 square feet) of sidewalk may be removed and replaced as necessary to facilitate the service transfer. To be paid for as 'Sidewalk, Rem' and 'Sidewalk, Conc, 4 inch".

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used

END OF SECTION

CITY OF OWOSSO

SPECIAL PROVISION
FOR
WATER MAIN INSTALLATION

DESCRIPTION

This work shall consist of installing water main and appurtenances in accordance with the plans, this special provision, AWWA, MDEQ, and the MDOT 2012 Standard Plans and Specifications. This shall include all labor, equipment, and materials to complete the work.

For the protection of underground utilities and in conformance with Public Act 174 of 2013, the Contractor shall contract the Miss Dig system, Inc. by phone at 811 or 800-482-7171 or via the web at either elocate.missdig.org for single address or rte.missdig.org, a minimum of 3 business days prior to excavation, excluding weekends and holidays.

The Department of Public Works can assist the Contractor in locating existing water service leads and mains. All removed valves and hydrants shall be salvaged and returned to the Department of Public Works.

The Contractor shall contact the Engineer to schedule work interfering with existing water service. Temporary shut off of service shall be obtained from the Department of Public Services.

A service charge of $1,000 will be required at time of permit application. This fee includes the minimum charge of $50 for 5,000 bulk gallons of water, plus additional charges of $10 per 1,000 gallons consumed in excess of the minimum quantity. Owosso Water System personnel will attach a water meter and RPZ backflow preventer to the hydrant for Contractor use. If the water meter and RPZ is returned in good operating condition, the Contractor will receive a $450 refund, less additional water consumed in excess of minimum quantity.

MATERIALS

All materials supplied by the Contractor shall be new, meeting minimum specifications of American Water Works Association (AWWA) Standards, and special provisions as delineated by the City of Owosso. All materials shall be lead free as defined by the USEPA Safe Drinking Water Act, in that; “All pipes, pipe fittings, plumbing fittings, and fixtures that are used for potable water must comply with the lead free requirement and must bear the mark NSF/ANSI Standard 61, Annex G or NSF 61-G.”

Michigan and United States of America products shall be used whenever possible.

Pipe

Water main constructed of PVC pipe shall conform to AWWA C900/C909 standards. C909 PVC pipe shall be used for open trench cut installations. C900 PVC fused pipe shall be used for

trenchless installations. Pipe shall meet both NSF/ANSI Standard 61 and NSF/ANSI Standard 14. PVC pipe shall have a ratio of diameter to wall thickness of 18, unless noted otherwise on the plans or in the proposal.

Water main constructed of ductile iron pipe shall conform to AWWA C151/C600. Pipe shall meet Thickness Class 52 and Pressure Class 350. Ductile iron pipe shall be lined with a cement mortar and bituminous seal coat in accordance with AWWA C104.

Pipe manufacturer and class shall be marked on each length of pipe.

Pipe, fittings, joints, and fire hydrants in soils contaminated with volatile organic compounds, as determined in the field by the Engineer, shall require the use of Linear Low Density Polyethylene black (8-mil) Poly Wrap ANSI/AWWA C105/A21.5, ASTM D882, for up to one foot of finished grade.

Fittings/Joints

Joints shall be push-on type with elastomeric gaskets meeting the requirements of ASTM D3139/ F477 or AWWA C111 and shall be provided with an electrical conductivity device.

Fittings shall be cast iron or ductile iron with mechanical joints and shall be in accordance with AWWA C153 / ANSI A21.53. Fittings shall be cement lined in accordance with ANSI/AWWA A21.4/C104 and rated for 250 psi, or more.

Following manufacturer's standards, mechanical joint restraint shall be required and shall be MEGALUG by EBAA Iron, or approved equal.

All mechanical joints and fittings requiring bolt-on fasteners shall use Blue Core Bolts.

Corrosion protective material as a barrier encasement in varying soil conditions shall be required. Use 1) Linear Low Density Polyethylene black (8-mil) Poly Wrap ANSI/AWWA C105/A21.5 ASTM D882, or 2) Sanchem, Inc. NO-OXG-ID GG-2 lubricant. Corotech coal tar epoxy is not permitted for use.

Ductile iron water main shall require the use of nitrile gaskets, and used in place of PVC pipe where hazardous soils exist..

Fire Hydrants

This item shall include the fire hydrant, an auxiliary valve (placed 3 feet from hydrant), valve box, connector pieces and the hydrant tee. These items shall be installed in accordance with the standard construction practices and the standard fire hydrant detail. Bends approved by Engineer

and Department of Public Works may be added into the connection, but shall not be paid for separately. Extensions will also not be paid for separately.

All fire hydrants shall be manufacturer by East Jordan Iron Works (**EJIW) Stortz** 5BR250, 55726D, open right, with 5 1/2 foot depth of bury, and painted yellow, and manufactured in accordance with AWWA C502 specifications. Hydrants shall be provided as outlined in the details within the construction plans and below:

1. Dry-barrel fire hydrant traffic model or traffic flange type and 150 pound working pressure, compression type, and opening with the line pressure, with mechanical joints.
2. Fire hydrants shall be bronze mounted throughout with no iron-to-iron or steel contacts or threads. The operating stem in the base and valve seat shall be bronze.
3. All iron parts shall be of high strength grey iron conforming ASTM A126 Class B.
4. Fire hydrants shall have a 6-inch valve opening with a 6-inch mechanical joint inlet.
5. The minimum inside dimension shall be 8 inches.
6. The operating nut shall turn to the right to open and have a weather shield. The opening direction shall be plainly marked with an arrow near the operating nut showing the opening direction.
7. The operating nuts and nut nozzle caps shall be square and slightly tapered; and it shall be $^{15}/_{16}$" at its base and $^{13}/_{16}$" square at its end and 1- $^{1}/_{8}$" long.
8. Fire hydrants shall be completely assembled at the factory with the drain opening sealed with a threaded plug.
9. Provide two fire hose connections and one pumper connection in accordance with municipality standards.
10. All nozzles shall be on a movable head on the hydrant barrel so that they may be rotated by changing the position of the top flange without removing the barrel.
11. Provide a Spring Cap Style McGard Fire Hydrant Lock for hydrant.
12. Provide proper length for installation at water main depth as indicated on the drawings.
13. All fire hydrants shall have a concrete collar around the lower barrel, 12" below the ground line with 1" of expansion joint material between the hydrant barrel and collar, as directed by the Engineer. The collar shall be 6 inches thick with a diameter of at least 24 inches. Diameter will be as wide as necessary to reach undisturbed earth. Fire hydrants shall be tested to 300 pounds hydrostatic pressure from inlet side with valve in both open and closed position.
14. Fire hydrants shall be painted yellow above the grade line conforming to the municipality standards and black below the grade line.
15. Fire hydrants shall be designed so one man can easily remove or replace the working parts without removing the main valve seat.
16. Fire hydrants shall be flagged per municipality specifications.
17. Hydrant valve operating nut shall be 2-inch.
18. Hydrant lead shall be six (6) inch with MEGALUG mechanical joint restraint.

Gate Valves & Boxes

All gate valves shall be manufactured by East Jordan Iron Works (EJIW). All valves for use in water distribution systems shall be resilient seat, single wedge valves. The valves shall be in accordance with AWWA Specification C515 and shall also meet any supplemental requirements

or specifications of the municipality. Valves used on this project shall have mechanical joints with stainless steel bolts. The valves shall be manually operated with non-rising stems, iron body, bronze trim, and be furnished with a standard AWWA 2 inch square-operating nut. The wrench nut shall turn right (clockwise) to open with red top and shall be indicated by an arrow cast on the operating nut skirt. Valve stem risers are required for depths greater than 6'-6" and will not be paid for separately.

All valve boxes shall be manufactured by EJIW**.** The valve box shall be cast iron, 5-½ inch diameter, and three-piece adjustable screw type. Valve box extensions are required for depths greater than 6'-6" and will not be paid for separately. No. 6 round bases are required for gate valves up 8" in diameter and No. 160 oval bases for gate valves 10" and greater. The drop covers shall be stamped "water".

Curb Stops/Boxes, Taps, and Services

The water service piping shall be copper tubing, Type K, annealed, in accordance with ASTM B88. The size of tubing shall match the existing size of the water service being replaced. The fittings shall conform to ASTM B16.26, cast bronze. Joints of the copper tubing shall be flared. All water services to be constructed 90 degrees from water main to curb-stop/meter pit.

Taps – Ductile Iron Pipe:

1. For ¾ inch residential service tap, no saddle required. Use Ford F-1000-3-Q-NL, taped thread x CTS – QJ (Note: 1-inch minimum now required)
2. For 1 inch residential service tap, no saddle required. Use Ford #F-1000-4-Q-NL
3. For larger than 1 inch service tap, use Ford #F series as appropriate.

Taps – PVC Pipe:

1. Use Power Seal stainless steel saddle Model 3417AS for 4" to 24" diameter pipe.

Curb stops/boxes shall follow below:

1. Curb Stops shall be manufactured by Ford, Model #B-44-333-Q-NL for ¾ inch ball-stop, and Model #B-44-444-Q-NL for 1 inch ball-stop. Female thread x CTS – QJ or CTS – QJ x CTS – QJ.

2. Curb Stops shall be 5' 6" deep.
3. Curb Stop Boxes shall be the Standard Buffalo patterns and all parts of the same, including extension sections, shall be interchangeable and fit up with corresponding parts of other Standard Buffalo pattern boxes.
4. Internal diameter of base shaft shall be 2-1/2 inches for (3/4 inch and 1 inch curb stop).
5. The boxes shall be cast iron, suitable coated to resist corrosion and the casting shall be smooth and free of any imperfections.
6. The covers shall overlap and fit outside the rim of the upper section, and they shall have a horseshoe-shaped groove in them to receive the bolt head and the word "water" embossed on the top surface.
7. All boxes shall be Tyler 6500 (2-1/2" Boxes) Series.

Tracer Wire and Boxes

Tracer wire shall be #10 AWG polyethylene coated steel core copper wire, attached to pipe by tape or other approved means, and manufactured by Copperhead Industries, LLC – Copperhead Reinforced Tracer Wire, or equal. Tracer wire connectors must contain a dielectric waterproof and corrosion proof sealant, lock shut, and be color coded blue. (See MRWA Detail as Attached)

Tracer wire boxes shall be magnetized, with a direct connection to tracer wire without removing the cover, be color coded, and have a locking cover. Boxes shall be installed at every fire hydrant isolation valve (separate from the valve riser), and at every distribution water main isolation valve (separate from the valve riser) and shall be Copperhead Industries, LLC – Snake-Pit Magnetized Tracer Box, or equal.

CONSTRUCTION METHODS

Excavation

The Contractor shall excavate all material to the depths necessary to construct the water main as shown on the plans. Excavation shall include the removal of rock, dirt, abandoned pipelines, old foundations, stumps and roots and similar materials encountered. Excavation, of whatever material encountered, shall be included in the contract unit prices for water main installation and will not be paid for separately. All excavated material shall be contractor responsibility for removal and disposal. Pavement removal and restoration will be paid for at the contract unit prices for the appropriate item in accordance with the Standard Specifications and Supplemental Specifications.

Excavated material that is suitable for backfill material shall be neatly piled adjacent to the excavation so as to prevent cave-ins of the excavation and damage to adjacent trees, shrubs,

fences, and other property.

The excavated area shall be kept free of water at all times. Sheeting and shoring shall be provided if necessary for the protection of the workers.

Excavated material that is not to be used as backfill shall be disposed of by the Contractor.

Backfilling shall follow immediately behind trench excavation and pipe laying operations. In no case shall more than 100 ft. of trench excavation be open at any one time. Any excavation left open and unattended shall be protected with lighted Type III barricades and a "snow fence" constructed around the perimeter of the excavation.

The Contractor shall excavate to the depths required to construct the water main and appurtenances as described on the plans. For water main construction, trench excavation shall be to a depth sufficient to provide a 5' 6” cover over the top of the pipe and a minimum four-inch sand cushion below the pipe. Over excavation will be at the Contractor's expense. The trench width at a level of twelve inches above the pipe shall be a minimum of 36 inches in width or as directed by the Director of Public Services or his designee.

In areas where the proposed construction may interfere with existing utilities, additional excavation may be required to determine the exact location of said existing utilities. This work will be included within the water main pay items and no additional compensation will be due to the Contractor for this work.

In some cases, the plans call for removing an existing water main or sewer in order to construct a new water main. All gate valve boxes shall be removed to at least 3 feet below the pavement surface under the road and to at least 12 inches below the planned grade outside the road. When required by construction specifications, the Contractor shall remove said existing pipelines and gate valve boxes and dispose of them at his expense. Old gate valves pulled by Contractor shall be turned over to the City of Owosso for further disposition.

Where abandoned water mains are to remain in place in the ground, open ends of an abandoned pipeline shall be capped with a metallic cap, flowable filled, and bulk headed with one course of brick and mortar. Removal, disposal, flowable filling, and bulk heading of pipelines to be abandoned are included in Cut and Plug Water Main pay item. The following exceptions apply:

- 4 and 6 inch abandoned water main not required for flowable filling material.
- 8 inch abandoned water main will be priced out by Contractor for flowable filling material. The City of Owosso, at its sole discretion, may waive flowable flow material requirement.
- Water mains larger than 8 inch shall be plugged with flowable fill material.

Pipe Handling

Pipe shall be handled in such a manner as to prevent the ends from splitting, damages to the protective coatings, and other undesirable conditions. Pipe shall not be dropped, skidded, or rolled into other conditions. Repairs to damaged pipe must be approved by the City Engineer or authorized representative.

Pipe Cutting

Pipe cutting shall be done in a neat and workmanlike manner without damage to the pipe or lining and as to leave a smooth end at right angles to the axis of the pipe. Cutting shall be done by an approved mechanical saw or cutter. Hydraulic squeeze cutters are not acceptable.

Pipe laying

Pipe located inside structures shall be rigidly supported.

Pipe laid underground shall be uniformly supported through its entire length on a minimum four-inch cushion of sand. A depression shall be carved out of the sand cushion to accommodate the pipe bells.

Pipe laid at a depth with less than 5 1/2 foot of cover, shall be wrapped in Linear Low Density Polyethylene black (8-mil) Poly Wrap ANSI/AWWA C105/A21.5 ASTM D882, and encased with minimum 2-inch thick rigid Styrofoam board top and sides of pipe.

Pipe shall be inspected for defects, debris, or dirt while suspended in a sling prior to lowering it into the trench. Defective pipe shall be removed from the project site immediately. Lumps, blisters, and excess coal tar coating shall be removed from inside the bell and outside the spigot. These areas shall be wire brushed and wiped clean with a dry oil-free rag. No debris, tools, clothing, or other materials shall be allowed in the pipe.

Pipe shall be laid in a dry trench with bell ends facing in the direction of laying. After placing a length of pipe in the trench, and after installing the gasket and applying the gasket lubricant, the spigot end shall be centered in the bell and the pipe pushed home and brought to the correct line and grade. The pipe shall be secured in place by tamping granular material Class II around it. Precautions shall be taken to prevent dirt from entering the joint space. A watertight plug shall be inserted in the open end(s) of the pipe to prevent water, dirt, animals, or other foreign matter from entering the pipe.

When it is necessary to deflect pipe from a straight line, either horizontally or vertically, the deflection shall not exceed the following values:

Nominal Pipe Size (In.)	Mechanical Joint Maximum Deflection (In./18 ft. length
8	20
12	18

Jointing

Mechanical joints shall be installed in accordance with the joint manufacturer's recommendations. Copies of such recommendations shall be furnished to the Engineer prior to the start of construction.

Thrust Blocking

Thrust blocking shall be placed to support water main components as follows:

- **at Tee's**
- **at 90 degree bends**
- **at dead end water mains**

Backfilling

Backfilling shall be in accordance with the trench detail called for on the plans or as directed by the Engineer in accordance with the following:

Trench Detail G shall be used when part of the trench is within the 1 on 1 influence area of an existing or proposed roadway, sidewalk, driveway, building (or similar structure), or located within the right of way. The trench shall be backfilled with granular material Class II, in lifts of ten inches, and mechanically tamped to 95% of maximum unit weight.

Trench Detail F shall be used when the trench is not within the 1 on 1 influence area of a road or structure. The trench shall be backfilled with granular material Class III to a level of six inches above the top of the pipe and compacted to not less than 95% of maximum weight. The remaining portion of the trench shall be backfilled in twelve-inch lifts with suitable excavated material and compacted to at least 90% of maximum unit weight. Suitable excavated material used for backfill shall be free of rocks, debris, trees, stumps, broken concrete, and organic material. Backfill material shall not be saturated with water.

Where the proposed water main crosses under an existing utility, the proposed water main shall

be deflected around the existing utility in accordance with the following:

1. Maintain 5' 6" cover over top of proposed water main.
2. Maintain at least 18" of vertical separation and 10' horizontal separation between the outside of the proposed water main and the outside of a sewer, drain pipe, or catch basin lead. **Where less than 18 inches of vertical separation, encase water main in a concrete pipe.**
3. Maintain at least one foot of vertical separation between the outside of the proposed water main and the outside of an existing utility other than a sewer, drain, or catch basin lead.
4. When crossing an existing sewer, drain pipe, or catch basin lead, construct the proposed water main so that its joints are equidistant from the utility being crossed.

Hydrants

General

Hydrants shall be located as shown on the plans and approved by the municipality.
Use of bends in connection shall be approved by Engineer and municipality.
Bury depth shall be a 5 1/2 foot minimum. Six (6) inch hydrant leads shall be ductile iron with MEGALUG mechanical joint restraint.

Valves

General

Valves shall be located as shown on the plans and approved by the municipality. Valves placed in location without approval will require that the Contractor correct the error at his own expense.

Setting Valves

Valves shall be examined by the Contractor prior to lowering in the trench. Check all nuts and bolts to assure tightness.

Valves shall be installed with the valve closed, supported on two 2" x 6" x 18" hardwood blocks, and vertically plumb. The valve box shall be set plumb and its axis shall be in line with the stem. Valve boxes shall have the ability for future adjustments of up to 6 inches, above or below grade.

Two isolation gate valves shall be installed at each 3-way intersection, and a three valve configuration at each 4-way intersection.

Isolation/gate valves should be located within each intersection for easy identification for the system operator. Spacing of these valves should be about 6 feet for quick and easy determination of directional isolation. As result, end points of new main/cross overs, shall be plugged, with a blow-off at each end point for appropriate disinfection & pressure testing. The new water main shall not be connected to the existing water main until pressure and disinfection testing has passed city requirements.

Reaction Backing

All tees and 90 degree bends, and other fittings subjected to unequal thrust shall be restrained using mechanical joint fittings with retainer glands on both sides of the bend or tee, and shall also be supported with thrust blocking. All 45 degree bends shall be restrained with mega lug fittings and shall be supported with thrust blocking.

Boring and Jacking

1. Construct and maintain jacking/boring pits as required. Adequately clear site required for pits as needed to perform the work. Size pits for boring machine, frames, and reaction blocks, minimum 2 sections of pipe and with sufficient room for working. Provide steel safety ladder.
2. Locate pits such that no damage occurs to trees, poles (not specified for removal) or structures in the immediate area.
3. Construct pits with sheeting and bracing as required for proper support in accordance with O.S.H.A. Standards and as needed to sufficiently support reaction blocks.
4. Place crushed rock or approved bedding to sufficiently support equipment and protect pit floor.
5. A pushing or jacking frame shall be built and furnished to fit or match the end of the pipe to be jacked so that the pressure of the jacks will be evenly distributed over the end of the pipe.
6. The hydraulic jacks shall have sufficient power to apply a smooth and even pressure to move the pipe in place. Hammering or ramming of the pipe will not be allowed.
7. The pipe shall be jacked upgrade where possible.
8. The excavation shall be done within the inside of the pipe and shall not exceed 12” ahead of the pipe being jacked in place.
9. After each pipe section is in place the pipe shall be checked for correct grade and line. Pipe not meeting the correct grade and line shall be rejected and replaced.
10. Excavation at the top and sides may be approximately 1” greater than the outside periphery of the pipe.
11. The bottom of the excavation shall be accurately cut to line and grade.

12. Adjoining sections of pipe sleeve shall be attached with a continuous weld. Connecting steel pipe to concrete shall be completed with a poured in place concrete collar with reinforcement.

HYDROSTATIC PRESSURE TEST

All new construction shall be subjected to a hydrostatic pressure test. Testing should be performed as soon as possible after construction on a section is complete.

The Contractor shall provide all equipment, materials, and labor necessary to perform the tests, including pumps, gauges, plugs, corporations, excavation and backfill, water, miscellaneous piping and fittings, and a means of measuring the volume of water lost.

The Contractor shall fill the main with water through hydrants or corporations. Air shall be bled off at the ends and at highpoints through corporations or hydrants. The Contractor shall plug all taps made solely for the pressure test by inserting brass plugs.

Water shall be added until hydrostatic pressure at highest point of the main is at least 150 psig.

The Engineer shall be notified two hours prior to testing and shall witness the test and determine the leakage over a two hour period.

Water shall be added as necessary throughout the two hour test period to maintain a uniform pressure of 150 psi, plus or minus 5 psi.

At the end of the two hour period, the total volume of water added to maintain the required test pressure will be determined and will be the actual leakage in a two hour period.

The allowable leakage rate will be determined by the following formula:

$$L = \frac{S*D*((P)^{1/2})}{148{,}000}$$

Where:

L = Total allowable leakage rate (gal/hr).
S = Total number of joints in line segment being tested.
D = Nominal inside pipe diameter (inches).
P = Actual test pressure (p.s.i.g).
^1/2 = Square Root of P

Maximum leakage for 8 inch pipe = 1.3 gallons per two hours per 100 joints.

If actual leakage rate exceeds the allowable leakage rate, the Contractor at his own expense shall locate and repair the leak(s). Testing shall be repeated until satisfactory results are obtained.

The cost of pressure testing shall be included in the pay item for Water Main Pipe actually constructed.

STERILIZATION

General

1. All pipe and fittings connected to and forming a part of a potable water supply shall be sterilized in accordance with the AWWA Standard C651-14.

2. Generally, sampling taps shall be provided on the water main every five hundred (500) feet, in order to afford representative water testing and sample collection. When long transmission mains are constructed, without side connections, the distance between each tap may, at the discretion of the Engineer, be increased. In addition, blow off connections and sampling taps shall be provided at every endpoint of the water main to be tested. No connection to the existing potable water system will be allowed until the new water main is approved. In all instances, sampling taps shall be provided to collect a source sample and enough representative water samples for laboratory examination.

Preliminary Flushing

The main shall be flushed prior to sterilization as thoroughly as possible with water pressure and outlets available. The main shall be flushed from the north gate valve first with the south gate valve closed, the north valve shall then be closed and the south valve opened. After the flushing is completed the plug for the 8 inch tee shall be installed. The minimum velocity in the main shall be 3.0 fps. The flushing operation shall be done after the pressure test has been made.

Disinfecting

1. Before being placed in service, all mains and existing piping disturbed in any manner by the work shall be disinfected in accordance with the AWWA Standard C651-14. Drawing the water from existing piping or even lowering the water pressure more than one-half will constitute disturbances of the piping.

2. The disinfecting of water mains, valves and other appurtenances incorporated into the main construction shall be done in accordance with the AWWA Standard C651-14.

3. During the disinfecting operation, valves, hydrants and other mechanical devices controlling the water shall be operated to permit full effectiveness of the disinfectant. Valves shall be manipulated so that the strong solution within the main being sterilized will not flow back into the supply line nor flow into mains already in service.

Final Flushing and Tests

1. After the required period of retention has elapsed, the heavily chlorinated water shall be flushed out completely discharged until the replacement water throughout the length of the main shall, upon test, be proven comparable in quality to the water supply source. Heavy chlorinated water shall be discharged to a nearby sanitary sewer manhole if available, or a contractor provided holding tank for proper disposal.

2. When the water in the treated main shall have been proven comparable to that of the source, at least 2 safe bacteriological samples collected at least 24 hours apart must be obtained from every 500 feet sections of WM, must be obtained before placing each section WM section in service. . In addition, blow off connections and sampling taps shall be provided at every endpoint of the water main to be tested. No connection to the existing potable water system will be allowed until the new water main is approved. Samples shall be taken in the presence of the Department of Public Services. Under no circumstances shall such samples be collected from unsterilized hydrants and hose connections. Should the results of the bacteriological examination prove satisfactory, the main shall be placed in service. Should the initial disinfecting fail to result in approval, the disinfecting procedure shall be repeated until satisfactory results are obtained.

3. Bacteriological samples must be picked up by the Contractor and run by a commercial or other laboratory, approved by the Engineer, employed and paid by the Contractor. The City of Owosso may offer to provide this service with existing laboratory facilities.

The completed work of water main installation will be paid for at the contract unit prices for the actual quantity of the following contract items (pay items) actually constructed.

PAY ITEMS	PAY UNIT
1 inch Copper Service Lead, Type “K”, Modified	Feet
Water Main, C909 PVC, 12 inch, **TB Detail** F, Modified	Feet
Water Main, C909 PVC, 12 inch, **TB Detail** G, Modified	Feet
Water Main, C909 PVC, 8 inch, **TB Detail** G, Modified	Feet
Water Main, DI, 12 inch, **TB Detail** F, Modified	Feet
Water Main, DI, 12 inch, **TB Detail** G, Modified	Feet
Water Main, DI, 8 inch, **TB Detail** G, Modified	Feet

Water Main, Rem	Feet
Connect to Existing Water Main	Each
Curb Box, Stop, ¾ inch Corporation Stop and Connection, Modified	Each
Fire Hydrant and Valve Assembly	Each
Gate Valve and Box, 12 inch, Modified	Each
Gate Valve and Box, 8 inch, Modified	Each
Hydrant, Rem	Each
Water Main, 4 inch, Cut and Plug, Modified	Each
Water Main, 6 inch, Cut and Plug, Modified	Each
Water Main, 8 inch, Cut and Plug, Modified	Each
Testing and Chlorination of Water Main	Lump Sum

Water main will be paid for at the contract unit price for the actual length of water main installed in-place, for the various sizes and trench details called for. The contract unit price includes all labor, equipment, and materials necessary for the construction of the water main, including excavation, disposal, pipe, fittings, tees, crosses, hydrant tees, bends, plugs, reducers, thrust blocking, connections to the existing mains, backfill, snow fencing and barricading, locating and protecting existing utilities, repair of defective work, and cleanup.

Water main will be measured horizontally in linear feet along the centerline of the main, including the length of valves, sleeves, and fittings. Measurements will begin and end at connections, plugs, or the centerline of a perpendicular pipeline.

Testing and Chlorination will be paid for at the contract price upon completion and acceptance of the proposed water main and all tie ins. The contract unit price includes all labor, equipment, and materials necessary for hydrostatic pressure testing, disinfecting, and bacteriological testing of the proposed water main and appurtenances.

Connections to Existing Water Main will be paid for at the contract unit price for each connection made. Payment will include all labor, equipment, and materials necessary to connect the proposed water main to existing water mains, including connections to oversized and undersized pipe. Additional payment will not be made for any/all necessary coordination with the Department of Public Services or any exploratory excavation that is required to connect the proposed water main to the existing water mains.

Fire hydrant and valve assembly with box will be paid for at the contract unit price for each assembly installed. Payment will include furnishing and installing the hydrant, valve, valve box, connection, and lead. Excavation, thrust blocking, and backfill are all incidental to the contract unit price for hydrant and valve assembly with box.

Gate valves, of the size required will be paid for at the contract unit price for each installed. The price includes excavation, installation of manhole or box, removal of valve and box to be replaced, anchorage, and backfill.

Cutting and Plugging of Water Main will be paid for at the contract unit price for each cut and plug made, and flowable fill. Payment will include all labor, equipment, and materials necessary to shore up the existing water main.

Glenn M. Chinavare
Director of Public Services & Utilities

Effective: 31 January 2018

SECTION 33 05 24

HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes the work required to install a carrier or casing pipe for underground utilities under an obstacle using the method commonly known as horizontal directional drilling (HDD), to the grades and alignments shown on the Drawings.

1.02 REFERENCES:

A. ASTM - American Society of Testing Materials, *Latest Edition.*

B. PPI - Plastics Pipe Institute

C. AWWA - American Water Works Association

D. ANSI - American National Standards Institute

1.03 GENERAL REQUIREMENTS:

A. The CONTRACTOR shall be responsible for the method of construction, the stability and accuracy of the drilled and reamed hole and pits constructed, and all costs for damages resulting from any failure thereof. The CONTRACTOR shall be solely responsible for the safety of the pits and related structures and personnel engaged in underground construction throughout the duration of the work.

B. The CONTRACTOR's methods and schedule shall consider the overall project requirements and anticipated subsurface soils and groundwater conditions. The CONTRACTOR's selection of inadequate, inappropriate or inefficient equipment and methods will not be cause for adjustments to the contract price or contract time.

C. The general dimensions, arrangement and details for the drilled hole and pits to be constructed shall be as needed to complete the required work.

D. Methods of excavation, equipment and procedures for the directional drilling operation and pits shall be selected by the CONTRACTOR to provide adequate working space and clearances for the work to be performed.

E. Pit excavation methods, groundwater control and pit support techniques shall be selected by the CONTRACTOR.

F. The CONTRACTOR shall comply with the HDD Plan for Preventing and Controlling the Loss of Drilling Mud in Paragraph 3.15 SCHEDULES.

1.04 CONTRACTOR QUALIFICATIONS:

A. The CONTRACTOR who will complete the work contained in this Section must be experienced in the type of work specified in this Section and must have successfully completed similar projects within the last three years.

B. Personnel that will perform the work must be trained and experienced in the fabrication and installation of the materials and equipment, as well as being knowledgeable of the design and the reviewed shop drawings.

C. At the ENGINEER's request, the CONTRACTOR responsible for the completion of the work contained in this Section shall submit a list of jobs successfully completed within the last three years. Information on each job must include the following:
   1. Date of Project
   2. Location
   3. Length of Directional Drill
   4. Size and Material of Pipe
   5. General CONTRACTOR's name, contact and phone number.
   6. OWNER's name, contact and phone number.
   7. Other information relevant to the successful completion of the project.

1.05 SAFETY:

A. The CONTRACTOR shall become familiar with, and shall at all times conform to, all applicable codes, ordinances and laws in relation to the work required.

B. Directional drilling equipment machine safety requirements shall include a common grounding system to prevent electrical shock in the event of a high voltage underground cable strike. The grounding system shall connect all pieces of interconnecting machinery; the drill, mud mixing system, drill power unit, drill rod trailer, operator's booth, worker grounding mats and any other interconnected equipment to a common ground. The drill shall be equipped with an "electrical strike" audible and visual warning system that shall notify the system operators of an electrical strike.

C. Operators of the drill shall wear electrical shock protection equipment and operate from common grounding mats as required.

1.06 SUBMITTALS:

A. Submit in accordance with SECTION 01 33 00 - SUBMITTALS.

B. Proposed drill profile data including the minimum information listed below:
   1. Entrance angle
   2. Exit angle
   3. Minimum radius of curvature
   4. Depth of pipe every 50 feet
   5. Pilot hole diameter
   6. Back ream hole diameter
   7. Wet or dry pullback
   8. Estimated maximum pullback force

C. Polyethylene pipe data including, but not limited to, the following:
   1. Manufacturer's brochures and catalog sheets
   2. Dimensions
      a. Inside diameter
      b. Outside diameter
      c. Standard dimension ratio
      d. Yield stress

D. PVC to DI connection and restraint:

1. Manufacturer
2. Product data sheet
3. Dimension drawing
4. Installation instructions

E. Drilling Fluid:
   1. Bentonite (or alternate):
      a. Product manufacturer
      b. Product data sheet
      c. Mixing instructions
   2. Polymer:
      a. Product manufacturer
      b. Product data sheet
      c. Mixing instructions
      d. Material safety data sheet (MSDS)

F. Drill Path Documentation upon completion: See Article 3.07.

1.07 DELIVERY, STORAGE AND HANDLING:

A. Handle and store materials in a manner that will prevent:
   1. Deterioration or damage
   2. Contamination with foreign matter
   3. Damage by weather or elements

B. After the pipe is fused together and before it is pulled through the drilled hole, the CONTRACTOR shall be responsible to provide vehicular and emergency access to all properties affected by the fused pipeline. The CONTRACTOR shall be responsible to repair all damage to existing surface and site improvements damaged by the fused pipeline.

1.08 UTILITY PROTECTION:

A. All underground utilities shown on the drawings are shown according to the best available information. It is the CONTRACTOR's responsibility to verify the location of all existing utilities prior to working in the area.

B. All utilities are to remain in service and shall be protected by the CONTRACTOR from any damage as a result of his operations.

C. Where utilities are encountered and are not shown on the drawings, the CONTRACTOR shall report them to the OWNER before proceeding with the work.

D. All utilities damaged by the CONTRACTOR's activities shall be repaired or replaced by the CONTRACTOR without preventable delay. All costs to repair the utility including, but not limited to, materials, labor, inspection, testing and temporary service shall be born by the CONTRACTOR with no cost to the OWNER.

E. All utilities in close proximity to the drill pilot bore, back ream or product pipe installation must be exposed in accordance with all codes, ordinances and regulations to ensure, by visual inspection, that the CONTRACTOR's work has not caused any damage to the utility or to the CONTRACTOR's work and adequate clearance between the utility and the CONTRACTOR's work is maintained.

1.09 APPLICABLE REGULATIONS:

A. All work covered by this Section shall be performed in accordance with all applicable federal, state and local laws, regulations, codes and ordinances which pertain to such work, as well as the supplemental regulations contained in these specifications. If a conflict exists between any laws, regulations, codes or ordinances, the most stringent shall govern.

PART 2 - PRODUCTS

2.01 MATERIALS:

1. PVC Pipe: Polyvinyl-chloride Fusible (PVC) pipe shall be of a class and designation as shown on Drawings, with a DR of 18 to 14 or less compound designation Class No. 12454, ASTM-D1784. PVC pipe shall be in accordance with current AWWA Standard C-900 (4-12 inches).

2. The pipe shall have a nominal diameter as indicated on the plans and a standard dimension ratio (SDR) of no greater than ____. The working pressure shall be rated at 160 psi.

3. The CONTRACTOR is responsible for calculating loads placed on the pipe during its installation based on the CONTRACTOR's chosen means and methods of construction. It is the CONTRACTOR's responsibility to ensure the pipe will withstand all loadings placed on it during installation. If the pipe with dimensions given above will not withstand the installation loads, it is the CONTRACTOR's responsibility to size the pipe to withstand the installation loads.

4. Manufacturers:
   a. Phillips Driscopipe, Inc.
   b. Chevron Chemical Company (Plexco)
   c. or Engineer approved equal

B. DRILLING FLUIDS
1. The CONTRACTOR must use a high quality Bentonite drilling fluid or equivalent to ensure hole stabilization, cuttings transport, bit and electronics cooling, and hole lubrication to reduce drag on the drill pipe and the product pipe. Oil-based drilling fluids or fluids containing additives that can contaminate the soil or ground water will not be considered acceptable substitutes. Composition of the drilling fluid must comply with all federal, state and local environmental regulations.
2. Polymer used as lubrication in the drilling fluid is acceptable, if desired.
3. Drilling fluids must be mixed with water that is free from significant solids and contamination. Potable water is acceptable. River water is acceptable provided no organic matter or soil particulates are mixed into the drilling fluid. It is the CONTRACTOR's responsibility to apply for and obtain any necessary permits for the procurement of drilling fluid water. It is also the CONTRACTOR's responsibility to pay permit application fees, metering charges or any other costs associated with drilling fluid mixing water.

C. PVC TO DUCTILE IRON CONNECTION

1. A restrained connection between the PVC pipe and DI pipe shall be made with a self-restraining, fusible, molded PE3408 mechanical joint adapter meeting the requirements of ASTM D2513 and ANSI/AWWA C906 and manufactured by Central Plastics Company or approved equal. The mechanical joint adapter shall be of the same SDR rating as the pipe. Additional restraint shall be provided on the ductile iron pipe side of the connection point by restraining pipe joints for a distance of at least 150 feet. Additional restraint may be provided on the HDPE pipe side in the form of an PVC anchor ring encased in concrete or other approved methods.

D. TRACER WIRE:
1. The Contractor shall install, with the directionally drilled pipe, a 12 gauge copper clad steel locator wire with insulation suitable for direct burial. The tracer wire shall be as manufactured by Copperhead Industries, or equal. In rural areas, a test station shall be installed at approximately 1,000 foot intervals, near a fire hydrant or other structure that would fall closest to that interval. In built up urban areas, a station shall be provided at each intersection.

2.02 EQUIPMENT:

A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe; a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the crossing; a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used; a magnetic guidance system to accurately guide boring operations; a vacuum truck of sufficient capacity to handle the drilling fluid volume; and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

PART 3 - EXECUTION

3.01 ALIGNMENT AND PROFILE OPTIONS:

A. Alignment and profile shown on the drawings.

B. An alternate alignment and profile developed by the CONTRACTOR with the following requirements:
1. Alignment must be within easement(s) and right-of-way.
2. Clearance between utilities is maintained.
3. 15 foot minimum vertical distance between the drill path and the bottom of a river to prevent drilling fluid breakout.
4. ENGINEER approved.

3.02 PIPE FUSION

A. All pipe shall be joined with the “butt fusion” method in accordance with the pipe manufacturers recommendations. Socket fusion, extrusion welding, hot gas welding and mechanical connections are not acceptable.

B. Butt fusion joining shall produce a joint of equal or greater tensile strength than the strength of the pipe.

3.03 DRILL ENTRANCE AND EXIT PITS

A. The CONTRACTOR is responsible for the design and construction of the drill entrance and exit pits. Supports may be required to maintain safe working conditions. Ensure stability of the pit, minimize loosening, and minimize soil deterioration and disturbance of the surrounding ground.

B. Entrance and exit pits must be contained in the easement(s) and right-of way.
C. Drill entrance and exit pits must be maintained at minimum size to allow only the minimum amount of drilling fluid storage prior to transfer to mud recycling or processing system or for removal from the site.

D. Drilling fluid will not be allowed to freely flow on the site or around the entrance or exit pits. Fluid spilled must be removed as soon as possible and the ground restored to original condition.

E. Pits must be shored to OSHA standard if workers are required to enter the pits for any reason.

3.04 DRILL ENTRANCE AND EXIT ANGLES

A. Entrance and exit angles of the drill can be whatever the CONTRACTOR desires such that the elevation profile maintains adequate ground cover to ensure no drilling fluid breakout occurs and that ground exit occurs within the designated easement(s) or right-of-way. The CONTRACTOR is responsible for ensuring that entrance and exit angles ensure pullback forces do not exceed 5% strain on the polyethylene pipe.

3.05 GUIDANCE SYSTEM

A. The guidance system must have the capability of measuring inclination, roll and azimuth. The guidance system must have an independent means to ensure the accuracy of the installation. The CONTRACTOR will demonstrate a viable method to eliminate accumulated error due to the inclinometer (pitch or accelerometer). The guidance system will be capable of generating a plot of the borehole survey for the purpose of an as-built drawing. The guidance system must meet the following specifications:

Inclination:	Range	-90º to +90º
	Accuracy	0.2º
Azimuth:	Range	0º to 360º
	Accuracy	0.5º
Roll:	Range	0º to 360º
	Accuracy	0.2º

3.06 PILOT HOLE TOLERANCES

A. The pilot hole shall be drilled along the agreed-to alignment and profile with the following tolerances:
   1. Vertical
      a. Plus 4 feet (deeper or additional ground cover).
      b. Minus 1 foot (shallower or reduced ground cover), except that the resulting pipe cover shall not be less than specified or indicated on the plans.
   2. Horizontal
      a. Plus or minus 2.5 feet.
   3. Curve radius

a. Curve radius shall not exceed the pipe manufacturer's recommendations and that of the drilling equipment.

3.07 DRILL PATH DOCUMENTATION

A. The CONTRACTOR is responsible for maintaining drilling logs that provide drill path data every 25 feet along the drill path. Information logged every 25 feet will, at a minimum, include the following:
   1. Pilot hole
      a. Distance out or station
      b. Depth below a known ground surface elevation
      c. Plus or minus (left or right) of alignment
      d. Torque
      e. Drill fluid flow rate
      f. Time
   2. Back ream
      a. Distance out or station
      b. Pull back force
      c. Torque
      d. Drill fluid flow rate
      e. Time

3.08 PIPE GOUGING

A. The CONTRACTOR shall take every precaution to prevent gouging of the pipe prior to and during pipeline installation.

B. It is expected some pipe gouging will occur during pullback. However, the constructed pipeline shall not have any gouges that are deeper than 10% of the pipe wall thickness. Pipe that has gouges greater than 10% of the pipe wall thickness will not be accepted.

3.09 INSTALLING PRODUCT PIPE

A. After the pilot hole is completed, install a swivel to the reamer and commence pullback operations. Pre-reaming of the tunnel may be necessary and is at the option of the CONTRACTOR.

B. Reaming diameter will not exceed 1.4 times the diameter of the product pipe being installed.

C. Allow sufficient length of product pipe to extend past the termination point to allow connections to adjacent pipe sections or gate valves. Pulled pipes will be allowed 24 hours of stabilization prior to making tie-ins. The length of extra product pipe will be at the CONTRACTOR'S discretion.

D. Install an AWWA C153 Mechanical Joint Adaptor, per the manufacturer's requirements, when connecting the pipe to a valve or hydrant.

3.10 YIELD STRESS

A. The yield stress shall be calculated from the HDPE material submitted and the cross-sectional area of the pipe. The result will be the force at which the HDPE pipe will yield.

B. The pullback force will be monitored throughout the pullback. At no time shall the equipment be operated to produce a pullback force that exceeds 75% of the yield force.

3.11 CLEANUP

A. All excavated soil, soil cuttings and drilling fluid shall be the property of the CONTRACTOR. All material shall be disposed of in accordance with all laws, regulations, codes, ordinance and these specifications.

B. Immediately upon completion of the work in this section, all rubbish and debris shall be removed from the job site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition.

C. If a drilling fluid breakout should occur, the area shall be cleaned immediately and the surface washed and returned to original condition.

D. Every precaution shall be implemented to prevent a drilling fluid breakout in the river. It is the CONTRACTOR's responsibility to conduct construction activities to prevent this occurrence. However, if a drilling fluid breakout occurs in the river, it is the CONTRACTOR's responsibility to clean up any resultant contamination. The CONTRACTOR is also responsible for any damage to property or the environment due to such a breakout.

3.12 HYDROSTATIC TESTING

A. The pipe shall be hydrostatically tested before being connected to other piping systems. The pipe shall be tested independently of other hydrostatic tests.

B. Hydrostatic testing will consist of filling the constructed pipeline with water taking care to bleed off trapped air. The CONTRACTOR shall pressurize the pipe to 150 psi for a minimum of 4 hours to give the pipe time to expand. During this initial 4 hours, make-up water shall be added as-needed to maintain the pressure within 5 psi of the specified pressure. At the end of the first 4 hours, the pipe shall be pressurized to the specified pressure and the test commences. The pipeline shall be maintained under the test pressure for a continuous period of between 1 and 3 hours, as determined by the ENGINEER, by pumping water into the line at frequent intervals. The volume of water so added to maintain pressure within 5 psi of the specified pressure shall be measured and considered to represent the "leakage" from the line during the interval.

The allowable "leakage" for the pipeline shall not exceed the allowances given in the following table.

Nominal Pipe	**Allowable "Leakage" (Gal/100' of Pipe)**		
Size (In)	***1-Hour Test***	***2-Hour Test***	***3-Hour Test***
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.5
10	0.75	1.3	2.1
11	1.0	2.0	3.0
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0

18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
28	5.5	11.1	16.8
32	7.0	14.3	21.5
36	9.0	18.0	27.0
40	11.0	22.0	33.0
48	15.0	27.0	43.0

It is understood that the pipe will continue to expand after the initial 4 hours under pressure and throughout the 1 to 3-hour test period. The allowable “leakage” presented in the table above accounts for this expansion and no additional allowable “leakage” will be considered.

C. Under no circumstances shall the total time under the specified test pressure exceed 8 hours. If the test is not completed due to leakage, equipment failure, etc., the test shall be terminated and the pipeline shall be de-pressurized and permitted to “relax” for a minimum of 8 hours prior to the next testing sequences.

D. If there are no visual leaks or significant pressure drops during the final test period, and the measured "leakage” is less than allowable, the pipeline passes the hydrostatic test.

E. In the event that the “leakage”, as determined by the ENGINEER, exceeds the specified allowable, the CONTRACTOR shall be responsible to repair or replace the pipeline until the pipeline passes the hydrostatic test, as determined by the ENGINEER.

3.13 TRACER WIRE

A. The Contractor shall install, with the directionally drilled pipe, a 12 gauge copper clad steel locator wire with insulation suitable for direct burial. In rural areas, a test station shall be installed at approximately 1,000 foot intervals, near a fire hydrant or other structure that would fall closest to that interval. In built up urban areas, a station shall be provided at each intersection. Tracer wire shall be installed with the directionally drilled pipe.

3.14 MEASUREMENT AND PAYMENT

A. The following is in addition to Measurement and Payment shown in SECTION 01 22 00 – MEASUREMENT AND PAYMENT.
   1. The pipeline must be a complete and usable system as specified. If for any reason including, but not limited to, broken drill, stuck pipe, etc., a complete pipeline is not constructed, the CONTRACTOR shall re-drill the pipeline per the Contract Documents at no additional cost to the OWNER. The CONTRACTOR is completely responsible to construct a usable crossing pipe.
   2. The length of pipe measured for payment shall be the actual length of pipe directionally drilled in place. No additional payment will be made if the CONTRACTOR installs additional pipe not shown on the drawings.
   3. Payment in full for directional drilling shall be per linear foot of pipe placed including, but not limited to, mobilization, containment pits, settlement pits and disposal of excavated soils and drilling fluid.
   4. Final quantity of directional drilled pipe will be determined by the ENGINEER. It shall be measured horizontally along the centerline of the pipe from the point where

minimum cover is attained on one side of the bore to the point where minimum cover is attained on the other side of the bore.

5. The “tag” ends of the drilled pipe that are not below minimum depth of cover may be buried to below minimum cover by excavating from the surface. If the “tag” ends are buried, the length of pipe buried to below minimum cover will not be paid as directional drilling. It will be paid as the pipe specified. Alternatively, the “tag” ends may be cut off and the pipe specified connected.

3.15 SCHEDULES:

A. Horizontal Directional Drilling Plan for Preventing and Controlling the Loss of Drilling Mud (5 sheets).

END OF SECTION

HORIZONTAL DIRECTIONAL DRILL PLAN

FOR

PREVENTING AND CONTROLLING THE LOSS OF DRILLING MUD

TABLE OF CONTENTS

SECTION

HORIZONTAL DIRECTIONAL DRILL PLAN

1.0 INTRODUCTION:

A. This directional drill contingency plan provides specific procedures and steps to prevent and/or to contain inadvertent releases of drilling mud (also referred to as frac-outs) for waterbodies that are crossed using horizontal directional drilling (HDD) techniques.

2.0 HORIZONTAL DIRECTIONAL DRILLING PROCESS:

A. Installation of a pipeline by HDD is generally accomplished in three stages. The first stage consists of directionally drilling a small-diameter pilot hole along a pre-determined path. The second stage enlarges this pilot hole to a diameter that will accommodate the pipeline. Numerous “reaming” passes will be necessary with each pass enlarging the diameter of the pilot hole incrementally. The third stage involves pulling the pipeline through the enlarged hole.

During the drilling of the pilot hole, directional control is achieved by using a non-rotating drill string with an asymmetrical leading edge. The asymmetry of the leading edge creates a steering bias, which allows the operator to control the direction of the drill bit. The actual path of the pilot hole is monitored during drilling by taking periodic readings of the inclination and azimuth. These readings are used to calculate the horizontal and vertical coordinates along the pilot holes relative to the initial entry point on the surface.

Once the pilot hole is complete, it is enlarged using reaming tools that are often custom-made for a particular diameter pipe or type of soil. The reamers are typically attached to the drill string at the exit point and are rotated and drawn to the drilling rig, thus enlarging the pilot hole with each pass. Pipe installation is accomplished by attaching a prefabricated pull section behind a reaming assembly at the exit point and pulling the entire assembly back to the drilling rig.

Ideally, horizontal directional drilling involves no disturbance to the bed or banks of a stream or wetland. However, it is possible that geologic irregularities could be encountered during drilling, and drilling could fail. This plan describes the potential for failure of horizontal directional drilling, the contingency methods that would be implemented in the event of inadvertent release of drilling fluids to water or land, and drill hole abandonment procedures.

The feasibility of the horizontal directional drill method primarily depends on the local geologic setting, as well as site topography and other surface features. For example, horizontal directional drilling may not be feasible in areas of glacial till or outwash interspersed with boulders and cobbles, highly fractured bedrock, or non-cohesive coarse sands and gravels. These formations increase the likelihood that drilling could fail due to refusal of the drill bit, continuous loss of drilling fluid through fractures or weak areas in the ground, or collapse of the bore hole in non-cohesive, unstable substrate.

Fortunately, surface characteristics at the proposed Project drill sites are generally favorable for HDD.

Also, subsurface geotechnical investigations indicate that conditions are favorable for horizontal directional drilling.

3.0 MONITORING PROCEDURES:

A. The Project Engineer and construction personnel will continuously monitor operations during drilling activities. Monitoring activities will include:
   - Visual inspection along the drill path, including monitoring the water body for evidence of a release.
   - Continuous examination of drilling fluid pressures and returns flows.

4.0 NOTIFICATION PROCEDURES

A. If in the course of an inspection an inadvertent release is discovered, steps will be taken by construction personnel to contain the release as described in Section 5.0, Corrective Action and Cleanup.

   If monitoring indicates an in-stream release, the Project Engineer will immediately notify the appropriate Federal and State agencies as soon as possible by telephone and/or facsimile of an in-stream release event, detailing the nature of the release and corrective actions being taken. The notified agencies will determine whether additional measures need to be implemented.

   If a release occurs that may migrate downstream and affect water quality, downstream water users will be contacted.

5.0 CORRECTIVE ACTION AND CLEANUP

A. By monitoring drilling operations continuously, it is intended to correct problems before they occur. In addition, containment equipment including earth-moving equipment, portable pumps, hand tools, sand, hay bales, silt fence, lumber, and a suction dredge will be readily available at the drill site. If a release does occur, the following measures will be implemented to stop or minimize the release and to clean it up:
   - The drilling contractor will decide what modifications to make to the drilling technique or composition of drilling fluid (*e.g.,* thickening of fluid by increasing bentonite content) to reduce or stop minor losses of drilling fluid.
   - If a minor bore path void is encountered during drilling, making a slight change in the direction of the bore path may avoid loss of circulation.
   - If the bore head becomes lodged resulting in loss of drilling pressure, the borehole may be sized by moving the bore head back and forth to dislodge the stuck materials.
   - If necessary, drilling operations will be reduced to assess the extent of the release and to implement other possible corrective actions.
   - If public health and safety are threatened, drilling fluid circulation pumps will be turned off. This measure will be taken as a last resort because it increases the potential for drill hole collapse resulting from loss of down-hole pressure.
   - If a land release is detected, the drilling crew will take immediate corrective action to contain the release and to prevent migration off site.
   - The contractor will construct pits and berms around the borehole entry point to contain inadvertent releases onto the ground.
   - Any drilling mud released into the pits will be pumped by contractor personnel into a mud-processing unit for recycling of drilling fluid and separation of cuttings.
   - Additional berms will be constructed around the bore pit as directed by the Project Engineer to prevent release materials from flowing into the water body.
   - If the amount of an on-land release does not allow practical collection, the affected area will be diluted with fresh water and allowed to dry. Steps will be taken (such as berm, silt fence, and/or hay bale installation) to prevent silt-laden water from flowing into the water body.

- If hand tools cannot contain a small on-land release, small collection sumps (less than 5 cubic yards) may be constructed to pump the released material into the mud processing system.
- Contractor HDD crews will immediately implement non-mechanized measures to contain the spread of drilling fluids, including the installation of hay bales or silt fence.
- Sump pumps or vacuum trucks will be used to remove and dispose of any drilling fluids.

6.0 ABANDONMENT

A. If corrective actions do not prevent or control releases from occurring into the water body, the HDD Contractor may opt to re-drill the hole along a different alignment or suspend the Project altogether. In either case, the following procedures will be implemented to abandon the drill hole.
   - The method for sealing the abandoned drill hole is to pump thickened drilling fluid into the hole as the drill assembly is extracted, and using cement grout to make a cap.
   - Closer to the surface of the hole(s) (within approximately 10 feet of the surface), a soil cap will be installed by filling with soil extracted during construction of the pit and berms.
   - The bore hole entry location will be graded by the contractor to its original grade and condition after the drill hole has been abandoned.

SPECIAL PROVISION
FOR
SUPPLY & INSTALL METER PIT, COMPLETE

Description
Work consists of the installation of a new water meter pit or replacement of an existing water meter pit, as required in the Contract Documents and as directed by the City of Owosso and Engineer. This work includes furnishing all labor and equipment required for the excavation, installation, backfilling, and all related work necessary to complete the water meter pit installation.

The City of Owosso will provide the materials for the installation of the meter pit.

Existing meter pits may be eliminated with the meter being reinstalled inside the dwelling if determined feasible by the City of Owosso. All meter installs will be completed by the City.

Materials
Water meter pits are to be installed in lawn areas that are not subject to vehicular traffic.

Water meter pit materials are identified on the Typical Meter Pit Detail on the following page. The City of Owosso will provide all new materials for the installation of the meter pits.

Construction
Construct meter pit in accordance with the Typical Meter Pit Detail. The City of Owosso will pull the existing meter from the meter pit to be removed and reinstall the meter in the new pit. The Contractor shall not handle or install the water meter or the meter transmission unit (MTU).

The City of Owosso will assist with the installation of the first couple of meter pits.

Measurement and Payment
The completed work, as described, will be measured and paid for at the contract unit price using the following contract pay item:

Pay Item	Pay Unit
Supply & Install Meter Pit, Complete	Each

Supply & Install Meter Pit, Complete will be measured in place by the unit Each and will be paid for at the contract unit price per Each, which price shall be payment in full for all labor, incidental material, and equipment necessary to complete this work. The unit price shall include verifying location of existing water service; notification of temporary service disruption; coordinating meter install with City of Owosso; picking up new materials from City of Owosso; excavation; bedding, installing meter pit; providing, placing, and compacting backfill; disposal of excess material; and adjustment of meter pit to finished grade. Materials to be provided by City of Owosso at no charge to Contractor.

Removal of existing meter pit shall be paid for as Water Meter Pit, Rem.

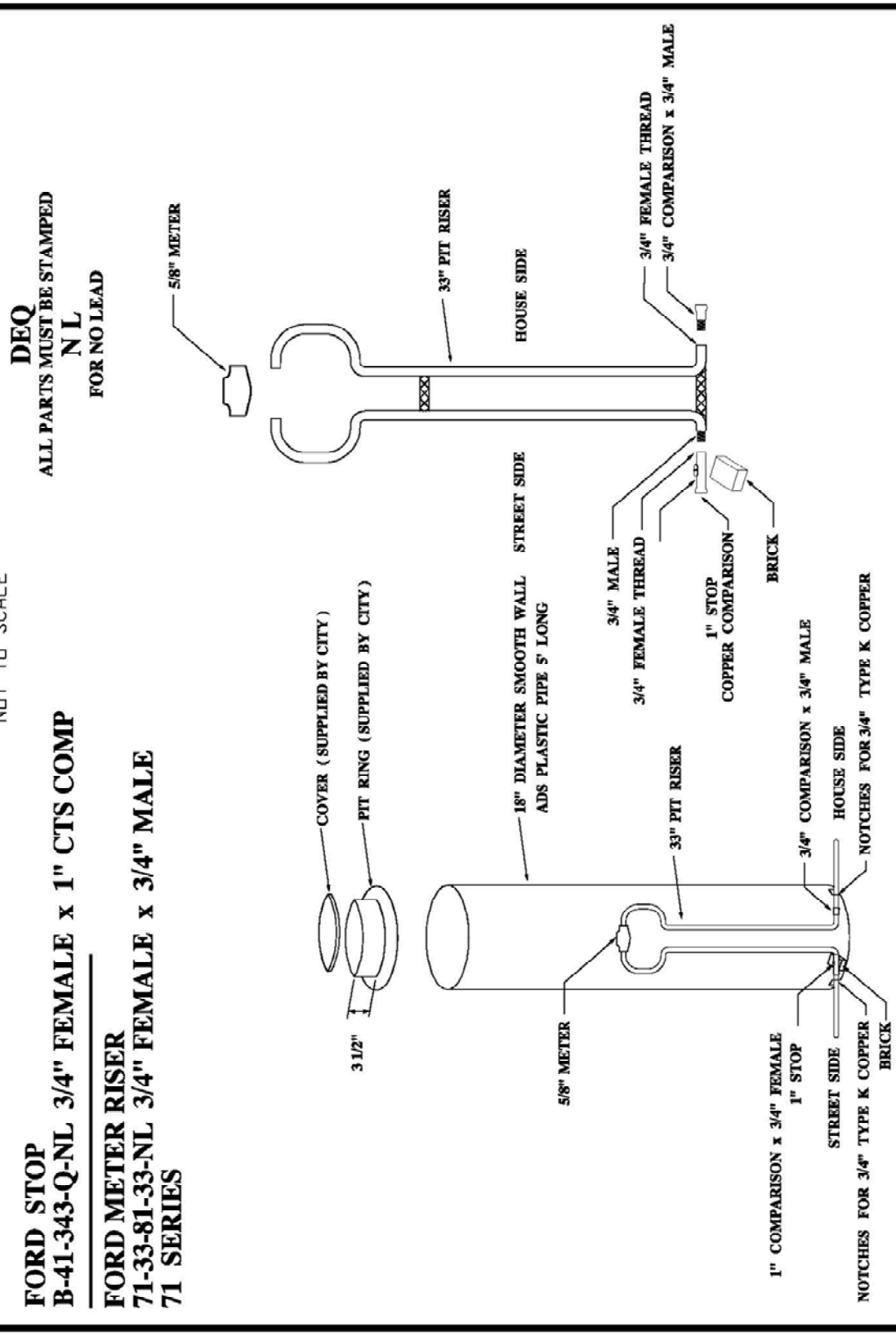
TYPICAL METER PIT DETAIL

NOT TO SCALE

FORD STOP
B-41-343-Q-NL 3/4" FEMALE x 1" CTS COMP

FORD METER RISER
71-33-81-33-NL 3/4" FEMALE x 3/4" MALE
71 SERIES

DEQ
ALL PARTS MUST BE STAMPED
N L
FOR NO LEAD



SPECIAL PROVISION
FOR
WATER METER PIT, REM

Description
Work consists of removing existing meter pits as required in the Contract Documents and as directed by the City of Owosso and Engineer. This work includes furnishing all labor, equipment, and material required for the excavation, removal, salvaging, disposal of removed materials, backfilling, and all related work necessary to complete the water meter pit removal.

Materials
The City of Owosso shall have right of refusal on all meter pit materials. All other material shall be properly disposed of off site by the Contractor.

Construction
The City of Owosso will remove the meter and meter transmission unit (MTU) from the existing meter pit and reinstall in the new meter pit. The Contractor shall not remove or handle the existing water meter or the meter transmission unit.

Remove all portions of the existing meter pit once the new meter pit is installed and in service. The City of Owosso will inspect and advise on the materials desired to be salvaged during the removal of the existing meter and meter transmission unit. Salvaged materials will be picked up on site by the City of Owosso.

Measurement and Payment
The completed work, as described, will be measured and paid for at the contract unit price using the following contract pay item:

Pay Item	Pay Unit
Water Meter Pit, Rem	Each

Water Meter Pit, Rem will be measured in place by the unit Each and will be paid for at the contract unit price per Each, which price shall be payment in full for all labor, materials, and equipment necessary to complete this work. The unit price shall include coordinating meter removal and installation with City of Owosso; excavation; removal and disposal; providing, placing, and compacting backfill; and salvaging existing materials as directed.

Installation of new or replacement meter pit shall be paid for as Supply & Install Meter Pit, Complete.

SPECIAL PROVISION
FOR
ABANDONED GAS MAIN, CONFLICT

General
The work of Abandoned Gas Main, Conflict shall be performed in accordance with Sections 402 and 702 of the MDOT 2012 Standard Specifications for Construction.

Description
The work of Abandoned Gas Main, Conflict consists of removing abandoned gas main, of various size and material, that directly conflicts with proposed storm sewer installation, or water main installation, and bulk heading the two exposed ends, as shown on the plans or as directed by the Engineer. The Engineer will determine whether a conflict exists and advise the Contractor in advance of any work.

Materials
The materials for bulk heading shall include mortar, geotextile wrap, and tape for attachment. Mortar mix shall be Type H-1 non-shrinking mortar and grout mixture.

Construction
The Contractor shall expose the existing pipe crossing in advance of proposed construction and confirm with the utility that the pipe is abandoned. The Contractor shall inform the Engineer of the conflict in advance of any work. After agreement is reached, then the Contractor shall remove that portion of conflicting abandoned pipe across the trench influence area and seal each exposed remaining ends with bulk heads. The bulk heads shall be constructed such that prepared mortar mix shall be extended at least one foot into the pipe, then wrapped with geotextile material same as used for the road, and secured in place with tape.

Measurement and Payment
The completed as measured for Abandoned Gas Main, Conflict will be paid for at the Contract Unit Price for the following Contract Item (Pay Item):

Pay Item	Pay Unit
Abandoned Gas Main, Conflict	Each

Abandoned Gas Main, Conflict will be measured in place by the unit Each; and will be paid for at the contract unit price per Each, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work.

SPECIAL PROVISION
FOR
AGGREGATE BASE, ___ INCH, MODIFIED

Description
The work of Aggregate Base, ___ Inch, Modified shall be done in accordance with Section 302 of the MDOT 2012 Standard Specifications for Construction for furnishing, placing, and compacting aggregate, and as modified herein.

Materials
The material shall meet gradation requirements of Section 902 of the MDOT 2012 Standard Specifications for Construction for 21AA aggregate, except all material shall be 100% crushed limestone. No substitutes will be allowed. The material shall be tested and certified in advance of delivery to the work site.

Construction
Aggregate material shall be properly placed and compacted in accordance with the project plans or as directed by the Engineer. Depth measures shall be taken at intervals not exceeding 100 lineal feet; locations will be as selected by the Engineer. Measured depth may be ½-inch less than specified thickness provided that the average of all measurements meet or exceed the specified thickness. Sections found deficient in thickness shall be corrected by the Contractor and retested by the Engineer.

Measurement and Payment
The completed work as measured for Aggregate Base, ___ Inch, Modified will be paid for at the Contract Unit Price for the following Contract Item (Pay Item):

Pay Item	Pay Unit
Aggregate Base, ___ Inch, Modified	Square Yard

Aggregate Base, ___ Inch, Modified will be measured in area by square yard; and will be paid for at the contract unit price per square yard, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work.

SPECIAL PROVISION
FOR
CONCRETE PAY ITEMS

Description
This work shall be done in accordance with sections 601 and 701 of the MDOT 2012 Standard Specifications for Construction, except as modified herein. This special provision indicates the type of concrete mixture to be used for pay items related to curb and gutter, drive approaches, and sidewalks.

Materials
Cement content for Concrete, Grades S2 and P1, shall be 564 pounds per cubic yard (6 Sack) for all concrete items, in accordance with Sections 601 and 701 of the MDOT 2012 Standard Specifications for Construction. Concrete mix shall not include fly ash or water reducing agents.

Construction
Construction of concrete related items including but not limited to curb and gutter, driveways, sidewalks, ADA ramps shall be done in accordance with the MDOT 2012 Standard Specifications for Construction, or as directed by the Engineer.

Measurement and Payment
Payment for the completed work for the various concrete pay items in this contract using a six full sack mix shall be included as part of their individual unit prices.

SPECIAL PROVISION
FOR
DRAINAGE STRUCTURE COVER EJ ____

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Description
Drainage Structure Cover EJ ____, shall consist of materials and work meeting requirements of Section 403 of the MDOT 2012 Standard Specifications for Construction, and as modified herein.

Materials
All covers will be manufactured and supplied by East Jordan Iron Works. Cover types shall match with the pay item cover number.

Measurement and Payment
The completed work as measured for Drainage Structure Cover EJ ___ will be paid for at the Contract Unit Price for the following Contract Item (Pay Item):

Pay Item	**Pay Unit**
Drainage Structure Cover EJ 1030	Each
Drainage Structure Cover EJ 1060	Each
Drainage Structure Cover EJ 1060 w/Type N Oval Grate	Each
Drainage Structure Cover EJ 1020 W/Gasket Seal	Each
Drainage Structure Cover EJ 7000	Each

Drainage Structure Cover EJ ____will be measured in place by count of Each; and will be paid for at the contract unit price per Each, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work.

SPECIAL PROVISION
FOR
DR STRUCTURE, ___ INCH DIA, MODIFIED

Description
The work of Dr Structure, ___ inch dia, Modified, of varying diameters, shall be done in accordance with Sections 403 and 913 of the 2012 MDOT Standard Specifications for Construction, MDOT Standard Plans, and as modified herein. The Contractor shall construct Dr Structure, ___ inch dia, Modified of the size and at locations as shown on the plans or as directed by the Engineer.

Materials
Drainage structures shall be precast reinforced concrete units and manufactured in accordance with ASTM C-478 specifications and Section 913 of the 2012 MDOT Standard Specifications for Construction, with either a cast in place bottom or fitted precast concrete base as detailed on the plans. Precast reinforced concrete units shall be furnished with butyl rubber sealant that conforms to ASTM C990; or as updated by MDOT design standard change.

All storm sewer orifices to receive sewer pipe shall be fitted with a Kor-N-Seal flexible connector, or approved equal.

Whenever conditions allow: provide 4” up to 12” adjustment area between top of cone to base of cover.

Measurement and Payment
The completed work of Dr Structure, ___ inch dia, Modified will be paid for at the contract unit price for the following contract item (pay item):

Pay Item	Pay Unit
Dr Structure, ___ inch dia, Modified	Each

Dr Structure, ___ inch dia, Modified will be measured in place by the unit Each; and will be paid for at the contract unit price per Each, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work. The unit price for Dr Structure, ___ inch dia, Modified shall include the cost of the concrete footing, and no greater than 8 feet of drainage structure depth. The unit price for Dr Structure, ___ inch dia, Modified includes the cost of temporary and/or final grade adjustments of the structure and the flexible connectors.

In the event where it is necessary to modify connection holes in the field, or additional taps are required into the structure walls, then this work will be paid for separately as Dr Structure, Tap, ___ inch of the appropriate size required to complete that special work.

SPECIAL PROVISION
FOR
GEOTEXTILE, SEPARATOR

Description
The work of Geotextile, Separator shall consist of furnishing and placing geotextile in accordance with section 910 of the Michigan Department of Transportation 2012 Standard Specifications for Construction, and as noted herein:

Materials
Geotextile, Separator shall be mechanically bonded non-woven fabric, meeting or exceeding products manufactured as Mirafi 180N, US Fabrics 205NW, or Synthetic Industries 801 non-woven product, or approved equal.

Construction
Spread geotextiles smoothly on prepared grade and anchor firmly prior to placing backfill or other cover materials. Construction equipment shall not operate directly onto the geotextile. Wrinkles and waves shall be smoothed by hand before placing cover material. Concurrent transverse and longitudinal edges between blankets shall be either shingle-lapped (minimum 24 inches) or seamed. Seamed edges may be either factory sewn or made by overlapping in the field. Factory sewn seams must meet specified grab tensile strength requirements of the manufacturer. Finished seams must lie upward after installation. Any cutting and fitting of the geotextile must be done to requirements of the manufacturer.

Measurement and Payment
The completed work as measured for Geotextile, Separator will be paid for at the contract unit price for the following contract item (Pay Item):

Pay Item	Pay Unit
Geotextile, Separator	Square Yard

Geotextile, Separator will be measured in place by area in square yards and will be paid for at the contract unit price per square yard which price shall be payment in full for all labor, material and equipment necessary to accomplish this work. Overlaps, cutting and fitting of Geotextile, Separator will not be measured and paid for separately, but are considered included as part of the in-place area measure of the Geotextile, Separator.

SPECIAL PROVISION
FOR
MACHINE GRADING, MODIFIED

Description
The work of Machine Grading, Modified shall be done in accordance with Section 205 of the MDOT 2012 Standard Specifications for Construction and as modified herein. The work of Machine Grading, Modified shall include all excavation including earth, embankment, and necessary grading to shape the subgrade to the cross sections shown on the plans for pavements, sidewalks, curbs, drive approaches, etc., within the R.O.W.'s of the project. The work shall also include proper disposal of excavated materials and handling of suitable material for backfill (embankment) in select locations.

The work of Machine Grading, Modified shall also include locating, protecting and preserving all public and private utility appurtenances within the proposed work area.

Construction
The roadbed shall be finished to grade with a blade grader then roller compacted. The finished grade will be inspected by the Engineer to determine whether subgrade undercutting is necessary before the finished grade is approved. Where undercuts below bottom of grade require additional excavation, that work shall be measured and paid for separately as Subgrade Undercutting, Type II.

The disposal of excavated surplus and unsuitable material shall be done in accordance with section 205.03P of the MDOT 2012 Standard Specifications for Construction. Disposal of excavated surplus and unsuitable material will not be paid for separately, but shall be considered included with payment for Machine Grading, Modified.

Measurement and Payment
The completed work as measured for Machine Grading, Modified will be paid for at the Contract Unit Price for the following Contract Item (Pay Item):

Pay Item	Pay Unit
Machine Grading, Modified	Station

Machine Grading, Modified will be measured in length in Stations along the curb line extended, each side of the roadway to be measured separately; and will be paid for at the contract unit price per Station, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work.

Work at intersections will not be paid for separately, but shall be considered included as part of the payment for Machine Grading, Modified.

The approximate quantities for excavation and embankment are listed as follows and are for the Contractor's information only. Suitable excavated material, as determined by the Engineer, may be used as embankment material behind the proposed curb.

W. Stewart Street:

Approximate Excavation quantity	950 Cyd
Approximate Embankment quantity	30 Cyd (CIP)

Howard Street:

Approximate Excavation quantity	625 Cyd
Approximate Embankment quantity	20 Cyd (CIP)

SPECIAL PROVISION
FOR
SANITARY SERVICE, CONFLICT

Description
The work of Sanitary Service, Conflict consists of relocating (lowering) existing sanitary service connections that conflict with proposed storm sewer installation as shown on the plans or as directed by the Engineer. The work must be coordinated with City of Owosso DPW officials.

Materials
The materials for relocating existing sanitary sewer service connections shall consist of new material meeting the requirements of the City of Owosso. City DPW officials will review with the Contractor the type of material found, then determine suitable new material and adaptors required to reconnect the sanitary service.

Construction
The City of Owosso will be responsible for temporarily shutting off the wastewater system. The Contractor shall cooperate with City of Owosso DPW officials in establishing service relocation, material selection, and work method in order to reroute the sanitary service under the proposed storm sewer. The entire crossing area shall be filled with 6A compacted crushed stone.

Measurement and Payment
The completed as measured for Sanitary Service, Conflict will be paid for at the Contract Unit Price for the following Contract Item (Pay Item):

Pay Item	Pay Unit
Sanitary Service, Conflict	Each

Sanitary Service, Conflict will be measured in place by the unit Each; and will be paid for at the contract unit price per Each, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work.

SPECIAL PROVISION
FOR
SAWCUTTING

Description
This work shall be accomplished in accordance with Section 501 of Michigan Department of Transportation 2012 Standard Specifications for Construction except as modified herein.

Construction
This item shall be for sawing HMA pavement, driveway approaches, sidewalks, and curb and gutter; wherever a joint of any does not exist; as shown on the plans and/or as directed by the Engineer. Sawcutting depths shall be full depth.

Measurement and Payment
The completed work as measured for Sawcutting will be paid for at the contract unit price for the following contact item (Pay Item).

Pay Item	**Pay Unit**
Sawcutting	Linear Foot

Sawcutting will be measured by length in feet; and will be paid for at the contract unit price per foot, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work.

SPECIAL PROVISION
FOR
VALVE BOX, ADJUST

Description
The work of Valve Box, Adjust shall be done in accordance with Section 403 of the MDOT 2012 Standard Specifications for Construction, and as modified herein. This work shall include the proper setting and support of valve boxes within the proposed pavement area.

Construction
This work item shall include adjustment of water valve boxes and covers to final grade in advance of the final course of HMA. The Contractor shall sawcut, remove adjacent pavement, square pavement edges, center box over the water valve, set and support cover to the required elevation, and replace pavement with HMA of same type and mix as top course material.

Measurement and Payment
The completed work as measured for Valve Box, Adjust will be paid for at the contract unit price for the following contract pay item (Pay Item):

Pay Item	Pay Unit
Valve Box, Adjust	Each

Valve Box, Adjust will be measured in in place by the unit Each and will be paid for at the contract unit price per Each, which price shall be payment in full for all labor, material, and equipment needed to accomplish this work.

The unit price for Valve Box, Adjust includes the following:
1. Sawcutting existing pavement.
2. Adjusting and supporting the valve box.
3. Removing and replacing pavement adjacent to the adjusted cover.

SPECIAL ROVISION
FOR
TURF ESTABLISHMENT, PERFORMANCE

a. Description. For the work identified in this special provision paid for by the pay item Turf Establishment, Performance only, delete section 816 of the Standard Specifications for Construction and replace it with this special provision. The Contractor is responsible for the performance and quality of turf growth in the areas indicated on the plans and as identified by the Engineer. Comply with all local, state and federal laws when completing this work.

Establish a durable, permanent, weed-free, mature, perennial turf. The work consists of fundamental turf work, including but not limited to top soiling, seeding, mulching, erosion control, maintenance, watering and repair of turf as described herein during the life of the contract and during the life of any supplemental performance bond which may ensue.

Choose and implement proven turf establishment industry practices; provide all necessary labor and equipment; select and provide all turf establishment materials; and control erosion and any subsequent sedimentation at all times.

Perform a site analysis, interpret the results and implement a turf establishment program to ensure compliance with this specification. The site analysis must take into consideration topsoil needs, fertilizer and pH requirements, seed mix, existing and future soil moisture levels, slopes and grades, required erosion control items and devices, maintenance requirements, local highway snow removal and deicing practices, and any other characteristics that influence and affect turf establishment.

Subsection 107.11 of the Standard Specifications for Construction is revised relative to the Contractor's responsibility for the repair of turf establishment work as follows. The Contractor is responsible, at no additional cost to the contract, for the repair of turf establishment work occasioned by storm events up to 3 inches of rain in a 24 hour period as documented by local meteorological data submitted to the Engineer for review and approval. All other portions of subsection 107.11 remain unchanged.

1. Contractor Turf Establishment Experience Requirements. Ensure weed control is done by a commercial herbicide applicator, licensed by the State of Michigan and certified by the Michigan Department of Agriculture (MDA) in the appropriate category to apply herbicides. Use application procedures and materials according to federal, state and local regulations. Use of restricted use chemicals is prohibited. Provide appropriate documentation and secure approval from the Engineer before application of herbicides.

At least 10 work days prior to start of turf establishment, provide documentation to the Engineer, from the Contractor performing the turf establishment work, that they meet one or both of the following requirements.

A. At least one person employed by the Contractor performing the turf establishment work and assigned to the job site has a degree or certificate in Turf

Management, Horticulture or related field.

B. At least one person employed by the Contractor performing the turf establishment work and assigned to the job site has at least 5 years of experience in roadside turf establishment.

b. Materials. Provide topsoil, seed, mulch, pesticide, herbicide, mulch blankets and any other unique erosion control materials as necessary to fulfill this specification, as detailed on the plans. Use additional materials, as necessary, to meet the standards set forth for turf establishment in this special provision. The use of sod on the project requires the prior approval of the Engineer and if approved, may be used at limited site locations only.

Selection of all materials is the responsibility of the Contractor with the following minimum conditions.

1. Soil. Provide furnished or salvaged topsoil, which may be blended compost, that will support vigorous growth. Ensure topsoil is humus bearing and placed at least 4 inches deep. Ensure it is free of stones larger than 1/2 inch (2 inches on freeway projects) in diameter and other debris. Trim and grade the finished slope in accordance with subsection 205.03.N of the Standard Specifications for Construction.

2. Seed. Use a seeding mixture that is composed of four or more species of perennial grass. Use only species and their cultivars or varieties which are guaranteed hardy for Michigan.

Recommended species of perennial grasses include: Kentucky Bluegrass, Perennial Ryegrass, Hard Fescue, Creeping Red Fescue, Chewings Fescue, Turf-type Tall Fescue, Buffalo grass, and Alkaligrass-Fults Puccinellia distans. Select cultivars or varieties of grasses that are disease and insect resistant and of good color. Ensure that no one species in the mix is less than 5 percent, or more than 25 percent, of the mixture by weight. Do not select grass species considered noxious or objectionable, such as Quack Grass, Smooth Brome, Orchard Grass, Reed Canary Grass and others.

A. Ensure the seed is legally saleable in Michigan. Ensure the seed product does not contain more than 10 percent inert materials. Ensure the seed source is an MDOT approved certified vender.

B. Adapt the species and varieties of seed to the site conditions, to the site use, and to the soils, moisture and local climate. Site use may include, but is not limited to, detention pond, wildlife habitat, playground, wetlands, forested wetland, rural roadside, urban roadside and highly maintained front yard.

C. Ensure at least two of the species in the mixture proposed to be planted within 15 feet behind the curb or the shoulder are salt tolerant.

3. Mulch. Mulch seeded areas with the appropriate materials for the site conditions to promote germination and growth of seed and to mitigate soil erosion and sedimentation.

4. Herbicides. Comply with all federal, state and local laws. As part of the MDA weed control application, the Contractor is required to make proper notifications and/or postings as per label and MDA requirements for all locations that will be sprayed. Notify the Engineer at least 48 hours prior to any applications being made. Furnish and apply herbicide(s) as

needed. It is the Contractor's responsibility to select the herbicide(s) and the rate at which it is used. Obtain the Engineer's approval of work methods and herbicide(s) selected prior to the application of the herbicide(s). Complete a spray log and submit to the Engineer each day an application is made.

Do not draw water from any waterway (i.e. river, ditch, creek, lake etc.) located on state, county or municipal right-of-way, for mixing with herbicides.

5. Fertilizers. Furnish and apply fertilizer(s) as needed. It is the Contractor's responsibility to select the fertilizer(s) and the rate at which it is used. Phosphorus is allowed for use only at the time of planting and when required by soil conditions. Obtain the Engineer's approval of work methods and fertilizer(s) prior to the application of the fertilizer(s).

6. Water. Furnish and apply water from an approved source at a rate to promote healthy growth.

c. Construction. The Contractor is responsible for all work and all construction methods used in completing this work. Implementation of any part of the standard specifications or standard plans by the Contractor does not relieve the Contractor of responsibility for acceptability of the construction methods or for the quality of the work.

1. Inspection of the Work. The Contractor is responsible for all inspection of turf establishment work.

Use a Contractor's Daily Report, approved by the Engineer, to report inspections made and to document turf establishment work performed on this project. Complete and submit a Contractor's Daily Report to the Engineer when any work performed under this special provision is in progress.

Include all necessary materials documentation including tests slips, certifications, etc. with the associated Contractor's Daily Report.

The Engineer will determine the acceptability of the Contractor's Daily Report in terms of their completeness and accuracy. The Engineer reserves the right to verify all submitted measurements and computations. Failure by the Contractor to submit acceptable and timely reports to the Engineer may result in withholding of progress pay estimates on turf-related items until such time as reports are submitted and deemed acceptable.

The Engineer reserves the right to inspect the project for any reason in accordance with subsection 104.01 of the Standard Specifications for Construction, including the fulfillment of other inspection requirements such as Soil Erosion and Sedimentation Control, NPDES, etc. Inspections made by the Engineer do not relieve the Contractor of the responsibility for inspections required by this special provision or the Contractor's responsibilities for erosion control and turf establishment.

2. Erosion Control. Control erosion at all times according to section 208 of the Standard Specifications for Construction. Control of soil erosion is the responsibility of the Contractor. However, sedimentation controls must be placed as indicated on the plans or as directed by the Engineer. Continuously monitor the site for needed erosion repair from any cause as addressed in the contract. Return all eroded areas to original grade as detailed in the contract.

Take immediate corrective action if sedimentation occurs in drainage structures or any watercourse or water containment area and stabilize all disturbed areas contributing to this sedimentation within 24 hours after the erosion occurrence. Remove sediment deposited as a result of the Contractor's inability to control the soil erosion at the Contractor's expense.

Reimburse the Department for any costs levied against the Department, such as fines, environmental costs, costs for remedies required, or any other costs as a result of the Contractor's failure to comply with this special provision and with federal, state and local laws.

3. Erosion Repair. The Contractor is responsible for all repairs and liable for all consequences (legal, monetary or other) associated with erosion or sedimentation damage to finished or unfinished work.

Report all erosion occurrences and the repairs made by the Contractor to the Engineer in the format and at the frequency required by the Engineer. Repair any erosion, displacement or disturbance to ongoing or completed work by any cause at no additional cost to the contract unless otherwise noted herein.

The Contractor is responsible and liable for all traffic control and safety measures required to repair and protect damaged turf areas. Repair any eroded area that may affect the support of the roadbed or safety of the public within 24 hours of the erosion occurrence.

Place protective devices such as barriers, directional signs/signals, temporary fence, or any other safety measures immediately after any erosion damage occurs that has the potential of endangering the public. In these instances, provide the Engineer with a written summary of the immediate action taken describing the repairs made and the safety measures taken, within 24 hours of the occurrence of the damage.

4. Mowing and Weeding. Maintain turf to a visually appealing level, and not more than 8 inches in height at any time, prior to acceptance. Weeds must be controlled to less than 10 percent of the turf establishment area at all times during construction.

5. Final Acceptance and Supplemental Performance Bond.

A. Final Acceptance Parameters. Ensure before final acceptance of the turf establishment work, all of the following minimum parameters are met throughout all exposed areas of the project designated on the plans or identified by the Engineer as turf establishment areas: there must be no exposed bare soil and the turf must be fully germinated, erosion free, weed free, disease free, dark green in color and in a vigorous growing condition.

The Engineer will notify the Contractor of the dates and times of all acceptance inspections. The Contractor may accompany the Engineer during these inspections. If the Contractor does not agree with the decision made by the Engineer, the Contractor may request an inspection by a mutually agreed upon third party (Michigan State University Extension service or other). A joint inspection, to include the Engineer, the Contractor, and the third party, will be scheduled by the Engineer. Pay all expert fees and expenses charged by the third party.

B. Supplemental Performance Bond. In the event that all contract items of work are

completed, including the placement of all turf establishment items of work, and the final acceptance of the project is delayed because the final acceptance parameters for the turf establishment work have not been fully met; the Contractor may propose to the Engineer the use of a supplemental performance bond.

The bond serves to secure the successful completion of turf establishment work and fulfillment of all final acceptance parameters for the turf establishment work. Ensure the supplemental performance bond, in all respects, is satisfactory and acceptable to the Department and executed by a surety company authorized to do business with the State of Michigan.

Ensure the bond is in an amount equal to 50 percent of the turf establishment work items covered by this special provision. Ensure the bond remains in place for two growing seasons. At the discretion of the Engineer, the bond may be reduced on a prorated basis as portions of the areas designated for turf establishment on the project meet the final acceptance parameters.

Prior to commencement of any work necessary to meet the acceptance parameters during the bonded period, the Contractor must apply for a permit to work within MDOT right-of-way using Form 2205. The permit fee and an individual permit performance bond will not be required. The permit insurance requirements, however, will be required.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Turf Establishment, Performance	Square Yard

Turf Establishment, Performance will include all labor, equipment and materials required or selected by the Contractor to install, maintain, inspect, repair and meet the acceptance parameters for turf establishment specified in this special provision, including preparation, updating and submittal of the Contractor's Daily Reports.

Repairs made to damaged turf establishment areas as a result of a documented storm by local meteorological data resulting in rainfall amounts of more than 3 inches in a 24 hour period will be paid for as an increase to original quantities in accordance with subsection 109.05 of the Standard Specifications for Construction.

The following schedule of payment applies to work performed according to this special provision. Upon completion of topsoil surfacing stage, 50 percent of the authorized amount for **Turf Establishment, Performance** will be paid to the Contractor. The remaining 50 percent of the authorized amount will be paid upon completion of all other work necessary to comply with this special provision and to meet all final acceptance parameters for **Turf Establishment, Performance** or at such time as the supplemental performance bond is accepted by the Department.

The supplemental performance bond and all costs associated with turf establishment work performed during the duration of the performance bond will not be paid for separately. These costs which may include, but are not limited to, mobilization, traffic control devices, and the required permit insurance are included in the unit price bid for **Turf Establishment, Performance.**