

REQUIREMENTS FOR WASTEWATER SERVICE

**GREER, SC
COMMISSION OF PUBLIC WORKS**



REVISED: JULY 2026

GREER CPW STANDARD WASTEWATER DETAILS

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INTRODUCTION

THIS DOCUMENT IS INTENDED TO PROVIDE GENERAL INFORMATION TO DEVELOPERS, CONSULTING ENGINEERS, PROJECT MANAGERS, BUILDERS, AND CONTRACTORS REGARDING ACCEPTANCE OF NEW WASTEWATER LINES INTO GREER COMMISSION OF PUBLIC WORK'S (GREER CPW) WASTEWATER COLLECTION SYSTEM FOR OPERATION AND MAINTENANCE. IT SHOULD BE USED IN CONJUNCTION WITH THE GREER CPW'S EXTENSION POLICY THAT OUTLINES AND PROVIDES MINIMUM STANDARDS FOR THE DESIGN AND CONSTRUCTION OF THESE SYSTEMS.

GREER CPW RESPONSIBILITIES

GREER CPW IS RESPONSIBLE FOR:

- VERIFYING THE AVAILABILITY OF UTILITY SERVICES FOR THE PROPERTY TO BE SERVED.
- REVIEWING CONSTRUCTION/UTILITY PLANS AND PROVIDING ANY COMMENTS ADDRESSING REVISIONS THAT NEED TO BE DONE FOR THE PROPOSED PROJECT.
- INSPECTING CONSTRUCTION OF THE WASTEWATER COLLECTION SYSTEM TO ENSURE COMPLIANCE WITH APPROVED PLANS AND SPECIFICATIONS.
- PROVIDING LEGAL DOCUMENTS NECESSARY FOR TRANSFER OF THE WASTEWATER COLLECTION SYSTEM TO GREER CPW:
 - DEDICATION AGREEMENT
 - EASEMENT AGREEMENT
 - AND OTHER APPLICABLE DOCUMENTS

CONTRACTOR RESPONSIBILITIES

THE PROJECT'S CONTRACTOR IS RESPONSIBLE FOR:

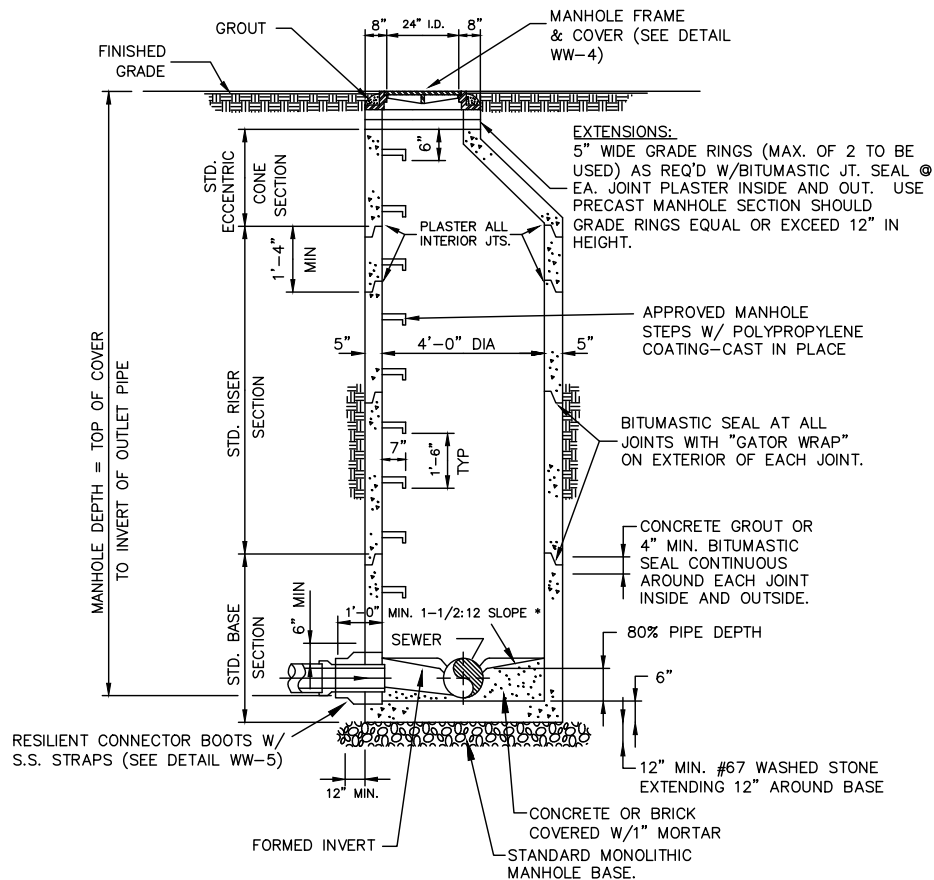
- CALLING IN A 72-HOUR WORK NOTICE TO GREER CPW AND SCHEDULING A PRE-CONSTRUCTION MEETING.
- ATTENDING A MANDATORY ON-SITE PRE-CONSTRUCTION MEETING WITH GREER CPW AND THE CONSULTING ENGINEER. THE CONTRACTOR MUST MAINTAIN CONTACT WITH GREER CPW AND THE CONSULTING ENGINEER THROUGHOUT CONSTRUCTION. THE CONTRACTOR MUST ALSO HAVE ON SITE:
 - SC DES CONSTRUCTION PERMIT(S) (WASTEWATER CONSTRUCTION PERMIT)
 - SC DES APPROVED PLANS
- APPLYING FOR AND OBTAINING ANY ENCROACHMENT PERMITS, IF APPLICABLE AND ANY OTHER APPLICABLE DOCUMENTS IN COOPERATION WITH GREER CPW.
- PROVIDING A 72-HOUR NOTICE TO ALL PROPERTY OWNERS OTHER THAN THE DEVELOPER BEFORE BEGINNING WORK ON PROPERTY.
- INSTALLING APPROVED UTILITY LINES.
- INSTALLING, MAINTAINING, AND RESTORING SEDIMENT AND EROSION CONTROL DEVICES THROUGHOUT CONSTRUCTION.
- ALL REQUIRED TESTING SUCH AS:
 - DEFLECTION TESTING, LOW AIR TESTING, AND VACUUM TESTING FOR THE WASTEWATER COLLECTION SYSTEM
 - ANY OTHER REQUIRED TESTING.



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INTRODUCTION, REQUIREMENTS, AND RESPONSIBILITIES

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-0			



NOTES:

1. MANHOLE TABLE SHALL RUN LEVEL IN DIRECTION OF FLOW. HEIGHT TO BE 80% OF PIPE ON INCOMING LINE.
2. USE DROP MANHOLE AS SHOWN ON PLANS OR AS DIRECTED BY ENGINEER.
3. PRECAST MANHOLES TO MEET ASTM C478-70.
4. RISER MANHOLE RING EXTENSIONS TO BE CONCRETE OR POLYPROPYLENE (EPP BY CRETEX) OR EQUAL.

MANHOLE COVER ELEVATIONS:

1. FLUSH WITH FINISHED GRADE WITHIN STREET RIGHT-OF-WAYS AND IN LANDSCAPED/LAWN AREAS UNLESS OTHERWISE SPECIFIED.
2. 18 INCHES ABOVE GRADE IN EASEMENTS EXCEPT TO ACCOMMODATE FLOOD ELEVATIONS PER NOTE (3) BELOW.
3. COVERS TO TERMINATE AT LEAST 1 FOOT ABOVE THE 100-YEAR FLOOD ELEVATION BUT NO GREATER THAN 3 FEET ABOVE GRADE TOTAL. WHERE THE FLOOD ELEVATION IS 2 FEET OR MORE ABOVE GROUND, WATERTIGHT COVERS SHALL BE USED, THE MANHOLE COVER SHALL TERMINATE 2 FEET ABOVE GRADE, AND A VENT PIPE SHALL BE INSTALLED TO 2 FEET ABOVE THE 100-YEAR FLOOD ELEVATION.

MANHOLE SCHEDULES

MANHOLE SIZING

MH DIAMETER	LARGEST PIPE DIAMETER
4 FEET	8" TO 15"
5 FEET	16" TO 27"
6 FEET	30" TO 45"
8 FEET	48"

DETAIL NO.	MANHOLE TYPE	WHEN TO USE
WW-1	PRECAST WITH CONE SECTION	(1) USE FOR 4-FOOT AND 5-FOOT DIAMETER MANHOLES ONLY.
WW-2	PRECAST WITH FLAT TOP	(1) USE FOR ALL 6-FOOT AND 8-FOOT DIAMETER MANHOLES. (2) USE FOR ALL 4-FOOT AND 5-FOOT MANHOLES THAT TERMINATE MORE THAN 2 FEET ABOVE GRADE. (3) USE FOR SHORT MANHOLES 4-FOOT AND 5-FOOT WHERE A CONE SECTION WILL NOT WORK.



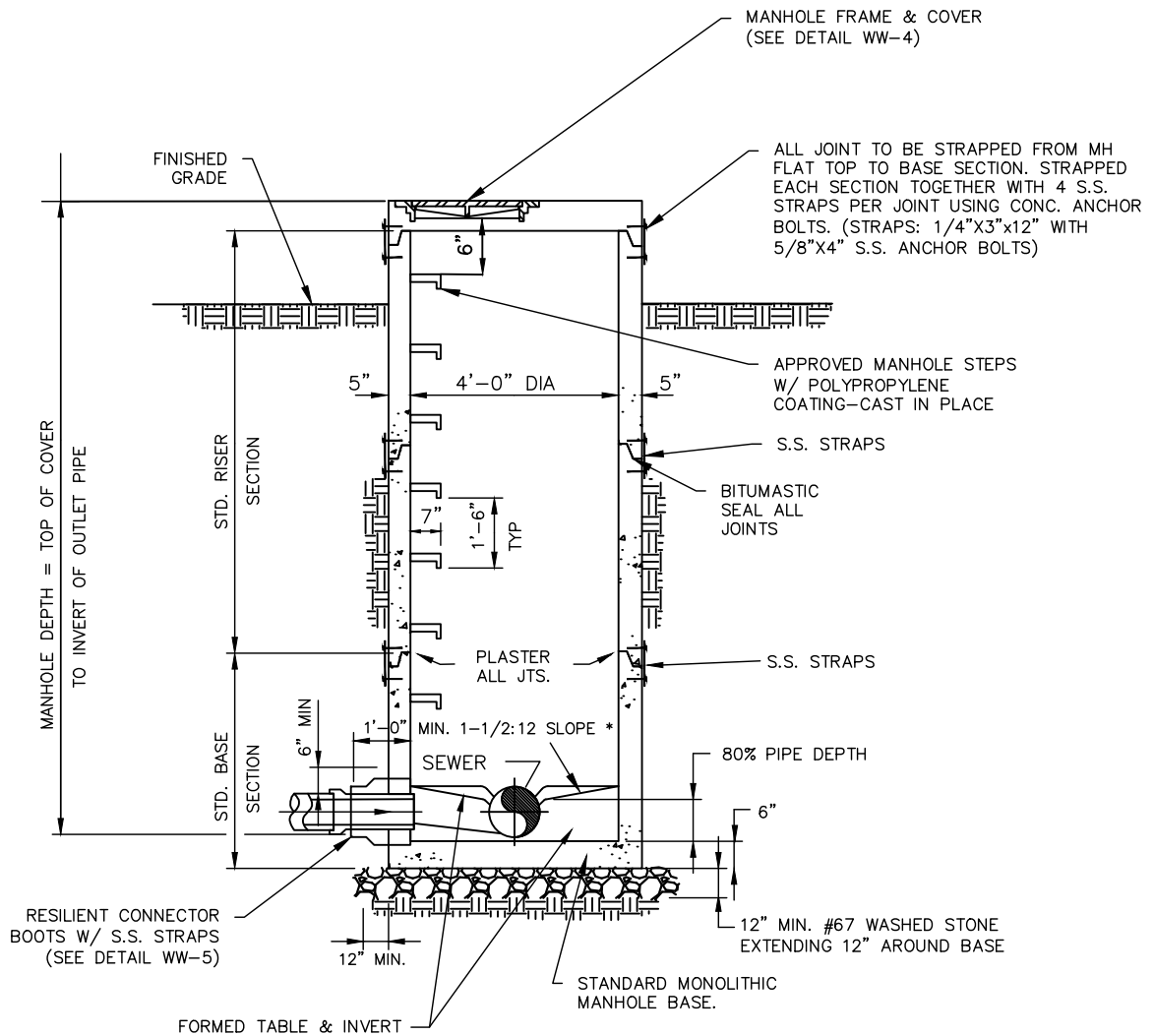
STANDARD PRECAST MANHOLE DETAIL

WATER	ELECTRIC	WASTEWATER	GAS
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		X	
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WW-1

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NOTES:

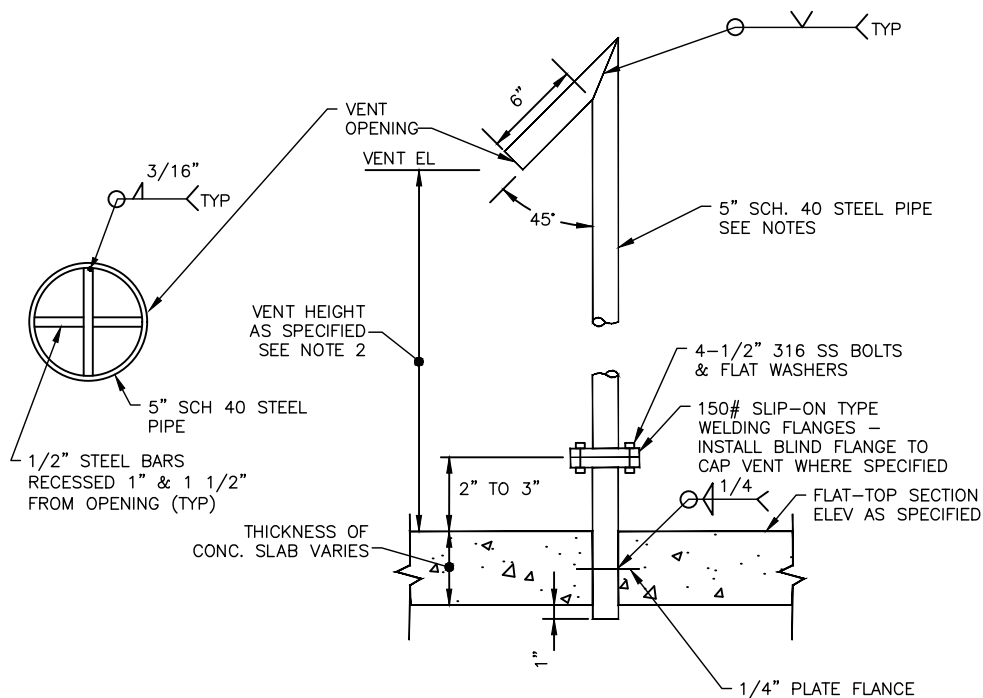
- 1) MANHOLE TABLE SHALL RUN LEVEL IN DIRECTION OF FLOW.
HEIGHT TO BE 80% OF PIPE ON INCOMING LINE.
- 2) USE DROP MANHOLE AS SHOWN ON PLANS OR AS
DIRECTED BY ENGINEER.
- 3) PRECAST MANHOLES TO MEET ASTM C478-70.



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PRECAST FLAT-TOP MANHOLE DETAIL

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-2			



NOTES:

1. FIVE INCH DIAMETER FLANGED BY PLAIN END STEEL WALL PIPE SHALL BE CAST IN PLACE (PLUMB) WITH BOLT HOLES IN FLANGE STRADDLING THE CENTER LINES. PIPE TO BE COATED PER VENT PIPE SPECIFICATIONS.

FIVE INCH DIAMETER STEEL VENT PIPE TO BE FURNISHED WITH COMPATIBLE FLANGE AND ALL NECESSARY STAINLESS STEEL HARDWARE FOR BOLTED ATTACHMENT. VENT OUTLET TO POINT DOWNSTREAM.

PROVIDE SCREEN ON END OF VENT PIPES – MADE OF 2 STEEL BARDS WELDED TO INSIDE OF PIPE.

ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION AND BEFORE BEING CAST-IN-PLACE.
2. TOP OF VENT OPENING TO BE 2 FEET ABOVE THE 100-YEAR FLOOD ELEVATION. IF MANHOLE COVER/TOP SLAB IS ABOVE 100-YEAR FLOOD ELEVATION, VENT OPENING TO BE 2 FEET ABOVE TOP SLAB.
3. VENTS TO BE INSTALLED EVERY 1,200 FEET OR AS APPROVED BY THE ENGINEER.



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STANDARD MANHOLE VENT PIPE DETAIL

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-3			

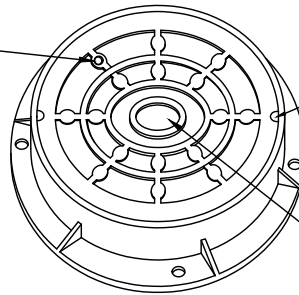
STANDARD FRAME AND COVERS
 EAST JORDAN IRON WORKS #V-1384
 US FOUNDRY #USF-668, KL

WATERPROOF FRAME AND COVER
 US FOUNDRY #USF-668, KL-BWTL
 OR APPROVED EAST JORDAN IRON WORKS BOLT-DOWN

FLAT SLAB FRAME AND COVER
 US FOUNDRY #USF-1261, KL
 EAST JORDAN IRON WORKS #V-1384-4

COVER TO HAVE A SINGLE, 1"
 DIAMETER VENT HOLE, UNLESS
 BOLT-DOWN COVER IS
 SPECIFIED, IN WHICH CASE,
 THE GASKET SHALL PROVIDE
 POSITIVE SEAL AT BOLT HOLES.

FRAME AND COVER SHALL
 BE CERTIFIED FOR A
 MINIMUM OF AASHTO
 H-20 LOADING

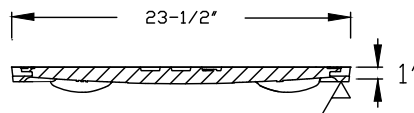
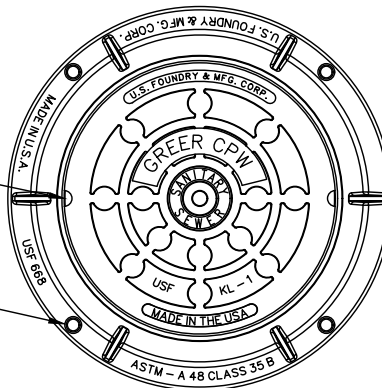


PROVIDE 2 (NON-PENETRATING)
 PICK HOLES

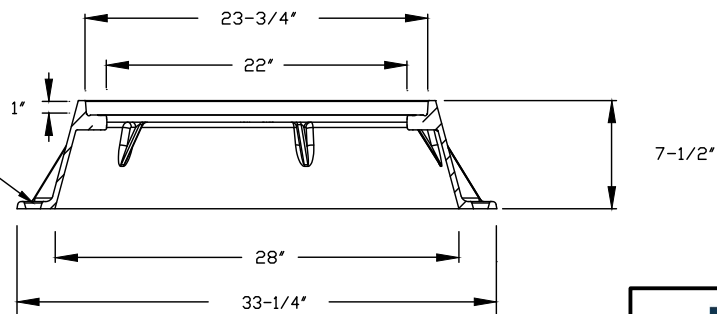
"GREER CPW" SHALL BE CAST
 ON THE COVER
 (SEE DETAIL THIS SHEET)

2X NPPH

4x Ø1"



FOUR - 1" DIA.
 ANCHOR HOLES



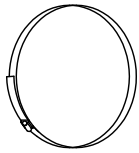
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STANDARD MANHOLE FRAME & COVER DETAIL

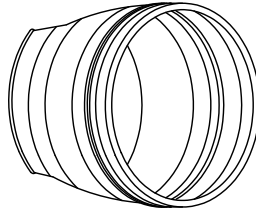
WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-4			

APPROVED MATERIALS

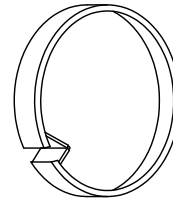
BOOTS – NPC (KOR-N-SEAL) AND PRESS-SEAL (PSX DIRECT DRIVE)
IN ACCORDANCE WITH ASTM C923



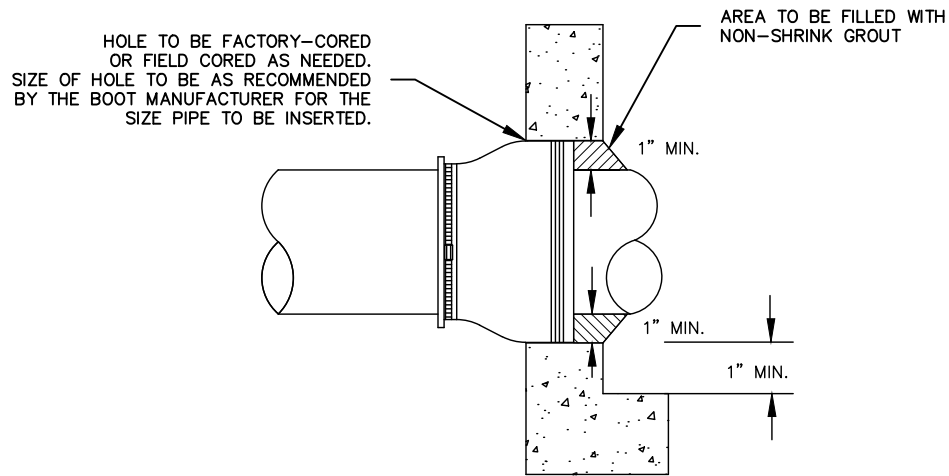
STAINLESS STEEL
PIPE CLAMP



FLEXIBLE SYNTHETIC
RUBBER CONNECTOR



STAINLESS STEEL
EXPANSION RING



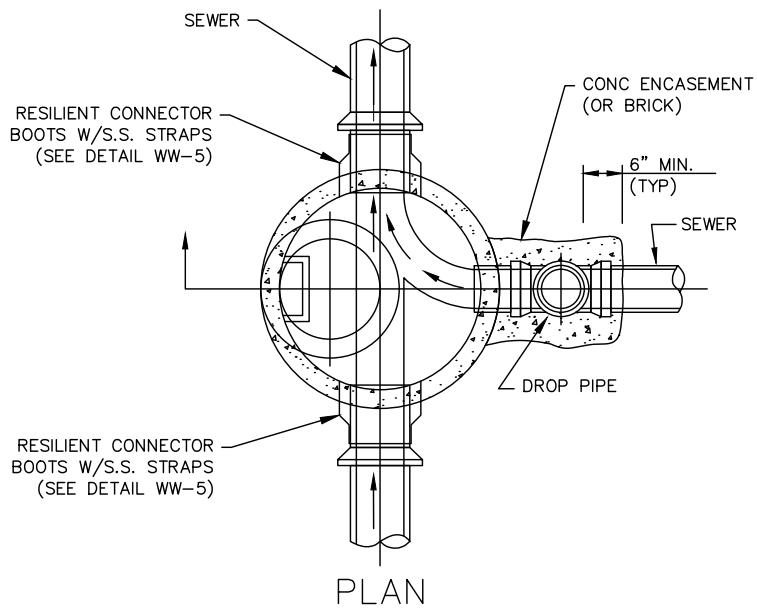
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MANHOLE ENTRANCE "BOOT" DETAIL

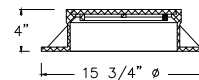
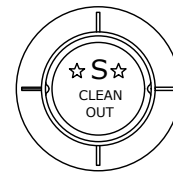
WATER	ELECTRIC	WASTEWATER	GAS
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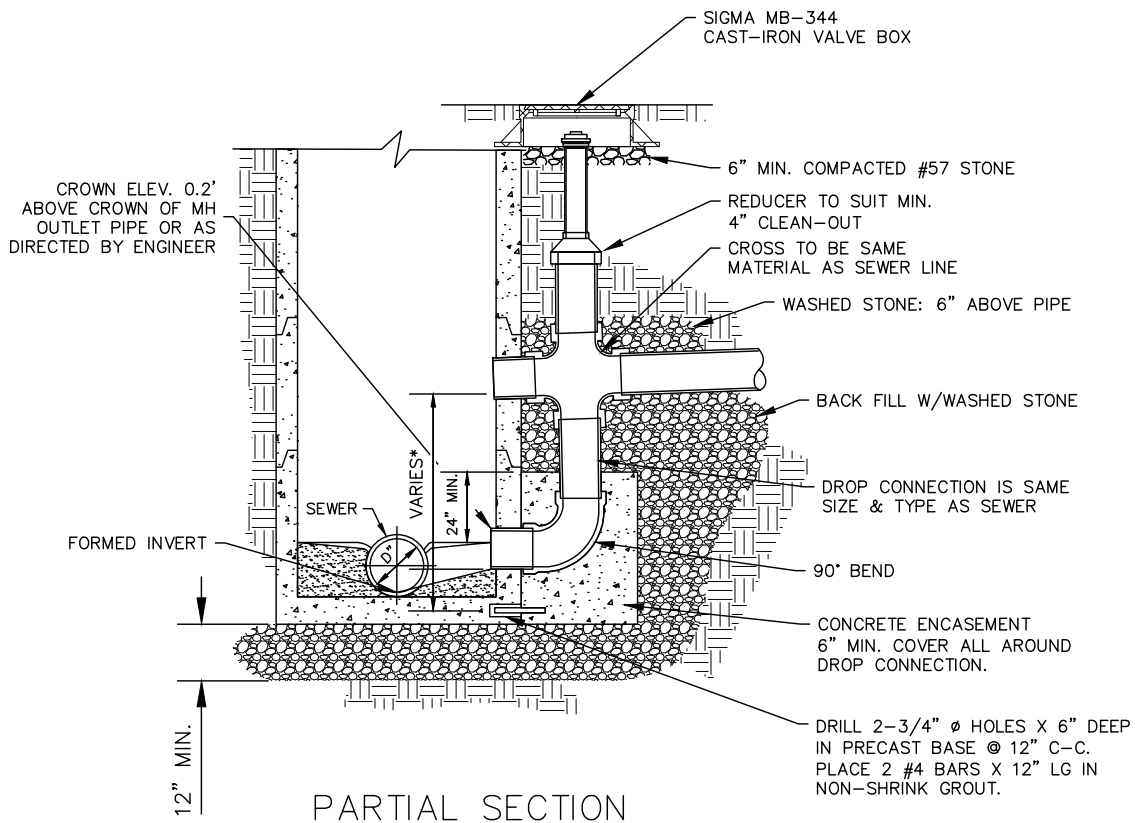
WW-5



NOTE: SEE DETAIL WW-1 FOR
INFO NOT SHOWN HERE



SIGMA MB-344 CAST-IRON VALVE BOX



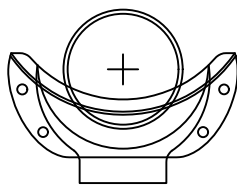
PARTIAL SECTION



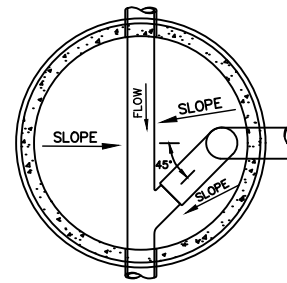
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TYPICAL PRECAST DROP MANHOLE (TYPE 3)
WITH EXTERNAL CLEAN-OUT

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-6			



DROP BOWL
MOUNTING
POSITION



INSIDE DROP - PLAN

RELINER® INSIDE DROP BOWL
SECURED WITH STAINLESS
STEEL BOLTS

TRIM PIPE TO 2" MAX.
V NOTCH BOTTOM EDGE

FERNCO FLEXIBLE
COUPLING OR EQUAL

COMPRESSION
COUPLING
MORTAR

RELINER® STAINLESS STEEL
STRAPS OR EQUAL. SECURE
TO STRUCTURE WITH 2
STAINLESS STEEL BOLTS.
STRAP AT 4' INTERVALS
(MIN. OF 2)

PVC SEWER PIPE

GLUE FITTING
BELL & SPIGOT
SWEEP ELBOW
EMBEDDED IN
CONC. AT 45°
W/ SEWER FLOW

INSIDE DROP CONNECTION

NOTES:

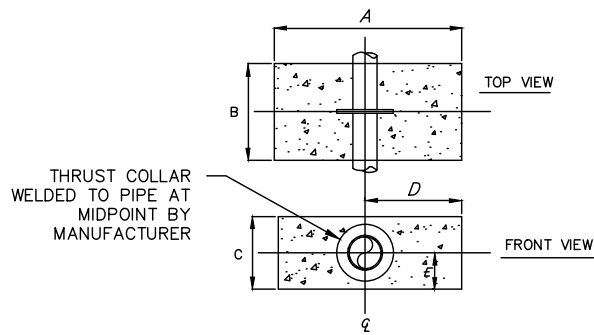
- 1) ALL INSIDE DROP CONNECTIONS FOR SERVICES AND COLLECTOR SEWERS SHALL USE THE DROP BOWL AS PRODUCED BY:
RELINER-DURAN, INC.
53 MT. ARCHER RD
LYME, CT 06371
(860)434-0277 FAX: (860)434-3195
- 2) SECURE DROP PIPE TO MANHOLE WALL WITH RELINER-DURAN, INC. STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS.
- 3) MINIMUM 5 FT DIAMETER MANHOLE REQUIRED FOR INSIDE DROP CONNECTION.



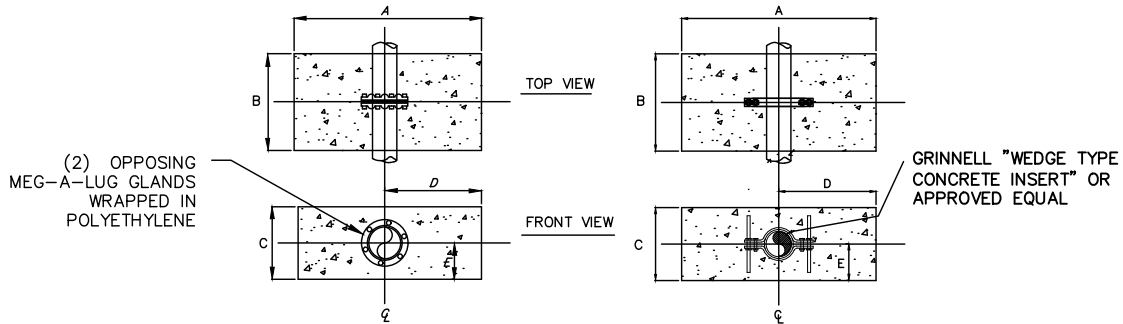
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TYPICAL PRECAST DROP MANHOLE (TYPE 3)
WITH EXTERNAL CLEAN-OUT

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-7			



DETAIL "A" DIP ONLY



DETAIL "B" DIP ONLY

DETAIL "C" SDR-35 PVC or DIP

PIPE SIZE	A	B	C	D	E	CY.	WELDED THRUST COLLAR MINIMUM RATING
4"	3'-0"	2'-0"	1'-6"	1'-6"	0'-8"	0.33	4,500 LBS
6"	4'-0"	2'-0"	1'-6"	2'-0"	0'-9"	0.44	9,300 LBS
8"	4'-6"	2'-0"	2'-0"	2'-3"	1'-0"	0.67	16,000 LBS
12"	6'-0"	2'-0"	3'-0"	3'-0"	1'-6"	1.33	34,000 LBS
16"	6'-6"	2'-0"	3'-3"	3'-3"	2'-3"	2.17	59,000 LBS

- DETAIL "A" AND "B" APPLY TO DIP IN GRAVITY AND PRESSURE APPLICATIONS
- DETAIL "C" APPLIES TO SDR-35 PVC AND DIP IN GRAVITY APPLICATIONS ONLY

NOTES:

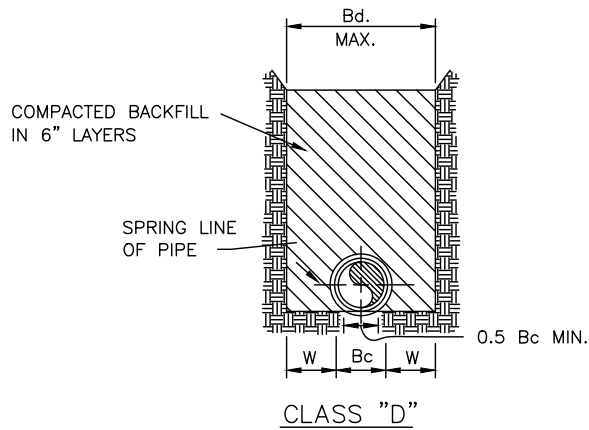
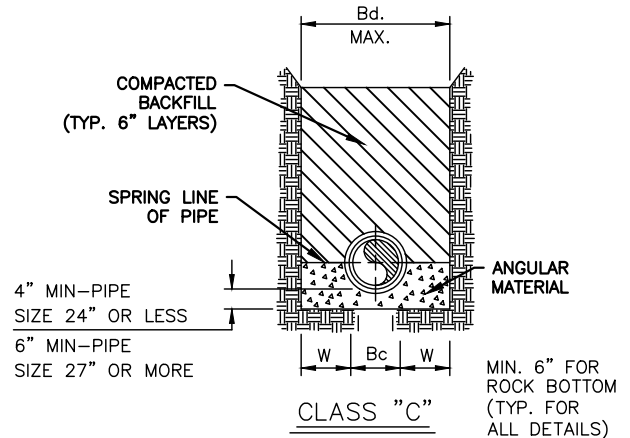
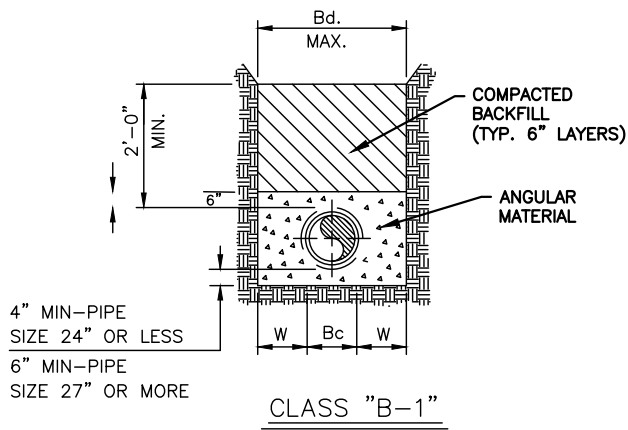
- 1) DIMENSIONS OF CONCRETE COLLARS BASED ON 2,000 POUNDS PER SQUARE FOOT (PSF) SOIL BEARING.
- 2) SPECIFICATIONS OF MEGA-LUGS SHALL CONFORM TO THE PIPE MANUFACTURERS SUPPLIED SHOP DRAWINGS, WHICH SHALL INDICATE A THRUST RATING NOT LESS THAN THAT INCLUDED IN THE CHART BELOW.
- 3) THRUST COLLARS SHALL CONFORM TO THE PIPE MANUFACTURER'S SUPPLIED SHOP DRAWINGS WHICH SHALL INDICATE A THRUST RATING NOT LESS THAN THAT INCLUDED IN THE CHART BELOW.
- 4) DIMENSIONS OF WELDED STEEL OR DUCTILE IRON.
- 5) CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 POUNDS PER SQUARE INCH (PSI) AT 28 DAYS. "HIGH EARLY STRENGTH" CONCRETE SHALL BE USED.
- 6) SOIL CONDITIONS SHALL BE VERIFIED BY A THIRD-PARTY TESTING FIRM AT THE EXPENSE OF THE CONTRACTOR PRIOR TO CONSTRUCTION.
- 7) FOR 3" PIPE, USE 4" DIAMETER THRUST RATING.



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TYPICAL PRECAST DROP MANHOLE (TYPE 3)
WITH EXTERNAL CLEAN-OUT

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-8			



NOTES

DITCH BEDDING DIMENSIONS			
PIPE SIZE (I.D.)	Bc (O.D.)	W MAX WORK SPACE	Bd MAX DITCH WIDTH
8"	10"	8"	2'-3"
10"	12"	9"	2'-6"
12"	14"	9"	2'-9"
15"	18"	10"	3'-0"
18"	22"	10"	3'-6"
21"	24"	9"	3'-6"
24"	27"	10"	4'-0"
27"	32"	10"	4'-6"
30"	36"	9"	5'-0"
36"	42"	9"	5'-6"
42"	50"	11"	6'-0"

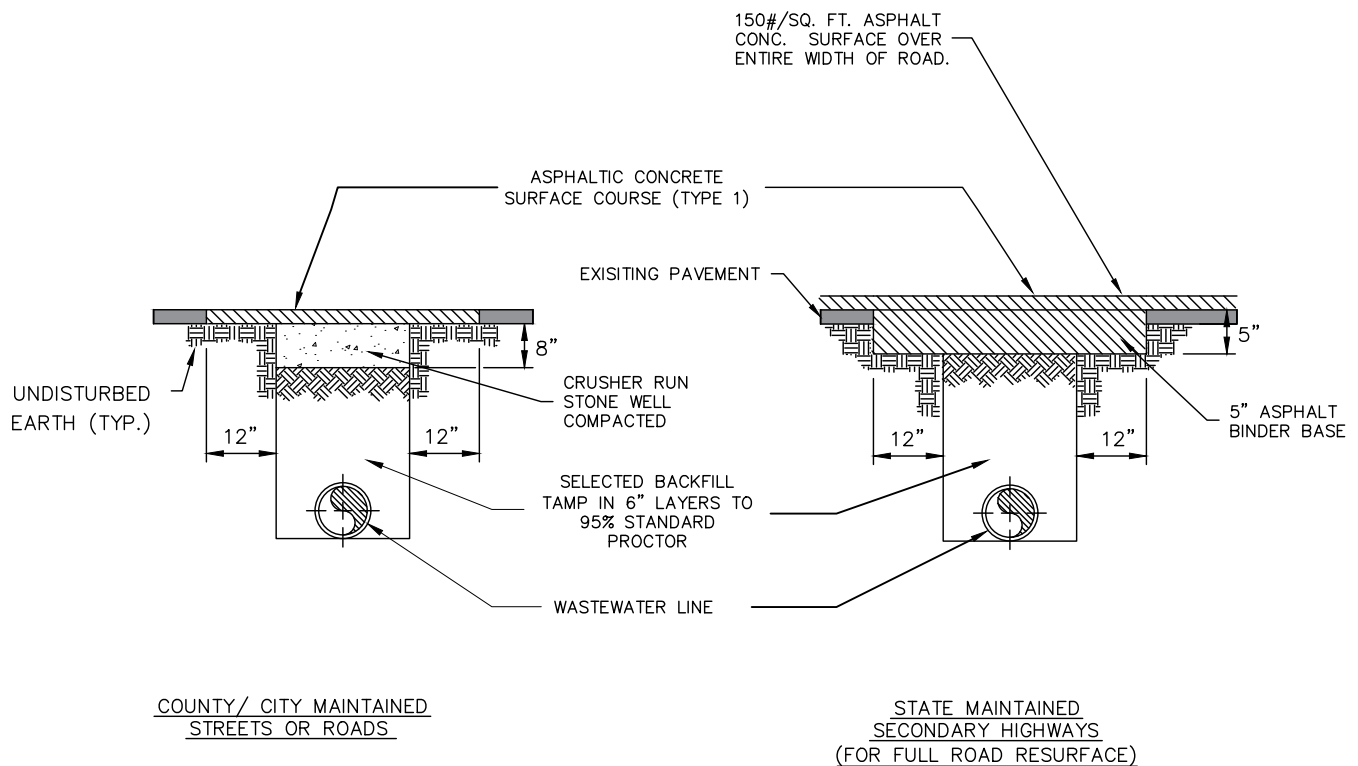
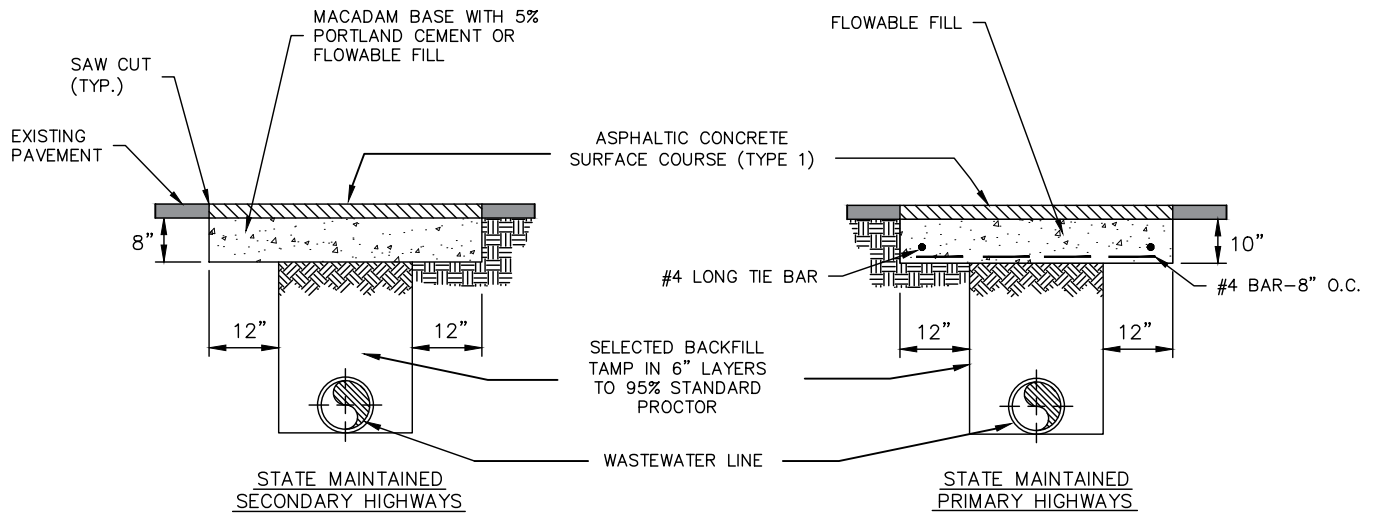
- POLYVINYL CHLORIDE (PVC) SDR-35 SHALL BE INSTALLED WITH CLASS "B-1" BEDDING.
- DUCTILE IRON PIPE (DIP) SHALL BE INSTALLED WITH A CLASS "C" BEDDING.
- PRESSURIZED LINES SHALL BE CLASS "D" UNLESS LAYING IN CLASSIFIED ROCK, THEN USE CLASS "C" WITH 6" OF WASHED STONE.
- COMPACTION TEST WILL BE MADE ON BACKFILL SOILS BY CONTRACTOR AT THE DIRECTION OF THE ENGINEER. USING ASTM 698, STANDARD PROCTOR, 95% COMPACTION IS REQUIRED IN ALL PAVED AREAS. 90% COMPACTION IS REQUIRED IN ALL OTHER AREAS UNLESS OTHERWISE NOTED.
- ANGULAR MATERIAL SHALL BE WASHED CRUSHED STONE OR GRAVEL CONFORMING TO ASTM C 33 (ALSO S.C. DOT) SIZE NO. 57.
- STABILIZATION STONE SHALL BE PROVIDED AS NEEDED TO OBTAIN A STABILIZED TRENCH BOTTOM, IN ADDITION TO STONE BEDDING SHOWN HEREIN.



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TYPICAL PRECAST DROP MANHOLE (TYPE 3) WITH EXTERNAL CLEAN-OUT

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-9			



NOTE:
ALL INSTALLATIONS TO BE AS SHOWN OR AS REQ'D BY STATE OR COUNTY ENGINEER

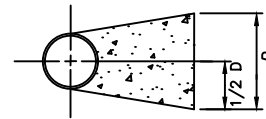
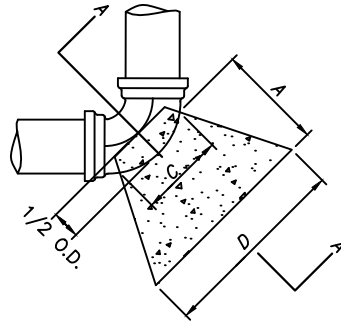


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ROAD REINSTATEMENT DETAILS

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-10			

POLYWRAP FITTINGS, GLANDS,
AND BOLTS TO FACILITATE
FUTURE REMOVAL



SECTION A-A

MINIMUM DIMENSIONS FOR CONCRETE BLOCKING

BEND	SIZE	VOLUME				CY
		A	B	C	D	
11 1/4°	6"	1'-0"	2'-0"	4"	1'-0"	0.05
	8"	1'-0"	2'-0"	5"	1'-0"	0.05
	12"	1'-0"	2'-0"	7"	1'-0"	0.05
	16"	1'-0"	2'-0"	1'-0"	2'-0"	0.22
	20"	2'-0"	3'-0"	1'-3"	2'-0"	0.32
22 1/2°	6"	1'-0"	2'-0"	6"	1'-0"	0.05
	8"	1'-0"	2'-0"	7"	1'-0"	0.05
	12"	1'-0"	2'-0"	10"	2'-0"	0.11
	16"	2'-0"	4'-0"	1'-0"	2'-0"	0.37
	20"	2'-0"	4'-0"	1'-3"	3'-0"	0.58
45°	6"	1'-0"	2'-0"	6"	1'-0"	0.05
	8"	1'-0"	2'-0"	7"	2'-0"	0.10
	12"	2'-0"	3'-0"	11"	3'-0"	0.44
	16"	3'-0"	5'-0"	1'-0"	3'-0"	1.00
	20"	4'-0"	6'-0"	1'-3"	4'-0"	2.15
90°	6"	1'-0"	2'-0"	1'-0"	2'-0"	0.11
	8"	2'-0"	3'-0"	1'-2"	2'-6"	0.37
	12"	2'-0"	4'-0"	2'-0"	4'-0"	0.84
	16"	4'-0"	6'-0"	2'-2"	4'-9"	2.84
	20"	4'-0"	7'-0"	2'-8"	6'-4"	4.51
TEES & PLUGS	6"	1'-0"	2'-0"	10"	1'-6"	0.08
	8"	1'-9"	2'-6"	1'-1"	2'-0"	0.23
	12"	2'-6"	3'-9"	1'-7"	3'-0"	0.75
	16"	3'-0"	5'-0"	2'-2"	4'-0"	1.59
	20"	4'-0"	6'-0"	2'-8"	5'-0"	3.21

FOR 3" & 4" PIPE, USE 6" SIZES

DESIGN DATA:

- DIMENSIONS OF THRUST BLOCK IN FEET BASED ON 2,000 POUNDS PER SQUARE FOOT (PSF) SOIL BEARING PRESSURE AND 200 POUNDS PER SQUARE INCH (PSI) TEST PRESSURE. ACTUAL INSIDE DIAMETER OF DUCTILE IRON PIPE, CLASS 51 USED AS STANDARD.
- CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS. HIGH EARLY STRENGTH CONCRETE SHALL BE USED.

NOTE:

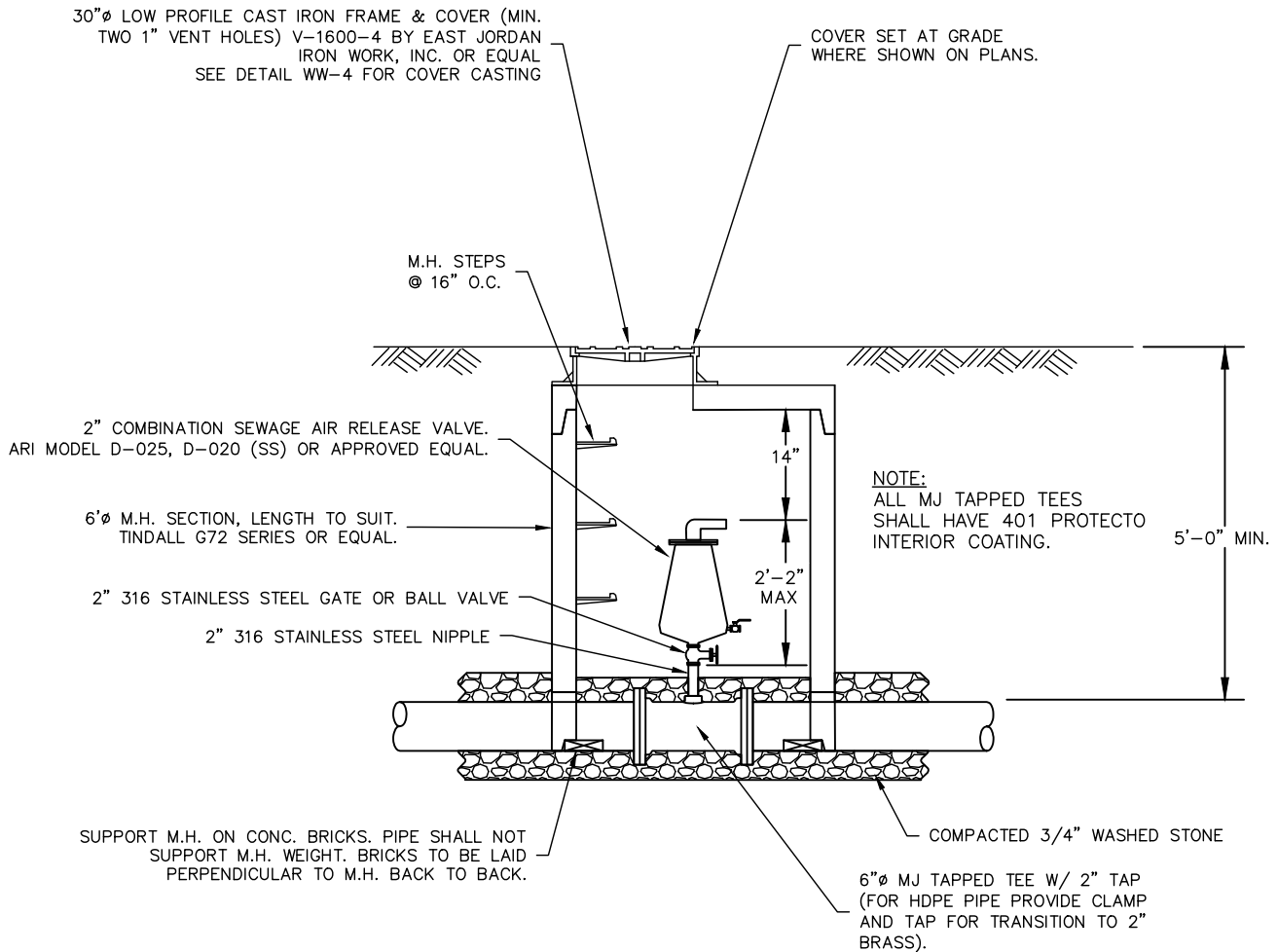
- SOIL CONDITIONS SHALL BE VERIFIED BY AN INDEPENDENT THIRD-PARTY GEOTECHNICAL TESTING FIRM BEFORE DESIGN IS IMPLEMENTED.



3				
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0	3/4/2026	SHERER	FAHR	CRAWFORD
REVISED	BY	CHK'D	APPR.	

CONCRETE THRUST BLOCK DETAIL

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-11			



GENERAL NOTES:

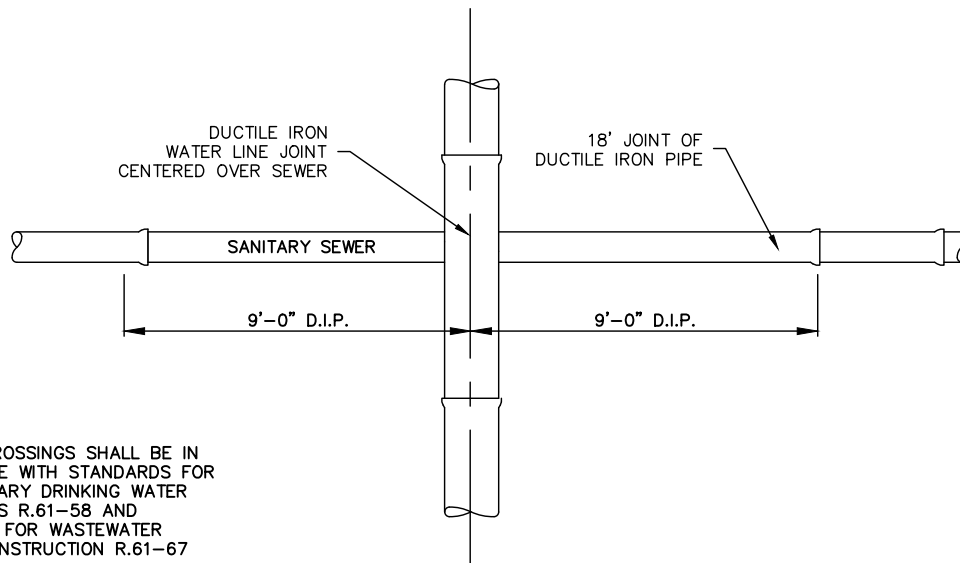
1. CONTRACTOR SHALL ASSESS THE EXISTING SITE CONDITIONS AT EACH NEW ARV LOCATION PRIOR TO INITIATING ANY WORK. NOTIFY THE OWNER AND ENGINEER IN WRITING OF ANY CONDITIONS WHICH MAY PREVENT THE WORK FROM BEING PERFORMED AS INDICATED ON THE DRAWINGS AND AS CALLED FOR IN THE SPECIFICATIONS.
2. WHERE INDICATED ON THE PLANS, FURNISH AND INSTALL NEW ARI COMBINATION AIR VALVE, PRECAST CONCRETE VALVE VAULT, PIPING AND APPURTENANCES AS SHOWN ON THE DRAWINGS AND AS CALLED FOR IN THE SPECIFICATIONS.
3. VERIFY VALVE VAULT DEPTH REQUIRED WITH VALVE MANUFACTURER.
4. FURNISH AND INSTALL ARI MODEL D-025 2-INCH COMBINATION AIR VALVE FOR WASTEWATER; FURNISH WITH NYLON BODY AND 2-INCH NPT THREADED INLET CONNECTION.
5. FURNISH AND INSTALL NEW TAPPING SADDLE OR SLEEVE IN ACCORDANCE WITH SPECIFICATIONS.
6. STEM PIPE AND BALL VALVE SHALL BE 316 STAINLESS STEEL AND SHALL BE THE SAME SIZE AS THE AIR VALVE INLET CONNECTION.
7. IN AREAS OUTSIDE OF ROAD RIGHTS-OF-WAY, INSTALL TOP SLAB 4" ABOVE GRADE. WITHIN ROAD RIGHTS-OF-WAY, INSTALL TOP SLAB FLUSH WITH EXISTING GRADE.
8. PRECAST MANHOLE TOP SLAB, AND FRAME AND COVER SHALL BE TRAFFIC RATED FOR HS-20 LOADING.



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0	3/4/2026	SHERER	FAHR	CRAWFORD
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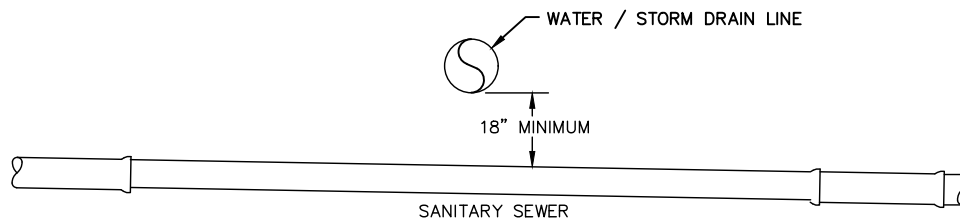
AIR RELEASE & AIR / VACUUM VALVE DETAIL

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-12			



NOTE:
ALL LINE CROSSINGS SHALL BE IN
ACCORDANCE WITH STANDARDS FOR
STATE PRIMARY DRINKING WATER
REGULATIONS R.61-58 AND
STANDARDS FOR WASTEWATER
FACILITY CONSTRUCTION R.61-67

PLAN VIEW



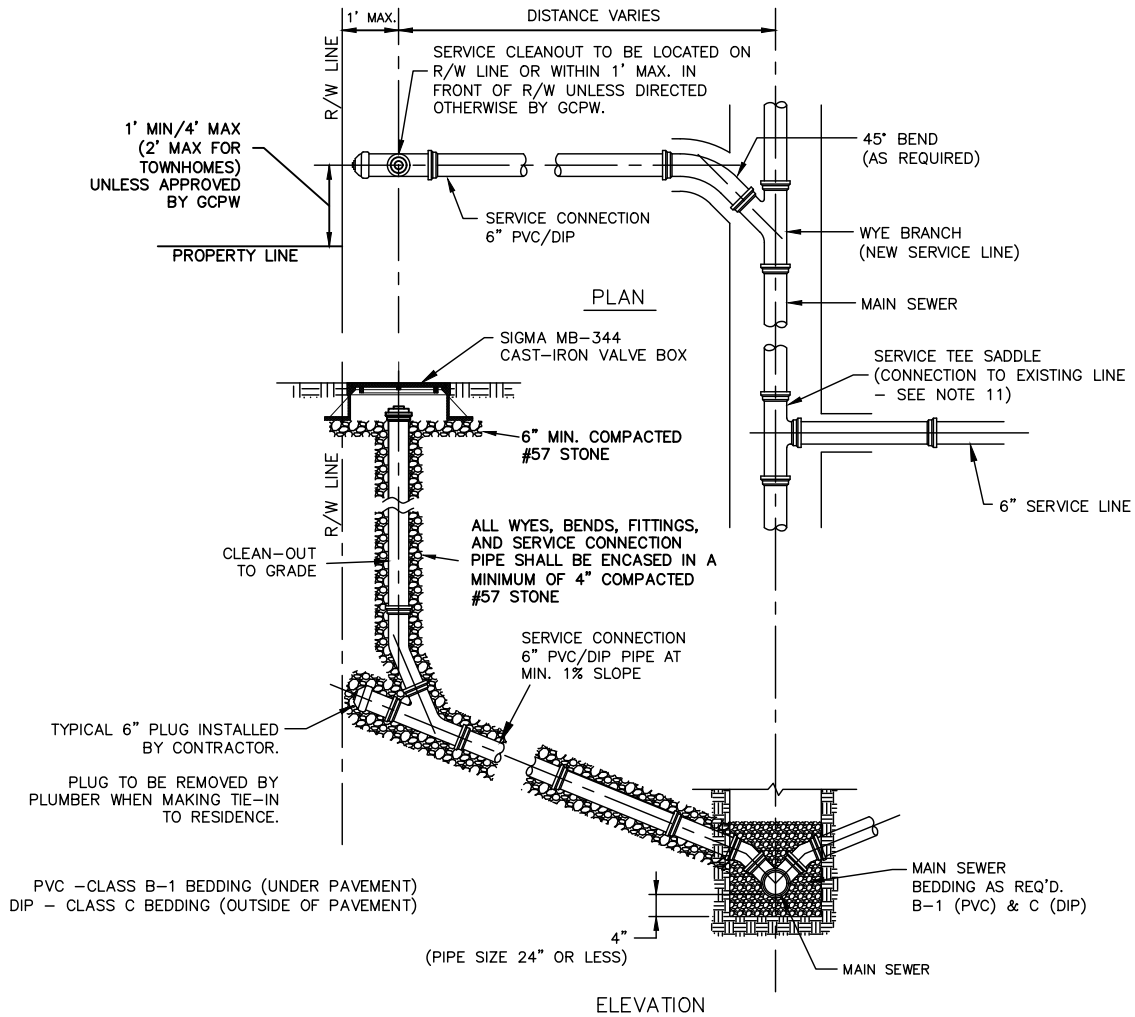
SECTION VIEW



3				
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0	3/4/2026	SHERER	FAHR	CRAWFORD
REVISED	BY	CHK'D	APPR.	

SANITARY SEWER CROSSINGS

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-13			



NOTES:

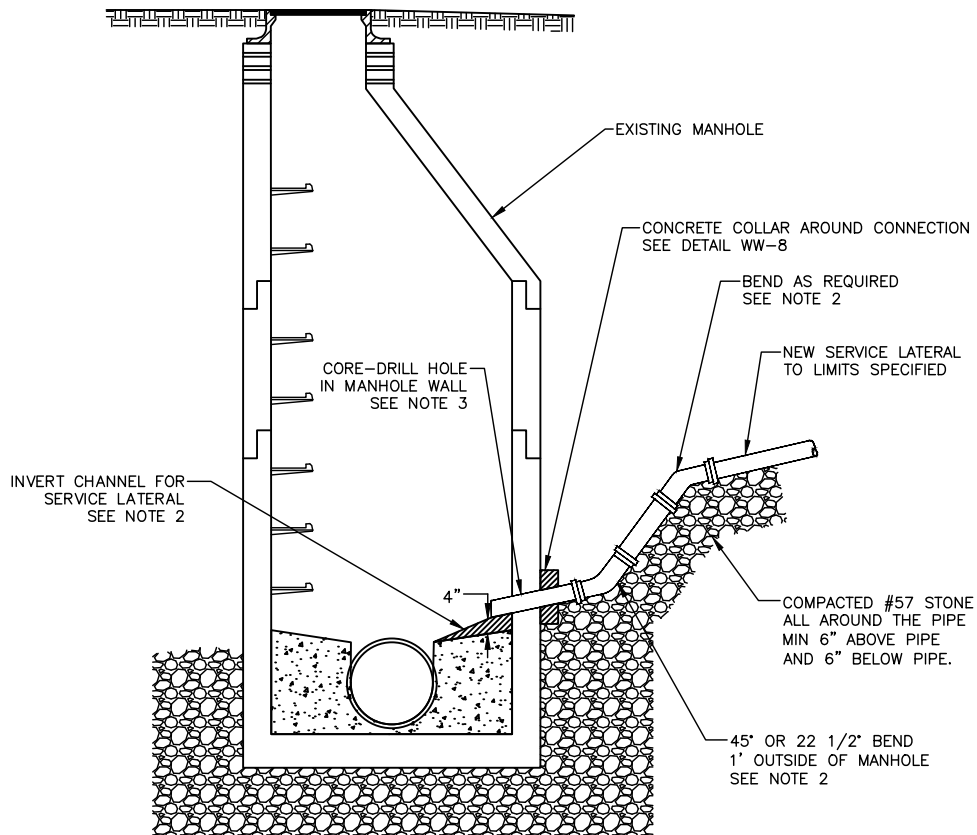
1. WHEN THE BUILDING SEWER IS EXTENDED FROM THE STUB OUT TO THE BUILDING DRAIN, THE BUILDING SEWER AND ITS APPURTENANCES SHALL BE PERMITTED THROUGH AND INSPECTED BY THE CITY OF GREER BUILDING CODES DIVISION (864-848-2175).
2. THE MINIMUM DIAMETER OF THE SERVICE CONNECTION STUB OUT SHALL BE MINIMUM FOUR (4)-INCH DIAMETER FOR SINGLE FAMILY RESIDENTIAL AND MINIMUM SIX (6)-INCH DIAMETER FOR COMMERCIAL AND MULTI-FAMILY DEVELOPMENT.
3. MINIMUM SLOPE OF THE SERVICE LATERAL IS 1.0%.
4. THE SERVICE CONNECTION STUB OUT AND ITS APPURTENANCES SHALL BE OF THE SAME MATERIAL AS THE GRAVITY SEWER LINE.
5. SERVICE CONNECTION SHALL BE MADE WITH ONE (1) WYE FITTING. THE LONG BRANCH OF THE WYE SHALL HAVE THE SAME INSIDE DIAMETER AS THE GRAVITY SEWER LINE.
6. THE WYE FITTING SHALL BE SET BETWEEN THE 10 AND 2 O'CLOCK POSITION ALONG THE GRAVITY SEWER LINE PIPE CIRCUMFERENCE.
7. NO BENDS GREATER THAN 45° SHALL BE USED IN SERVICE CONNECTION INSTALLATION.
8. NO ADDITIONAL BENDS SHALL BE USED TO ADJUST ALIGNMENT TO THE SEWER LINE SERVICE CONNECTION. THE SERVICE CONNECTION TO BE PERPENDICULAR TO THE PROPERTY LINE. MISALIGNED SERVICE CONNECTIONS ARE NOT PERMITTED.
9. SERVICE CONNECTIONS SHALL BE A MINIMUM OF THREE (3) FEET FROM PIPE JOINT OR MANHOLE, MEASURED FROM THE NEAREST EDGE OF THE WYE FITTING.
10. CONNECTIONS SHALL BE POSITIONED ALONG THE GRAVITY SEWER LINE TO PROVIDE AN INDIVIDUAL, SPEARATE, AND DIRECT CONNECTION FROM THE STRUCTURE TO THE GRAVITY SEWER LINE. CONNECTIONS SHALL NOT CROSS ADJACENT LOT PROPERTY LINES.
11. CLEANOUT FRAME AND COVER SHALL BE INSTALLED AT FINAL GRADE AND LOCATED AS SHOWN ON THIS DETAIL NO PORTION OF THE SEWER SERVICE CONNECTION LINE, THAT IS OWNED AND MAINTAINED BY GCPW, SHALL BE LOCATED WITHIN/UNDER/THROUGH A DRIVEWAY. CLEANOUT FRAME AND COVER SHALL BE SIGMA MB-344 CAST-IRON VALVE BOX WITH SEWER LID. A WATER METER WILL NOT BE SET IF THE CLEANOUT FRAME AND COVER ARE NOT INSTALLED.
12. IF A SEWER TAP NEEDS TO BE MADE, TAPPING SADDLE SHALL BE ROMAC INDUSTRIES TYPE CB SEWER SADDLE. HAMMER TAPS ARE PROHIBITED. EXISTING PIPE SHALL BE CORED. NEW SEWER TAP AND CLEANOUT FRAME AND COVER SHALL BE INSPECTED BY GCPW.
13. SERVICE CONNECTION SHALL BE PLUGGED TO PREVENT INFILTRATION AND SEDIMENTATION OF THE LINE.
14. CLEANOUTS SHALL BE PLACED AT A 75' MAX. SPACING AND AT A MINIMUM 5' FROM THE STRUCTURE ON THE PRIVATE PORTION OF THE SERVICE CONNECTION.
15. NO ADDITIONAL DISCHARGES (SUCH AS ROOF DRAINS, FLORIDA HEAT PUMPS, ETC.) SHALL BE ALLOWED INTO THE GRAVITY WASTEWATER LINE.
16. SERVICE CONNECTIONS SHALL NOT BE CONNECTED TO A NEWLY CONSTRUCTED GRAVITY SEWER LINE UNTIL A PERMIT TO OPERATE HAS BEEN ISSUED BY SCDES. CONTACT GCPW'S ENGINEERING AND PLANNING DEPARTMENT (864-848-5500) WITH ANY QUESTIONS.



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NEW SANITARY SEWER CLEANOUT / SERVICE CONNECTION TO NEW OR EXISTING GRAVITY LINE

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-14			



NOTES:

1. REFER TO THIS DETAIL WHEN INSTALLING NEW SERVICE LATERALS TO EXISTING MANHOLES.
2. ROUTE ALL SERVICE LATERALS BEING INSTALLED TO MANHOLES SUCH THAT THE SERVICE ENTERS THE MANHOLE FOUR (4) INCHES ABOVE THE TOP OF THE BENCH. CONTRACTOR SHALL USE BENDS AS NECESSARY. DROP PIPES INSIDE MANHOLES SHALL NOT BE ALLOWED.

FORM AN INVERT CHANNEL FOR THE SERVICE LATERAL USING MIN. 3500 PSI CONCRETE. THE WIDTH AND HEIGHT OF THE CHANNEL SHALL BE EQUAL TO SERVICE LATERAL DIAMETER. PROVIDE A SWEEP IN THE CHANNEL FOR A SMOOTH FLOW TRANSITION TO THE MAIN INVERT CHANNEL. THE CHANNEL SHALL BE SMOOTH, UNIFORM, FREE OF BURRS, AND CONSTANTLY SLOPING FROM THE INLET CONNECTION TO THE MAIN INVERT CHANNEL. THE SLOPING CHANNEL SHOWN IN THIS DETAIL IS THE CENTER OF THE INVERT CHANNEL.

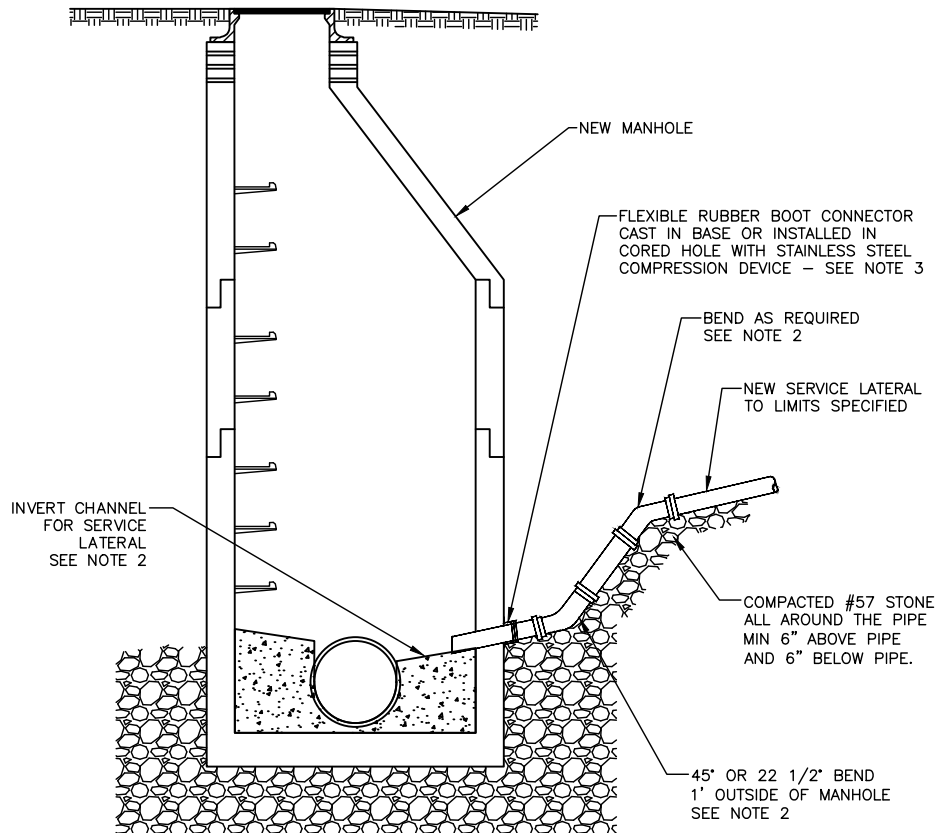
3. PROVIDE A WATERTIGHT SEAL AT THE PIPE CONNECTION USING NON-SHRINK GROUT. AS AN OPTION TO CORE DRILLING THE WALL, THE MANHOLE CAN BE PROVIDED WITH AN OPENING FOR THE LATERAL AND A FLEXIBLE RUBBER BOOT CONNECTOR CAN BE USED TO PROVIDE THE WATERTIGHT CONNECTION. IF A BOOT IS NOT USED, INSTALL A CONCRETE COLLAR AROUND THE PIPE CONNECTION PER DETAIL WW-8.



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0	3/4/2026	SHERER	FAHR	CRAWFORD
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**NEW SERVICE LATERAL TO
EXISTING MANHOLE**

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-15			



NOTES:

1. REFER TO THIS DETAIL WHEN INSTALLING NEW SERVICE LATERALS TO NEW MANHOLES.
2. ROUTE ALL NEW SERVICE LATERALS BEING INSTALLED TO NEW MANHOLES SUCH THAT THE SERVICE LATERAL CROWN ELEVATION MATCHES THE HIGHEST CROWN ELEVATION OF THE CONNECTING SEWER(S). CONTRACTOR SHALL USE BENDS AS NECESSARY. DROP PIPES INSIDE MANHOLES SHALL NOT BE ALLOWED.

THE INVERT CHANNEL FOR THE NEW LATERAL SHALL BE FORMED AND POURED AS PART OF THE MAIN PRECAST INVERT CHANNEL AND SHALL MEET ALL REQUIREMENTS SHOWN IN DETAIL WW-1.
3. IF THE HOLE FOR THE SERVICE LATERAL MUST BE CORE-DRILLED IN THE FIELD AND A FLEXIBLE RUBBER BOOT CONNECTOR CANNOT BE USED, REFER TO DETAIL WW-17 FOR REQUIREMENTS.



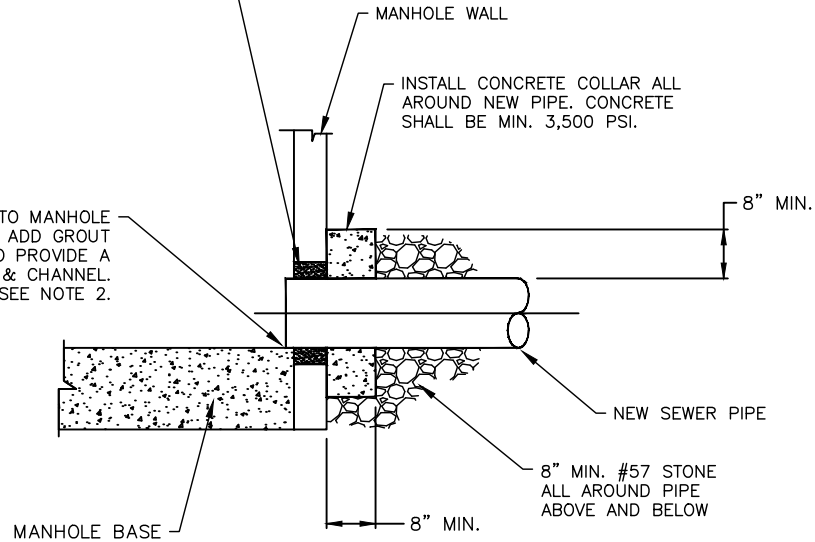
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0	3/4/2026	SHERER	FAHR	CRAWFORD
REVISED	BY	CHK'D	APPR.	

**NEW SERVICE LATERAL
TO NEW MANHOLE**

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-16			

CORE-DRILL HOLE IN WALL. OPENING TO BE TYPICALLY 1 PIPE DIAMETER LARGER THAN THE NEW SEWER. AFTER PIPE INSTALLATION, FILL VOIDS AROUND PIPE COMPLETELY WITH NON-SHRINK GROUT.

MATCH NEW PIPE TO MANHOLE INVERT ELEVATION. ADD GROUT AS NECESSARY TO PROVIDE A SMOOTH TRANSITION & CHANNEL. SEE NOTE 2.



NOTES:

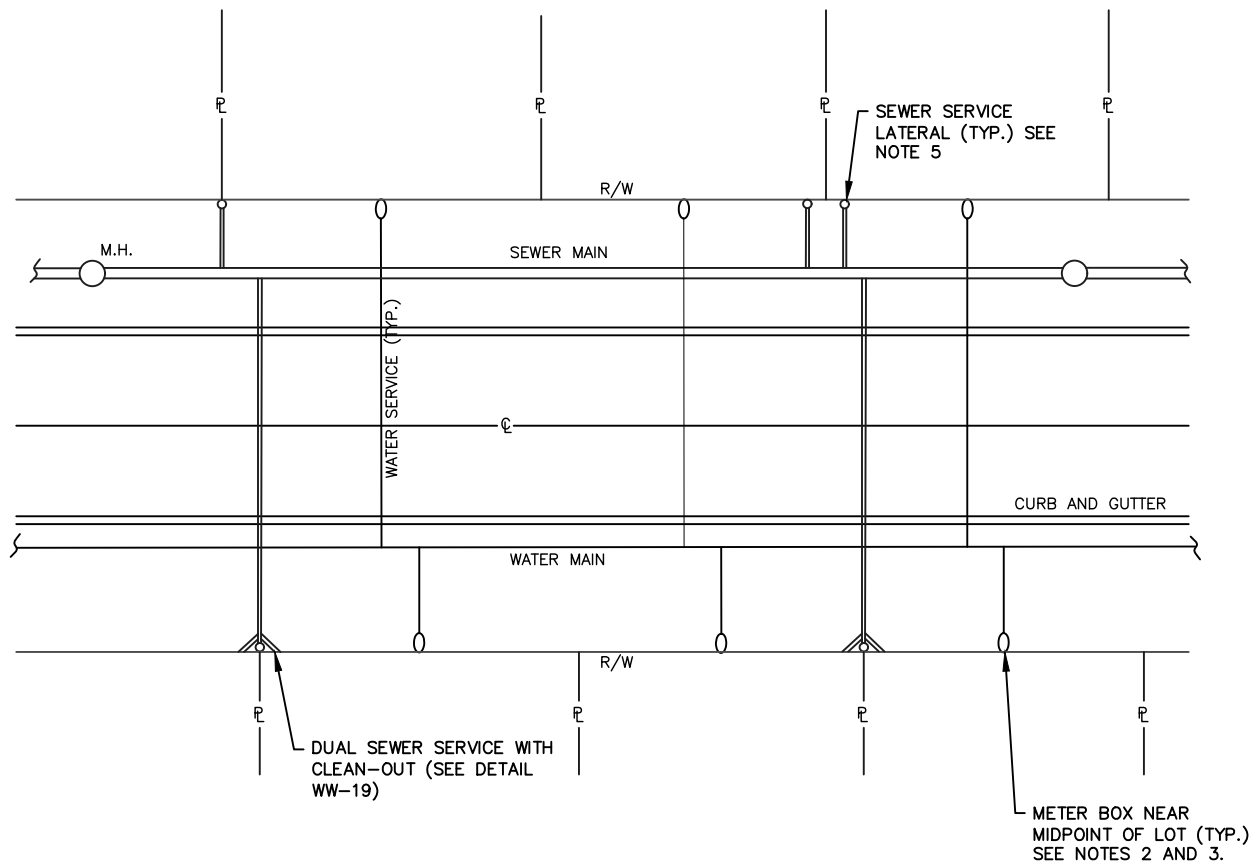
1. REFER TO THIS DETAIL WHEN CONNECTING NEW SEWER PIPES (INCLUDING SERVICE LATERALS) TO EXISTING MANHOLES OR NEW MANHOLES WHERE FLEXIBLE COUPLINGS ARE NOT USED.
2. THIS DETAIL DEPICTS THE NEW SEWER ENTERING AT THE EXISTING INVERT ELEVATION. THIS WILL NOT BE THE CASE FOR ALL MAIN SEWERS. PROVIDE A SMOOTH TRANSITION AND INVERT CHANNEL FOR ANY INCOMING ELEVATION PER DETAIL WW-1.
3. NEW SERVICE LATERALS WILL ENTER MANHOLES ON TOP OF THE BENCH. REFER TO DETAIL WW-15. PROVIDE AN INVERT CHANNEL ON THE BENCH PER DETAIL WW-15.



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0	3/4/2026	SHERER	FAHR	CRAWFORD
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**NEW SERVICE LATERAL
TO NEW MANHOLE**

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-17			



NOTES:

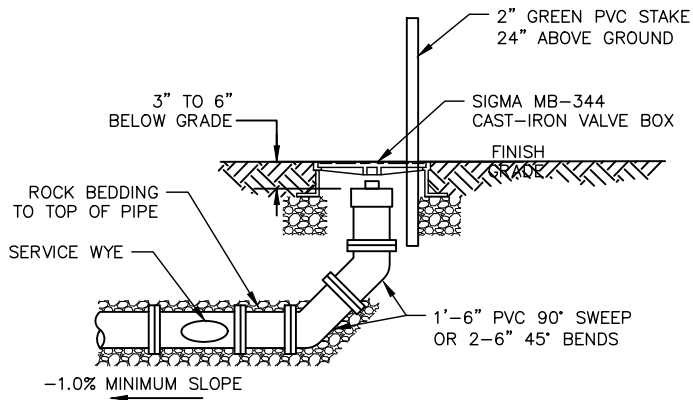
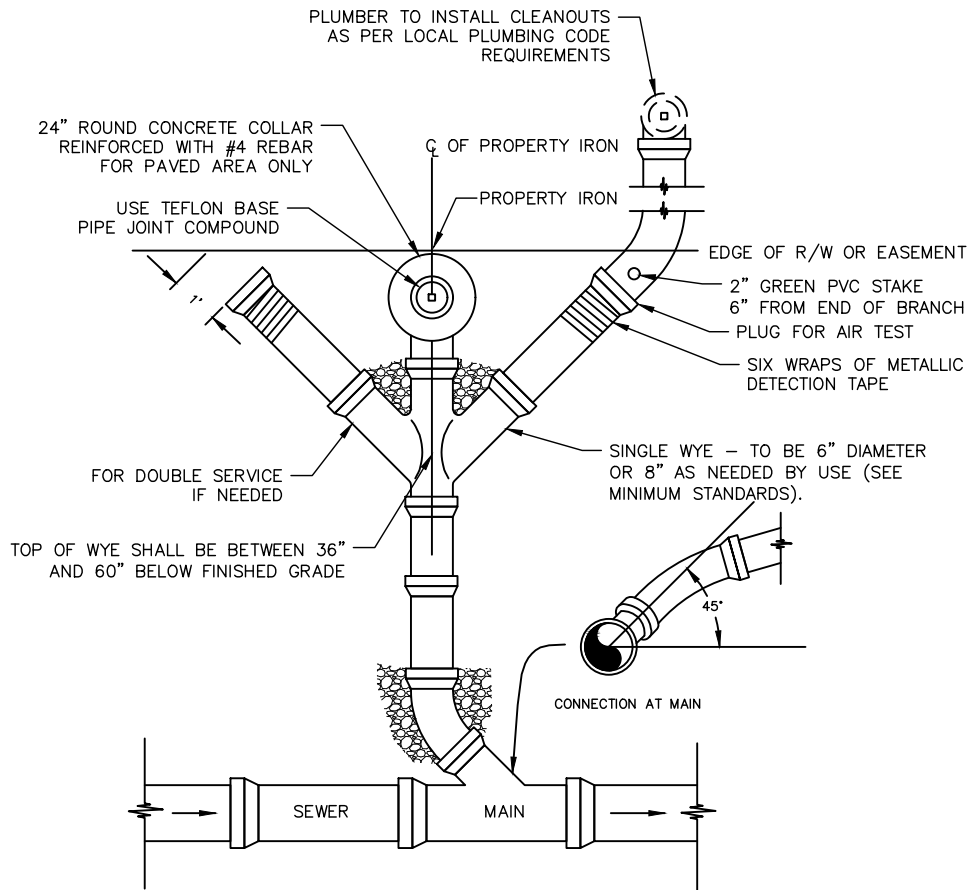
- 1) METER BOXES SHALL TYPICALLY BE SET PERPENDICULAR TO THE RIGHT-OF-WAY LINE OR PROPERTY LINE AS SHOWN.
- 2) METER BOXES SHALL BE INSTALLED OUTSIDE OF ANY PAVED SURFACE.
- 3) EXCEPTIONS TO NOTE 1 AND 2 MUST HAVE WRITTEN APPROVAL FROM GREER CPW.
- 4) FOR ADDITIONAL INFORMATION CONCERNING SERVICE LOCATIONS, REFER TO THE SERVICE DETAILS.
- 5) SEWER SERVICE LATERAL TO BE LOCATED MINIMUM 1'-0" TO MAXIMUM 4'-0" FROM PROPERTY LINE.



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0	3/4/2026	SHERER	FAHR	CRAWFORD
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TYPICAL SERVICE LAYOUT DETAIL

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-18			



CLEANOUT IN LANDSCAPED AREA

SERVICE NOTES:

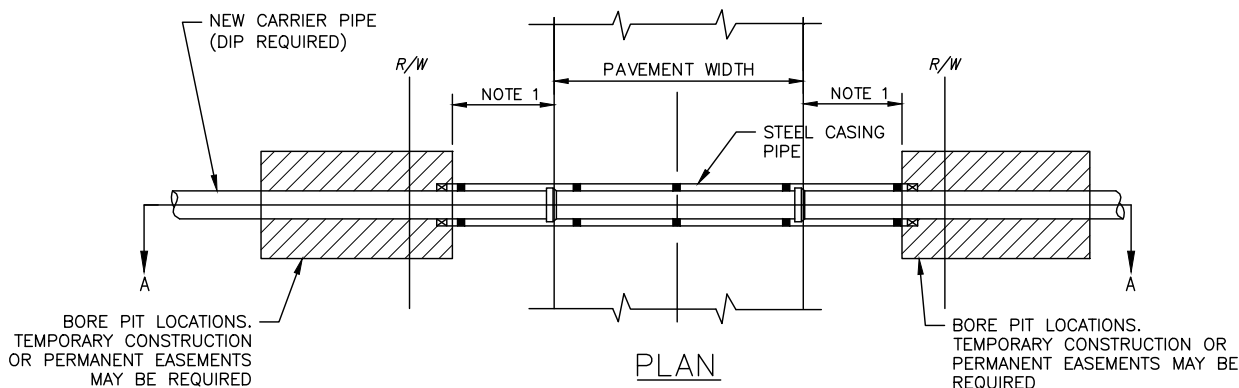
1. SERVICE LINE SHALL BE ON SUCH A GRADE THAT WILL PERMIT SERVICING OF THE PROPERTY. MINIMUM GRADE SHALL BE 1.0%; MAXIMUM GRADE SHALL BE 50%.
2. NO VERTICAL STACKING SHALL BE ALLOWED.
3. THIS DETAIL TO BE USED FOR STRUCTURES WITH 4' OR LESS "GREENSPACE" BETWEEN ADJACENT DRIVEWAYS.



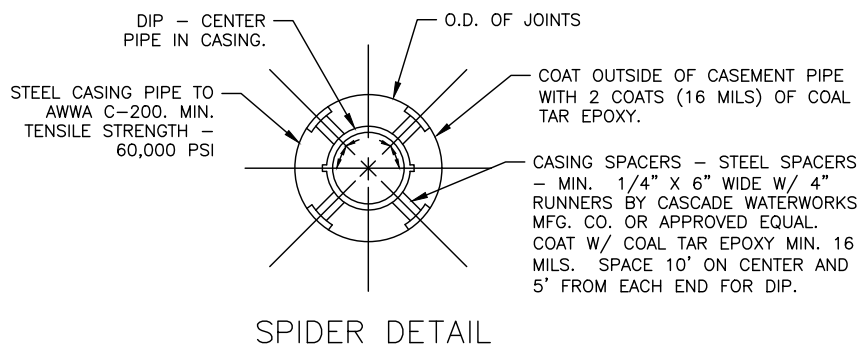
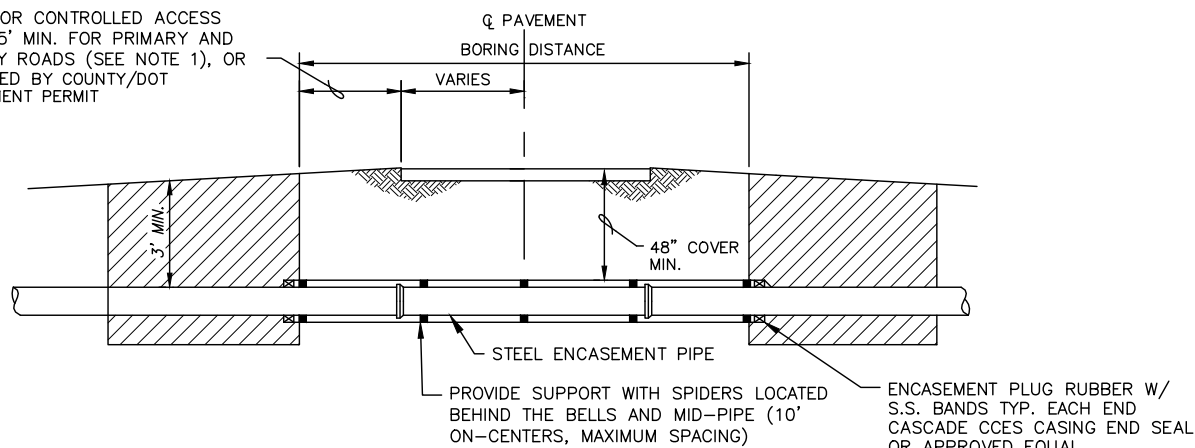
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0	3/4/2026	SHERER	FAHR	CRAWFORD
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DUAL SEWER SERVICE WITH CLEANOUT

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-19			



30" MIN. FOR CONTROLLED ACCESS ROADS & 5' MIN. FOR PRIMARY AND SECONDARY ROADS (SEE NOTE 1), OR AS REQUIRED BY COUNTY/DOT ENCROACHMENT PERMIT



MIN. STEEL CASING SCHEDULE

DIP WL SIZE	STEEL CASING SIZE	MINIMUM WALL THICKNESS
4"	10"	0.250"
6"	12"	0.250"
8"	16"	0.250"
10"	18"	0.250"
12"	24"	0.312"
14"	24"	0.312"
15"	26"	0.344"
16"	30"	0.406"
18"	30"	0.406"
20"	36"	0.469"
24"	42"	0.562"
30"	48"	0.562"
36"	54"	0.562"

NOTES:

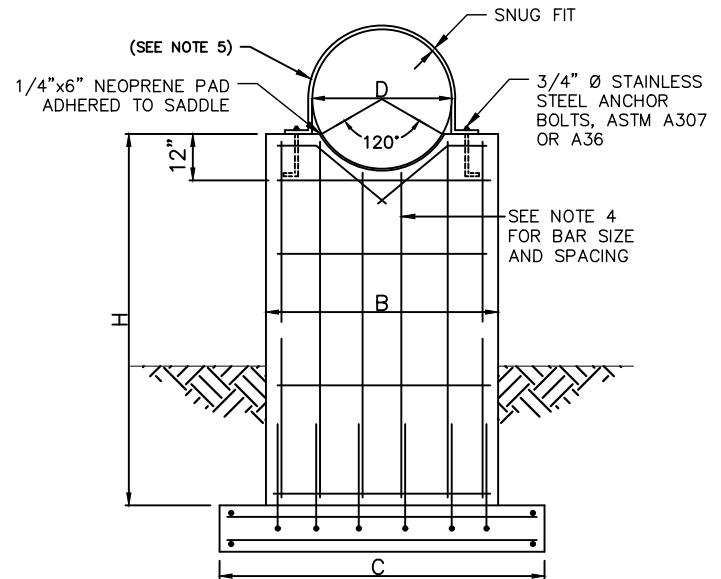
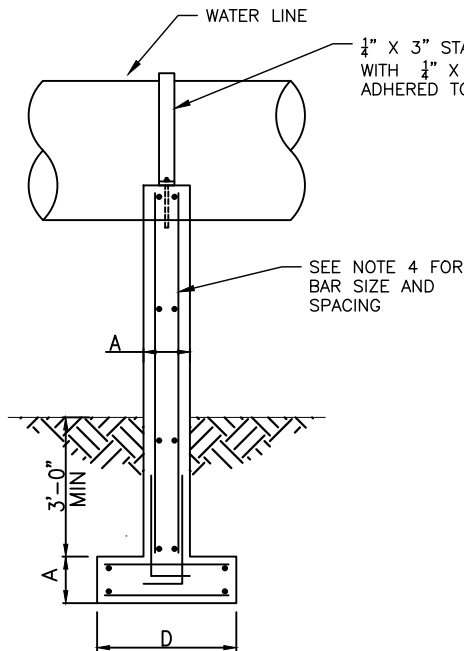
1. THE NEAR EDGE OF THE PIT CAN BE NO CLOSER TO THE EDGE OF THE TRAVELWAY THAN ITS DEPTH BELOW THE SURFACE OF THE TRAVELWAY UNLESS BULKHEADED.
2. ALL PIPE WITHIN AND TO 5' OUTSIDE THE CASING TO BE D.I.P.
3. ALL PIPING IN CASING SHALL UTILIZE LOCKING GASKETS SUPPLIED BY THE PIPE MANUFACTURER.



CASING PIPE BORE AND JACK DETAIL

3				
2				
1				
0	3/4/2026	SHERER	FAHR	CRAWFORD
REVISED	BY	CHK'D	APPR.	

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-20			



PIPE DIA. "D" (IN.)	"H" (FT.)	THICKNESS "A" (IN.)	PIER WIDTH "B" (FT.)	FOOTING LENGTH "C" (FT.)	FOOTING WIDTH "D" (FT.)
6-12	≤ 6	12	2'-4"	5'-6"	3'-0"
	8	12	2'-4"	6'-3"	3'-0"
	10	12	2'-4"	6'-8"	3'-0"
	12	12	2'-4"	7'-2"	3'-0"
14-20	≤ 6	12	3'-0"	8'-0"	3'-0"
	8	12	3'-0"	9'-0"	3'-0"
	10	12	3'-0"	9'-10"	3'-0"
	12	14	3'-0"	10'-6"	3'-0"
22-28	≤ 6	14	3'-8"	8'-9"	4'-0"
	8	14	3'-8"	10'-0"	4'-0"
	10	14	3'-8"	11'-0"	4'-0"
	12	14	3'-8"	11'-10"	4'-0"
30-36	≤ 6	18	4'-4"	9'-0"	4'-0"
	8	18	4'-4"	10'-6"	4'-0"
	10	18	4'-4"	11'-6"	4'-0"
	12	18	4'-4"	12'-4"	4'-0"
38-48	≤ 6	18	5'-4"	9'-6"	5'-0"
	8	18	5'-4"	11'-0"	5'-0"
	10	18	5'-4"	12'-0"	5'-0"
	12	18	5'-4"	12'-10"	5'-0"
51-56	≤ 6	18	6'-4"	9'-10"	5'-0"
	8	18	6'-4"	11'-4"	5'-0"
	10	18	6'-4"	12'-4"	5'-0"
	12	18	6'-4"	13'-2"	5'-0"

NOTES:

- SHALLOW FOUNDATION DESIGN SHOWN IN THIS DETAIL IS BASED ON THE FOLLOWING PARAMETERS:
 - ALLOWABLE SOIL BEARING CAPACITY = 2000 PSF
 - CONCRETE COMPRESSIVE STRENGTH = 4000 PSI
 - GRADE 60 REINFORCING STEEL
 - MAXIMUM STREAM VELOCITY = 10 FT/SEC
 - MAXIMUM SUPPORT HEIGHT (H) = 12'-0"

IF FIELD CONDITIONS REQUIRE ANY DEVIATION FROM THESE PARAMETERS, ENGINEER SHALL SUBMIT A PROJECT SPECIFIC FOUNDATION DESIGN FOR GREER CPW'S REVIEW.

- IF SUBGRADE AT LOCATION OF SUPPORTS IS DEEMED UNABLE TO WITHSTAND 2000 PSF BEARING PRESSURE, ENGINEER SHALL SUBMIT A PILE SUPPORTED FOUNDATION DESIGN, OR APPROVED ALTERNATIVES, FOR GREER CPW REVIEW.
- IF BEDROCK IS ENCOUNTERED WHICH WILL PREVENT 3-FOOT MINIMUM COVER OVER FOOTING, ENGINEER TO SUBMIT DESIGN, OR APPROVED ALTERNATIVE, FOR GREER CPW'S REVIEW.
- TWELVE-INCH AND FOURTEEN-INCH THICK PIERS AND FOOTINGS SHALL BE REINFORCED WITH #5 BARS AT 12 INCHES OC IN EACH DIRECTION ON EACH FACE. EIGHTEEN-INCH WIDE PIERS AND FOOTINGS SHALL BE REINFORCED WITH #7 BARS AT 12 INCHES OC IN EACH DIRECTION ON EACH FACE.
- EIGHTEEN-INCH THICK PIERS SHALL REQUIRE TWO STRAPS OVER THE PIPE INSTEAD OF ONE (AS SHOWN).
- CONCRETE SUPPORTS SHALL NOT BE LOCATED WITHIN A STREAM WITHOUT APPROVAL OF GREER CPW AND THE APPROPRIATE REGULATORY AGENCIES.
- MAXIMUM SPAN DISTANCE SHALL BE DETERMINED BY PROFESSIONAL ENGINEER AND SUBMITTED TO GCPW FOR INFORMATION.

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0	3/4/2026	SHERER	FAHR	CRAWFORD
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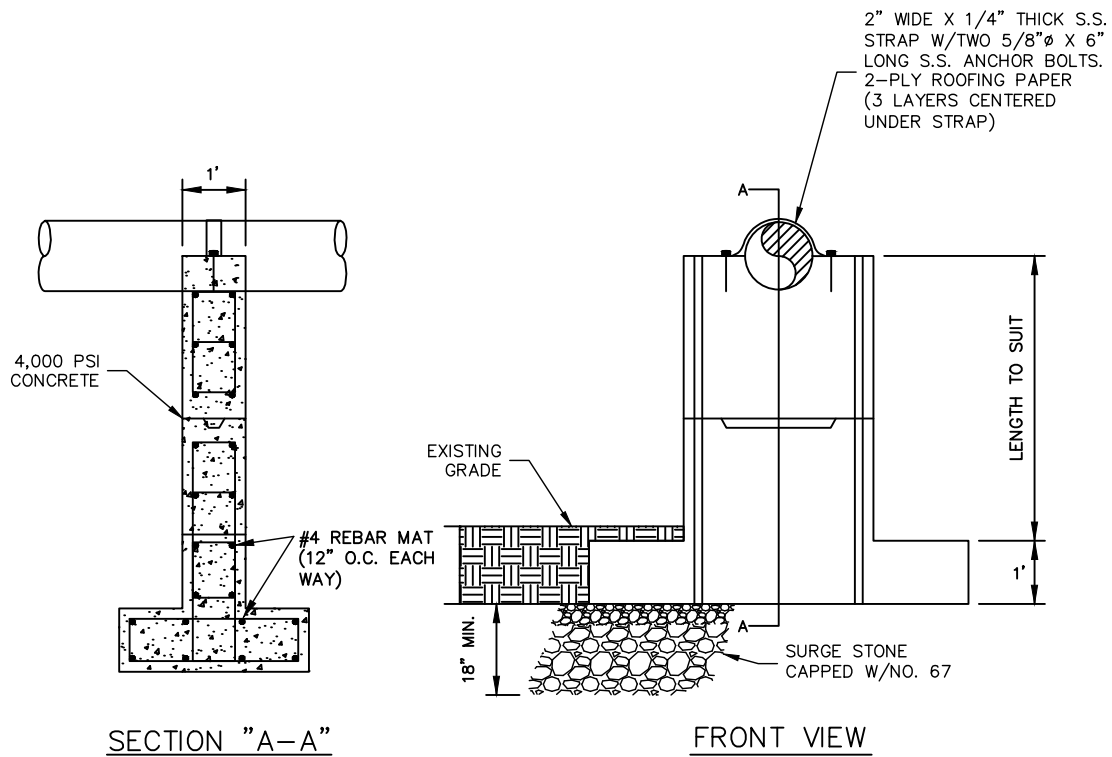
CASING PIPE BORE AND JACK DETAIL



WATER	ELECTRIC	WASTEWATER	GAS
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		X	
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WW-21



RISER SECTIONS MAY BE USED AS NEEDED. IF USED, THEY MUST BE CONNECTED W/ NO. 8 REBAR DOWEL THAT IS GROUTED IN PLACE WITH NON-SHRINK GROUT.

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0	3/4/2026	SHERER	FAHR	CRAWFORD
REVISED	BY	CHK'D	APPR.	

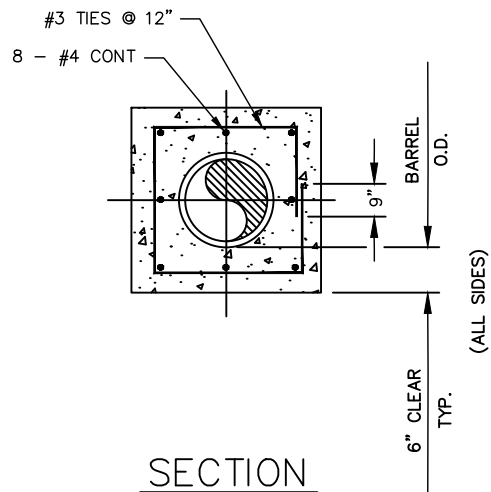
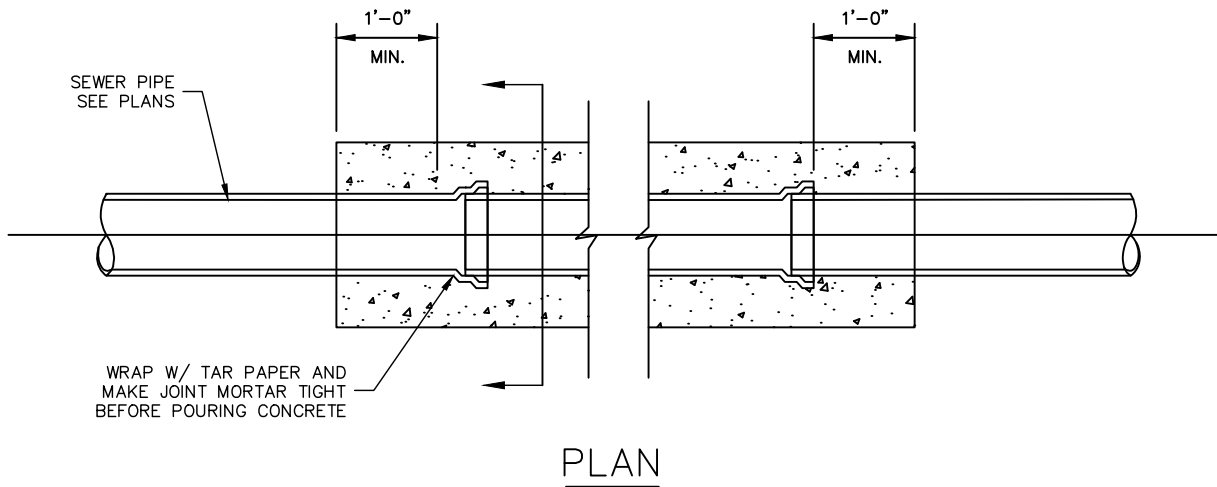
"SHORT" CONCRETE PIER DETAIL



WATER	ELECTRIC	WASTEWATER	GAS
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		X	
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WW-22



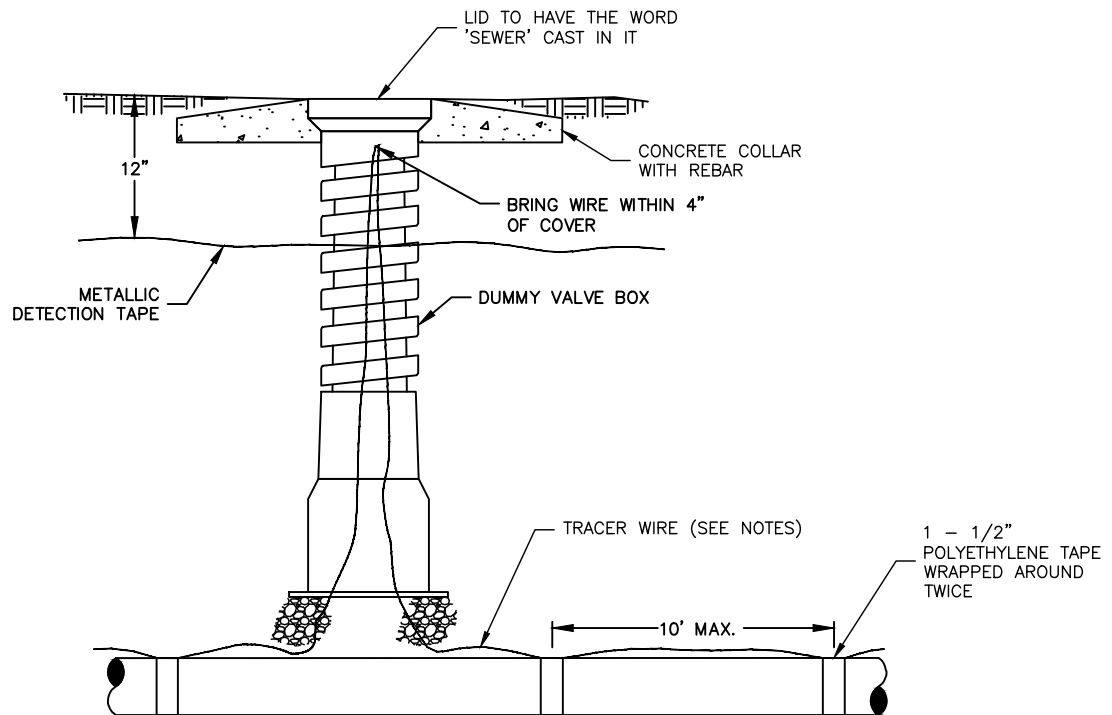
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0	3/4/2026	SHERER	FAHR	CRAWFORD
REVISED	BY	CHK'D	APPR.	

CONCRETE-ENCASED PIPE DETAIL

WATER	ELECTRIC	WASTEWATER	GAS
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		X	
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WW-23



NOTES:

- 1) OPEN CUT INSTALLATIONS WILL REQUIRE INSULATED 12 GAUGE COPPER WIRE.
- 2) TRENCHLESS INSTALLATIONS WILL REQUIRE INSULATED 10 GAUGE STAINLESS STEEL WIRE.
- 3) CONTRACTOR SHALL INSTALL DUMMY VALVE BOXES AT INTERVALS NO GREATER THAN 500 FEET, INCLUDING ONE AT THE PUMP STATION AND ONE AT THE DISCHARGE POINT.
- 4) REFER TO BEDDING DETAIL FOR ADDITIONAL INFORMATION.

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0	3/4/2026	SHERER	FAHR	CRAWFORD
REVISED	BY	CHK'D	APPR.	

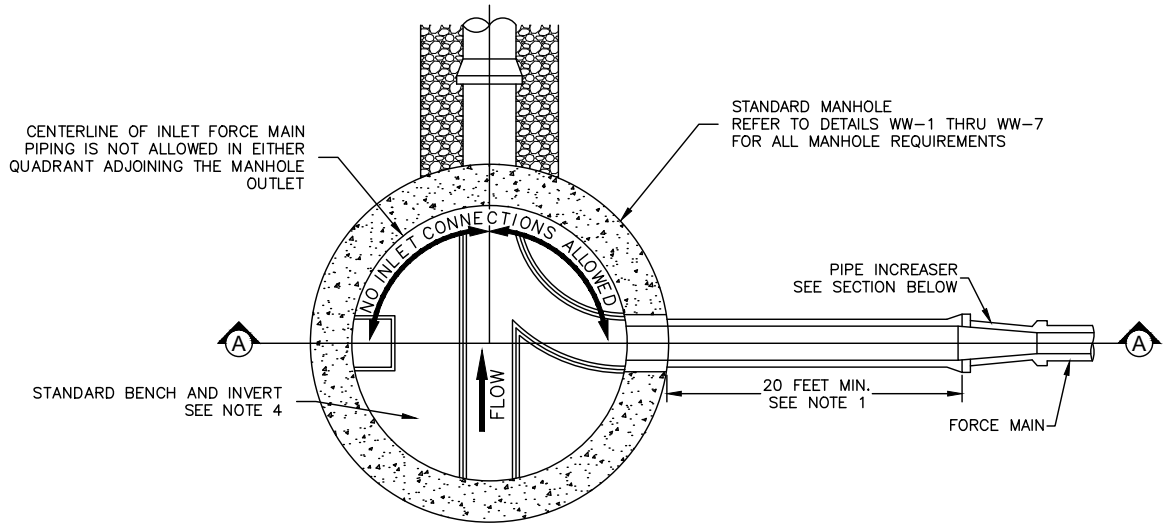
CONCRETE-ENCASED PIPE DETAIL



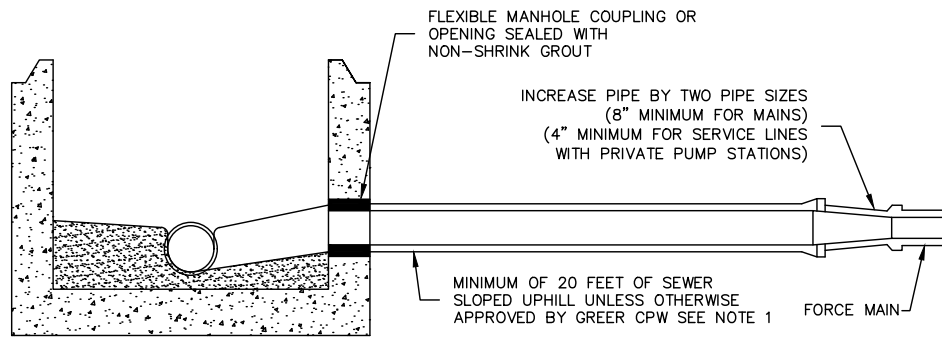
WATER	ELECTRIC	WASTEWATER	GAS
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		X	
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WW-24



SECTIONAL PLAN



SECTION A-A

NOTES:

1. THIS DETAIL DEPICTS THE TYPICAL ACCEPTABLE METHOD FOR CONNECTING FORCE MAINS TO EXISTING OR NEW MANHOLES ON THE GRAVITY PORTION OF THE SYSTEM. THE LAST 20 FEET (MINIMUM) OF SEWER (INCREASED 2 PIPE SIZES FROM THE FORCE MAIN DIAMETER) SHALL BE SLOPED UPHILL UNLESS OTHERWISE APPROVED BY GREER CPW. THE REVERSE-GRADE SLOPE SHALL BE DETERMINED BY THE ENGINEER WITH THE INTENT OF KEEPING THE FORCE MAIN FULL DURING ALL OPERATING CONDITIONS AND SLOWING THE WASTEWATER PRIOR TO ENTERING THE MANHOLE TO REDUCE TURBULENCE AND TO FACILITATE A SMOOTH, UNIFORM FLOW PASSING THROUGH THE MANHOLE AND JOINING ANY OTHER GRAVITY FLOW.
2. FOR SMALLER FORCE MAINS WITH LITTLE FLOW, IT MAY BE NECESSARY TO PROVIDE A POSITIVE SLOPE TO THE MANHOLE TO MAKE SURE THAT SOLIDS WILL PASS TO THE MANHOLE AND NOT SETTLE OUT. IN THESE CASES, THE ENGINEER SHALL PROVIDE GREER CPW WITH DETAILS OF THE DESIGN FOR REVIEW.
3. OTHER ALTERNATE DESIGNS FOR CONNECTING FORCE MAINS TO RECEIVING MANHOLES MAY BE SUBMITTED TO GREER CPW FOR REVIEW AND CONSIDERATION. ANY SUCH ALTERNATE SHALL MINIMIZE TURBULENCE THROUGH THE MANHOLE AND PROVIDE FOR A SMOOTH, UNIFORM FLOW PATH.
4. THE HEIGHT OF THE BENCHING SHALL BE INCREASED FROM THE SPECIFIED CROWN OF THE PIPE AS NECESSARY AND/OR AS REQUIRED BY GREER CPW TO KEEP ALL WASTEWATER IN THE INVERT CHANNEL AS IT PASSES THROUGH THE MANHOLE. THE HEIGHT OF THE BENCH/INVERT CHANNEL MAY HAVE TO BE UP TO 2 TIMES THE LARGEST PIPE CONNECTING TO THE MANHOLE.



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FORCE MAIN CONNECTION TO MANHOLE DETAIL

WATER	ELECTRIC	WASTEWATER	GAS
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WW-25			

WASTEWATER LIFT STATIONS

1. **SCOPE:** The following specification is intended for developer-engineered submersible pump stations with pump motors sized at 50 horsepower (HP) or less. The specifications in this document are required for all new developer-engineered pump stations that are intended for ownership to be conveyed to Greer Commission of Public Works (CPW). Any deviation from this standard without written authorization from Greer CPW may result in refusal of acceptance to take over ownership of the pump station. For pump stations requiring pumps with motors greater in size than 50 HP additional requirements, like Variable Frequency Drives (VFDs), will be considered on a case by case basis. Developer's Engineer shall contact Liftstations@greercpw.com with Greer CPW for additional pump station requirements. The Contractor shall provide the pumps, pump controls, and appurtenances as shown on the plans and as specified herein. The pumps and controls shall be furnished by one supplier. All materials and equipment shall be UL listed for its intended application in this project, including but not limited to all motor controls and operator control panels.
2. **MATERIALS:**
 - A) **Pumps**
 - 1) Three (3) raw wastewater submersible pumps shall be provided (two installed, one spare delivered to Greer CPW at the Maple Creek Wastewater Treatment Plant located at 650 Gilliam Rd., Greer SC), complete with motors, controls, and all appurtenances. All pumps in a station shall be by one manufacturer. The controls shall be provided by the pump manufacturer or the controls to be used must be approved by the pump manufacturer. The Developer's Engineer shall specify the exact pumps, including make and model, with the motor horsepower clearly denoted on their drawings. The pumps shall conform to the following:
 - a. Pump shall be Sulzer submersible grinder/non-clog pumps or Flygt pumps with motors designed and manufactured to convey raw unscreened wastewater. Any pumps that are not Sulzer or Flygt require approval by Greer CPW prior to inclusion in project drawings or specifications. The developer's engineer is responsible for contacting Greer CPW for approval. The pumps shall be suitable for the physical and chemical properties of the wastewater conveyed.
 - i. If Sulzer submersible pumps are utilized, Contractor is to provide a macerator which shall be housed in a separate vault immediately upstream of the wet well with shall have hatches that meet the specifications outlined in Section 2.B.1)b).
 - b. Each pump (three (3) required) shall have the same necessary characteristics to meet the design criteria and the following must be clearly denoted on the Developer's engineered drawings:
 - Pump shall be capable of delivering the specified GPM at the specified total dynamic head as shown on the Plans. The # of GPM at the # feet of head (TDH) shall be clear noted on developer's engineer drawings.
 - Overall minimum efficiency of ##% at above conditions.
 - Maximum pump speed of [###]RPM.
 - Minimum [##]mm by [##] mm solids passage.
 - Minimum motor efficiency [##]%.
 - Minimum L10 bearing life shall be 50,000 hours at any point along the usable portion of the pump curve at maximum motor speed.
 - c. **Volute/Casing and Impeller:** All major parts of the pumping units including the volute, impeller motor frame and discharge elbow shall be constructed of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The volute shall be of non-concentric design with smooth passages large enough to pass minimum 3-inch solids or larger solids that may enter the impeller. All exposed bolts and nuts shall be stainless steel or brass. All metal surfaces coming into contact with the wastewater, unless stainless steel or brass, shall be protected by a factory applied spray coating of alkyd dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump and motor. The impellers shall be dynamically balanced. The impellers design must have a long throughlet without acute turns. Impellers shall be keyed to the shaft. All units shall be equipped with a replaceable 304 stainless steel ware ring.
 - d. **Pump Design:** Pump design shall allow the pump to be automatically and firmly connected to the discharge elbow, guided stainless steel guide bar(s) extended from the top of the station to the discharge elbow. There shall be no need for personnel to enter the wet well. No portion of the pump shall bear directly on the sump floor.

								
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LIFT STATION SPECIFICATIONS

- e) Pump Seal: Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an oil reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate.
- f) Motor: Motors shall be 460/480-volt, 3-phase, 60 Hz, induction type with a squirrel cage rotor, shell type design, housed in an air-filled, watertight chamber. The motor shall be designed for continuous service while submerged in wastewater. The stator windings and stator leads shall be insulated with moisture resistance Class F insulation rated for 155°C. The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into stator housing. The motor shall have copper windings and cast iron construction. Motor horsepower shall be selected to ensure non-overloading performance at any point along the pump curve. Maximum motor speed shall be RPM as determined by Developer's Engineer, with a 1.15 safety factor. Motor nominal power factor is to be not less than 85%.
- g) Motor and Detector Cables: Motor and detector cables shall be suitable for submersible pump applications. Cable entry shall be composed of a one piece, vulcanized, three-way mechanical sealing connector with a thickly molded shoulder with increasing cable diameters to resist fatigue from bending forces. The cable entrance shall also incorporate a limited tightening plate with built in strain relief. The cable entry shall prevent water from leaking into the motor due to capillary action even if cable is cut or damaged.
- h) Temperature Protection: A thermostat shall be mounted in each motor to detect temperature. If the pump motor temperature should rise to a level which could cause damage, the thermostat shall cause the motor starter to drop out and cause the pump failure amber light to come on. The pump shall remain locked out until the pump has cooled and the circuit has been manually reset. Automatic Reset is not acceptable.
- i) Moisture Detection System: An electrical probe shall be provided in a moisture sensing chamber for detecting the presence of water. A solid-state device mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe. If, due to mechanical seal failure, water enters the sensing chamber, the probe shall send a low voltage, low amperage signal to the control panel and cause the pump to be shut down. Systems utilizing float switches, dual probes, or any other monitoring devices located solely in the stator housing are not considered to be early warning systems and shall not be considered equal. The moisture sensing chamber shall have a drain/inspection plug with a positive anti-leak seal, which is easily accessible from the outside of the pump. Moisture detection shall cause the pump failure amber light on the control panel to come on.
- j) Lifting Chain: Each pump shall have a stainless steel lifting chain system for retrieving the pump without entering the wet well. This system shall be a "GRIP-EYE" system by Flygt or equal. Any pump stations with pumps of 50 HP (or greater), or have a pump assembly with a weight of greater than 1,250 lbs, are required to have a hoist and mono-rail system. Please contact Greer CPW for additional specifications.
- k) Guiderails: Guiderails shall be Schedule 40 stainless steel pipe to pump manufacturer's recommendations.

B. Wet Well & Valve Vault

- 1) Precast wet wells shall be constructed conforming to ASTM C-478. Joints shall be made to receive rubber gasket, butyl mastic rope sealer, and a non-shrink type grout especially made for this purpose. Solid concrete fillets shall be poured to create a sump in which the pump sits. These fillets shall be in accordance with standard details as far as height and slope but shall be oriented in relation to the pump installation requirements. Wet well bottom shall be integrally cast with extended base and walls shall conform to ASTM C-478 or to minimum dimensions shown on the drawings. Wet well & valve vault tops shall be cast with access doors and pipe penetrations. All exposed concrete finishes for the valve vault and wet well shall be uniform and finished to a light brush finish after all patchwork is completed. The wet well shall be installed plumb.
- a) Wet well supplier shall design manhole sections to resist earth loads and to resist uplift resulting from buoyant forces calculated with groundwater table at finished grades. Wall and/or base dimension shall be increased accordingly.

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LIFT STATION SPECIFICATIONS

			
WATER	ELECTRIC	WASTEWATER	GAS
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WW-27			

- b) Wet well & valve vault access doors shall be as manufactured by US Foundry or approved equal. Door leafs shall be ¼" thick aluminum floor plate reinforced to 300 pounds per square foot live load. The frames shall be extruded aluminum with an integral anchor flange and seat. The hatches shall be equipped with a flush aluminum drop handle which does not protrude above the cover and an automatic hold open arm with red vinyl grip on a release handle. Hinges shall be all stainless steel with tamper-proof stainless steel bolts and nuts, and be removable for maintenance after the hatches are in place. For security, the hatches shall be equipped with a staple for padlock and stainless steel compression springs and torsion bars for easy opening. Hatches shall be furnished with mill finish. Hatches shall be equipped with orange double safety grates for fall protection. Fall protection grating at wet well shall be hinged on opposite side of pump slide rails. The access hatches shall be provided to the precaster for installation in the concrete top slabs as shown on the plans. Contractor shall ensure sizes and placement are compatible with pumping equipment provided.

2) Wet Well Coating

- a) Greer CPW will consider wet well coating on a case-by-case basis. greer cpw retains the right to require wet well coating in cases where it believes that corrosion protection may be an issue. All materials are subject to review and approval by Greer CPW.

C. Piping, Valves & Appurtenances

- 1) All piping inside the wet well and through the valve vault shall be flanged ductile iron pipe with 300 series stainless steel nuts and bolts. There shall be a flexible restrained joint between the wet well and valve vault to prevent damage from differential settlement.
- 2) Valve Vault Drain Piping
 - a) The valve vault shall have a drain piped back to the wet well to prevent water from collecting in the valve vault. This drain line shall have a Red Valve Tideflex check valve, or approved equal, installed on the wet well end, which will prevent the backflow of wastewater from the wet well to the valve vault.
- 3) By-Pass Pumping Valves and Piping
 - a) A vertical plug valve and cam-lock fitting shall be provided in the valve vault between the manifold tee and horizontal plug valve to provide an isolated connection from the force main for by-pass pumping purposes.
- 4) Pressure Gauge
 - a) A single 0-100 psi pressure gauge with 'Red Valve' pressure isolation sensor shall be installed in the valve vault on one of the discharge lines between the plug valve and the manifold tee. The pressure range on the gauge shall be of an appropriate range given the expected range of the pressures to be seen from the pump station.
- 5) Plug Valves
 - a) Plug valves shall be of the non-lubricated, eccentric type with resilient faced plugs suitable for use with sewage and shall be for direct bury where shown. Port areas shall be at least 80% of full pipe area. Bodies shall be cast iron. Valves shall have stainless steel permanently lubricated upper and lower plug stem bushings. All 4-inch and larger valves shall be of the bolted bonnet design. All nuts, bolts, springs, and washers shall be stainless steel. Flanged valves shall be faced and drilled to ANSI 125 lb. standard. Mechanical joint ends shall be used below grade and flanged ends above grade. Plug facing and packing materials shall be as recommended by valve manufacturer for domestic wastewater and domestic wastewater sludge service.
 - i. Plug valves shall be as manufactured by DeZurik PEC or equal.
 - ii. For buried plug valves 8-inch and larger, use geared operator suitable for direct bury, unless otherwise noted.
- 6) Check Valves
 - a) Check valves, 4-inch and larger, shall be cast iron body, resilient seat, swing check type suitable for use with sewage at pressures up to 200 psi minimum. Valves shall have outside lever and spring operation to provide full seating during low back pressure operation. Flanges shall be faced and drilled to ANSI 125 lb standard.



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LIFT STATION SPECIFICATIONS

WATER	ELECTRIC	WASTEWATER	GAS
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WW-28			

7) Surge Relief Valve (as needed)

- a) Surge relief valve shall be installed on the force main piping as shown on the construction drawings. This unit shall be of a "wye" (globe) body pattern configuration specifically designed for sewage service. The normally closed valve shall open when the line pressure exceeds the spring adjustment setting. The open stroke shall be limited to that which is necessary to provide protection against pressure exceeding the spring setting. The valve shall close at a slow speed controlled by adjustable self-contained oil cushion chamber that is provided with the surge relief valve.
 - i. The valve disc shall have resilient replaceable seat firmly held in place by a bronze or stainless steel ring fastened to the disc with screws. When line pressures are below the spring setting, the valve shall provide drop tight closure.
 - ii. The valve disc shall be guided throughout its movement and provide full opening of the pipeline area when required.
 - iii. The sewage surge relief valve shall be as manufactured by Golden Anderson (GA Industries, Fig. 626-D, 3" size) or approved equal.

8) Combination Sewage Air Release and Vacuum Valves

- a) Combination sewage air release and vacuum valves shall be installed on the high points of the force main at locations shown on the drawings. This combination air release and vacuum valve system shall perform the function of small orifice air release valve as well as a large orifice air release and vacuum valve.
 - a. Combination sewage air release and vacuum valves shall be as manufactured by A.R.I. Stainless Steel (Model No. D- 020 or D-025), or approved equal, as specified on the drawings.

9) Rain Gauge

- a) A rain gauge shall be installed on the site using a mounting base attachment for a pole or post. Sensor type will be a tipping bucket with magnetic switch.
 - i. MODEL: Davis Instruments Model # 6465 with Mountable Base and designed with new AeroCone design or approved equal.

3) ELECTRICAL EQUIPMENT AND CONTROLS:

A. Controls

- 1) Controls shall be provided with the pumps and shall be coordinated with the pump manufacturer to meet the requirements herein. Service requirements for controls shall be as stated in Section 8.4 below. The pump control panel shall include: a main breaker (fused disconnects are not allowed) for the power supply to the control panel, a starter for each pump circuit, breakers for auxiliary equipment, liquid level controller, communications device, and all items required for a complete system to operate on 460/480-volt, 60 Hz, 3-phase power. The system shall be complete, requiring only connection of power wiring, motor wiring, liquid level control wiring for float switches, and communications wiring.

B. Liquid Level Controls

1) Equipment

- a. Float Switch System
 - i. The float switch system shall be Roto-Floats (Type S) by Anchor Scientific.
- b. Float Rack and Hanger
 - ii. The float rack and hanger shall be stainless steel.



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LIFT STATION SPECIFICATIONS

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WW-29			

7) Surge Relief Valve (as needed)

- a) Surge relief valve shall be installed on the force main piping as shown on the construction drawings. This unit shall be of a "wye" (globe) body pattern configuration specifically designed for sewage service. The normally closed valve shall open when the line pressure exceeds the spring adjustment setting. The open stroke shall be limited to that which is necessary to provide protection against pressure exceeding the spring setting. The valve shall close at a slow speed controlled by adjustable self-contained oil cushion chamber that is provided with the surge relief valve.
 - i. The valve disc shall have resilient replaceable seat firmly held in place by a bronze or stainless steel ring fastened to the disc with screws. When line pressures are below the spring setting, the valve shall provide drop tight closure.
 - ii. The valve disc shall be guided throughout its movement and provide full opening of the pipeline area when required.
 - iii. The sewage surge relief valve shall be as manufactured by Golden Anderson (GA Industries, Fig. 626-D, 3" size) or approved equal.

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- a) Combination sewage air release and vacuum valves shall be installed on the high points of the force main at locations shown on the drawings. This combination air release and vacuum valve system shall perform the function of small orifice air release valve as well as a large orifice air release and vacuum valve.
 - a. Combination sewage air release and vacuum valves shall be as manufactured by A.R.I. Stainless Steel (Model No. D- 020 or D-025), or approved equal, as specified on the drawings.

9) Rain Gauge

- a) A rain gauge shall be installed on the site using a mounting base attachment for a pole or post. Sensor type will be a tipping bucket with magnetic switch.
 - i. MODEL: Davis Instruments Model # 6465 with Mountable Base and designed with new AeroCone design or approved equal.

3) ELECTRICAL EQUIPMENT AND CONTROLS:

A. Controls

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B. Liquid Level Controls

1) Equipment

- a. Float Switch System
 - i. The float switch system shall be Roto-Floats (Type S) by Anchor Scientific.
- b. Float Rack and Hanger
 - ii. The float rack and hanger shall be stainless steel.



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LIFT STATION SPECIFICATIONS

WATER	ELECTRIC	WASTEWATER	GAS
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WW-30			

(Cont'd from Section 3.0 - Electrical Equipment and Controls)

D. Components

- 1) Components of the control panel shall include the starters for both pumps, a step-down transformer sufficiently sized to provide control power to the control panel, time meters, and a phase monitor.
 - a. Motor Starters
 - i. A motor starter for each pump shall be across the line and included in the pump control panel. Each starter shall be NEMA-rated, solid-state, and shall limit starting current to 200% full load currents. The starters shall have overload protection and under voltage release for all three phases. Overload reset buttons shall be located on the face of the pump control panel to permit reset without opening the pump control panel. Overloads shall have visual trip indication. Short circuit protection shall be provided with distribution type circuit breakers in the electrical equipment enclosure.
 - b. Transformer
 - i. A suitable transformer shall be provided in the pump control panel to provide single phase power for the control panel and all devices within the panel. The transformer shall be a Square D Mini-Power Zone Package Power Supply or approved equal.
 - c. Time Meters
 - i. Elapsed time meters (six-digit non-reset type) shall be connected to each motor to record total running time for each pump in hours and tenths of an hour. Meters shall be mounted on the face of the pump control panel.
 - d. Phase Monitor
 - i. Pump controls shall include continuous power phase monitoring that will stop the pumps and activate the communications device in the case of losing one phase of power.
 - e. Flow Metering
 - i. A flow meter shall be installed at the inlet piping of the station and shall be a clamp on type. The flow meter shall be a Pulsar Transit Time Flow Meter.

E. Wiring, Design, Workmanship, and Wiring Diagrams

- 1) Wiring, design, workmanship, and wiring diagrams of the control panel shall be in compliance with standards and specifications of the Joint Industrial Council (JIC), National Machine Tool Builders Association (NMTBA), and National Electric Code (NEC). All wiring shall be color coded and a minimum 14 gauge in the panel. Control wires in the panel shall be bundled and tied with bundles flexible at the hinged side of the enclosure to allow the door(s) to open fully. All wires, connections and terminal strips shall be numbered and identified on the wiring shop drawings and service manuals. Internal components shall be identified by nameplates. Exterior controls, switches, indicators and components shall be permanently identified with engraved plastic nameplates. This panel shall be constructed and labeled as having been constructed in accordance with Underwriters Laboratories (UL) standards. The control panel design shall consist of electro-mechanical devices and not a solid-state card type design.

F. Control Panel Enclosure

- 1) The control panel enclosure shall be a NEMA 4X (stainless steel) having a plain front door with an interior hinged stainless steel door. All switches, lights, meters and controls shall be mounted on the interior door. Control compartments shall be removable from panels on which components are mounted. Back panels shall be secured to the enclosure with collar studs. All control units and wiring shall be accessible from the operator side (front) of the panel. No rear or side access shall be required for component access or maintenance. The back panel within the enclosure shall be stainless steel. The high-level alarm light and horn as described herein shall be mounted on the exterior. The control panel enclosure door shall be latched with a single handle.

G. Electrical Conduit

- 1) All above grade electrical conduit must be galvanized metal to a depth of 12 inches below grade.

H. Control Panel Sun Shield

- 1) A sun shield shall be provided for the control panel.



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LIFT STATION SPECIFICATIONS

WATER	ELECTRIC	WASTEWATER	GAS
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WW-31			

(Cont'd from Section 3.0 - Electrical Equipment and Controls)

- I. Control Panel Light
 - 1) A 24-inch fluorescent light shall be installed in the control panel with an on/off switch.
- J. Control Panel Heater
 - 1) A control panel heater with thermostat shall be provided in the control panel to control moisture and minimize corrosion.
- K. Control Panel Ventilation Blower
 - 1) A control panel ventilation blower shall be provided in the control panel to prevent the overheating of components inside the control panel.
- L. Communication Device
 - 1) The communications device shall be a High Tide Technologies (HTT) Model Gen 2 self-contained device that will receive input data from digital sensors and transmits that data either through a low-Earth orbit satellite (LEO) network or available GSM cellular directly to the High Tide Technologies server. The transmitted information is checked for alarms and stored in a historical database. The system shall be programmed to call Greer CPW Operations personnel if any of the alarm conditions are activated. This device shall be mounted in the pump station control panel.
- M. Lightning Protection
 - 1) The control panel shall be provided with a lightning arrestor (rack mounted) to protect the full station. This equipment shall be manufactured by Eaton designed to protect this equipment against the damaging effects of lightning, utility switching, switching power sources, etc. The lightning arrestor unit shall come equipped with an integral circuit breaker.
- N. Transient Voltage Surge Suppressor
 - 1) The contractor shall supply and install, either in the control panel or as a NEMA 4X rack mountable unit, a transient voltage surge suppression unit. This equipment shall be a Square D Model SDSA3650. This unit shall be installed on the commercial power feed between the fused disconnect and automatic transfer switch.
- O. Power Phase Monitor
 - 1) The primary power to the pump control panel shall be monitored by a Diversified Electronics (DE) power phase monitor. If there is a loss of phase, both pumps shall be automatically turned "Off" until power is restored either from commercial or standby source.



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LIFT STATION SPECIFICATIONS

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4. EMERGENCY AND STANDBY POWER SYSTEMS:

A. General Requirements

- 1) A backup operations system is to be installed at all proposed Pump Station Sites. Either a standby pump system or generator shall be provided at the station which shall be adequate to continuously operate all equipment at the site in the event of the loss of the primary power source. The backup operations system will be coordinated with and approved by Greer CPW and shall be proposed based on Greer CPW's preference as follows. The backup operations system shall have a minimum of 5 feet of clearance in all directions per the standards detailed in this Submersible Pumping Station Section. A service disconnect shall be provided between the backup operations system and the power source. Detail Drawings provided for the backup operations system must show all relevant details for proper installation including but not limited to pad, anchoring, and interconnections. The backup operations system shall be programmed to automatically start and run for one hour each week at a time to be determined by Greer CPW. The backup operations system shall be equipped with an Automatic Transfer Switch in accordance with Section B below.
 - i. The preferred backup operation system is natural gas-powered standby pumps.
 - a. The developer's engineered drawings shall note that the contractor building the pump station is responsible for all natural gas line plumbing from the natural gas meter into the site or equipment.
 - ii. If natural gas-powered standby pumps are not feasible, the secondary preference is diesel-powered standby pumps.
 - iii. If neither standby pump option is feasible for the station, a generator will be allowed. The generator is preferred to be powered by natural gas and shall be manufactured by Cummins, Kohler, Caterpillar, or a Greer CPW approved equal.
 - a. The developer's engineered drawings shall note that the contractor building the pump station is responsible for all natural gas line plumbing from the natural gas meter into the site or equipment.

B. Automatic Transfer Switch

- 1) The automatic transfer switch shall be an ASCO 300.

5. WARRANTIES:

A. Pump Warranty

- 1) The pump manufacturer shall warrant the pumps to be supplied to Greer CPW for a period of five (5) years under normal use. The warranty period shall start from the date of initial operation by the equipment representative, as described under Service below. The warranty must include 100% coverage of the manufacturer's shop labor and parts including seals for five (5) years (non-prorated) from startup.

B. Other

- 1) All other mechanical and electrical equipment, piping, valves, and other pump station components shall be warranted for a period of one (1) year, unless otherwise noted.



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LIFT STATION SPECIFICATIONS

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WW-33			

6. PUMP STATION SITE DESIGN

A. Access Road and Pump Station Site

- 1) The pump station shall be located on a tract of land with an assigned address or easement properly deeded and recorded to Greer CPW.
 - a. The station site (not including roadway/access) shall be a minimum of 50 ft by 50 ft.
- 2) Paving
 - a. Paved areas shall be finished with a minimum of 6 inches (compacted depth) of crusher run stone and 2 inches of surface courses asphalt pavement.
 - b. A turnaround shall be constructed adjacent to and outside the fence with a minimum turning radius of 30 feet and a minimum depth of 35 feet.
 - c. The pump station site, turnaround, and access road shall be paved as specified above. The pump station site shall be paved 1 foot outside the fence, and sloped ¼ inch per foot from the center outward.
- 3) Access
 - a. The pump station site shall be designed such that a minimum of 5 feet of clearance is provided between the fence and the wet well, valve vault, poles, generator, control panels and any other above ground equipment. If an ARV or other additional equipment is required at the Pump Station Site such that the minimum clearance is not feasible within the typical 50-FT x 50-FT Pump Station Site, final spacing of equipment is to be coordinated with and approved by Greer CPW.

B. Security

- 1) Lighting
 - a. An outside weatherproof 20-FT pole-mounted light with a 160W LED light head, shall be provided. The light shall be located appropriately to direct light towards the wet well and valve vault. The light shall operate by photocell with an HOA. control switch capable of over-riding the photocell.
- 2) Signage
 - a. A weather resistant sign with a 24-hour emergency telephone number shall be provided in accordance with SCDES requirements and located at a conspicuous point on the fence gate. Greer CPW will provide the signage.
- 3) Fencing (Class A)
 - a. Scope: This section includes furnishing all labor, materials, and equipment for installing all fences shown on the drawings or specified herein. It is the Developer's responsibility to ensure the fencing conforms to any County/City requirements. If the County/City requires any fencing material or style not found in this document, the Developer is responsible for notifying Liftstations@greercpw.com and working with Greer CPW staff to determine acceptable fencing prior to construction.
 - b. Fabric shall be black vinyl coated chain link type, 6 feet high, of number 9 copper bearing steel wire, 2-inch mesh, twisted and barbed selvages, and thoroughly galvanized after weaving and coated with black vinyl coating. Three strands of barbed wire shall be installed on the top of the fence and gates. It shall be 4-point pattern composed of two strands of No. 12 gauge galvanized wire.
 - c. Line Posts shall be 2" O.D. black vinyl coated galvanized standard pipe weighing 3.65 pounds per foot, or black vinyl coated hot-dip galvanized 2" x 2- 1/4" "H" column weighing 4.1 pounds per foot, carbon content 0.35%. End, corner, gate and pull posts shall be black vinyl coated hot-dip galvanized 3" O.D., weighing 5.79 pounds per foot, except double gate posts shall be 4" O.D., weighing 9.11 pounds per foot. Posts shall not be spaced farther apart than 10-foot centers. Posts shall be set in 9-inch diameter hole 36 inches deep with hole filled with concrete.



3					LIFT STATION SPECIFICATIONS	WATER	ELECTRIC	WASTEWATER	GAS
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(Cont'd from Section 6.3.B - Pump Station Design - Security - Fencing)

- d. Extension Arms shall be black vinyl coated hot-dip galvanized pressed steel for line posts and malleable iron for corner posts; each arm to carry three barbed wires at an angle of 45 degrees, and extending one foot (vertically) above the fabric. Angle shall project out from the site.
 - e. Top Rail shall be black vinyl coated hot-dip galvanized 1-5/8" O.D. pipe, weighing 2.27 pounds per foot and shall be provided with couplings every 20 feet. Coupling shall be outside sleeve type. Top rail shall pass through base of line post tops to form a continuous brace from end to end of each stretch of fence.
 - f. Braces shall be black vinyl coated hot-dip galvanized of same material as top rail and spaced one foot below top rail. Braces are to extend from terminal, end, corner or gate post to first line post. Braces shall be trussed from line post to terminal post with 3/8" round rod.
 - g. Gate Frames shall be 2" O.D. black vinyl coated hot-dip galvanized pipe, weighing 2.72 pounds per foot. Fabric shall be same as in fence and shall be securely attached to the frame. Gates shall be furnished with malleable iron ball and socket hinges, stops, center rest catch for double gates, locking device, and padlock.
 - h. Double-swing gates shall have a minimum clear opening of 24 feet.
 - i. Where applicable, a black vinyl coated second gate shall be installed in the fence in cases where Greer CPW's pump station adjoins its right-of-way in the rear, allowing it an additional point of access for its right-of-way.
 - j. A gate and fencing (up to 1 ft from edge of R/W) shall extend across the drive way or access road at the point of entry from public roadway, with gates that are lockable and have a duck bill style gate holdback installed. Access shall be restricted to Greer CPW staff and/or entities (power company, water company, etc.) requiring access. No public or neighborhood access is allowed. This gate is to prevent public parking or overflow parking from the neighborhood that would impede Greer CPW staff's access to the site.
- C. Water Service
- 1) In areas where potable water is available, the station shall be furnished with a ¾" water service and freeze-proof yard hydrant. A double-check valve backflow prevention device as listed on SCDHEC's approved list of backflow prevention devices is required. This shall be located within the fenced station enclosure and supplied with a strainer screen, heating element, and an insulated cover anchored with stainless steel hardware. Yard hydrants shall be mounted 30-inches high, frost-proof and equipped with stems and seat washers that are removable through the top of the hydrant. Operating rod shall be brass. The yard hydrant shall be installed complete with washed stone drain bed of at least 1 cubic foot and an 18-inch square concrete splash pad.
- D. Hoist
- 1) The following hoist specification is intended for submersible pumping stations with pump motors sized at 50 horsepower (HP) or less. For pump stations requiring pumps with motors greater in size than 50 HP, Developer's Engineer shall contact Liftstations@greercpw.com with Greer CPW to coordinate structural design of hoist system. An electric motor driven winch hoist capable of both vertical (hoisting) and horizontal (rotational) movement shall be provided and located to service both pumps. The hoist shall be a cable type having a fabricated steel support frame. It shall have a minimum capacity as required by the pump provider and suitable for the specified pumps. The cable end shall be fitted with a grab hook to properly connect to the lifting chain which is attached to the pump-motor combination. Accommodations for any power requirements for the hoist shall be met as part of the Pump Station's electrical design.
 - a. For any pump assemblies with an aggregate weight greater than 1250 lbs, a monorail system with electric hoist is required and should be included in the developer's engineer drawings. This will require seal and signature by a South Carolina licensed structural engineer.

									
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(Cont'd from Section 6 - Pump Station Design)

E. Canopy Shelter

- 1) Scope: A canopy shelter shall be provided over the electrical/control equipment rack in order to provide Greer CPW maintenance personnel ability to access the rack for the reasons of repairs or maintenance free from precipitation.
- 2) Dimensions: The canopy shelter shall be a minimum of 8 feet deep with a minimum clearance of 2 feet beyond the clearance of opened panel doors on the equipment rack. The shelter shall extend 1 foot beyond the ends of the equipment rack on both ends. The shelter shall have a minimum 8 feet clear headroom underneath to clear the control panel top by a minimum of 18 inches.
- 3) Specifications and Installation: Canopy Shelter shall be specified and installed by Greer Awning or Greenville Awning.
- 4) Materials
 - a. The shelter shall have four (4) posts located at each corner. These posts shall be Schedule 40 galvanized steel posts with a minimum 4-inch diameter, set in a minimum 18" of concrete.
 - b. The shelter roof shall be an aluminum awning to cover the entire concrete pad. The roof shall be a single-pitched, flat top configuration, with slope towards the backside of the equipment rack (fence side).
- 5) Lighting: Four (4) LED strip fixtures, sealed and gasketed, (IP66 rated / IEC 60529 Standard) shall be mounted to the underside of the awning with 316 stainless steel hardware /fasteners. Two (2) fixtures shall be mounted in front of the control panel and two (2) fixtures shall be mounted in the rear in front of the electrical rack.

F. Odor Control

- 1) Greer CPW will consider odor control systems on a case-by-case basis. If a developer or owner of a development wishes to install an odor control system at a pump station, they shall contact Greer CPW to discuss the need and type of equipment. Greer CPW also retains the right to require an odor control system in cases where it believes that odor or corrosion protection of the downstream force main and manholes may be an issue. All equipment is subject to review and approval by Greer CPW.
 - a. Controls
 - i. All stations (including those without an odor control system) shall include in their control systems an additional contact closure to run an odor control system when the pump runs.
 - b. Piping
 - i. All stations shall make appropriate piping accommodations for future odor control system installations even in the event that they are not initially installed.
 - c. Site Provisions
 - i. All stations shall make appropriate site layout accommodations for future odor control system installations even in the event that they are not initially installed.



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7. QUALITY ASSURANCE AND QUALITY CONTROL

A. Shop Drawings and Operations & Maintenance (O&M) Manuals

1) Shop Drawings

- a. Shop drawings shall be submitted for review and shall include complete data to show function, physical description and compliance with the Plans and Specifications, including outline drawings showing equipment and shipping dimensions and weights, location of accessories, and clearances required; wiring and schematic diagrams including accessories, spare parts list, materials, written functional control description, functional control schematic, description of all components, characteristic pump curves and motor efficiency rating. Any changes to structures and other features which are necessary to accommodate the equipment supplied by the Contractor shall be clearly shown on the submittal and marked as a change.

2) O&M Manuals

- a. Service manuals shall be furnished for each type of equipment specified in this section. Manual shall contain a description of equipment, complete accessory and parts list, and complete installation, operation and maintenance instructions. Four copies of manual shall be submitted for review. After review of manual, three additional copies shall be furnished.

B. Pump Testing

1) Factory Testing

- a. Testing shall be performed by the pump manufacturer prior to shipping. Each pump shall be tested at the manufacturer's testing facility in accordance with the latest code of the Hydraulic Institute to determine the actual head versus capacity and kilowatt draw required. Certified pump curves shall be submitted to the Engineer in triplicate. Results of the tests shall be approved by the Engineer prior to shipment and shall be maintained as part of the construction record documentation.
- b. If construction of lift station is delayed or halted for a period of 6 months or greater, the developer and/or their contractor is responsible for the following:
 - i. Notifying Greer CPW of the delay at Liftstations@greercpw.com
 - ii. Any cost associated with the Pump manufacturer either sending a representative to check the pumps for degradation or sending the pumps back to the manufacturer to check the pumps for degradation. Failure to provide a successful confirmation by manufacturer this may result in commissioning delays or refusal to accept the lift station.

3) Drawdown Testing

- a. Following installation, each pump in the pump station shall be subjected to drawdown and "shut-off" head tests to verify that pump performance meets the design criteria with a full, operational force main. Surge pressure will also be measured. These tests shall be performed in the presence of an authorized Greer CPW representative and in conjunction with other instrumentation and control testing. The results shall be maintained as part of the construction record documentation.

2) Electrical & Control System Testing

- a. As mentioned above, electrical and control system testing shall be conducted in conjunction with the field drawdown testing. The Contractor shall be responsible for simulating the level controls to confirm proper operation of the Pump Off, Lead Pump On, Lag Pump On, and High-Water controls. Contractor shall also confirm the alternation of the Lead pump. Pumps shall be checked for Manual and Auto mode. Contractor shall simulate an alarm condition to confirm the operation of the visual, audible, and autodialer alarms. Contractor shall verify the proper time delays between pump starts and adjust as necessary. Contractor shall also verify that the emergency backup power systems are functioning correctly. The lights (area, canopy and control panel) and hoist shall be tested to confirm proper operation.



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WW-37			

C. Service

- 1) The Contractor shall provide for the services of a qualified service representative to include startup services and operation-maintenance instruction. The manufacturer shall provide detailed instructions for the proper installation of equipment and the Contractor shall furnish two complete copies of the installation and startup manual to the Engineer prior to installation of the pumps, controls, and accessories. The manufacturer's representative shall provide the necessary time required to insure proper installation, startup, and instruction. Service shall be not less than two (2) 8-hour days, exclusive of travel time to and from the project site and divided into two (2) trips to the site. The first trip shall be for final inspection, minor adjustments, initial operation services and initial instruction. The second trip about 30 days later, shall be for final adjustments and follow-up operating instructions. The Greer CPW staff and Developer's Engineer shall be notified 48 hours in advance of each trip. Service and startup shall be coordinated so that pump and controls service personnel are on the job together.

D. Spare Parts

1) Mechanical

- a. The pump manufacturer shall furnish a third pump as a spare as noted in Section 2.0 above. The manufacturer is to furnish all recommended spare parts including, at a minimum, one hydraulic kit, one mechanical seal, and profile gaskets or discharge bracket o-ring. The spare parts shall be provided by startup date. Spare parts shall be provided in original packaging in factory new condition.

2) Electrical

- a. The manufacturer is to furnish a list of all recommended spare parts including at a minimum two sets of fuses, indicator lamps and gaskets. The spare parts shall be provided, together with service manuals, prior to startup date.



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LIFT STATION SPECIFICATIONS

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8. SUBMITTALS

A. Submittals for Plan Review

- 1) Submittals for plan review shall include detailed drawings as specified herein and design calculations. Design calculations shall include flow calculations, pump cycle time calculations, pump on/off and alarm level, anti-flotation calculations, and system curve showing operating point efficiency, and required brake horsepower.

B. Pump Station Design Submittal Checklist

- 1) See the attached Pump Station Design Submittal Checklist sheet.

C. Shop Drawing Submittal List

- 1) Three sets of shop drawings for Greer CPW, plus additional copies for the Engineer and the Contractor, shall be submitted for review and approval prior to manufacture, fabrication and construction. The shop drawings shall include the following at a minimum:
 - a. Pumps
 - b. All electrical components
 - c. Control panel
 - d. Generator / transfer switch
 - e. Valve vault / Wetwell
 - f. Level control, alarm, and communication devices
 - g. Auxiliary equipment
 - h. Certified factory test and characteristic curves showing field performance for each pump and a pump curve / system curve with beginning and end of life operating points
 - i. Wiring and schematic diagrams including accessories
 - j. Force main piping, valves and appurtenances
 - k. Spare parts list
 - l. Awning
 - m. Security Light with Pole with a HOA Control Switch

B. Operations and Maintenance Manuals

- 1) An O&M Manual shall be prepared for each pump station and three copies submitted to Greer CPW for review within 14 days of startup date. After approval, three copies and a bookmarked and indexed PDF file on an electronic file that reflect any changes during construction shall be provided by the startup date, along with the spare parts specified elsewhere. O&M Manuals shall contain the following information, at a minimum:
 - a. Approved shop drawings, including design data for all installed equipment and each major component.
 - b. Control panel wiring diagrams and a reduced set of station / force main plans.
 - c. Warranty information for all installed equipment and each major component.
 - d. Inventory, functional descriptions, and complete operating instructions for all installed equipment and each major component, including all valves.
 - e. Instructions for startup / shut-down as well as for calibration and adjustment of all installed equipment and each major component.
 - f. Recommended maintenance plan, including preventative and predictive maintenance, for all installed equipment and each major component including odor control.
 - g. Contingency plan and analysis of critical safety issues.
 - h. Contact information for local parts suppliers and service companies as well as instructions for replacement of all installed equipment and each major component.
 - i. Contact information for local contractors capable of performing emergency repairs.
 - j. Factory startup report.



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LIFT STATION SPECIFICATIONS

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WW-39			

PUMP STATION DESIGN SUBMITTAL CHECKLIST

The design submittal checklist includes, but is not necessarily limited to, the following items:

- _____ 1. Wet well is properly sized for 4 - 8 cycles per hour at design flow.
- _____ 2. Wet well is designed to resist buoyant force, if applicable.
- _____ 3. Pipe, valves and fittings meet Greer CPW specifications.
- _____ 4. All ductile iron piping is minimum Class 350.
- _____ 5. Guide rails and lifting cable or chain and cable hanger are stainless steel.
- _____ 6. All mounting hardware, flange bolts and hardware mounting bolts are stainless steel.
- _____ 7. The site layout provides adequate clearance between the wet well and the control panels and the wet well and the generator.
- _____ 8. The wet well and valve vault hatches are of adequate size for entry, valve operation, and force main bypass connection.
- _____ 9. The wet well and valve vault hatches are of adequate size for equipment removal.
- _____ 10. 1,500 lb (min) electric winch hoist is provided with 115 volt weatherproof electrical outlet within 8 feet, with adequate footing.
- _____ 11. All power and control panels are housed in stainless steel NEMA 4X enclosures.
- _____ 12. The support structure for power and control panels is stainless steel channel sections.
- _____ 13. Adequate area lighting is provided.
- _____ 14. Adequate enclosure fence is provided w/minimum 24' wide gate and adequate clearance between fence and equipment.
- _____ 15. Adequate access road, turn-around, pavement, and drainage.
- _____ 16. Adequate canopy shelter over electrical/control panel equipment rack is provided.
- _____ 17. Water service is provided with meter, backflow preventer, and yard hydrant.
- _____ 18. Pump station odor control system space, piping and electrical accommodations provided.
- _____ 19. Pump station odor control system provided (as needed).
- _____ 20. Wet well has a ductile iron screened vent.
- _____ 21. Wet well coating provided (as needed).
- _____ 22. The force main drawings include a plan and profile view with maximum scales of 1" = 10' vertical and 1" = 50' horizontal.
- _____ 23. Downstream odor control and line coating provided (as needed).
- _____ 24. Pump station site is above 100-year flood elevation.

PUMP STATION STANDARD DETAILS

- 1. Pump Station Layout
- 2. Wet Well / Valve Vault Plan Detail
- 3. Wet Well / Valve Vault Profile Detail
- 4. Wet Well / Valve Vault Hatch Location Detail
- 5. Pumps & Control, Hatch & Electrical Conduit Notes
- 6. Transformer & Engine/Generator Pad Details
- 7. Hose Bib Detail
- 8. Double Check Valve Assembly Detail

END OF SECTION



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LIFT STATION SPECIFICATIONS

WATER	ELECTRIC	WASTEWATER	GAS
		X	
WW-40			

Appendix A - Vendor List ¹

Engineering Firms:

Garver Engineering

Derek Scott
Email: jdscott@garverusa.com
Phone: 864-979-5131

GMC

John Raiford
Email: John.Raiford@gmcnetwork.com
Office Phone: 864-527-0460

KCI

Matt Broderick
Email: Matthew.Broderick@kci.com
Office Phone: 864-714-1291

Construction Contractors:

Bowen Utilities

Mark Bowen
Phone: 706-491-7135

JL Construction

Langston Corn
Email: Langston@jlconstructioncompany.com
Phone: 864-608-9660

Long & Sons Utilities

Trent Long
Email: atlong@long-sons.com
Phone : 864-967-2813

Reeves & Young

Matt McCormack
Email: MMcCormack@reevesyoung.com
Phone: 678-288-2063

Pump Reps:

Flygt Pumps

Brian Moore
Email: Brian.Moore@xylem.com
Phone: 979-220-3999

Godwin Pumps

Robert "Bobby" Landwher
Phone: 910-263-9866

Sulzer (AVS)

Chris Caldwell (Pete Duty & Associates)
Email: Chris@petedutysc.com
Phone: 864-918-1619

¹. This list is provided as a recommendation only and is listed alphabetically. Greer CPW does not make any warranty or guarantee of the vendors work or acceptance thereof by providing this list.



3					LIFT STATION SPECIFICATIONS	WATER	ELECTRIC	WASTEWATER	GAS
2									
1								X	
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