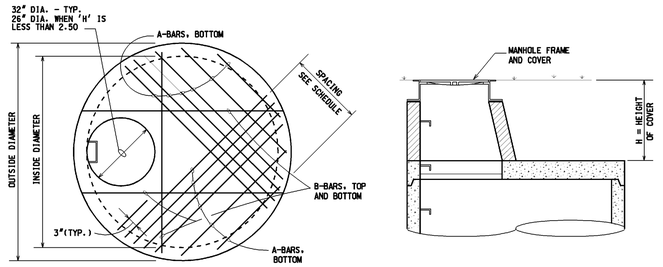
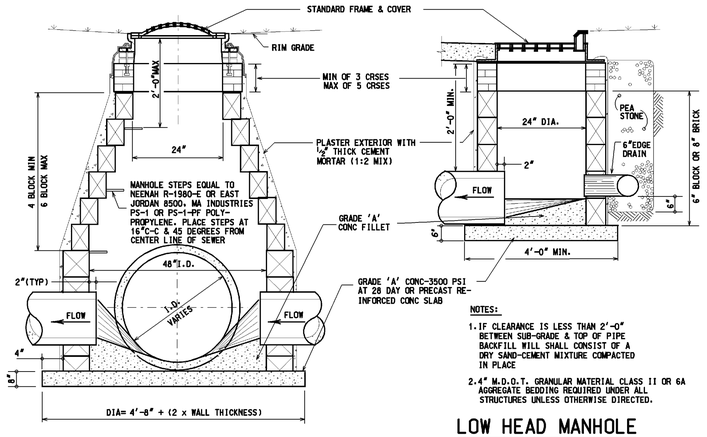


PLAN

SECTION

INSIDE DIA.	SLAB THICKNESS	MAX. HEIGHT OF COVER	REINFORCEMENT		
			A-BARS EA. SIDE		B-BARS TOP & BOTTOM
			NO. SIZE	SPACING	
4'-0"	8"	8'-0"	(4)-#5	3 @ 3"	(3)-#5
5'-0"	8"	8'-0"	(6)-#5	3 @ 3" 2 @ 6"	(3)-#5
6'-0"	8"	8'-0"	(5)-#6	4 @ 8"	(3)-#5
7'-0"	8"	8'-0"	(7)-#6	6 @ 6"	(3)-#5
8'-0"	8"	8'-0"	(9)-#6	8 @ 6"	(3)-#5
9'-0"	10"	8'-0"	(11)-#6	10 @ 6"	(3)-#5
10'-0"	10"	8'-0"	(13)-#7	12 @ 6"	(3)-#5

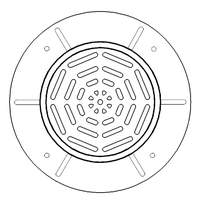


TYPE A-N INLET

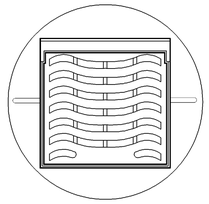
NOTES:

1. IF CLEARANCE IS LESS THAN 2'-0" BETWEEN SUB-GRADE & TOP OF PIPE BACKFILL WILL SHALL CONSIST OF A DRY SAND-CEMENT MIXTURE COMPACTED IN PLACE
2. 4" M.D.O.T. GRANULAR MATERIAL CLASS II OR 6A AGGREGATE BEDDING REQUIRED UNDER ALL STRUCTURES UNLESS OTHERWISE DIRECTED.

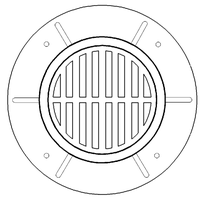
LOW HEAD MANHOLE
TYPE C INLET



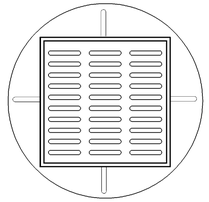
CATCH BASINS AND INLETS WITHIN PAVED DRIVING AREAS
FRAME & COVER EJIW #1040 WITH TYPE 'M-1' GRATE



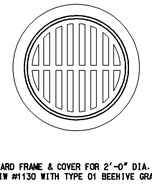
CURBED PAVEMENT SECTION
FRAME & COVER EJIW #7045 WITH TYPE 'M-1'
FOR 6" HIGH BACK CURB



BEEHIVE FRAME & COVER EJIW #1040
WITH TYPE 02 GRATE



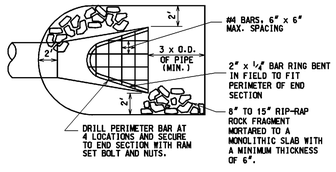
CURBED PAVEMENT SECTION
FRAME & COVER EJIW #7300 WITH TYPE "M"
FOR 4" MOUNTABLE CURB



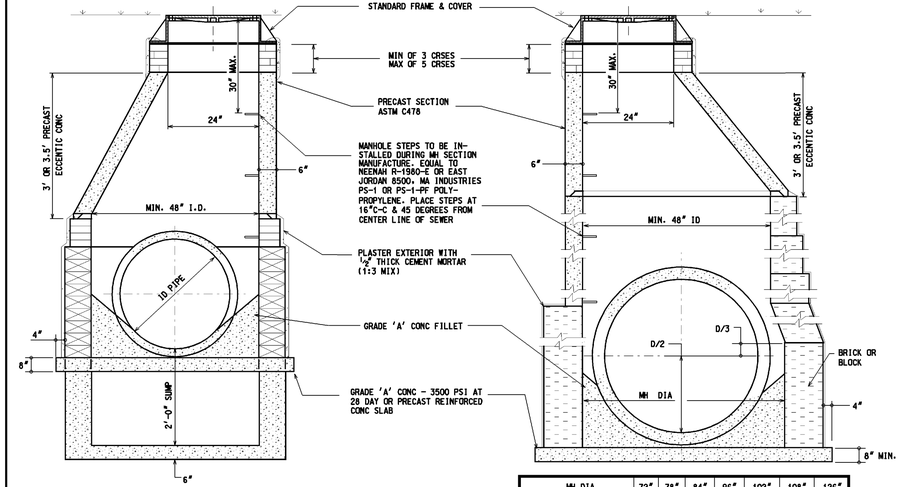
REAR YARD FRAME & COVER FOR 2'-0" DIA. INLET
EJIW #1130 WITH TYPE 01 BEEHIVE GRATE

STORM SEWER FRAME & COVER EJIW #1040
WITH TYPE 'B' COVER

FRAMES AND COVERS



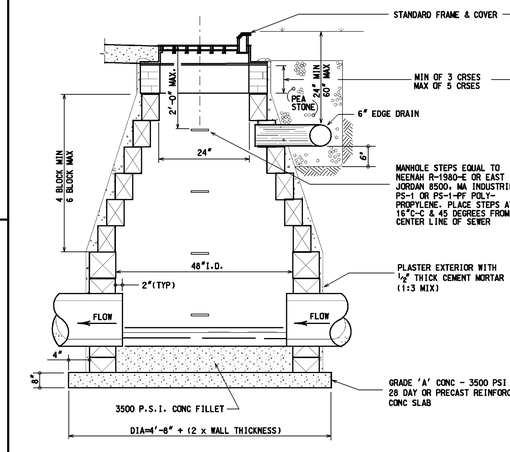
END SECTION AND BAR SCREEN DETAIL
INCLUDING RIP-RAP



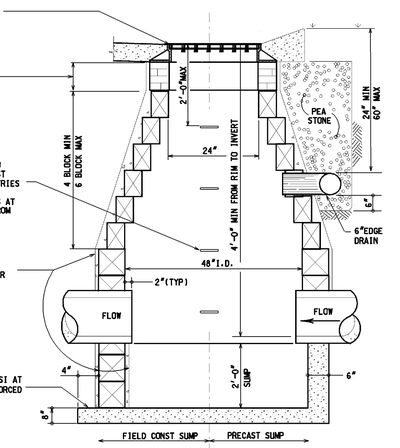
MH DIA	72"	78"	84"	96"	102"	108"	126"
D=SEWER PIPE ID SIZE	48"	54"	60"	66"	72"	84"	96"

STORM MANHOLE
FOR 42" PIPE AND SMALLER

STORM MANHOLE
FOR 48" PIPE AND LARGER



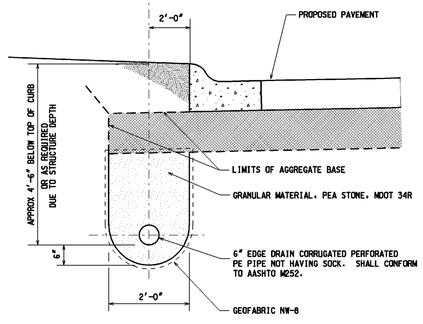
TYPE "A" INLET



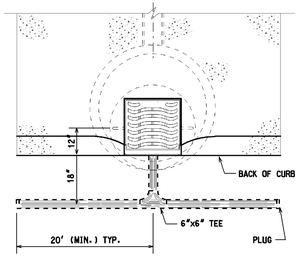
TYPE "B" CATCH BASIN

NOTES:

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT ENGINEERING DESIGN STANDARDS AND SPECIFICATIONS OF HIGHLAND TOWNSHIP.
2. IT SHALL BE THE OWNER'S ENGINEER AND CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXISTENCE AND LOCATION OF ALL UNDERGROUND UTILITIES.
3. ALL SEWER TRENCHES UNDER THE 45 DEGREE ZONE OF INFLUENCE LINE OF EXISTING OR PROPOSED PAVEMENTS, BIKE PATHS, SIDEWALKS OR DRIVE APPROACHES SHALL BE BACKFILLED WITH MDOT CLASS II SAND COMPACTED TO AT LEAST 95% OF MAXIMUM UNIT WEIGHT.
4. ALL STORM SEWER SHALL BE INSTALLED ON CLASS "B" BEDDING OR BETTER.
5. JOINTS FOR STORM SEWER SHALL BE PREMIUM JOINTS (TONGUE AND GROOVE WITH RUBBER GASKETS).
6. LEAD MATERIAL SHALL BE 4" DIA. (MIN.) PVC SCHEDULE 40 OR SDR 23.5. LEAD CONNECTIONS MAY ONLY BE AT STRUCTURES.
7. CONTACT THE TOWNSHIP ENGINEER 48 HOURS PRIOR TO STORM SEWER INSTALLATION TO SCHEDULE OBSERVATION. FULL TIME OBSERVATION IS REQUIRED FOR ALL UNDERGROUND STORM SEWER AND LEACHING SYSTEM CONSTRUCTION. CONTACT MICHAEL DARGA WITH HUBBELL, ROTH & CLARK, INC. 248-454-6532.
8. BEFORE YOU DIG CALL MISS DIG AT 1-800-482-7171.
9. ALL MORTAR AND CONCRETE WORK SHALL BE PROTECTED FROM FREEZING (40° F. AND FALLING) FOR A MINIMUM OF 48 HOURS.
10. PIPE FOR STORM SEWERS WITHIN THE PUBLIC ROAD RIGHT-OF-WAY OR PRIVATE ROAD EASEMENT SHALL BE RCP, C-76, CLASS IV OR V RCP.
11. DOUBLE WALLED HDPE MEETING THE REQUIREMENTS OF ASTM F2306.



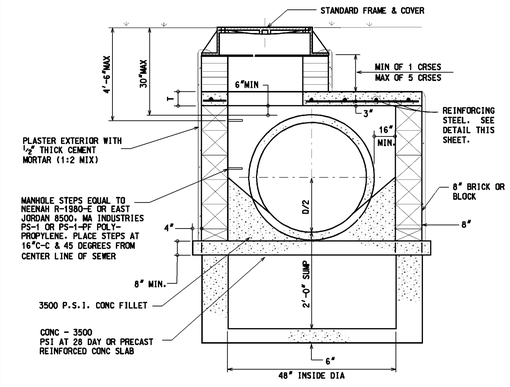
EDGE DRAIN DETAIL



NOTES:

1. LENGTH OF 6" EDGE DRAIN TO BE DETERMINED BY THE TOWNSHIP.
2. EDGE DRAIN SHALL BE INSTALLED AT ALL CATCH BASINS & INLETS WITHIN LIMITS OF PAVEMENT OF A ROADWAY. 20' (MIN.) IN EACH DIRECTION.

6" EDGE DRAIN



LOW-HEAD STORM
SEWER STRUCTURE

HRC
Hubbell, Roth & Clark, Inc.
CONSULTING ENGINEERS
105 W. GRAND RIVER AVE.
HOWELL, MICHIGAN 48843
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DIRECT PHONE: (517) 552-9199
FAX: (517) 552-6099
WEB SITE: http://www.hrc-engr.com

DATE	ADDITIONS AND/OR REVISIONS
DESIGNED	M.P.D.
DRAWN	T.E.W.
CHECKED	J.B.
APPROVED	G.E.H.

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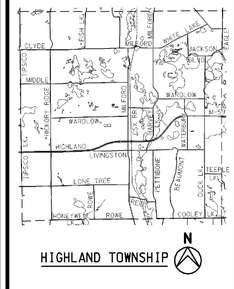
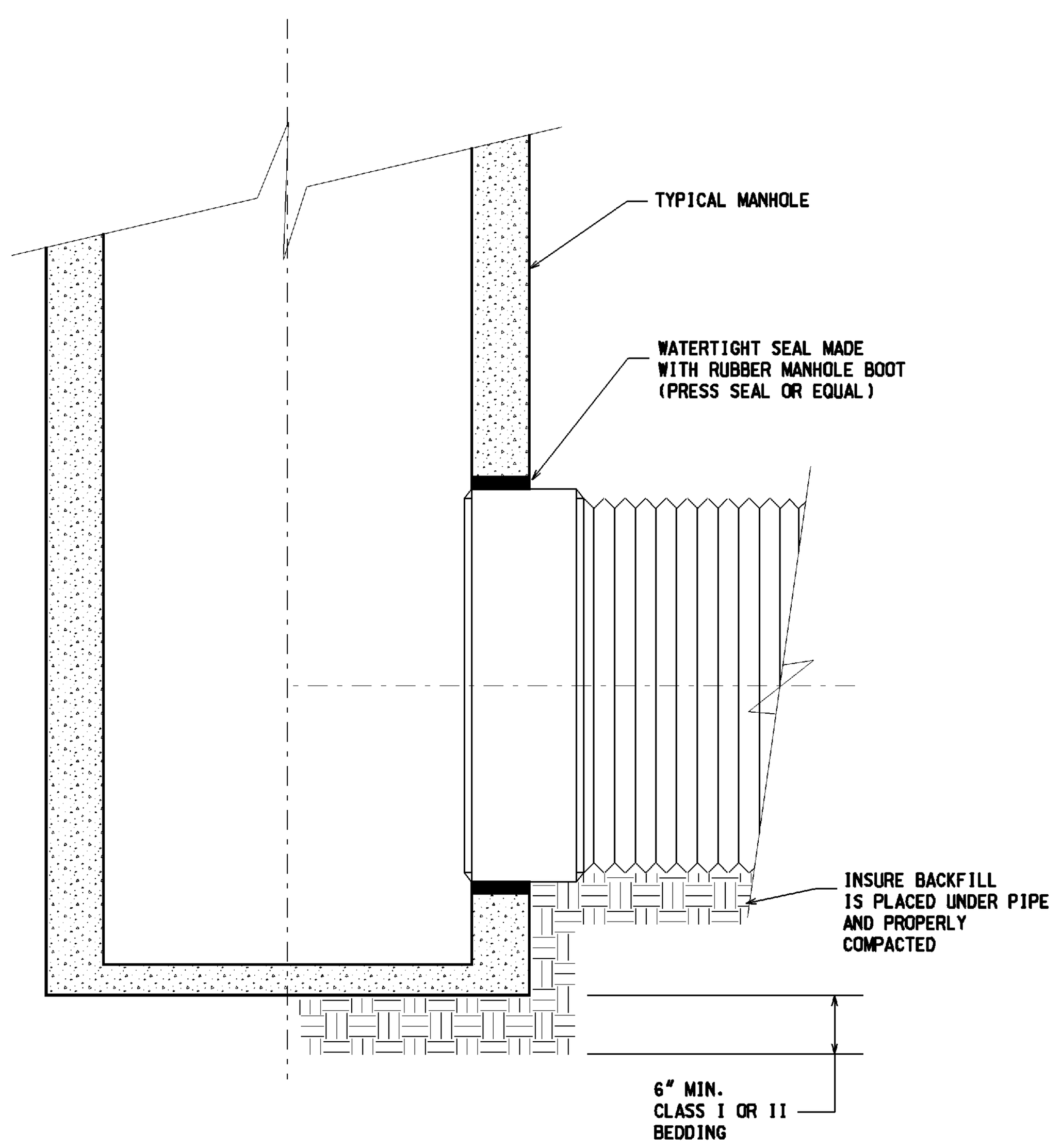


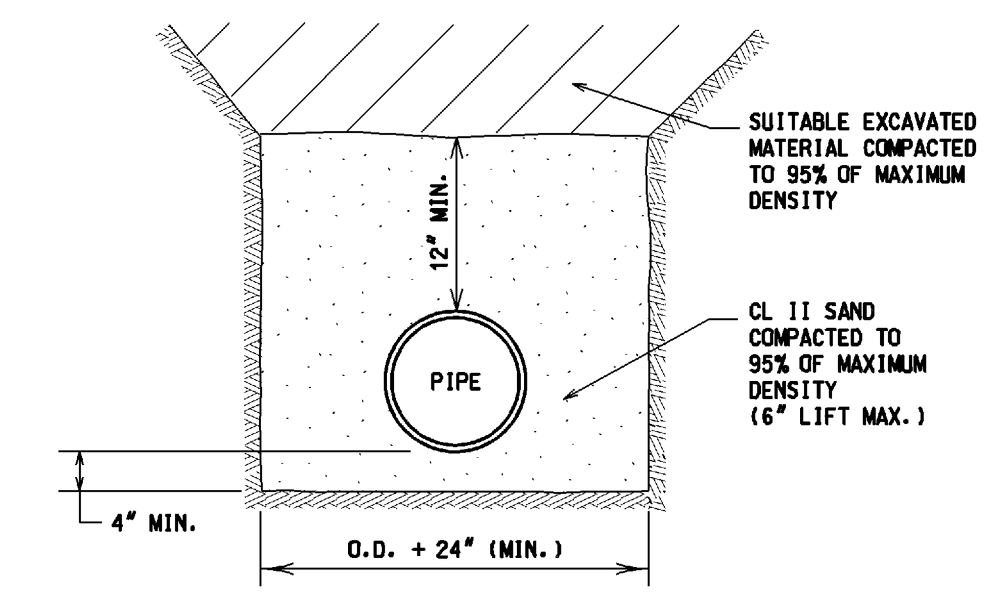
HIGHLAND TOWNSHIP
DESIGN STANDARDS

STORM SEWER DETAILS

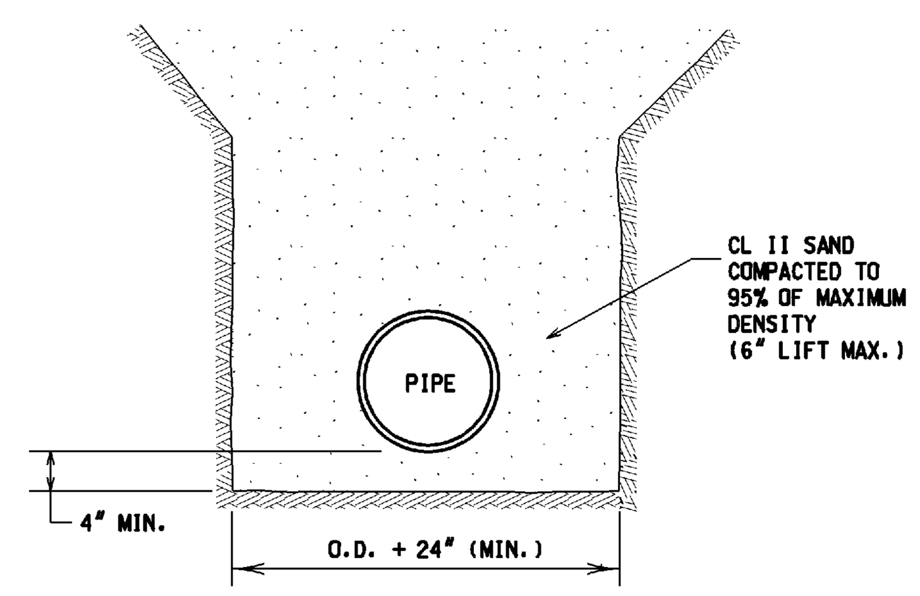
HRC JOB NO.	SCALE
20050368	NONE
DATE	SHEET NO.
SEPTEMBER 2005	1 OF 2



WATERTIGHT MANHOLE CONNECTION HDPE TO CONCRETE DETAIL

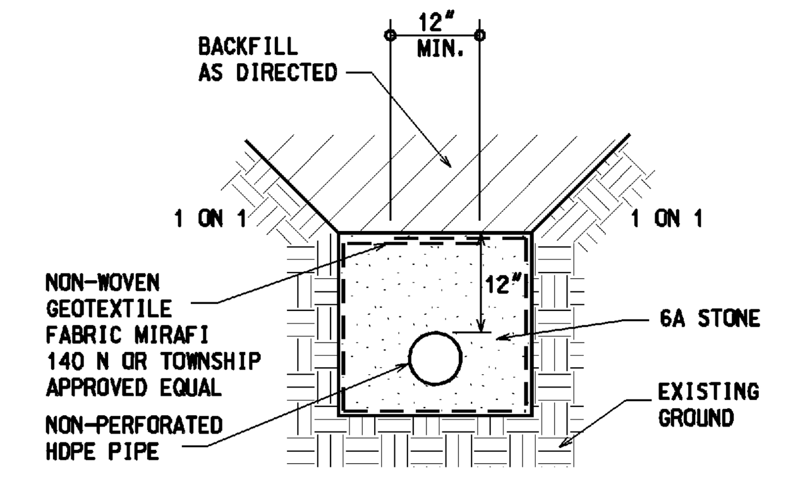


BEDDING DETAIL - TRENCH B

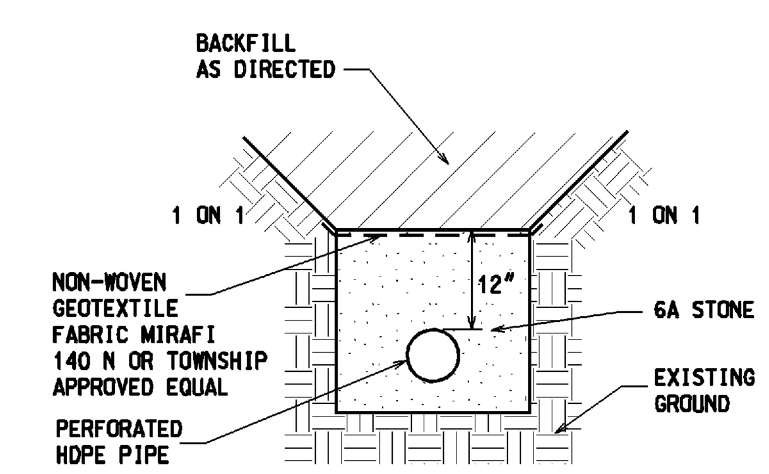


BEDDING DETAIL - TRENCH A

(REQUIRED FOR INSTALLATION UNDER PAVEMENT OR WITHIN THE INFLUENCE OF ROAD BED.)



HDPE PIPE TRENCH DETAIL FOR DETENTION SYSTEMS WITHOUT GROUNDWATER RECHARGE



HDPE PIPE TRENCH DETAIL FOR DETENTION/RETENTION SYSTEMS WITH GROUNDWATER RECHARGE

NOTES:

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT ENGINEERING DESIGN STANDARDS AND SPECIFICATIONS OF HIGHLAND TOWNSHIP.
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6. LEAD MATERIAL SHALL BE 4" DIA. (MIN.) PVC SCHEDULE 40 OR SDR 23.5. LEAD CONNECTIONS MAY ONLY BE AT STRUCTURES.
7. CONTACT THE TOWNSHIP ENGINEER 48 HOURS PRIOR TO STORM SEWER INSTALLATION TO SCHEDULE OBSERVATION. FULL TIME OBSERVATION IS REQUIRED FOR ALL UNDERGROUND STORM SEWER AND LEACHING SYSTEM CONSTRUCTION. CONTACT MICHAEL DARGA WITH HUBBELL, ROTH & CLARK, INC. 248-454-6532.
8. BEFORE YOU DIG CALL MISS DIG AT 1-800-482-7171.
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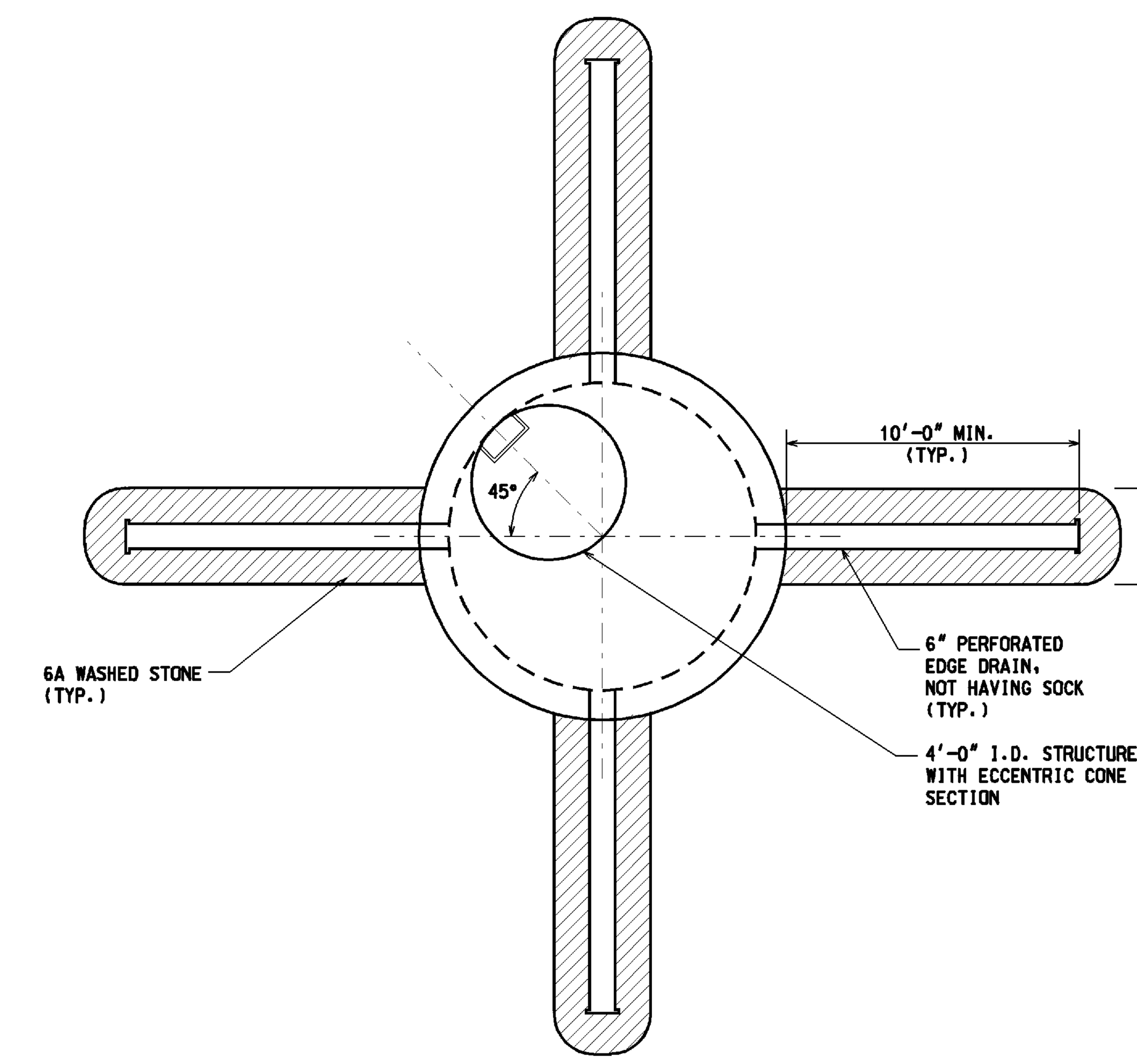
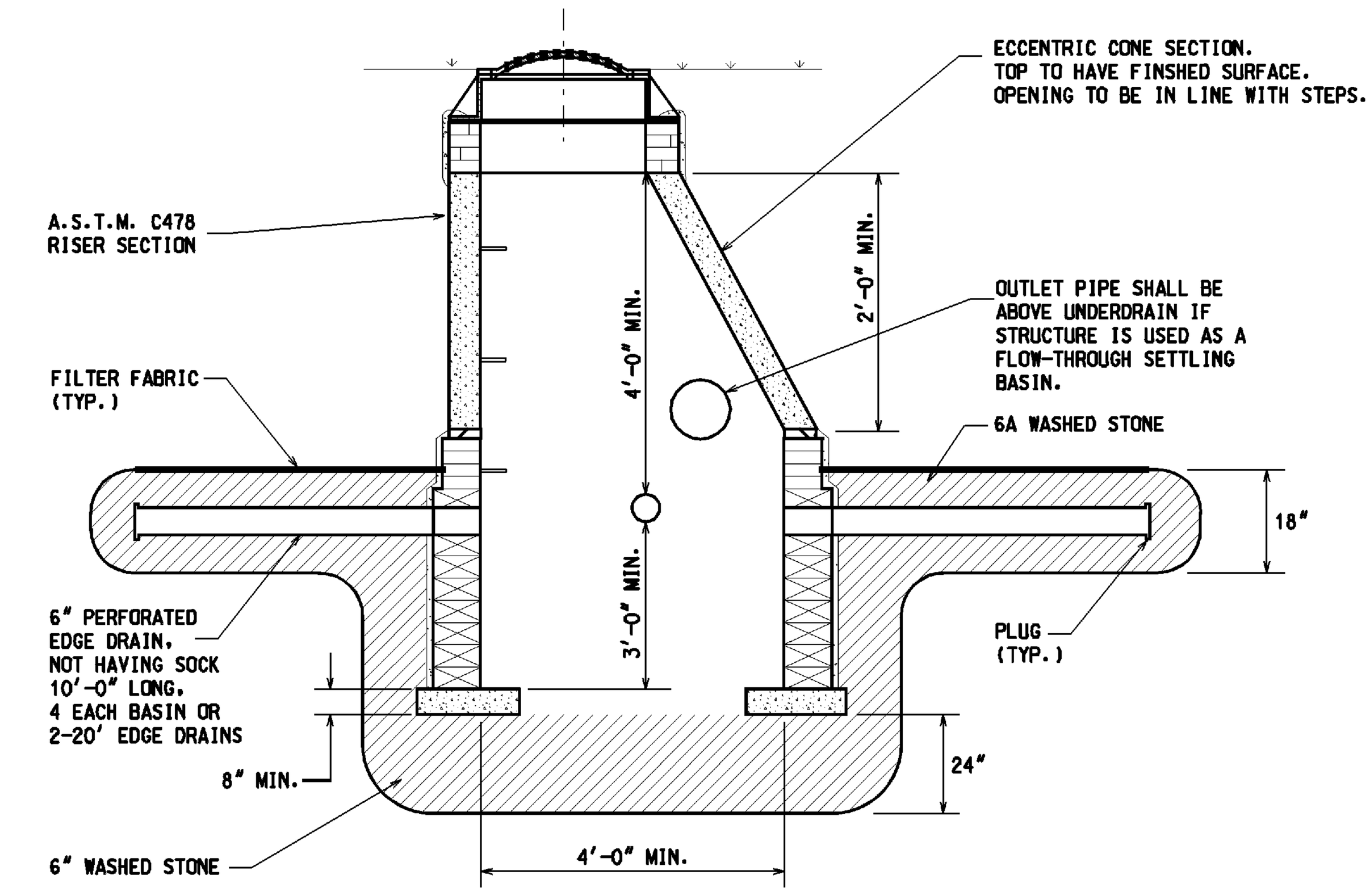
11. DOUBLE WALLED HDPE MEETING THE REQUIREMENTS OF ASTM F2306.

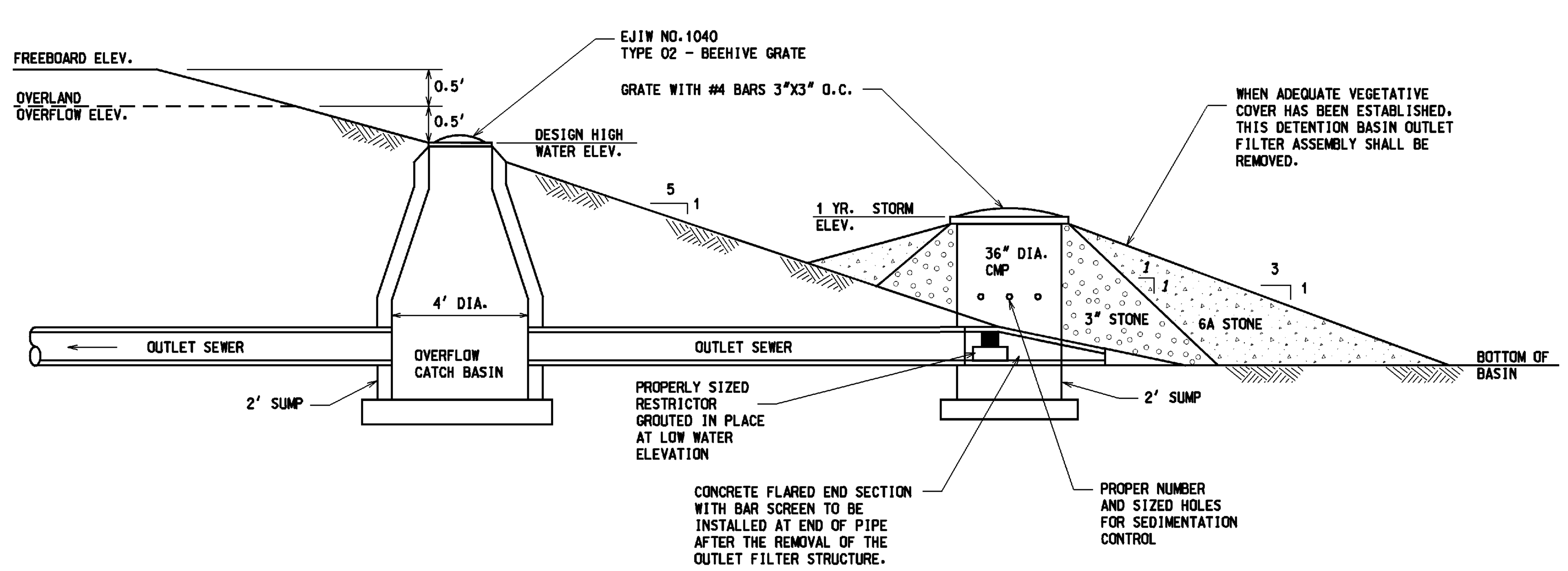


PLAN VIEW



SECTION

STANDARD LEACHING BASIN



DETENTION POND OUTLET STRUCTURE DETAIL

HRC™
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105 W. GRAND RIVER AVE.
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DIRECT PHONE: (517) 552-9199
FAX: (517) 552-6099
WEB SITE: http://www.hrc-engr.com

DATE	ADDITIONS AND/OR REVISIONS

DESIGNED	M.P.D.
DRAWN	T.E.W.
CHECKED	J.B.
APPROVED	G.E.H.

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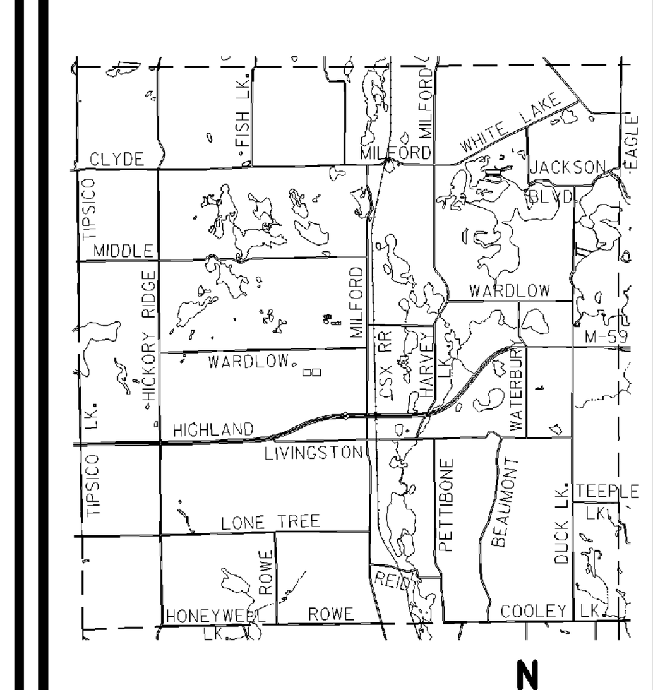


HIGHLAND TOWNSHIP

HIGHLAND TOWNSHIP DESIGN STANDARDS

STORM SEWER DETAILS

HRC JOB NO. 20050368	SCALE NONE
DATE SEPTEMBER 2005	SHEET NO. 2 OF 2

GENERAL NOTES

1. ALL CONSTRUCTION PROCEDURES AND MATERIALS SHALL CONFORM TO THE CURRENT STANDARDS AND SPECIFICATIONS OF THE WATER RESOURCES COMMISSIONER'S OFFICE AND/OR THE LOCAL MUNICIPALITY.
2. THE CONTRACTOR SHALL OBTAIN AN WATER RESOURCES COMMISSIONER'S OFFICE WATER INSPECTION PERMIT PRIOR TO THE START OF CONSTRUCTION. SEE CORRESPONDING WATER MAIN CONSTRUCTION PERMIT REQUEST LETTER FOR COST OF THE PERMIT.
3. A PRE-CONSTRUCTION MEETING SHALL BE HELD PRIOR TO THE START OF CONSTRUCTION AND SHALL BE SCHEDULED BY THE LOCAL MUNICIPAL ENGINEER. THOSE IN ATTENDANCE SHALL INCLUDE 1) LOCAL MUNICIPAL ENGINEER, 2) DESIGN ENGINEER, 3) OWNER/DEVELOPER, 4) ROAD COMMISSION FOR OAKLAND COUNTY, 5) OAKLAND COUNTY WATER RESOURCES COMMISSIONER'S OFFICE (WATER, SEWER AND STORM DIVISIONS) AND 6) ALL UTILITY COMPANIES. CONTRACTOR SHALL PROVIDE MATERIALS LISTING FOR APPROVAL BY MUNICIPAL ENGINEER AND OCWRC.
4. CONTRACTOR MUST CONTACT MISS DIG (1-800-482-7171) THREE WORKING DAYS BEFORE THE START OF CONSTRUCTION FOR UNDERGROUND UTILITY LOCATIONS. ALL UTILITIES SHALL BE STAKED BEFORE CONSTRUCTION STARTS.
5. ALL NECESSARY EASEMENTS FOR WATER MAINS SHALL BE PROVIDED IN THE NAME OF THE OWNER OF THE WATER MAIN PRIOR TO CONSTRUCTION AND ACCEPTANCE OF THE WATER DISTRIBUTION SYSTEM FOR OPERATION.
6. ALL WATER MAINS SHALL BE CONSTRUCTED WITH A MINIMUM COVER OF FIVE AND ONE-HALF (5-1/2) FEET BELOW FINISHED GRADES INCLUDING OPEN DRAINAGE COURSES.
7. ALL TRENCHES UNDER OR WITHIN A 1:1 RATIO OF EXISTING OR PROPOSED PAVEMENT OR DRIVEWAYS SHALL BE BACKFILLED WITH THOROUGHLY COMPACTED CLASS II SAND TO GRADE AT NOT LESS THAN 95% OF THE MAXIMUM UNIT WEIGHT
8. WHERE TWO UTILITIES CROSS, PROVIDE CLASS II BACKFILL MATERIAL IN TWELVE (12) INCH COMPACTED LAYERS TO THE UNDERSIDE OF THE HIGHER UTILITY.
9. WHERE WATER MAINS MUST DIP TO PASS UNDER OTHER UTILITIES, THE SECTIONS WHICH ARE DEEPER THAN NORMAL SHALL BE KEPT TO A MINIMUM LENGTH AND SHALL BE CONSTRUCTED WITH ELEVEN AND ONE-QUARTER (11-1/4) DEGREE VERTICAL BENDS, PROPERLY ANCHORED. BENDS GREATER THAN 11-1/4° MUST HAVE ROD RESTRAINTS.
10. ALL PRECAST CONCRETE GATE WELL SECTIONS SHALL BE MANUFACTURED TO CONFORM WITH A.S.T.M. C478, STANDARD SPECIFICATIONS FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS, EXCEPT WALL THICKNESS SHALL BE AS SHOWN ON THESE DETAILS. ALL JOINTS FOR PRECAST CONCRETE GATE WELL SECTIONS SHALL BE "MODIFIED GROOVE TONGUE" WITH GASKET MANUFACTURED TO CONFORM WITH A.S.T.M. C 443, STANDARD SPECIFICATION FOR JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE USING RUBBER GASKETS.
11. CONTRACTOR SHALL INSTALL VALVES, TAPPING SLEEVES AND GATE WELL STRUCTURES IN STRICT COMPLIANCE WITH MEASUREMENTS PROVIDED ON SHEET 2 (i.e. 2'-0" BETWEEN GATE WELL WALL & CENTERLINE OF OPERATING NUT) TO ALLOW PROPER OPERATION OF VALVE THROUGH GATEWELL OPENING. FAILURE TO DO SO WILL REQUIRE CONTRACTOR TO CORRECT AT HIS EXPENSE.
12. ALL CROSS-CONNECTION CONTROL DEVICES SHALL BE INSTALLED AS REQUIRED BY THE LOCAL PLUMBING INSPECTOR AND IN ACCORDANCE WITH THE STANDARDS OF THE WATER RESOURCES COMMISSIONER'S OFFICE OPERATION AND MAINTENANCE DIVISION AND THE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES AND ENERGY, DIVISION OF DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION
13. ALL WATER SERVICE CONNECTIONS TWO (2) INCHES AND SMALLER SHALL BE MADE BY THE WATER RESOURCES COMMISSIONER'S OFFICE, OPERATIONS AND MAINTENANCE DIVISION AFTER WATER MAIN ACCEPTANCE AND APPLICABLE TAP PERMITS ARE OBTAINED.
14. ALL FITTINGS AND BENDS SHOULD BE BLOCKED IN ACCORDANCE WITH THRUST BLOCK DETAILS, UNLESS ALTERNATE THRUST RESTRAINT SYSTEM, AS INDICATED IN PLANS AND SPECIFICATIONS, IS APPROVED BY WATER RESOURCES COMMISSIONER'S OFFICE AND THE LOCAL MUNICIPALITY.
15. ALL STEEL AND IRON MATERIAL AND PRODUCTS FOR PERMANENT INCORPORATION INTO THE WORK SHELL MEET BUY AMERICA REQUIREMENT, FEDERAL CODE OF REGULATIONS SECTION 635.410

WATER MAIN MATERIALS NOTES

1. WATER SUPPLY SYSTEM PIPING (3-INCH & LARGER) SHALL BE DUCTILE IRON OR HIGH DENSITY POLYETHYLENE (HDPE) UNLESS OTHERWISE APPROVED BY THE LOCAL COMMUNITY.
2. DUCTILE IRON PIPE SHALL BE CLASS 54 FOR SIZES THREE (3) INCH THROUGH EIGHTEEN (18) INCH, CLASS 55 FOR TWENTY (20) INCH, AND CLASS 56 FOR TWENTY-FOUR (24) INCH AND LARGER. (ABBREVIATED "D.I." IN DETAILS AND ON THIS SHEET).
3. PIPES OF SIZES LARGER THAN TWENTY-FOUR (24) INCHES IN NOMINAL DIAMETER SHALL MEET ALL THE REQUIREMENTS OF THE CURRENT AWWA C100 FOR DUCTILE IRON WATER PIPE.
4. THE DUCTILE IRON PIPE TO BE FURNISHED AND DELIVERED UNDER THIS SPECIFICATION SHALL MEET ALL THE REQUIREMENTS OF THE CURRENT AWWA C151 (ANSI A21.5), EXCEPT AS OTHERWISE SPECIFIED HEREIN. PIPE SHALL BE DOUBLE CEMENT-LINED AND SEAL COATED WITH AN APPROVED BITUMINOUS SEAL COAT IN ACCORDANCE WITH AWWA C104 (ANSI A21.4).
5. REFER TO SHEET 5 FOR HDPE MATERIAL REQUIREMENTS.
6. MECHANICAL AND SLIP-ON JOINTS FOR DUCTILE IRON WATER MAIN SHALL BE IN ACCORDANCE WITH AWWA C111 (ANSI A21.11).
7. FLANGE JOINTS FOR DUCTILE IRON WATER MAIN SHALL BE IN ACCORDANCE WITH AWWA C110 (ANSI A21.10).
8. FITTINGS FOR DUCTILE IRON PIPE SHALL BE DUCTILE IRON OR CAST IRON AND SHALL MEET REQUIREMENTS OF AWWA C110 (ANSI A21.10) OR AWWA C153 (ANSI A21.53). DUCTILE IRON FITTINGS SHALL BE RATED FOR 350 PSI, PIPE SIZES TWENTY-FOUR (24) INCH DIAMETER AND LESS AND 250 PSI FOR PIPE SIZES OVER TWENTY-FOUR (24) INCH DIAMETER. DUCTILE IRON FLANGE FITTINGS SHALL BE RATED FOR 250 PSI FOR ALL PIPE DIAMETERS.
9. INSTALL BRASS WEDGES AT ALL PUSH ON JOINTS IN DUCTILE IRON PIPE INSTALLATIONS. TWO (2) WEDGES PER JOINT FOR PIPES 12 INCH IN DIAMETER AND LESS, FOUR WEDGES PER JOINT FOR PIPES GREATER THAN 12 INCHES IN DIAMETER.
10. ALL WATER MAINS SHALL BE DESIGNED FOR 150 PSI MINIMUM WORKING PRESSURE.
11. ALL BURIED BOLTS, NUTS, AND WASHERS SHALL BE AWWA C111 LOW ALLOY STEEL COATED WITH A MINIMUM OF TWO (2) COATS OF FLUOROPOLYMER EPOXY COATING AND HEAT CURED (COR-BLUE OR APPROVED EQUAL) AND POLY-WRAPPED WHEN SPECIFIED.
12. ALL BURIED BOLTS, NUTS, AND WASHERS FOR ALL FLANGED CONNECTIONS SHALL BE STAINLESS STEEL (ASTM A320, GRADE B8M) AND HAVE A NEVER SEIZE TYPE COMPOUND APPLIED TO THE THREADS PRIOR TO INSTALLATION.
13. CORPORATION STOPS USED FOR INSERTION INTO MAINS SHALL BE MUELLER TYPE H-15000, FORD METER BOX FB-1000-X-Q-NL OR FORD METER BOX FB1000-4-Q-NL. ALL STOPS SHALL HAVE BRONZE CAST BODIES, KEYS, STEM WASHERS AND NUTS. INLET THREADS SHALL CONFORM TO THE LATEST VERSION OF AWWA C800.
14. TEMPORARY CONNECTIONS, WHICH MAY BE MADE FOR CHLORINATING AND FLUSHING PURPOSES, SHALL INCLUDE A TESTABLE REDUCE PRESSURE ZONE (RPZ) VALVE WITH CURRENT CERTIFICATION.

VALVE AND SLEEVE NOTES

1. GATE VALVES, SIZES THREE (3) INCH THROUGH SIXTEEN (16) INCH AND TAPPING VALVES SHALL BE LOCAL MUNICIPAL STANDARD AS DETAILED WITH NON-RISING STEM.
2. ALL IN LINE GATE VALVES THREE (3) INCH AND LARGER SHALL BE IN WELLS AS DETAILED. SPECIFICATIONS SHALL INCLUDE THE DIRECTION OF OPERATION OF ALL VALVES.
3. ALL GATE WELL COVERS SHALL BE LOCAL MUNICIPAL STANDARD AS DETAILED.
4. ALL GATE VALVES WITH OPERATING NUTS AT A DISTANCE GREATER THAN FIVE (5) FEET BELOW GROUND SURFACE SHALL BE PROVIDED WITH A STAINLESS STEEL EXTENSION STEM. THE LENGTH OF THE EXTENSION STEM SHALL REACH WITHIN FIVE (5) FEET FROM THE GROUND SURFACE. WHEN AN EXTENSION STEM IS USED, IT SHALL BE HELD IN PLACE BY A STAINLESS STEEL EXTENSION STEM GUIDE SUITABLY FASTENED TO THE WALL OF THE GATE WELL. THE EXTENSION STEM SHALL BE MECHANICALLY ATTACHED TO THE OPERATING NUT. DETAILS OF THE EXTENSION SYSTEM AND THE METHOD OF INSTALLATION SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
5. TAPPING VALVES SHALL BE AWWA C515 FL X MJ AS MANUFACTURED BY EJ WITH RESILIENT SEATED GATE VALVES AS APPROVED BY LOCAL MUNICIPALITY.
6. TAPPING SLEEVES SHALL BE ALL STAINLESS STEEL (BODY, FLANGE AND HARDWARE), MANUFACTURED BY ROMAC INDUSTRIES SST; JCM 432; SMITH-BLAIR 663/665 OR APPROVED EQUAL BY THE WATER RESOURCES COMMISSIONER'S OFFICE.

HYDRANT REQUIREMENTS

1. ALL HYDRANTS SHALL BE CONSTRUCTED WITH A SIX (6) INCH COMPANION GATE VALVE IN A THREE (3) PIECE, ADJUSTABLE DUCTILE IRON VALVE BOX, WHICH SHALL INCLUDE A FIVE AND ONE-QUARTER (5-1/4) INCH SCREW SHAFT. VALVE BOXES SHALL BE SERIES 6860 AS MANUFACTURED BY TYLER PIPE, EJ VALVE BOX NO. 8560 OR APPROVED EQUAL.
2. ALL HYDRANTS SHALL BE EJ 5BR250 TRAFFIC MODEL, OR APPROVED EQUAL WITH A MINIMUM OF 6'-0" DEPTH OF BURY UNLESS OTHERWISE INDICATED. SELF-DRAINING HYDRANTS SHALL NOT BE USED. ALL HYDRANTS SHALL BE LOCAL MUNICIPAL STANDARD AS DETAILED. HYDRANTS SHALL HAVE BREAKAWAY FLANGE.
3. ALL HYDRANTS SHALL BE PAINTED RED ABOVE GROUND AND BLACK BELOW GROUND WITH A FINISH COAT OF GLAMORTEX 501 ENAMEL, COLOR 314 VERMILLION OR APPROVED EQUAL. HYDRANT CAP SHALL BE PAINTED SAME COLOR AS THE HYDRANT. FOR PONTIAC: YELLOW RUST-OLEUM #7543 SAFETY YELLOW.

ACCEPTANCE OF NEW WATER MAINS

1. PRIOR TO WATER MAIN ACCEPTANCE THE FOLLOWING CONDITIONS MUST BE MET:
   1.1. PRESSURE TESTING AND BACTERIA TESTING MUST BE COMPLETED IN ACCORDANCE WITH THE WATER RESOURCES COMMISSIONER'S OFFICE REQUIREMENTS
   1.2. ALL EASEMENT AND RIGHT-OF-WAY ACQUISITION MUST BE ACCEPTED BY THE WATER RESOURCES COMMISSIONER'S OFFICE, RIGHT-OF-WAY DIVISION
   1.3. THE LOCAL MUNICIPALITY MUST BE PROVIDED WITH THE BILL OF SALE
   1.4. ALL "RECORD DRAWINGS" MUST BE ACCEPTED AND APPROVED BY THE WATER RESOURCES COMMISSIONER'S OFFICE, OPERATIONS AND MAINTENANCE DIVISION. THE WATER RESOURCES COMMISSIONER'S OFFICE AND LOCAL ENGINEER MUST WITNESS THE CONNECTION OF THE WATER MAIN TO THE EXISTING WATER MAIN, AFTER WHICH RESIDENTIAL AND COMMERCIAL TAPS WILL BE ALLOWED.
2. THE CONTRACTOR SHALL NOTIFY THE WATER RESOURCES COMMISSIONER'S OFFICE, OPERATIONS AND MAINTENANCE DIVISION THROUGH THE LOCAL ENGINEER FOR NEW CONSTRUCTION TAP, PRESSURE TESTING, BACTERIOLOGICAL SAMPLING, CONNECTIONS TO EXISTING WATER MAIN AND FINAL FIELD REVIEW. A SEVENTY-TWO (72) HOUR ADVANCE NOTICE IS REQUIRED.
3. THE CONTRACTOR SHALL DISINFECT AND PRESSURE TEST ALL NEW WATER MAIN CONSTRUCTION PURSUANT TO THE CURRENT STANDARDS SPECIFIED BY THE WATER RESOURCES COMMISSIONER'S OFFICE.
4. HYDROSTATIC TESTING FOR DUCTILE IRON WATER MAIN SHALL BE COMPLETED IN ACCORDANCE WITH ANSI/AWWA C600, SEC 5.2. THE SPECIFIED TEST PRESSURE IS 150 PSI OR 1.5 TIMES THE MAXIMUM ALLOWABLE OPERATING PRESSURE (MAOP) OF THE TEST SECTION, WHICHEVER IS GREATER. THE TEST METHOD IS GENERALLY SUMMARIZED AS FOLLOWS:
   4.1. SLOWLY FILL PIPELINE WITH WATER, VENTING ENTRAPPED AIR AS NECESSARY.
   4.2. REPAIR ANY VISIBLE LEAKS THAT OCCUR DURING FILLING OR AT ANY POINT DURING THE TEST.
   4.3. GRADUALLY APPLY PRESSURE UP TO THE SPECIFIED WORKING PRESSURE USING A SUITABLE PUMP CONNECTED TO THE PIPELINE, BLEEDING TRAPPED AIR, AND ADDING WATER AS NECESSARY UNTIL A STABLE PRESSURE IS HELD.
   4.4. HYDROSTATIC TEST BEGINS AFTER THE PIPELINE IS STABILIZED AT THE WORKING PRESSURE BY INCREASING THE PRESSURE UP TO THE SPECIFIED TEST PRESSURE AND HOLD IT WITHIN PLUS/MINUS 5 PSI FOR THE DURATION OF THE TEST, OR A MINIMUM OF TWO HOURS.
   4.5. CAREFULLY RECORD THE AMOUNT OF MAKEUP WATER ADDED DURING THE TEST. THE HYDROSTATIC TEST PASSES IF THE AMOUNT OF MAKEUP WATER DOES NOT EXCEED THE TESTING ALLOWANCE.
   4.6. IF THE TESTING ALLOWANCE IS EXCEEDED, LOCATE AND REPAIR ANY LEAKS AND REPEAT TEST.
5. REFER TO SHEET 5 FOR HYDROSTATIC TESTING REQUIREMENTS FOR HDPE PIPE.
6. PRESSURE TESTING AGAINST VALVES PHYSICALLY CONNECTED TO AN EXISTING WATER SUPPLY SYSTEM IS STRICTLY PROHIBITED.
7. WHERE CONTRACTOR SUPPLIED GAUGES ARE REQUIRED, MINIMUM SIZE SHALL BE 3½" DIAMETER OR LARGER GRADUATED IN ONE (1) OR TWO (2) POUND INCREMENTS FROM 1 TO 160 P.S.I. OR HIGHER.
8. PRESSURE TESTING AND BACTERIA TESTING MUST BE SUCCESSFULLY COMPLETED PRIOR TO CONNECTING TO THE EXISTING WATER SUPPLY SYSTEM.

WATER RESOURCES COMMISSIONER WATER SYSTEM STANDARDS – GATE VALVES

COMMUNITY	DIRECTION TO OPEN	VALVE TYPE STD. GATE VALVE	TAPPING VALVE
BINGHAM FARMS	RIGHT	C515	C515
BLOOMFIELD HILLS	RIGHT	C515	C515
COMMERCE TOWNSHIP	LEFT	C515	C515
FARMINGTON HILLS	RIGHT	C515	C515
HIGHLAND TOWNSHIP	LEFT	C515	C515
KEEGO HARBOR	RIGHT	C515	C515
OAKLAND TOWNSHIP	LEFT	C515	C515
ORCHARD LAKE VILLAGE	LEFT	C515	C515
OXFORD TOWNSHIP	LEFT	C515	C515
PLEASANT RIDGE	RIGHT	C515	C515
PONTIAC	LEFT	C515	C515
ROYAL OAK TOWNSHIP	RIGHT	C515	C515
SPRINGFIELD TOWNSHIP	LEFT	C515	C515
SYLVAN LAKE	RIGHT	C515	C515
WALLED LAKE	LEFT	C515	C515

1.) C515 RESILIENT SEATED GATE VALVE – MANUFACTURED BY U.S. PIPE, MUELLER, EAST JORDAN IRON WORKS, AMERICAN FLOW CONTROL OR APPROVED EQUAL.

FIRE HYDRANT NOZZLE SIZE AND THREAD SPECIFICATIONS

CVT	PUMPER NOZZLE	HOSE NOZZLE	OPERATING NUT	DEPTH OF BURY	STYLE	MODEL #
BINGHAM FARMS	(1) – 4"-STORZ	(2) – 2-1/2"-DFD	1-1/2"	5'-6"	5BR250	54831D
BLOOMFIELD HILLS	(1) – 3-3/4"-DFD	(2) – 2-1/2"-DFD	1-1/8"	6'-0"	5BR250	55825D
COMMERCE TWP/ WOLVERINE LAKE	(1) – 5"-STORZ	(2) – 2-1/2"-NST	1-1/2"	5'-6"	5BR250	54913D
FARMINGTON HILLS	(1) – 3-3/4"-DFD	(2) – 2-1/2"-NST	1-1/8"	5'-6"	5BR250	54329D
HIGHLAND TWP	(1) – 5"-STORZ	(2) – 2-1/2"-NST	1-1/2"	5'-6"	5BR250	54913D
KEEGO HARBOR	(1) – 3-3/4"-DFD	(2) – 2-1/2"-DFD	1-1/8"	5'-6"	5BR250	54826D
OAKLAND TWP	(1) – 4"-STORZ	(2) – 2-1/2"-DFD	1-1/2"	5'-6"	5BR250	54831D
ORCHARD LAKE	(1) – 3-3/4"-DFD	(2) – 2-1/2"-DFD	1-1/8"	6'-0"	5BR250	55825D
OXFORD TWP	(1) – 5"-STORZ (1) – 4-1/2"-NST		1-1/2"	6'-0"	5BR250	55601D
PLEASANT RIDGE	(1) – 3-3/4"-DFD (1) – 5"-STORZ		1-1/8"	5'-6"	5BR250	54949D
PONTIAC	(1) – 3-3/4"-DFD	(2) – 2-1/2"-DFD	1-1/2"	6'-0"	5BR250	55822D
ROYAL OAK TWP	(1) – 3-3/4"-DFD	(2) – 2-1/2"-NST	1-1/8"	5'-6"	5BR250	54329D
SPRINGFIELD TWP	(1) – 5"-STORZ	(2) – 2-1/2"-NST	1-1/2"	5'-6"	5BR250	54913D
SYLVAN LAKE	(1) – 3-3/4-DFD	(2) – 2-1/2"-NST	1-1/2"	6'-0"	5BR250	55827D
WALLED LAKE	(1) – 4-1/2-NST	(2) – 2-1/2"-NST	1-1/8"	5'-6"	5BR250	54534D

1. D.F.D. – DETROIT FIRE DEPARTMENT THREAD
2. N.S.T. – NATIONAL STANDARD THREAD
3. STORZ NOZZLES SHALL BE COMPATIBLE WITH STORZ COUPLED LARGE DIAMETER FIRE HOSE. NOZZLES SHOULD BE MADE OF "LEAD FREE" BRASS OR ALUMINUM, AS APPROVED BY LOCAL CITY, VILLAGE OR TOWNSHIP. THE NOZZLE SHALL BE AN INTEGRAL PART OF THE HYDRANT, RESISTANT TO TAMPER AND REMOVAL. ENGAGEMENT LUGS SHALL BE ON THE NOZZLE AND CAP TO PREVENT FAILURE UNDER HIGH PRESSURE. NOZZLE AND CAP SHALL MEET AWWA C502 SPECIFICATIONS. NOZZLE SHALL BE COMPATIBLE WITH HOSE LOCK TO PREVENT HOSE FROM DISCONNECTING WHILE IN USE.

WATER RESOURCES COMMISSIONER'S OFFICE
WATER SYSTEMS OPERATIONS AND MAINTENANCE DIVISION
RECORD DRAWING SPECIFICATIONS

IN AREAS WHERE WATER SYSTEMS ARE OPERATED AND MAINTAINED BY THE WATER RESOURCES COMMISSIONER'S OFFICE, OPERATIONS AND MAINTENANCE DIVISION, FINAL ACCEPTANCE OF THE WATER SYSTEM MUST BE RENDERED BY THE WATER RESOURCES COMMISSIONER'S OFFICE, OPERATIONS AND MAINTENANCE DIVISION, BEFORE THE SYSTEM CAN BE USED FOR THE SERVICE INTENDED.

ONE ITEM REQUIRED FOR FINAL ACCEPTANCE SHALL BE THE SUBMISSION OF RECORD DRAWINGS TO THE WATER RESOURCES COMMISSIONER, OPERATIONS AND MAINTENANCE DIVISION, BY THE DESIGN ENGINEER. RECORD DRAWINGS SHALL BE DEFINED AS AND CONTAIN THE FOLLOWING INFORMATION:

1. THE DESIGN ENGINEER SHALL FURNISH "RECORD DRAWINGS" WATER MAIN PLANS UPON JOB COMPLETION. "RECORD DRAWINGS" SHALL BE FORWARDED TO THE WATER RESOURCES COMMISSIONER BY THE LOCAL MUNICIPAL ENGINEER AFTER THEIR REVIEW AND APPROVAL.
2. THE COVER SHEET SHALL BE SIGNED AND SEALED BY THE PROJECT DESIGN ENGINEER AND INCLUDE THE FOLLOWING CERTIFICATION STATEMENT:

> I HEREBY CERTIFY THAT OUR FIRM HAS PREPARED THESE RECORD DRAWINGS OF THE IMPROVEMENTS AS CONSTRUCTED, AND THAT TO THE BEST OF MY KNOWLEDGE THOSE IMPROVEMENTS NOTED AS "RECORD DRAWINGS" WERE CONSTRUCTED IN SUBSTANTIAL CONFORMANCE WITH THE APPROVED CONSTRUCTION PLANS; AND ALSO THAT THE WATER MAIN AND STRUCTURES, AS CONSTRUCTED, LIE WITHIN THE EASEMENT DESCRIPTIONS REQUIRED BY THE WATER RESOURCES COMMISSIONER'S OFFICE.
>
> ______________________________
> (COMPANY NAME)
>
> ______________________________
> (ENGINEER'S SIGNATURE)
>
> PROFESSIONAL ENGINEER NO. ______________
>
> ENGINEER SEAL

3. THE MINIMUM SCALE SHALL BE ONE (1) INCH EQUALS FIFTY (50) FEET.
4. THE SIZE, LENGTH, CLASS AND MANUFACTURER OF PIPE INSTALLED SHALL BE INDICATED.
5. THE SIZE, BRAND AND MODEL NUMBERS OF ALL VALVES AND HYDRANTS INSTALLED SHALL BE INDICATED.
6. A TOTAL RECORD DRAWING QUANTITY LIST SHALL BE INCLUDED, AS WELL AS A RECORD DRAWING QUANTITY LIST ON EACH INDIVIDUAL SHEET.
7. THE LOCATIONS SHALL BE SHOWN ON THE PLANS WITH AN ACCURACY OF ONE (1) FOOT.
8. THE OFFSET OF THE WATER MAIN FROM PROPERTY LINES SHALL BE INDICATED.
9. ALL GATE VALVE WELLS, HYDRANTS AND ALL WATER SYSTEM APPURTENANCES SHALL BE LOCATED FROM THE NEAREST PROPERTY CORNER.
10. ALL UNDERGROUND APPURTENANCES, SUCH AS GATE VALVE WELLS, METER PITS, PRESSURE REDUCING VALVE PITS, ETC. SHALL BE LOCATED FROM THE NEAREST HYDRANT THAT IS CONNECTED TO THE SAME WATER MAIN AS THE APPURTENANCE.
11. THE LOCATION, SIZE, BRAND AND MODEL NUMBER OF EVERY RESTRAINED JOINT SHALL BE NOTED.
12. THE ACCURATE LOCATION OF ALL UTILITY CROSSINGS WHERE THE RECOMMENDED SEPARATION, VERTICALLY OR HORIZONTALLY, IS LESS THAN THE TEN STATE STANDARDS SHALL BE NOTED.
13. WATER MAINS 12" AND LARGER IN DIAMETER SHALL BE DRAWN IN PROFILE VIEW IN ADDITION TO PLAN VIEW ON THE CONSTRUCTION PLANS.

WATER MAIN STANDARD DETAILS

REVISION BLOCK

Data Source / Source Date: N/A

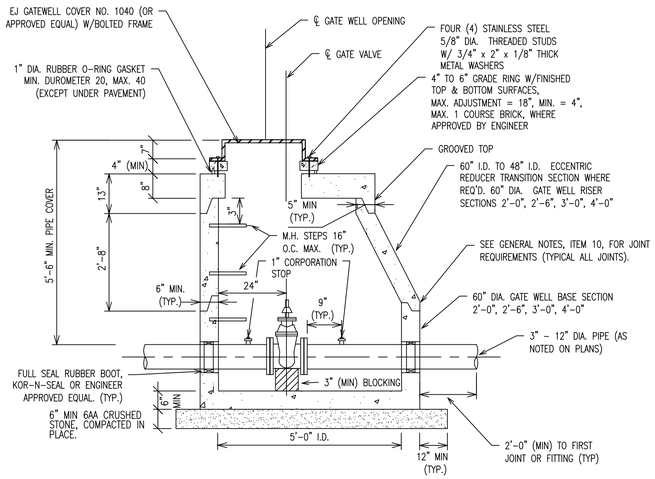
Rev. No.:	Rev. By:	Rev. Date:	Description:
1	KB	02/14/18	MARKUPS PER G. APPEL
2	HRC	08/31/20	GENERAL UPDATE
3	KB	03/20/23	ADD PRC AND SLC INFO TO TABLES
4	KB	05/09/23	UPDATE BFV HYDRANT SPECS

ORIG. DATE: 01/01/01
SCALE: NONE
DESIGNED BY: WRC
DRAWN BY: WRC Mapping

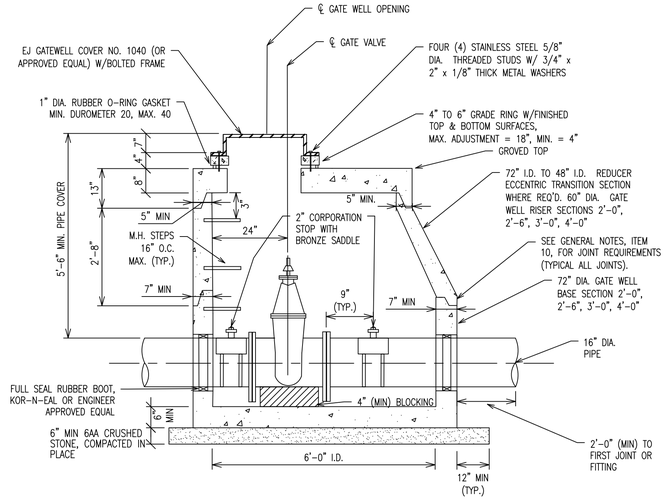
WRC WATER RESOURCES COMMISSIONER Jim Nash

ONE PUBLIC WORKS DRIVE, BLDG 95 WEST
WATERFORD, MICHIGAN
48328-1907

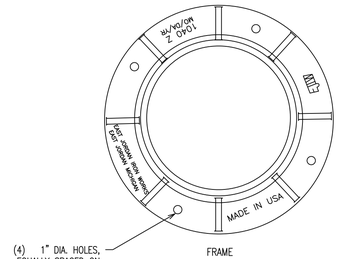
GATE VALVE & WELL DETAILS

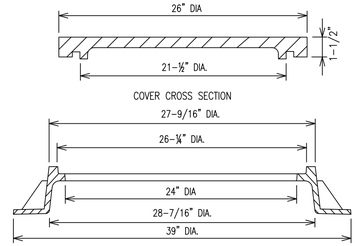


3" THRU 12" GATE WELL

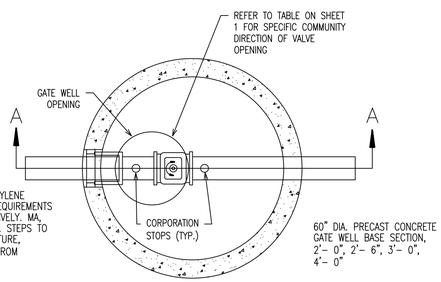


16" GATE WELL



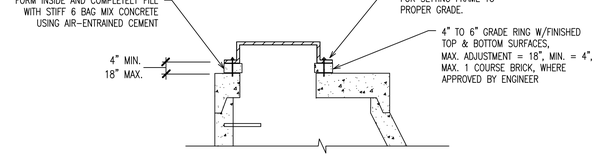


FRAME



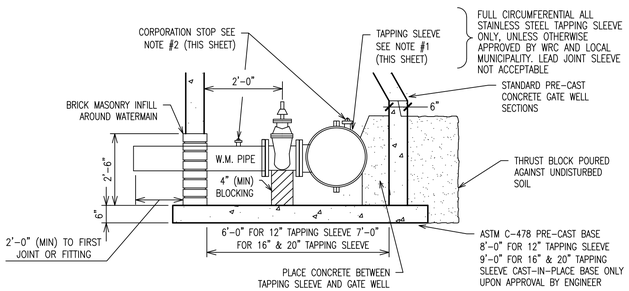
MANHOLE STEPS TO BE COPOLYMER PROPYLENE COATED GRADE 60 STEEL MEETING THE REQUIREMENTS IN ASTM D4101 AND ASTM A615 RESPECTIVELY. MA, INDUSTRIES PS2-PF OR APPROVED EQUAL. STEPS TO BE INSTALLED DURING MANHOLE MANUFACTURE, PLACED AT 16" C. TO C. MAXIMUM, 45° FROM CENTERLINE OF WATER MAIN.

PLAN GATE WELL TYPICAL



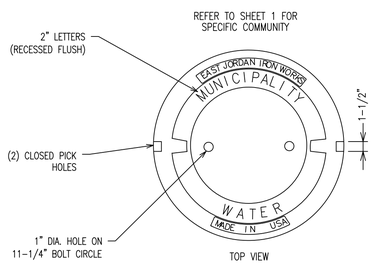
GATE WELL TOPS WITHIN PAVEMENT AREAS

RUBBER O'RINGS SHALL NOT BE USED IN PAVEMENT

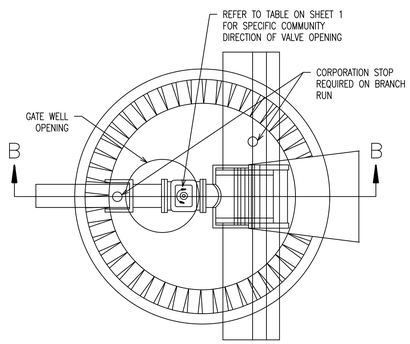


20" x 12", 20" x 8", 16" x 12", 16" x 8", 12" x 8" TAPPING SLEEVE, VALVE & WELL

NOTES:
1. REFER TO NOTE 7 OF "VALVE AND SLEEVE NOTES" ON SHEET 1.
2. FOR PIPE SMALLER THAN 16" USE 1" CORPORATION STOP, FOR 16" PIPE OR LARGER USE 2" CORPORATION STOP WITH BRONZE SADDLE.
3. WRC DOES NOT RECOMMEND SIZE ON SIZE TAPPING.



LETTERING LAYOUT FOR GATEWELL COVERS

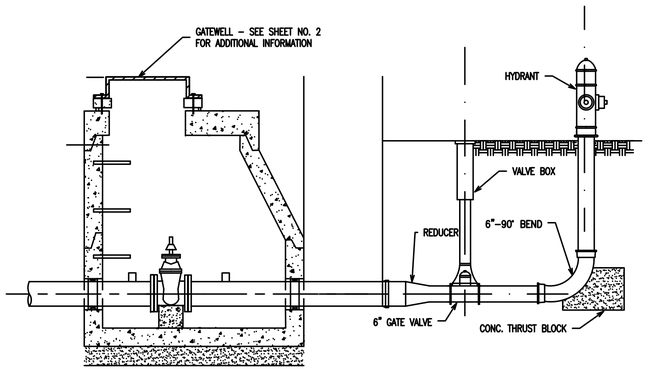


PLAN TAPPING SLEEVE VALVE & WELL (TYPICAL)

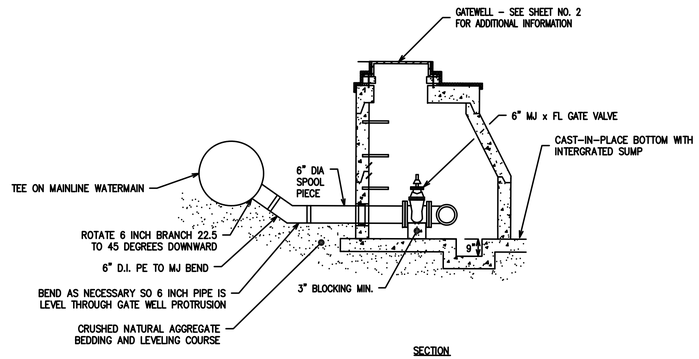
WATER MAIN STANDARD DETAILS

REVISION BLOCK			
Data Source / Source Date: N/A			
Rev. No.:	Rev. By:	Rev. Date:	Description:
1	DL	03/23/15	FINAL CHANGES TO GATE VALVE STANDARDS, HYDRANT SPECIFICATIONS AND PIPE CLASS UPDATES
2	DL	01/03/17	UPDATE "DIRECTION TO OPEN" COMMERCE TOWNSHIP FROM RIGHT TO LEFT
3	KB	02/14/18	MARKUPS PER G. APPEL
4	HRC	08/31/20	GENERAL UPDATE

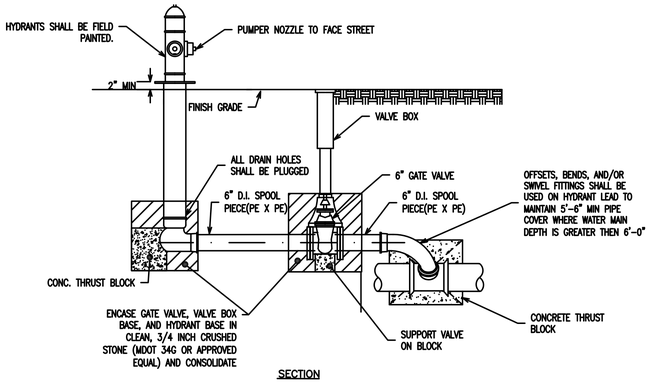
ORIG. DATE:	01/01/01	WRC WATER RESOURCES COMMISSIONER Jim Nash	ONE PUBLIC WORKS DRIVE, BLDG 95 WEST WATERFORD, MICHIGAN 48328-1907
SCALE:	NONE		
DESIGNED BY:	WRC		SHEET NO.: 2 of 7
DRAWN BY:	WRC Mapping		



DEAD END BLOWOFF CONNECTION



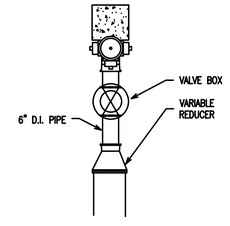
BLOW–OFF VALVE AND WELL



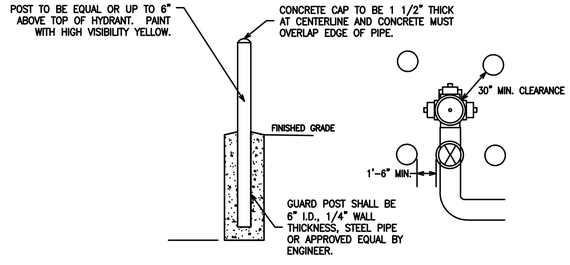
6" HYDRANT SIDE OUTLET

NOTES:

1. HYDRANT EXTENSIONS BETWEEN THE STANDPIPE LOWER SECTION & STANDPIPE UPPER ARE LIMITED TO 18 INCHES
2. ALL HYDRANTS COMPANION VALVES, BENDS, AND TEES TO BE FULLY RESTRAINED BY MECHANICAL JOINT RESTRAINT SYSTEM FITTINGS (MEGA–LUG OR APPROVED EQUAL).
3. THRUST BLOCKS ARE REQUIRED AT ALL TEES, BENDS AND ENDS.
4. ALL HARDWARE (BOLTS, NUTS, WASHERS, ETC.) FOR HYDRANT ASSEMBLIES SHALL BE COR–BLUE OR APPROVED EQUAL.



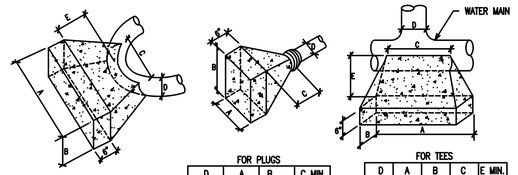
PLAN 6" HYDRANT WATER MAIN END



GUARD POST

NOTES:

1. GUARD POST SHALL NOT INTERFERE WITH HYDRANT OPERATION
2. TO BE INSTALLED IN ALL PAVED AREAS PARKING LOTS, PARKS, PLAZAS, ETC. (NOT RIGHT–OF–WAYS)SPACE WHERE VEHICLE EQUIPMENT DAMAGE TO HYDRANT IS POSSIBLE.



FOR 90° BENDS OR SMALLER

D	A	B	C	E MIN.
20"	8'	6.5'	3.5'	2.5'
16"	6'	4'	2.5'	2'
12"	4'	3'	2'	1.75'
10"	3'	3'	2'	1.75'
8"	3'	2'	2'	1.5'
6"	2'	1.5'	2'	1.25'

FOR PLUGS

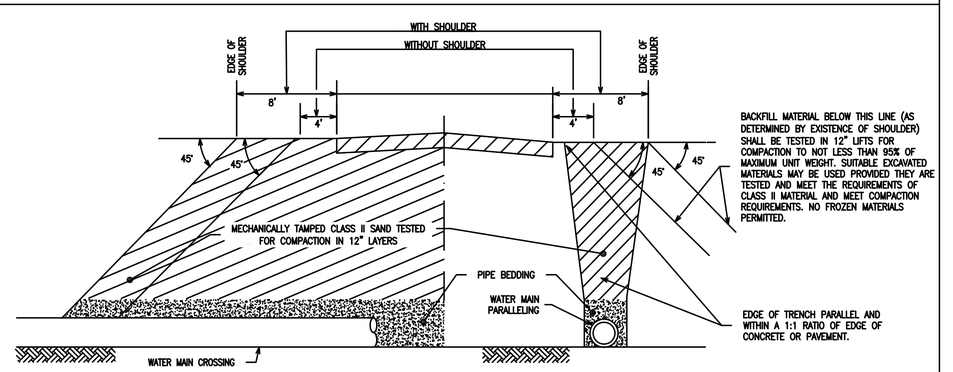
D	A	B	C MIN.
20"	7'	5'	2.5'
16"	4'–10"	4'–10"	2'
12"	4'–4"	3'	1'–9"
10"	3'	2'	1'–6"
8"	2'–10"	2'–6"	1'–6"
6"	1'–6"	1'–6"	3"

FOR TEES

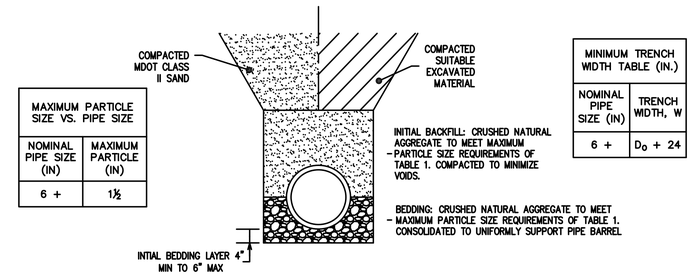
D	A	B	C	E MIN.
20"	6.5'	4.5'	3.5'	3'
16"	4'–8"	4'–8"	2.5'	2.75'
12"	4'	3'	2.5'	2.5'
10"	3'	2'	2'	2.25'
8"	2'–6"	2'	2'	2.25'
6"	2'	2'	2'	2.25'

THRUST BLOCK DETAILS

NOTE:
1. 3000 PSI CONCRETE TO BE USED. THRUST BLOCK TO ABUT & REST AGAINST UNDISTURBED SOIL OR EARTH COMPACTED TO 95% MODIFIED PROCTER.



MINIMUM BACKFILL UNDER OR NEAR PAVEMENT



MAXIMUM PARTICLE SIZE VS. PIPE SIZE	
NOMINAL PIPE SIZE (IN)	MAXIMUM PARTICLE (IN)
6 +	1½

MINIMUM TRENCH WIDTH TABLE (IN.)	
NOMINAL PIPE SIZE (IN)	TRENCH WIDTH, W
6 +	D_O + 24

DUCTILE IRON PIPE TRENCH DETAIL

NOTES:

1. DUCTILE IRON PIPE IS CONSIDERED A FLEXIBLE PIPE THAT WHEN INSTALLED UNDERGROUND IS DESIGNED TO DEFLECT UNDER LOAD.
2. DO NOT COMPACT INNER BEDDING OF INITIAL BEDDING LAYER.
3. CAREFULLY EXCAVATE BELL OR COUPLING HOLES FROM THE INITIAL BEDDING LAYER.
4. SHOVEL SLICE BEDDING MATERIAL IN THE HAUNCH AREA ALONG THE BOTTOM CIRCUMFERENCE OF THE PIPE TO CONSOLIDATE BEDDING AND UNIFORMLY SUPPORT THE PIPE BARREL.
5. COMPACT INITIAL BACKFILL MATERIALS IN LIFTS NOT EXCEEDING 6 INCHES BY HAND TAMPING AROUND AND DIRECTLY ABOVE PIPE TO MINIMIZE VOIDS.
6. DO NOT USE MECHANICAL COMPACTION EQUIPMENT DURING INITIAL BACKFILL OPERATIONS UNTIL MATERIAL HAS BEEN BROUGHT TO 12 INCHES ABOVE THE TOP OF PIPE BARREL.
7. COMPACT SAND BACKFILL AND STANDARD TRENCHES OUTSIDE OF PIPE ZONE TO NOT LESS THAN 95% OF THE MAXIMUM UNIT WEIGHT IN LIFTS NOT EXCEEDING 12 INCHES.
8. FOR MINIMUM TRENCH WIDTHS, REFER TO TABLE 2, MAXIMUM TRENCH WIDTH = D_O + 2D_O UNLESS MINIMUM TRENCH WIDTH IS GREATER.
9. IF THE PIPE IS LOCATED BENEATH THE GROUND WATER TABLE, THE PIPE ZONE SHALL BE WRAPPED IN A GEOTEXTILE SEPARATOR TO MINIMIZE MIGRATION OF SOIL INTO THE PIPE ZONE.

WATER MAIN
STANDARD DETAILS

REVISION BLOCK
Data Source / Source Date: N/A

Rev. No.:	Rev. By:	Rev. Date:	Description:
1	DS	11/21/14	PROPOSED CHANGE TO DELETE REFERENCE TO BOTTLE SLEEVE MANUFACTURER
2	DL	03/23/16	FINAL CHANGE TO DELETE REFERENCE TO BOTTLE SLEEVE MANUFACTURER
3	KB	02/14/18	MARKUPS PER G. APPEL
4	HRC	06/31/20	GENERAL UPDATE

ORIG. DATE: 01/01/01
SCALE: NONE
DESIGNED BY: WRC
DRAWN BY: WRC Mapping

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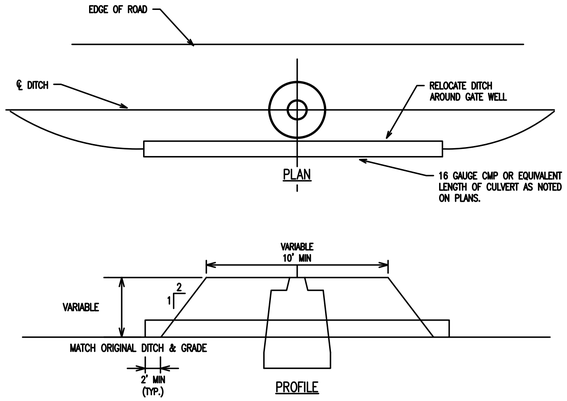
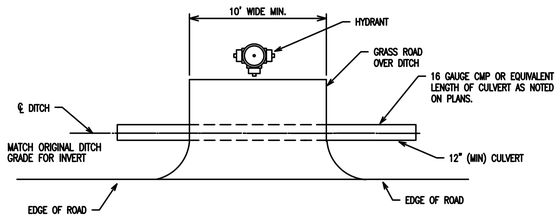
Jim Nash

ONE PUBLIC WORKS DRIVE, BLDG 95 WEST
WATERFORD, MICHIGAN
48328-1907

SHEET NO.: 3 of 7



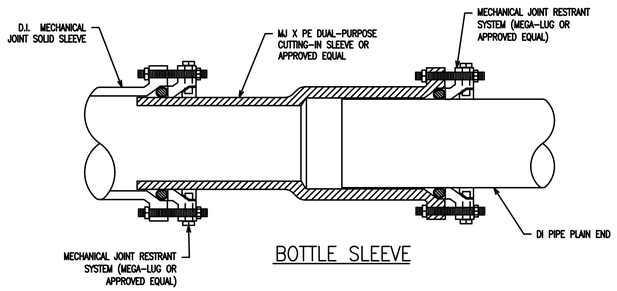
DITCH ENCLOSURE AT GATE WELL



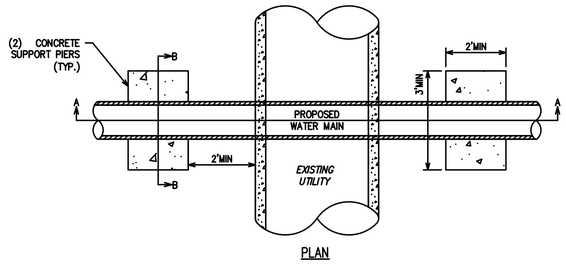
DITCH ENCLOSURE AT HYDRANT

NOTES:

1) REQUIRED FOR DITCHES GREATER THAN 18 INCHES IN DEPTH.
2) CULVERT SHALL BE SIZED BASED ON THE EXISTING CARRY CAPACITY OF THE DITCH OR AS REQUIRED BY THE PERMITTING AUTHORITY FOR THE LOCAL ROAD AGENCY. STAMPED ENGINEERING CALCULATIONS ARE REQUIRED FOR ALL CULVERT INSTALLATION.
3) MINIMUM DEPTH OF COVER FOR CULVERT PIPE IS 12 INCHES UNLESS OTHERWISE AUTHORIZED BY CULVERT MANUFACTURER.
4) END SECTIONS ON CULVERTS GREATER THAN 12 INCHES IN DIAMETER.



BOTTLE SLEEVE



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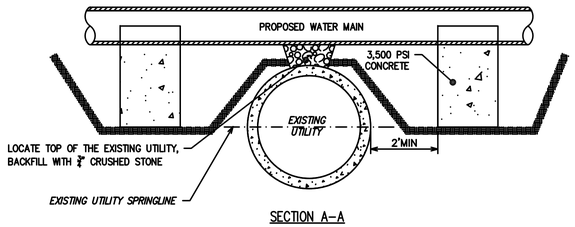
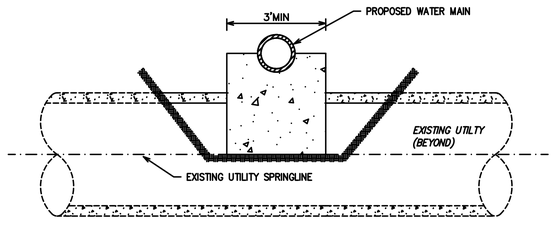


SECTION A–A

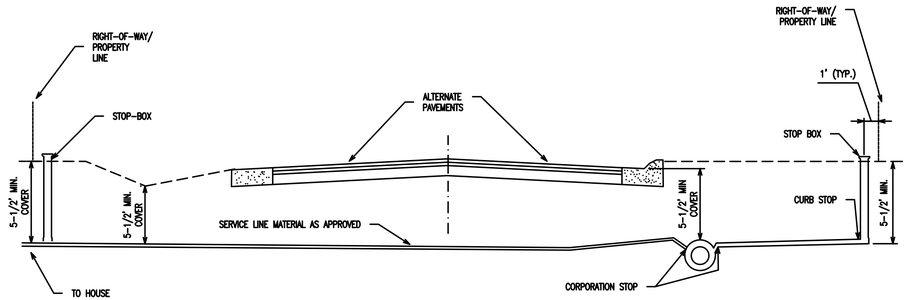


SECTION B–B

WATER MAIN CROSSING BRIDGE

NOTES:

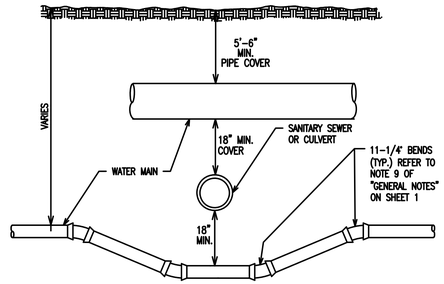
1. CROSSING BRIDGE IS REQUIRED WHEN 18 INCHES OF CLEARANCE OR GREATER ABOVE (WITHIN A 1:1 INFLUENCE OF THE SPRING LINE) AN EXISTING UTILITY CANNOT BE MAINTAINED.
2. WATER MAIN PIPE SPANNING THE EXISTING UTILITY MUST BE CENTERED BETWEEN JOINTS OVER THE EXISTING UTILITY.
3. ALL WORK NECESSARY TO INSTALL THE WATER MAIN CROSSING BRIDGE AS SHOWN SHALL BE CONSIDERED INCLUDED IN THE COST OF THE PROJECT UNLESS OTHERWISE NOTED.
4. CROSSING FOR PROPOSED WATER MAIN 16-INCH AND LARGER SHALL BE DESIGNED BY A LICENSED PROFESSIONAL ENGINEER.



TYPICAL PUBLIC ROAD WATER SERVICE CONNECTION

NOTES:

1. WATER SERVICE CURB STOP TO BE PLACED ONE (1) FOOT OFF THE PROPERTY LINE.
2. LATERAL LOCATION SHALL BE AS REQUESTED BY THE ABUTTING PROPERTY OWNER.
3. SERVICE TAP LOCATION TO BE AT CLOCK POSITION 10:30 OR 1:30 UNLESS OTHERWISE INDICATED.



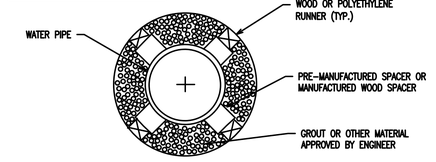
SEWER OR CULVERT CROSSING

UNLESS OTHERWISE SPECIFIED, MINIMUM CASING PIPE SHALL BE ASTM A-139 GRADE B, WALL THICKNESS AS FOLLOWS:

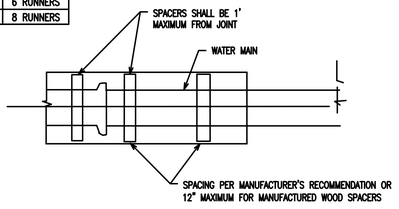
NOMINAL SIZE	MINIMUM WALL THICKNESS
8"– 42"	0.375
48"– 60"	0.500

REQUIRED QUANTITY OF RUNNERS IN ACCORDANCE WITH SIZE

TO 14" DIA.	4 RUNNERS
16" TO 36" DIA.	6 RUNNERS
38" TO 48" DIA.	8 RUNNERS



SUPPORT FOR WATER MAIN CONSTRUCTED IN CASING PIPE



WATER MAIN IN CASING SECTION

WATER MAIN IN CASING DETAILS

WATER MAIN SPECIAL DETAILS

REVISION BLOCK

Data Source / Source Date: N/A

Rev. No.:	Rev. By:	Rev. Date:	Description:
1	KD	03/18/19	MARKUPS PER G. APPEL
2	HRC	08/31/20	GENERAL UPDATE
3			
4			

ORIG. DATE: 01/01/01
SCALE: NONE
DESIGNED BY: OCDC
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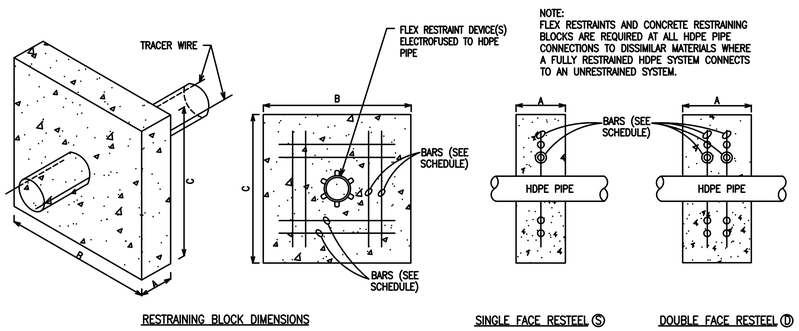
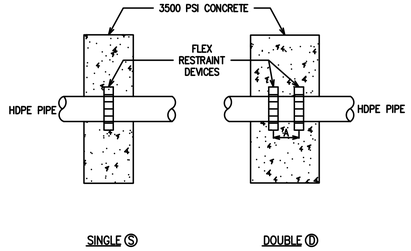
WATERFORD, MICHIGAN
48328-1907

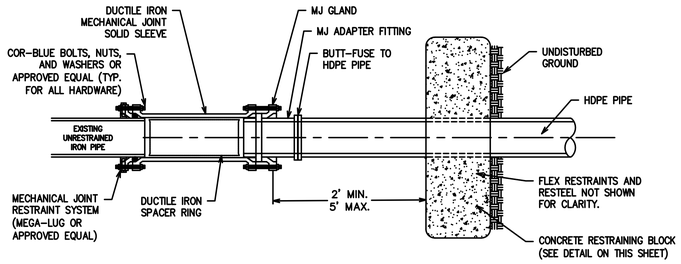
SHEET NO.: 4 OF 7



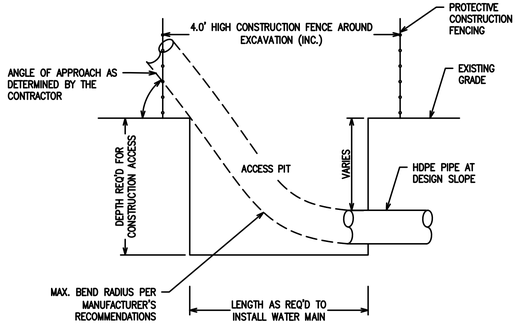
RESTRAINING BLOCK RESTEEL



RESTRAINING BLOCK RESTRAINTS



HDPE TO DUCTILE IRON TRANSITIION



ACCESS PIT DETAIL

ACCESS PIT NOTES:

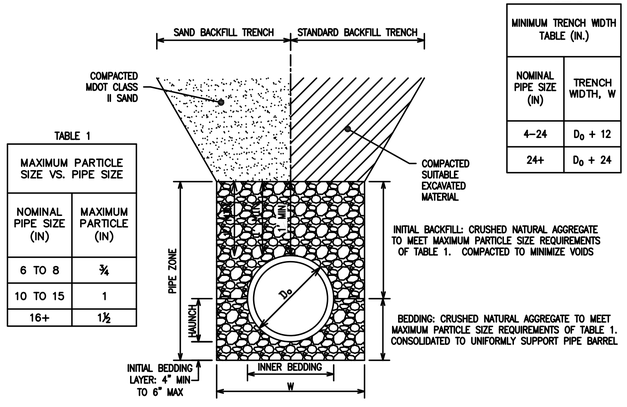
1. ACCESS PIT WIDTH SHALL BE KEPT TO THE MINIMUM NECESSARY TO ALLOW CONSTRUCTION ACCESS.
2. ACCESS PITS WITHIN PAVED AREAS SHALL INCLUDE BARRIER WALLS (TEMP. WATER FILLED OR CONCRETE) IN ADDITION TO THE CONSTRUCTION FENCING.
3. BRACE AND/OR SUPPORT EXCAVATION AS NECESSARY TO CONTAIN EXCAVATION TO PLANNED DIMENSIONS.
4. PROVIDE ANY NECESSARY DEWATERING TO MAINTAIN A DRY WORKING SPACE (INC).
5. BACKFILL ACCESS PIT WITH COMPACTED CLASS II SAND BACKFILL OR SUITABLE EXCAVATED MATERIAL IN ACCORDANCE WITH THE DETAIL ON SHEET 3 AND THE PROJECT SPECIFICATIONS.

TABLE 1

MAXIMUM PARTICLE SIZE VS. PIPE SIZE	
NOMINAL PIPE SIZE (IN)	MAXIMUM PARTICLE (IN)
6 TO 8	¾
10 TO 15	1
16+	1½

TABLE 2

MINIMUM TRENCH WIDTH TABLE (IN.)	
NOMINAL PIPE SIZE (IN)	TRENCH WIDTH, W
4–24	D_O + 12
24+	D_O + 24



PLASTIC PIPE TRENCH DETAIL

NOTES:

1. FLEXIBLE PIPES ARE CONSIDERED PIPES THAT WHEN INSTALLED UNDERGROUND ARE DESIGNED TO DEFLECT UNDER LOAD AND INCLUDE:POLYINYL CHLORIDE (PVC), AND HIGH DENSITY POLYETHYLENE (HDPE) PIPES.
2. DO NOT COMPACT INNER BEDDING OF INITIAL BEDDING LAYER.
3. CAREFULLY EXCAVATE BELL OR COUPLING HOLES FROM THE INITIAL BEDDING LAYER.
4. SHOVEL SLICE BEDDING MATERIAL IN THE HAUNCH AREA ALONG THE BOTTOM CIRCUMFERENCE OF THE PIPE TO CONSOLIDATE BEDDING AND UNIFORMLY SUPPORT THE PIPE BARREL.
5. COMPACT INITIAL BACKFILL MATERIALS IN LIFTS NOT EXCEEDING 6 INCHES BY HAND TAMPING AROUND AND DIRECTLY ABOVE PIPE TO MINIMIZE VOIDS.
6. DO NOT USE MECHANICAL COMPACTION EQUIPMENT DURING INITIAL BACKFILL OPERATIONS UNTIL MATERIAL HAS BEEN BROUGHT TO 12 INCHES ABOVE THE TOP OF PIPE BARREL.
7. COMPACT SAND BACKFILL AND STANDARD BACKFILL TRENCHES OUTSIDE OF PIPE ZONE TO NOT LESS THAN 95% OF THE MAXIMUM UNIT WEIGHT IN LIFTS NOT EXCEEDING 12 INCHES.
8. FOR MINIMUM TRENCH WIDTHS, REFER TO TABLE 2, MAXIMUM TRENCH WIDTH SHOULD NOT EXCEED THE MINIMUM TRENCH WIDTH BY MORE THAN 18 INCHES.
9. IF THE PIPE IS LOCATED BENEATH THE GROUND WATER TABLE, THE PIPE ZONE SHALL BE WRAPPED IN A GEOTEXTILE SEPARATOR TO MINIMIZE MIGRATION OF SOIL INTO THE PIPE ZONE.

HDPE SDR11 DIPS RESTRAINING BLOCK SCHEDULE

HDPE SDR11 DIPS SIZE	A	B	C	EFFECTIVE AREA	# RESTRAINTS	REINFORCING
4"	1 FT	2 FT	2 FT	3.5 S.F.	1	4 #6 Ⓢ
6"	1 FT	2.75 FT	2.75 FT	7.5 S.F.	2	4 #6 Ⓢ
8"	1 FT	3.75 FT	3.75 FT	12.5 S.F.	2	4 #6 Ⓢ
10"	1 FT	4.5 FT	4.5 FT	19 S.F.	3	8 #4 Ⓢ
12"	1.5 FT	5.25 FT	5.25 FT	27 S.F.	4	8 #6 Ⓢ
14"	1.5 FT	6 FT	6 FT	36 S.F.	6	8 #6 Ⓢ
16"	2 FT	7 FT	7 FT	46.5 S.F.	7	16 #6 Ⓓ
18"	2 FT	7.75 FT	7.75 FT	58 S.F.	9	16 #6 Ⓓ
20"	2 FT	8.5 FT	8.5 FT	71.5 S.F.	11	16 #6 Ⓓ
24"	2 FT	10.25 FT	10.25 FT	102 S.F.	15 Ⓓ	16 #6 Ⓓ
30"	2.5 FT	12.75 FT	12.75 FT	157 S.F.	23 Ⓓ	16 #6 Ⓓ
36"	2.5 FT	15 FT	15 FT	224 S.F.	31 Ⓓ	16 #6 Ⓓ

1. RESTRAINING BLOCKS SHALL HAVE A MINIMUM OF 3.0' OF COVER.
2. RESTRAINING BLOCK DIMENSIONS "B" AND "C" MAY BE CHANGED DUE TO DEPTH OF COVER LIMITATIONS PROVIDED THE EFFECTIVE AREA IS MAINTAINED.
3. THE EFFECTIVE AREA OF ALL THE RESTRAINING BLOCKS ARE BASED ON A RECURRING SURGE PRESSURE OF 250 PSI AND 1,000 PSF BEARING SOIL. SHOULD SOILS THAT ABUT THE RESTRAINING BLOCK BE LESS THAN 1,000 PSF, PROVIDE STAMPED ENGINEERING CALCULATIONS TO DETERMINE THE APPROPRIATE EFFECTIVE AREA FOR THE RESTRAINING BLOCK.
4. THE NUMBER OF FLEX RESTRAINTS INDICATED IS BASED ON PROVIDING 7,000 LBS OF SHEAR FORCE EACH. SHOULD THE FLEX RESTRAINTS INTENDED FOR USE PROVIDE LESS THAN 7,000 LBS OF SHEAR FORCE EACH, INCLUDE STAMPED ENGINEERING CALCULATIONS FOR THE NUMBER OF RESTRAINTS REQUIRED.

HDPE WATERMAIN NOTES

1. HDPE WATERMAIN SHALL BE D.I.P.S. SDR 11 MANUFACTURED FROM A PE 4710 RESIN. HDPE PIPE SHALL BE MARKED WITH A PERMANENTLY CO-EXTRUDED BLUE STRIPE.
2. HDPE FITTINGS SHALL BE MANUFACTURED FROM A PE 4710 RESIN AND SHALL HAVE A PRESSURE RATING GREATER THAN OR EQUAL TO THE PRODUCT PIPE.
3. ALL FITTINGS TO COME FROM SAME MANUFACTURER UNLESS OTHERWISE APPROVED BY ENGINEER
4. HDPE WATER SERVICES SHALL BE SDR 9. HDPE WATER SERVICE SHALL NOT BE USED UNLESS IT IS CONFIRMED THAT THE BUILDING OR PREMISES THAT IS TO BE SERVICED HAS AN UPDATED ELECTRICAL SYSTEM THAT IS NOT GROUNDED TO THE INTERNAL PLUMBING.
5. ALL HDPE PIPING SHALL BE INSTALLED WITH TWO (2) TRACER/LOCATOR WIRES INSULATED WITH HIGH MOLECULAR WEIGHT POLYETHYLENE (HMWPE) SPECIFICALLY FOR USE IN DIRECT BURIAL APPLICATIONS.
6. TRACER WIRES SHALL BE ATTACHED TO THE WATERMAIN PIPE AT FIVE FOOT INTERVALS OR AS APPROVED BY THE ENGINEER. ATTACHMENT TO PIPE SHALL BE MADE WITH PLASTIC CABLE TIES OR EQUIVALENT. THE USE OF TAPE IS NOT APPROVED. TRACER WIRES SHALL BE CHECKED FOR CONTINUITY PRIOR TO PLACING THE WATERMAIN INTO SERVICE.
7. HDPE JOINING SHALL BE COMPLETED USING BUTT FUSION.
   - FUSION TECHNICIAN MUST BE CERTIFIED IN ACCORDANCE WITH ASTM F3190 FOR THE USE OF HEAT FUSION EQUIPMENT AND THE STANDARD PRACTICE FOR HEAT FUSION JOINING OF HDPE PIPE AND FITTING IN ACCORDANCE WITH ASTM F2620.
7. THE USE OF ELECTRO FUSION IS ALLOWABLE ONLY UPON APPROVAL BY THE LOCAL MUNICIPALITY.
   - FUSION TECHNICIANS MUST BE CERTIFIED IN ELECTRO FUSION JOINING BY THE PRODUCT MANUFACTURER.
   - FUSION TECHNICIANS ARE REQUIRED TO FOLLOW GENERIC ELECTROFUSION PROCEDURE FOR FIELD JOINING OF POLYETHYLENE PIPE AS PUBLISHED BY THE PLASTIC PIPE INSTITUTE MUNICIPAL ADVISORY BOARD AND ASTM F1055.
   - ELECTROFUSION EQUIPMENT SHALL BE CALIBRATED AND CERTIFIED PER THE PIPE MANUFACTURER'S REQUIREMENTS.
8. HDPE PIPE TRANSITIONS TO DUCTILE IRON PIPE SHALL BE PERFORMED USING BUTT FUSED MECHANICAL JOINT ADAPTERS.
9. THE USE OF MECHANICAL JOINT RESTRAINT SYSTEMS ON HDPE PIPE IS PROHIBITED UNLESS APPROVED BY THE LOCAL MUNICIPALITY.
10. HYDROSTATIC TESTING FOR HDPE PIPE SHALL BE COMPLETED IN ACCORDANCE WITH AWWA STANDARDS AND ASTM F2164. TESTING SHALL BE PERFORMED AFTER THE INITIAL EXPANSION PHASE AND AFTER THE SYSTEM HAS STABILIZED. THE SPECIFIC TARGET TEST PRESSURE IS 150 PSI OR 1.5 TIMES THE MAXIMUM ALLOWABLE OPERATING PRESSURE (MAOP) OF THE TEST SECTION, WHICH EACH IS GREATER. THE TEST METHOD IS GENERALLY SUMMARIZED AS FOLLOWS:
    - 10.1. ZERO LEAKAGE ALLOWED.
    - 10.2. THE AMBIENT AIR TEMPERATURE AND SURFACE TEMPERATURE OF THE PIPE MUST BE CONSIDERED AND ADJUSTMENT TO TEST PRESSURE MAY BE APPROPRIATE.
    - 10.3. SLOWLY FILL THE TEST SECTION WITH WATER AND CAREFULLY AND COMPLETELY EXHAUST ALL OF THE AIR FROM THE TEST SECTION.
    - 10.4. ALLOW TIME FOR TEST FLUID AND PIPE TEMPERATURE TO EQUALIZE.
    - 10.5. ALLOW FOR INITIAL EXPANSION AS FULL TEST PRESSURE IS APPLIED. THE INITIAL EXPANSION PHASE IS FOUR HOURS.
    - 10.6. REDUCE PRESSURE BY 10 PSI, OBSERVE TARGET TEST PRESSURE FOR ONE HOUR, AND IF THE PRESSURE REMAINS WITHIN 5% OF THE TARGET TEST PRESSURE, THEN A PASSING TEST IS INDICATED.
11. IF LEAKS ARE DETECTED, DEPRESSURIZE MAIN AND REPAIR AS NEEDED. ALLOW THE TEST SECTION TO REMAIN DEPRESSURIZED FOR 8 HOURS BEFORE RETESTING.
12. TESTING PER ASTM F2164 WILL BE REQUIRED WHEN GREATER THAN 25% OF THE TEST SECTION IS HDPE PIPE.

HDPE WATER MAIN
STANDARD DETAILS

REVISION BLOCK
Data Source / Source Date: N/A

Rev. No.:	Rev. By:	Rev. Date:	Description:
1	KB	02/14/18	MARKUPS PER G. APPEL
2	HRC	08/31/20	GENERAL UPDATE
3			
4			

ORIG. DATE: 01/01/01
SCALE: NONE
DESIGNED BY: OCDC
DRAWN BY: OCDC Mapping

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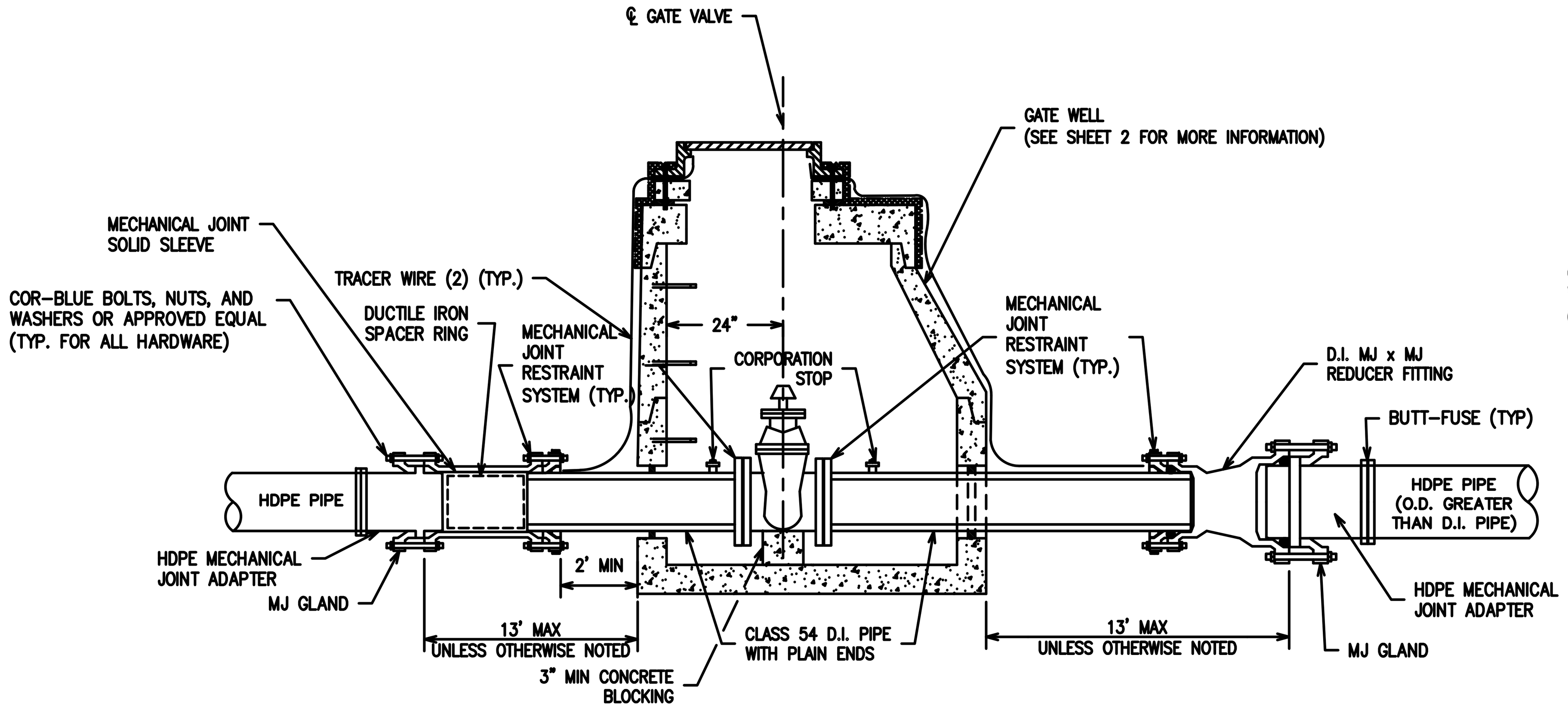
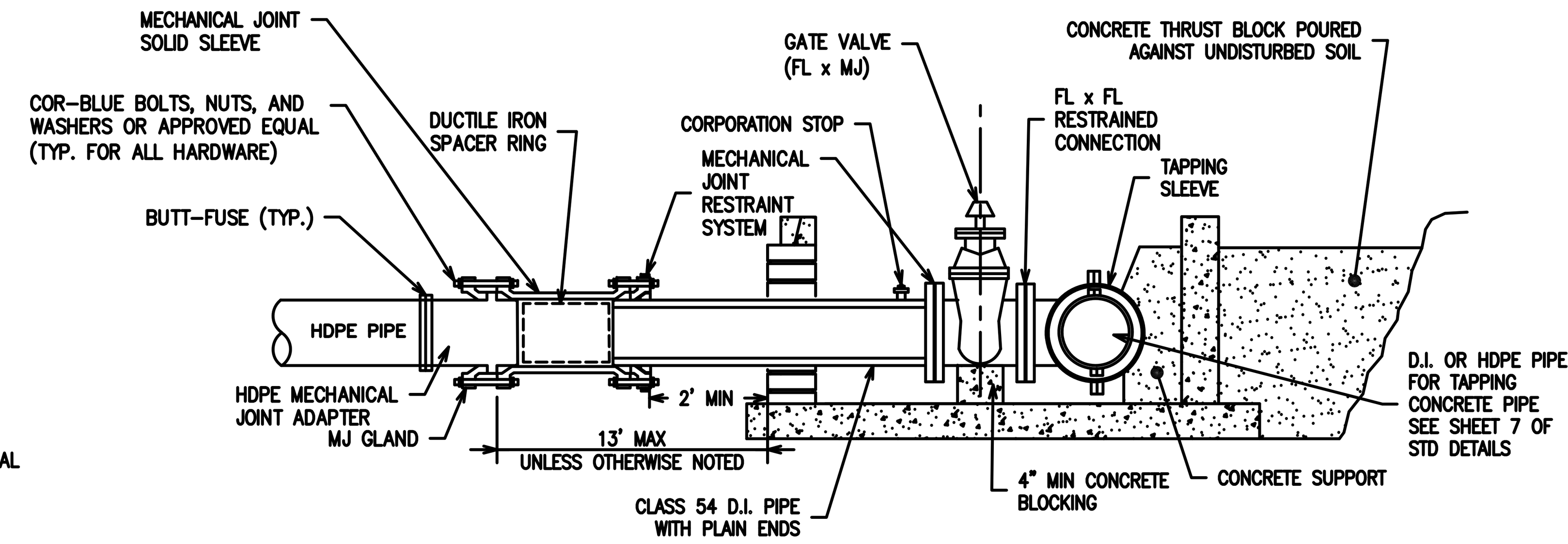
SHEET NO.: 5 of 7



TYPICAL HDPE CONNECTION TO GATE VALVE

NOTES:

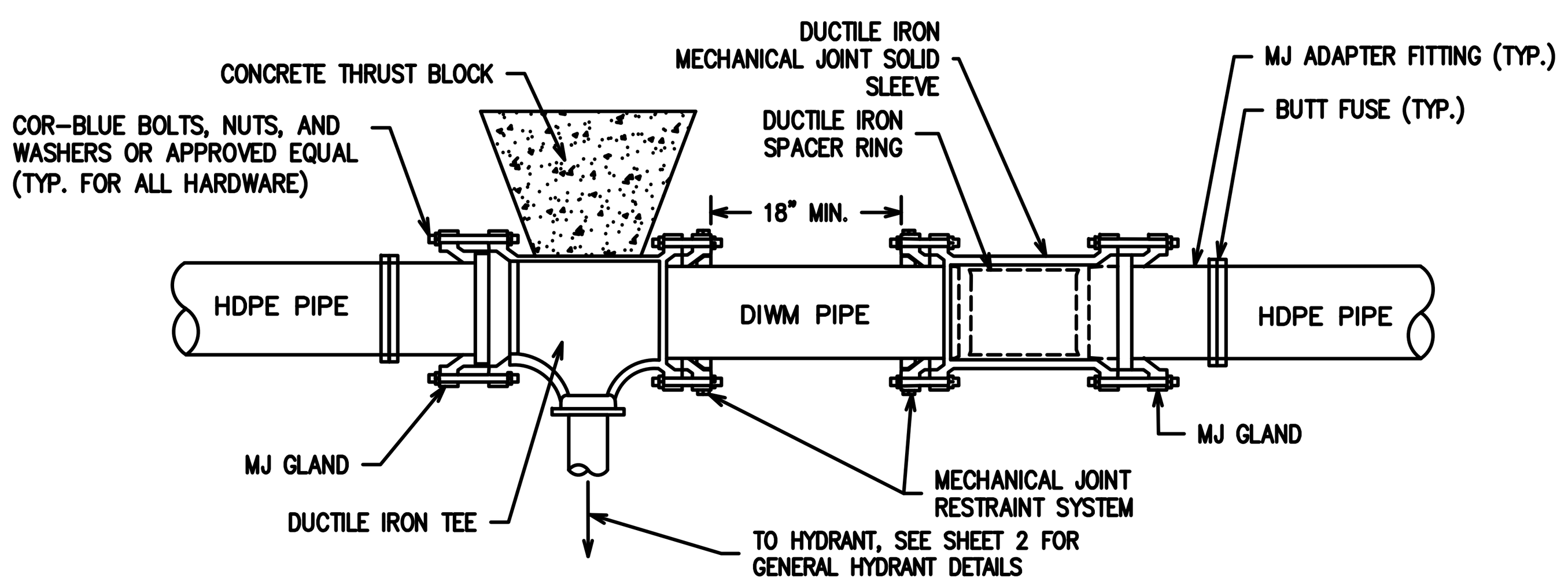
1. WHERE GATE VALVE IS IN LINE WITH THE HDPE WATER MAIN, INSTALL D.I. PIPE THROUGH GATE WELL MAKING CONNECTION TO HDPE PIPE OUTSIDE OF GATE WELL AS SHOWN.
2. TRACER WIRES SHALL BE INSTALLED ALONG THE OUTSIDE OF THE GATE WELL AND BENEATH THE FRAME AND COVER.



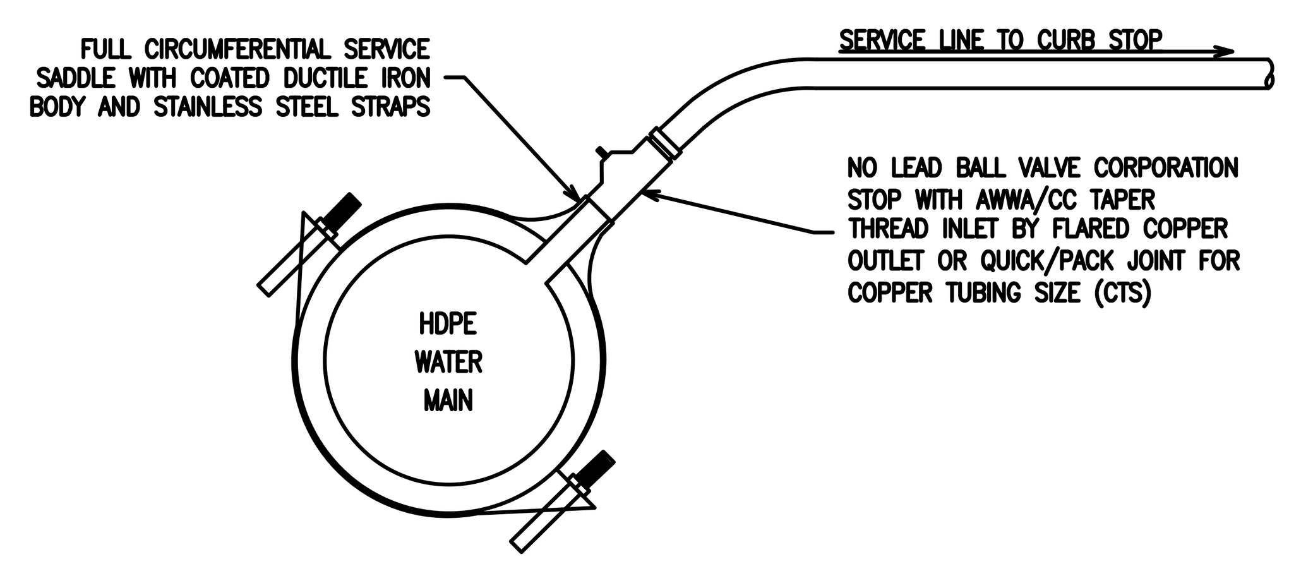
HDPE TAPPING SLEEVE, VALVE & WELL

NOTES:

1. SEE SHEET 2 OF THE WATER MAIN STANDARD DETAIL SHEETS FOR GENERAL TAPPING SLEEVE VALVE AND WELL DETAILS.
2. TAPPING SLEEVES FOR HDPE PIPE REQUIRE AN OUTLET SEAL GASKET AND SPRING WASHERS IN ADDITION TO THE REQUIREMENTS DETAILED IN SHEET 2 (JCM 452, ROMAC SSTH OR APPROVE EQUAL).



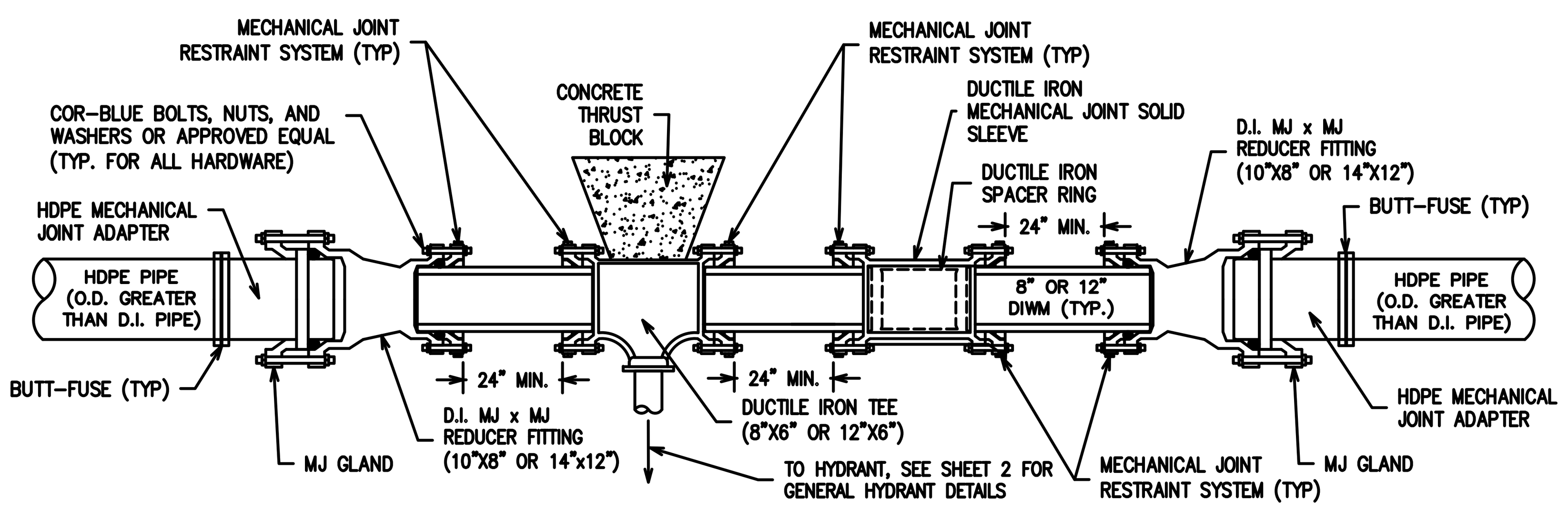
CUT-IN HYDRANT TEE DETAIL



SERVICE LINE CONNECTION TO HDPE PIPE

NOTES:

1. FLARED HDPE SERVICE LINES ARE PROHIBITED.



CUT-IN HYDRANT TEE DETAIL WITH 14" OR 10" HDPE

WATER MAIN
HIGH DENSITY POLYETHYLENE PIPE (HDPE) DETAILS

REVISION BLOCK

Data Source / Source Date: N/A

Rev. No.:	Rev. By:	Rev. Date:	Description:
1	KB	03/19/18	MARKUPS PER G. APPEL
2	HRC	08/31/20	GENERAL UPDATE
3			
4			

ORIG. DATE:	01/01/01
SCALE:	NONE
DESIGNED BY:	OCDC
DRAWN BY:	OCDC Mapping

WRC
WATER RESOURCES COMMISSIONER
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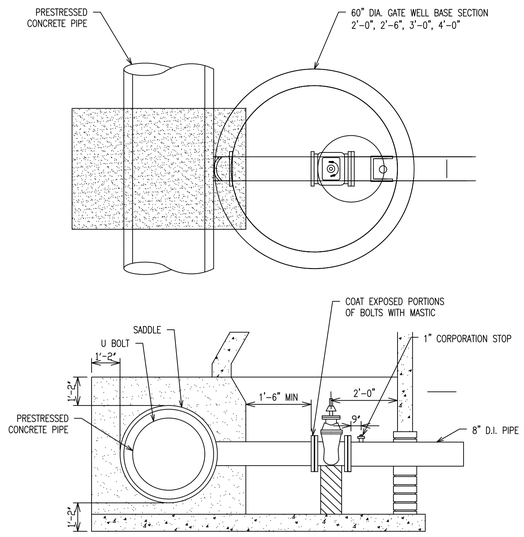
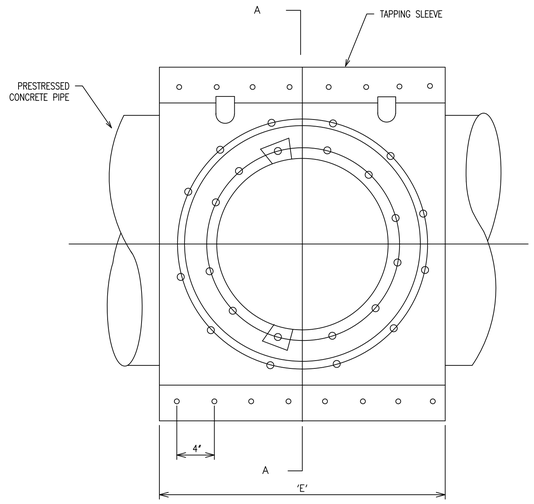
48328-1907

SHEET NO.: 6 of 7

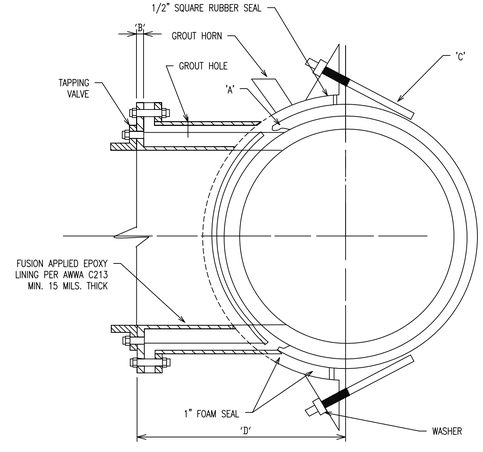


20"x 8" CONCRETE PRESURE TAP VALVE & WELL ASSEMBLY W/ CONCRETE ENCASEMENT

NOTES:
1) THESE DIMENSIONS ARE FOR REFERENCE ONLY.
2) ENTIRE SADDLE, INCLUDING STRAPS, TO BE ENCASED IN PORTLAND CEMENT MORTAR OR CONCRETE TO PROVIDE AT LEAST ONE (1) INCH OF THICKNESS OVER EXTERNAL STEEL SURFACES PRIOR TO BACKFILLING.
3) TAP SADDLES ARE DESIGNED FOR 150 PSI OPERATING PRESSURE.
4) FLANGE DRILLED AND TAPPED IN ACCORDANCE WITH AWWA C207 CLASS D, CENTERING RING CONFORMS TO MSS– SP 60.
5) GROUT SHALL SET A MINIMUM OF TWENTY–FOUR (24) HOURS PRIOR TO PRESSURE TESTING.



PLAN VIEW



SECTION A–A

PIPE SIZE X TAP SIZE	A	B	C	D	E
16" X 4"	1/4"	7/8"	6	14–1/16 "	24"
16" X 6"	1/4"	1–1/8"	6	14–5/16 "	24"
16" X 8"	1/4"	1–1/8"	6	14–5/16 "	24"
16" X 10"	1/4"	1–3/8"	7	14–9/16 "	28"
16" X 12"	1/4"	1–3/8"	8	14–9/16 "	32"
18" X 4"	1/4"	7/8"	6	15–3/8 "	24"
18" X 6"	1/4"	1–1/8"	6	15–5/8 "	24"
18" X 8"	1/4"	1–1/8"	6	15–5/8 "	24"
18" X 10"	1/4"	1–3/8"	7	15–7/8 "	28"
18" X 12"	1/4"	1–3/8"	8	15–7/8 "	32"
20" X 4"	1/4"	7/8"	6	16–1/2 "	24"
20" X 6"	1/4"	1–1/8"	6	16–1/2 "	24"
20" X 8"	1/4"	1–1/8"	6	16–1/2 "	24"
20" X 10"	1/4"	1–3/8"	7	17"	28"
20" X 12"	1/4"	1–3/8"	8	17"	32"
24" X 4"	1/4"	7/8"	6	18–3/4"	24"
24" X 6"	1/4"	1–1/8"	6	19"	24"
24" X 8"	1/4"	1–1/8"	6	19"	24"
24" X 10"	1/4"	1–3/8"	7	19–1/4"	28"
24" X 12"	1/4"	1–3/8"	8	19–1/4"	32"
30" X 4"	1/4"	7/8"	6	22–1/8"	24"
30" X 6"	1/4"	1–1/8"	6	22–3/8"	24"
30" X 8"	1/4"	1–1/8"	6	22–3/8"	24"
30" X 10"	1/4"	1–3/8"	7	22–5/8"	28"
30" X 12"	1/4"	1–3/8"	8	22–5/8"	32"
36" X 4"	1/4"	7/8"	6	25–1/2 "	24"
36" X 6"	1/4"	1–1/8"	6	25–3/4 "	24"
36" X 8"	1/4"	1–1/8"	7	25–3/4 "	28"
36" X 10"	1/4"	1–3/8"	8	26"	32"
36" X 12"	1/4"	1–3/8"	9	26"	36"
42" X 4"	1/4"	7/8"	6	28–7/8"	24"
42" X 6"	1/4"	1–1/8"	7	29–1/8"	28"
42" X 8"	1/4"	1–1/8"	8	29–1/8"	32"
42" X 10"	3/8"	1–3/8"	9	29–3/8"	36"
42" X 12"	3/8"	1–3/8"	10	29–3/8"	40"
48" X 4"	3/8"	7/8"	7	32–1/4"	28"
48" X 6"	3/8"	1–1/8"	7	32–1/2"	28"
48" X 8"	3/8"	1–1/8"	7	32–1/2"	28"
48" X 10"	3/8"	1–3/8"	7	32–3/4"	28"
48" X 12"	3/8"	1–3/8"	9	32–3/4"	36"

CONCRETE TAPPING SLEEVE DETAILS

WATER MAIN
CONCRETE WATER MAIN DETAILS

REVISION BLOCK
Data Source / Source Date: N/A

Rev. No.:	Rev. By:	Rev. Date:	Description:
1	KB	03/19/18	MARKUPS PER G. APPEL
2	HRC	08/31/20	GENERAL UPDATE
3			
4			

ORIG. DATE: 01/01/01
SCALE: NONE
DESIGNED BY: OCDC
DRAWN BY: OCDC Mapping

WRC WATER RESOURCES COMMISSIONER *Jim Nash*

ONE PUBLIC WORKS DRIVE, BLDG 95 WEST
WATERFORD, MICHIGAN
48328-1907

SHEET NO.: 7 OF 7