

CITY OF BENTONVILLE

WATER UTILITIES DEPARTMENT SPECIFICATIONS

Water Utilities Department - (479) 271-3140

Wastewater Treatment - (479) 271-3160

Fire Department - (479) 271-3151

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CITY OF BENTONVILLE
WATER UTILITIES
1000 SW 14TH STREET
(3200 SW MUNICIPAL DR)
BENTONVILLE, AR 72712

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Appendix A Detailed Drawings

BENTONVILLE WATER UTILITIES CONSTRUCTION SPECIFICATIONS

SECTION 1 GENERAL INFORMATION

1.1 ALL MATERIALS SHALL BE DOMESTICALLY MADE

Any deviation to require DEPARTMENT approval, and certificate(s) of materials origin shall be provided at the pre-construction meeting.

1.2 The intent of this publication is to simplify and expedite the process of water and sewer construction within the jurisdiction of the City of Bentonville. This publication specifically applies, but is not limited to "Subdivision" and "Large Scale Development". All rules and regulations set forth by the ADH - Division of Engineering, shall be the minimum standard of all construction and development practices to be approved by the Bentonville Water Utilities. In such case as the standard specifications herein set forth exceeds the Arkansas Department of Heath specifications, this document as approved by the City Council of Bentonville, Arkansas shall govern.

1.3 These general and detailed specifications shall govern the handling and installation of pipe and appurtenances for the City of Bentonville Water Utilities. Specifications stipulate general requirements for the preparation of reports, plans, specifications, methods of construction, inspection, testing, and final approval of any proposed water and/or sanitary sewer lines, appurtenances, or other structures that are within the jurisdiction of Bentonville Water Utilities. Any requested deviation from the specifications herein set forth, shall be reviewed on a case-by-case basis by the DEPARTMENT and approved or denied by written authorization of the MANAGER.

1.4 Special conditions may arise on projects that are not covered in these specifications or that may require special handling. In case of such special conditions, complete detail as to materials, method of construction or other procedures shall be submitted to the Bentonville Water Utilities for review and approval. Standard construction details are incorporated and made a part of the specifications and shall become a part of the standard requirements for water line, sewer line and lift station construction. The standard details are included in these appendices at the back of these specifications. Where reference is made to a particular industry specification (ASTM, etc) it is hereby understood that reference is made to the latest specification revision in effect.

1.5 These specifications are intended to set forth minimum standards of quality for the construction of water and sewer facilities which are to be accepted by the Bentonville Water Utilities. These specifications do not replace the ENGINEERS specifications and contract documents; however, construction of all water and sewer facilities must meet these standards of quality as a minimum. The Bentonville Water Utilities shall not be responsible nor shall it bear any liability for CONTRACTOR'S means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, nor shall the Bentonville Water Utilities be responsible for any actions resulting from direction of the project by a City of Bentonville ENGINEER/INSPECTOR. The Bentonville Water Utilities shall not be responsible for the acts or omissions of the CONTRACTOR, Sub-Contractor, supplier, or of any other person or organization performing or furnishing any of the work. Nothing contained in these specifications shall be construed as an endorsement or warranty by the Bentonville Water Utilities of any product, material, or workmanship. The Bentonville Water Utilities shall not be responsible nor shall it bear any liability for the durability of any material or method of construction. Material used on any project shall be warranted against defects and workmanship by responsible CONTRACTOR for one calendar year from date of acceptance.

SECTION 2 DEFINITIONS AND ABBREVIATIONS

2.1 **DEPARTMENT:** Refers to the Bentonville Water Utilities, under the jurisdiction of the Bentonville City Council, hereinafter referred to as "DEPARTMENT"; having full and complete authority to manage, operate, improve, extend and maintain the City water distribution system and sewer collection system.

2.2 **ENGINEERING DEPARTMENT:** City of Bentonville Engineer.

2.3 **MANAGER:** Bentonville Water Utilities Manager.

2.4 **DEVELOPER:** Industrial partnership, corporation, or other legal entity such as an improvement district, desiring to construct water and/or sanitary sewer facilities for immediate or contemplated future inclusion in the city system.

2.5 **ENGINEER:** Individual registered to practice Engineering in the State of Arkansas who is responsible for the preparation of reports, plans, specifications and inspection of the work herein approved.

2.6 **CONTRACTOR:** The person, firm or corporation with whom the DEVELOPER has entered into an agreement to construct the water and/or sewer improvements.

2.7 **CITY INSPECTOR:** City of Bentonville Water Utilities Department Inspector responsible for inspection, and notification of proposed reconstruction or alterations and inspections involving the City of Bentonville's water and sewer system.

2.8 **RESIDENT INSPECTOR:** An authorized representative of the ENGINEER responsible for the inspection of construction for compliance with approved plans, specifications and other contract documents.

2.9 **NORMAL WORK SCHEDULE:** The City of Bentonville's normal work schedule is Monday through Friday 7:30 AM to 4:00 PM except HOLIDAYS.

2.10 **HOLIDAYS:** New Year's Day, Martin Luther King Day, President's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, Friday following Thanksgiving Day, Christmas Eve and Christmas Day.

2.11 **TERMS:** "As specified" shall mean as specified by the DEPARTMENT in plans, proposals, specifications, and other written instructions.

2.11.1 The term "or equal" shall mean that the proposed material or item shall perform adequately the duties imposed by the general design and is of the same or equal design, substance and junction to that specified by using the name of a product, manufacturer, or vendor. Use of the term "equal" shall mean any party proposing to substitute an "equal" shall obtain an approval from the DEPARTMENT. The DEPARTMENT shall make final approval of such items or materials judged to be "equal".

2.11.2 The term "these specifications" shall refer to the "Design Materials and Construction Specification of Water and Sewer Facilities", latest revision, written by the DEPARTMENT. It is the responsibility of the CONTRACTOR, ENGINEER, DEVELOPER or OWNER, etc. to obtain copies and to comply with the latest revision of these specifications.

2.12 Abbreviations used throughout these specifications have meanings as follows:

ASTM.....American Society for Testing and Materials
AASHTO.....American Association State Highway & Transportation Officials
ARDOT.....Arkansas Highway Transportation Department
DEQ.....Arkansas Department of Energy Environment, Division of Environmental Quality
ADH.....Arkansas Department of Health
ADL.....Arkansas Department of Labor
ANSI.....American National Standards Institute
AWWA.....American Water Works Association (Latest Revision)
CTS.....Copper Tubing Size
CI.....Gray Cast Iron
CS or CC.....AWWA (Mueller Corp Stop Thread)
DI.....Ductile Iron
DFT.....Film Thickness
FCCCHR.....Foundation for Cross Connection Control & Hydraulic Research
FIP.....Female Iron Pipe
HDPE.....High Density Polyethylene
ID.....Inside Diameter
IP.....Iron Pipe
MIP.....Male Iron Pipe
NFPA.....National Fire Protection Association
OD.....Outside Diameter
OSHA.....Occupational Safety and Health Administration
PE.....Polyethylene
PSI/PSIG.....Pounds per Square Inch (gauge)
PVC.....Polyvinyl Chloride
SSPC.....Steel Structures Painting Council
USACE.....U.S. Army Corps of Engineers

SECTION 3 LAWS, REGULATIONS AND ORDINANCES

3.1 This section covers such rules and regulations as required by statute for the completion of plans, specifications and construction work on any and all proposed water and/or sanitary sewage facilities.

3.2 All Federal, State, County and City Laws, Regulations or Ordinances shall be complied with on all projects. This shall include, but not be limited to the obtaining of approval from ADH, DEQ, and USACE. Submission to and approval by ADH, DEQ, and USACE shall be the ENGINEERS responsibility, including payment of any applicable fees. Approved plans and specifications shall be returned to the City of Bentonville for file and inspection prior to the pre-construction meeting.

SECTION 4 PERMITS AND LICENSES

4.1 All permits and licenses required by a Federal, State, County or City shall be obtained in strict accordance with requirements of the governing agency. When required by the licensing agency, the DEPARTMENT will assist in application for permits and licenses, but the cost of any permit, fee or bond required will be borne by the DEVELOPER. The DEPARTMENT shall charge 10% of the bond fee as a handling charge. Permits for all street bores within the City of Bentonville's corporate limits shall be permitted by the Bentonville Street Department. Permits for boring of state highways will be permitted via the DEPARTMENT as to obtaining permission from ARDOT. The project ENGINEER shall provide footage's, profiles, and any other documented information necessary to the DEPARTMENT for State boring permits. Project ENGINEER may

obtain permit and obtain ARDOT permit without going through the DEPARTMENT. ARDOT will require a check for the full amount of bond to ARDOT. Project ENGINEER to submit copy of approved permit to DEPARTMENT when received.

SECTION 5 PLANS AND SPECIFICATIONS

5.1 RECORD DRAWING STANDARDS

5.1.1 Prior to site final of the project, one (1) complete set of "As-Built" drawings shall be PDF and furnished or emailed to the DEPARTMENT for record purposes by the same ENGINEER who prepared and submitted the construction plans and specifications. Change of ENGINEERING firm shall warrant re-submittal both to CITY ENGINEERING and ADH. CITY ENGINEERING shall be notified in writing of change in Engineering Firm, additional requirements considered on a case-by-case basis. Record Drawing Standards shall be as outlined below:

5.1.2 All files associated with acceptance of the record drawings found in this section shall be received prior to site final. If any are found to be incorrect or inconsistent during review or at the site final, all files shall be revised as necessary and the corrected files sent to the DEPARTMENT for review and acceptance prior to approval of the site final.

5.1.3 Record Drawings shall include the site plan, construction plan sheets, and any supplementary drawings and shop drawings. Plan of lift stations or other special features should be shown if applicable. "Record Drawing" is to be stamped in large clear print on plans.

5.1.4 Public vs. Private Infrastructure shall be delineated on the PDF plans as well as the digital and data (.shp & .csv) files. Public vs. Private utilities shall clearly be identified on the PDF plan when both are present. If private utilities are present, then two (2) sets of data files will be required with the submittal. One set for public only, as outlined in these standards, and the other shall include private infrastructure only.

5.1.5 Piping line work for both water and sewer infrastructure shall be drawn as continuous segments without breaks. Breaks shall only occur at constructed locations of valves, manholes or other assets along a pipe segment.

5.1.6 Material Quantity Table – Utility Sheet to include a material quantity table of all public infrastructure that was installed during construction for each project. Table information shall quantify the entire water and sewer infrastructure that was constructed. To include all water and sewer lines, bends, tees, hydrants, valves, meter sets, manholes, etc. Table 5.8.

5.1.7 All plans shall be drawn to a scale suitable for adequately showing the facilities proposed, except as stipulated herein. All plans and profiles of sewer lines shall be drawn to scale with the profile vertical scale at **1" = 5'** and plan horizontal scale for water and/or sewer lines of **1" = 30'** or larger. All drawings shall be no larger than **24" X 36" sheets**. All elevations shall be based on mean sea level. An overall project map shall be a minimum 24" X 36" and shall depict the entire project and show all proposed water and/or sewer lines properly labeled as to size and pipe material. All other utilities shall be shown along with the proposed road profile if applicable. A vicinity map at a scale of **1" = 2,000'** shall be furnished indicating the location of the project in relation to arterial streets and major highways. Reduced size drawings may be allowed for inspection purposes after all approvals have been obtained.

5.2 **Cad Files - .dwg & .dxf**

5.2.1 Submit one or more AutoCAD / Civil 3D (.dwg format AND .dxf) drawing files that contain the entire utility infrastructure (water and sewer,) that was constructed with the project, as well as all other pertinent reference lines, project information, and survey control data. The following layers are requested to be used for all “Water” features: BWD-WATER & BWD-WATERTXT and the following layers are requested to be used for all “SEWER” features; BWD-SEWER & BWD-SEWERTXT.” The infrastructure shall be drawn in the file at the as-built locations as surveyed and certified by the Professional Land Surveyor. The AutoCAD file(s) shall be placed into a folder named “CAD” on the submitted media. Please note: the delivered CAD files should not be of the Plan/Profile sheets, but should be the overall working drawing in “model space” that is registered to AR North State Plane, NAD 1983.

5.3 **Shape Files - .shp**

5.3.1 Submit as-built data for direct import into the City’s Geographic Information System (GIS). Submit four (4) shape (.shp) files; One (1) shape file (points), named “WTR_F” that contains all of the water infrastructure features that was constructed with the project; One (1) shape file (lines), named “WTR_L” that contains all of the water infrastructure lines that was constructed with the project; One (1) shape file (points), named “SWR_F” that contains all of the sanitary sewer infrastructure features that was constructed during the project; One (1) shape file (lines), named “SWR_P” that contains all of the sanitary sewer infrastructure lines that was constructed during the project. Each shape file shall include all features and line work that was constructed with the project only. Correctly name the files as outlined above. The shape files shall match the data files (.csv)

5.4 **Data Files - .csv**

5.4.1 Data shall consist of files in an ASCII Comma Separated Value (CSV) file format. The preferred horizontal coordinate system for the digitally submitted data as described below shall be AR NORTH State Plane (NAD83), U.S. Survey Feet. The preferred vertical coordinate system for the digitally submitted data as described below shall be North American Vertical Datum, 1988 (NAVD 1988), U.S. Survey Feet. All of these file(s) shall be placed into a folder named “DATA” on the submitted media.

5.5 **Water Features**

5.5.1 The file shall be named “Water_Features” and contains various elements that connect and control the distribution of water within and among various water lines. These features include both buried fittings (bends, crosses, end caps, reducers, and tees) and features that are accessible and/or visible at the surface (meters, valves, and hydrants). Buried features should be located similar to the method our utility locators use: (a paint dot is placed on the pavement at the approximate location of the feature and then surveyed location is taken at the paint mark.)

Water line locations are required only if the water line curves. These locations shall be surveyed at 25 foot stations along the length of the water line.

Each line of the file shall contain the following information:

ID, Type, Northing, Easting, Elevation, Description (all on first line of the file)

Where:

ID - A unique ID number assigned to each feature noted on the as-built plan and profile sheets (e.g. GV1, HYD1, etc.)

Type - The type of feature. Provide the following codes as indicated in the table below:

5.5.2

Water Features Descriptions

Feature Description	Type
Air Release Valve	ARV
Backflow Preventer	BFP, RPZ, RPA, etc.
Bend	BEND
Blow Off	BLOWOFF
Cross	CROSS
Demarcation Valve	DMV
Encasement	ENCASE
End Cap	CAP
Fire Department Connection	FDC
Fire Hydrant	HYDRANT
Post Indicator Valve	PIV
Reducer/Increaser	REDUCER
Tee/Tapping Sleeve	TEE
Water Valve	VALVE
Water Line	WATERLINE
Water Meter	METER

Northing – North coordinate value (+/- 2.0' if buried, +/- 0.1' otherwise)

Easting – East coordinate value (+/- 2.0' if buried, +/- 0.1' otherwise)

Elevation – Elevation, collected as follows: (+/- 2.0' if buried, +/- 0.1' otherwise)

5.5.3

Water Feature Elevation Locations

Feature Type	Elevation Location
BEND/BLOWOFF/CROSS/END CAP/REDUCER/TEE	Surface, at the mark that indicates the approximate location of the buried feature.
HYDRANT	Top of the fire hydrant.
METER/VALVE	Center of the access structure.
WATERLINE	Surface, at the mark that indicates the approximate location of the buried line, at 25 foot stations. <i>Only required if a water line is curved.</i>

Description - The description of the item for the feature; encoded as follows:

5.5.4

Water Feature Descriptions

Feature Type	Description
BEND	Degree of bend (e.g. 11.25/22.5/45/90).
BLOWOFF	Size (in inches) of the blow off.
CROSS	Size (in inches) of each water line that connects to the cross (e.g. "12x12x8x8").
ENDCAP	Size (in inches) of the water line.
HYDRANT	Manufacturer and year of manufacture. This information will be on the hydrant (e.g. "CLOW- 2004").
METER	The size (in inches).
REDUCER	The size (in inches) of the lines on either side of the reducer (e.g. "8x4").
TEE	The sizes (in inches) of each water line that connects to the tee (e.g. "12x12x8").
VALVE	The size (in inches) and type of the valve (e.g. 6 GV, 12 BFV)
WATERLINE	No description required.

Example file format:

ID	Type	Northing	Easting	Elevation	Description
GV1	VALVE	749862.3433	653776.6033	1215.05	8 GV
BEND1	BEND	749818.6838	653805.9192	1214.15	22.5 BEND

5.5.6

Water Lines

The file shall be named "Water_Lines" and shall contain the following data. There is one line of data for each water line that connects two water features.

ID, Size, Material, FeatureID1, FeatureID2 (all on first line of the file)

Where:

ID – A unique number assigned to each section of water line noted on the as-built plan and profile sheets (e.g. "WL1")

Material – Water line material

Size – The size (in inches) of the water line

FeatureID1 - The ID of the feature on the near end of the water line as shown on the as-built plans (e.g. "GV1")

FeatureID2 - The ID of the feature on the far end of the water line as shown on the as-built plans (e.g. "HYD1")

Example file format:

ID	Material	Size	FeatureID1	FeatureID2
WL1	PVC	8	GV1	GV2
WL2	PVC	8	GV10	GV1

5.6

Sewer Features

The file shall be named “Sewer_Features” and shall contain information about manholes, cleanouts, and other features listed in the table below. There is one line of data for each sewer feature.

Buried features such as force main bends and tees should be located similar to the method our utility locators use: (a paint dot is placed on the pavement at the approximate location of the feature and then surveyed location is taken at the paint mark.)

Force main locations (see the “FORCEMAIN” type in the table below) are required only if the force main curves. These locations will be surveyed at 25 foot stations along the length of the water line.

End of service locations shall be the location at which the stub-out connection point is to be made. Section 14.2.7

ID, Type, Northing, Easting, Elevation, Invert, Material (all on first line of file)

Where:

ID – If the feature is a manhole then the number as shown on the as-built drawings (e.g. “MH1”). If feature is a clean out then a lot number or street address (e.g. “LOT10” or “123 Street Name”).

Type – The feature type, coded according to the following table:

5.6.1

Sanitary Sewer Features Descriptions

Feature Description	Type
Clean Out	CLEANOUT
Drain	DRAIN
End Of Service	SERV
Force Main Valve	FMVALVE
Force Main Tee	FMTEE
Force Main Bend	FMBEND
Force Main	FORCEMAIN
Grease Trap	GREASETRAP
Manhole	MANHOLE
Sand / Oil Separator	SOS
Tracer Wire Port	TWPORT

Northing – North coordinate value at the center of cover (+/- 0.1').

Easting – East coordinate value at the center of cover (+/- 0.1').

Elevation – Rim elevation at the center of cover (+/- 0.1')

5.6.2

Sanitary Sewer Features Elevation Locations

Feature Type	Elevation Location
CLEANOUT	Surface adjacent to the cleanout.
DRAIN	Center of the drain grate.
FMVALVE	Center of the access structure.
FMTEE/FMBEND	Surface, at the mark that indicates the approximate location of the buried feature.
FORCEMAIN	Mark that indicates the approximate location of the buried main, at 25 foot stations. <i>Only required if a force main curves.</i>
GREASETRAP/OWS	Center of the structure
MANHOLE	Center of Rim

Invert Elevation– Invert elevation (+/- 0.1', bottom of manholes)

Material – Construction material

Example file format:

ID	Type	Northing	Easting	Elevation	Invert	Material
MH1	MANHOLE	751915.787	662437.91	1282.86	1277.71	CIP
CLEANOUT1	CLEANOUT	751927.504	662217.212	1285.37	1280.13	PVC

5.6.3

Sewer Pipes

The file shall be named “Sewer_Pipes” and shall contain the following data. There is one line of data for each sewer pipe.

If the pipe is a force main, values for Size, Material, USId, and DSId only need to be provided.

ID, Size, Material, USId, DSId, USInv, DSInv, Slope, Length (all on first line of the file)

Where:

ID – A sequential pipe number as noted on the as-built drawings (e.g. “SSP1”).

Size – Inside pipe diameter (inches).

Material – Pipe material

USId – Upstream manhole number as shown on the as-built drawings (e.g. “MH1”).

DSId - Downstream manhole number as shown on the as-built drawings (e.g. “MH2”).

USInv – Invert elevation at the upstream end.

DSInv – Invert elevation at the downstream end. If downstream end is a drop connection, provide both elevations separated by a slash (e.g. 1100.05 / 1100.15).

Slope – The as-built grade of the pipe, expressed as a percentage and carried out to two decimal places.

Length – The length (in linear feet) of the pipe as indicated on the as-built carried out two decimal places.

Example file format:

ID	Size	Material	USID	DSID	USINV	DSINV	Slope	Length
SSP1	8"	PVC	MH1	MH2	1233.15	1228.41	6.02%	78.76

5.7 REQUIRED DATA FOLDER FILE FORMAT:

Example file format:

Name	Date modified	Type	Size
SWR_F.shx	3/18/2019 3:39 PM	AutoCAD Compiled Shape	1 KB
SWR_P.shx	3/18/2019 3:40 PM	AutoCAD Compiled Shape	1 KB
WTR_F.shx	3/18/2019 3:38 PM	AutoCAD Compiled Shape	1 KB
WTR_L.shx	3/18/2019 3:39 PM	AutoCAD Compiled Shape	1 KB
UTILITY.dwg	3/18/2019 3:37 PM	AutoCAD Drawing	3,556 KB
UTILITY.dxf	3/18/2019 3:35 PM	AutoCAD Drawing Interchange	15,583 KB
SWR_F.shp	3/18/2019 3:39 PM	AutoCAD Shape Source	1 KB
SWR_P.shp	3/18/2019 3:40 PM	AutoCAD Shape Source	1 KB
WTR_F.shp	3/18/2019 3:38 PM	AutoCAD Shape Source	1 KB
WTR_L.shp	3/18/2019 3:39 PM	AutoCAD Shape Source	1 KB
SWR_F.dbf	3/18/2019 3:39 PM	DBF File	1 KB
SWR_P.dbf	3/18/2019 3:40 PM	DBF File	1 KB
WTR_F.dbf	3/18/2019 3:38 PM	DBF File	1 KB
WTR_L.dbf	3/18/2019 3:39 PM	DBF File	1 KB
SWR_F.idx	3/18/2019 3:40 PM	IDX File	2 KB
SWR_P.idx	3/18/2019 3:40 PM	IDX File	2 KB
WTR_F.idx	3/18/2019 3:40 PM	IDX File	2 KB
WTR_L.idx	3/18/2019 3:40 PM	IDX File	2 KB
Sewer_Features.csv	3/18/2019 3:26 PM	Microsoft Excel Comma Separated Values File	1 KB
Sewer_Pipes.csv	3/18/2019 3:26 PM	Microsoft Excel Comma Separated Values File	1 KB
Water_Features.csv	3/18/2019 3:26 PM	Microsoft Excel Comma Separated Values File	1 KB
Water_Lines.csv	3/18/2019 3:26 PM	Microsoft Excel Comma Separated Values File	1 KB
SWR_F.prj	3/18/2019 3:39 PM	PRJ File	1 KB
SWR_P.prj	3/18/2019 3:40 PM	PRJ File	1 KB
WTR_F.prj	3/18/2019 3:38 PM	PRJ File	1 KB
WTR_L.prj	3/18/2019 3:39 PM	PRJ File	1 KB

Material Quantity Table

WATER SYSTEM IMPROVEMENTS		TYPE	QUANTITY
16" ENCASEMENT		LF	20
8" PVC WATER LINE		LF	1200
GATE VALVES (8")		EA	16
TAPPING SLEEVE & VALVE		EA	2
FIRE HYDRANTS		EA	8
45° BEND		EA	4
METER SETS		EA	36
SEWER SYSTEM IMPROVEMENTS			
8" PVC		LF	880
8" DIP		LF	40
CIP SMH		EA	10
CLEANOUT		EA	2
4" FM		LF	180

SECTION 6 INSPECTION

6.1 This section covers the requirements of inspection for the construction of water and sewer facilities.

6.2 The responsible ENGINEER who prepared and submitted the construction plans and specifications shall be responsible for construction layout, general direction, resident inspection and site final as described in more detail in the following sections. Continuous project responsibility shall be an express condition of plan approval. The ENGINEERS responsibility shall extend through site final approval and submittal of "As-Built" drawings for acceptance of the project by the DEPARTMENT for maintenance.

6.3 All water and sewer facilities proposed shall be constructed by a licensed utility CONTRACTOR with the correct classification and inspected by the responsible ENGINEER as defined under definitions. Inspection shall consist of, but not be limited to, periodic visits to the construction site to observe the progress and quality of the executed work to determine if the work is proceeding in accordance with the approved plans and specifications and with the standards set forth by the DEPARTMENT. Any defects, deficiencies or irregularities in the work found by the ENGINEER or reported by the RESIDENT INSPECTOR shall be reported to the CITY INSPECTOR. Such action, as deemed appropriate, and as approved by the DEPARTMENT, shall be taken to correct such deficiencies. All work performed, shall at all times be subject to general inspection by the MANAGER or representative.

6.4 If deemed necessary by the DEPARTMENT to insure conformance with the approved plans and specifications, full time resident inspection may be required during all or part of the project and shall be performed by qualified personnel under the direct supervision of the ENGINEER. The name(s) of the RESIDENT INSPECTOR shall be furnished to the DEPARTMENT, any changes shall be notified to the DEPARTMENT in writing with all contact information included. It shall be the responsibility of the RESIDENT INSPECTOR to safeguard the DEPARTMENT'S interest by checking the construction work for compliance with the approved plans, specifications and other standards. The responsible ENGINEER shall provide an inspector for each location within a project that would use more than one pipe laying crew (e.g. two pipe laying crews on two different sites, two inspectors, one for each site). The CITY INSPECTOR or DEPARTMENT

representative and the RESIDENT INSPECTOR shall witness all test procedures. The RESIDENT INSPECTOR shall provide a documented report of results, conditions, and time of test to the DEPARTMENT for its use and approval. If the CONTRACTOR intends to work outside of the normal work schedule or on a holiday, the RESIDENT INSPECTOR shall be required to be on the job site at all times and shall notify the DEPARTMENT. **Refer to Section 2.**

6.5 Any defects, deficiencies or irregularities shall be reported to the ENGINEER. A job diary shall be kept, outlining all aspects of the construction project and shall be made available to the DEPARTMENT upon request.

SECTION 7 CONSTRUCTION LAYOUT

7.1 The layout and staking of the construction work shall be completed by trained and qualified survey personnel under the supervision of the ENGINEER. Construction layout shall consist of staking (physical monuments) necessary to determine alignment and elevations to properly construct the proposed facilities. All depths shall be approved by the DEPARTMENT during plan review.

SECTION 8 SITE FINAL PROCEDURES

8.1 Before acceptance of new construction involving water lines or sewer main extensions, a physical site inspection will be scheduled by the ENGINEERING DEPARTMENT referred to as a "Site Final".

8.2 All lot corners shall be in place and witnessed by a survey marker. Said marker shall bear the number of the respective lot it represents. If lot lines do not coordinate with newly constructed utilities, it shall be the DEVELOPER'S responsibility to make the appropriate adjustments. If said situation exists at time of site final, approval shall be withheld until lot lines and utility locations coordinate. If these requirements have not been met, then site final shall be cancelled.

8.3 Water valve boxes will be to final ground elevation or paving grade centered directly over operator nut. Water valves and valve boxes shall be positioned in a manner to allow operability at all times. A continuous locator wire shall be present and operable in all valve boxes.

8.4 Fire hydrants shall be set at bury line at finished grade. Hydrants shall be positioned 3' to 9' from back of curb or edge of any driving surface (measured from the steamer cap nut) or as directed by the DEPARTMENT during plan review.

8.4.1 All public fire hydrants shall be painted Industrial Safety Yellow. All private fire hydrants not maintained by the DEPARTMENT shall be painted Industrial Safety Red. Fire hydrants shall be painted prior to inspection unless otherwise instructed by the DEPARTMENT.

8.4.2 All fire hydrant assemblies shall have an auxiliary gate valve installed at the point of connection serving the hydrant. Hydrant lead lines in excess of 50' shall have an additional auxiliary gate valve installed at the fire hydrant or as designated by the DEPARTMENT during plan review.

8.5 Fire Department Connection (FDC) for each sprinkler or standpipe system shall be located not more than 100' from the nearest public fire hydrant connected to an approved public water supply. The FDC height shall be between 36" and 48" from the finished grade with a 30° bend and a 5" Storz connection. There shall be #10 tracer wire taped every 10 feet on the top of FDC line. Additional fire hydrants may need to be installed as required by the Fire Chief or his designated representative. With respect to hydrants, driveways, buildings and landscaping, fire department connections shall be so located that the fire apparatus and hose connected to supply the system will not obstruct access to the buildings for other fire apparatus. The location of the fire department

connections and/or fire hydrants shall be approved by the Fire Chief or his designated representative. This fire hydrant will be solely used for the FDC. (**Or per newest Fire Department Ordinance**).

- 8.5.1 FDC's shall be located on address side of building and shall be approved by the Fire Department's Inspection Division prior to installation.
- 8.5.2 Butterfly valves are not approved for use in fire suppression systems. Only approved Post Indicator gate valves (P.I.V.) or wall indicator valves shall be utilized and approved. P.I.V. needs to be 30" to 36" above final grade to the sight glass. There shall be #10 tracer wire taped at 10' intervals on top of the fire line. PIV shall to be shown on construction plans.
- 8.6 Residential Meter boxes shall be set at 3" above proposed final grade or as directed by the DEPARTMENT during plan review. All meter setters inside the box shall not touch the sides of the box and shall be located where the turn-on and turn-off valves are easily accessible and operable by meter personnel. All meter sets shall have a minimum 3' stub-out service line for each service placed in such a manner to minimize disturbing meter box in the process of plumbing connection from pigtail to the customer's service line. All damage to meter boxes shall be the responsibility of the owner or builder after final acceptance has been completed. Meter personnel reserve the right to refuse placement of meters if setters or boxes are damaged, misaligned, or if finished grades have changed. All meter box lids shall have one or two pre-drilled holes, depending on the number of meter setters installed within the meter box. The holes are for use with the DEPARTMENT'S meter reading system. Failure to install predrilled lids will lead to acceptance failure.
- 8.7 All meter vault plans and installations shall be approved by the DEPARTMENT during plan review. All meter vaults are to be installed by designated CONTRACTOR of the project. **Section 12.18.4**
- 8.8 All pipe and fittings shall meet the DEPARTMENT'S specifications. All DI pipe shall be cement lined and tar coated, all fittings shall be epoxy coated. Meter by-pass material shall be rigid copper or DI pipe. Valves shall meet specifications herein. Vault depth shall not exceed 5' unless approved by the DEPARTMENT.
- 8.9 The vault cover shall be removable to allow full access to the vault. Four recessed lifting points shall be provided. An access door shall be installed in the center of the vault. The lid shall have pre-drilled holes for meter capability. Approved doors shall be similar or equal to Bilco or Halladay and shall be a minimum of 36" x 36".
- 8.10 Water meters shall not be installed within buildings without prior approval by the DEPARTMENT. If approved, meters inside buildings shall meet the following criteria, **Section 8.11**, which shall be furnished and guaranteed by owner of future development prior to approval.
- 8.11 Meters must have capability via outside of building and accessible to meter personnel, (no obstructions). Meters 4" and larger are to be purchased by OWNER with direction of the DEPARTMENT.
- 8.12 Sewer stub-outs installed for a domestic sewer connection shall be marked and made visible by installing a metal tee post painted green at the precise location above said sewer line end, at a height of 3' exposed above ground and buried a minimum of 3' below ground.
- 8.13 All trees planted in large scale projects and subdivisions shall be planted at a minimum of 5' from any water or sewer mains.

8.14 ENGINEER shall contact the DEPARTMENT by email to schedule televising of sewer mains and tracer wire inspections before roadways have been completed and before 1st full inspection is requested. Full CCTV inspection shall be completed and 1st tracer wire inspection shall be completed before site final. ENGINEER shall provide revised “as-built” drawing of utility sheet with sewer profile before testing will be scheduled.

8.15 The OWNER/CONTRACTOR/DEVELOPER shall pay any outstanding (3 or more months) invoice issued by the Water Utilities Office prior to final acceptance of the current project. This includes previous projects, water/sewer line repairs, fire hydrant contracts, discontinue services, replace meter tiles, re-inspection fees, survey fees, etc. – Does not include Utility Bills.

8.16 The DEPARTMENT shall charge for each re-inspection. **Refer to current fee ordinance.**

SECTION 9 GENERAL REGULATIONS FOR CONSTRUCTION PURPOSES

9.1 **Refer also to current Transportation Department Specifications.**

9.1.1 This section outlines minimum construction procedures and standards for the installation of water and sewer extensions.

9.1.2 Any CONTRACTOR/DEVELOPER/CUSTOMER/RESIDENT that requests the use of a hydrant meter will be required to fill out a Contract and pay for a Fire Hydrant Meter at the Water Utilities Office. The CONTRACTOR/DEVELOPER/CUSTOMER/RESIDENT of the City of Bentonville will determine the location for the hydrant meter with the DEPARTMENTS approval. The current contract may also be found online on the City of Bentonville Water Utilities Department website.

UNDERGROUND UTILITY NOTIFICATION

9.2.1 It is the CONTRACTOR'S responsibility to notify **"Arkansas One-Call" (1-800-482-8998 or 811)** two days in advance of any excavation. Location of utility requests for surveying purposes will be charged to the requesting party. A notice of at least 2 working days (normal work schedule) should be expected before locates are performed by the DEPARTMENT. **Refer to current fee ordinance.**

WATER OUTAGES

9.3.1 In the event that the CONTRACTOR must have a water main out of service in order to connect to the water system, the CONTRACTOR shall notify the DEPARTMENT of impending loss of service at least 5 days in advance. All shutdowns shall be coordinated and scheduled by the DEPARTMENT. Notifying customers will be accomplished by means of approved door hanger notices supplied by the DEPARTMENT, however it is the CONTRACTOR'S responsibility to notify the customers a minimum of 24 hours ahead of time. **Section 13.1.2**

TRENCH DEWATERING

9.4.1 The CONTRACTOR shall install dewatering systems as necessary that will be required to construct the proposed utilities in a manner that will prevent groundwater contamination. Must meet current City of Bentonville Storm Water Regulations. For 12" and larger pipe sizes, ground water encountered shall be prevented from migrating along the trench with either clay or flowable fill mitigation dams and wrapping pipe bedding with filter fabric as approved by the DEPARTMENT, in accordance with geotechnical recommendations.

9.5

LOCATION, ALIGNMENT AND GRADE

9.5.1 The pipe, fittings, valves, fire hydrants, meter boxes, manholes, and other appurtenances shall be constructed to conform to the location, line size and material, and grades specified or as shown on the Plans.

9.5.2 Valves and fire hydrants shall be set with operating stem and nut plumb.

9.5.3 Horizontal and vertical control points will be established along or adjacent to the construction area. It shall be the responsibility of the CONTRACTOR to make necessary measurements from these control points in order to maintain the proper alignment and grade of the structures. The CONTRACTOR shall preserve all stakes and markers established by the ENGINEER.

9.5.4 In a residential or commercial subdivision, the water and sewer mains will be placed at 12' back of curb or 2' behind master plan street right-of-way. The manholes and fire hydrants will be placed on the lot line and water and sewer services will be placed 3' off the lot line. Water services that are on the same side as the water main will be placed at 14' back of curb and the water services across the road from the water main will be placed in the green space centered between the curb and proposed sidewalk. The 1" tubing going to the meter set will be installed without excess tubing wrapping around the meter tile. The sewer services are to extend to the building setback or the back edge of the utility easement. The fire hydrants that are placed on the lot line need to meet the back of curb measurement that is shown on the fire hydrant installation **Details W04 and W05**. The manholes that are street side need to have a final rim elevation that is 4" to 6" above final grade and any manholes that are at the back of lots or along drainage areas need to be 12" above final grade. Please keep in mind that the maximum vertical extension above the cone is 24". If the vertical extension is greater than 24" it will be necessary to take the cone off, extend the walls, re-pour the cone and do a vacuum test on the manhole. Any variation from the above described layout needs to be submitted to the DEPARTMENT for approval during the plan review process.

9.6

PUBLIC TRAVEL

9.6.1 Traffic control shall be in accordance with the City of Bentonville Minimum Standard Specification for Streets.

9.7

SURFACE & SUBSURFACE STRUCTURES LOCATION AND PROTECTION

9.7.1 The DEPARTMENT does not guarantee the accuracy or correctness of locations of subsurface structures. It shall be the responsibility of the CONTRACTOR to satisfy himself as to the actual location and nature of subsurface structures.

9.7.2 The CONTRACTOR shall make necessary exploratory excavations to determine the location of underground structures such as pipes, drains, conduits, and other structures. The CONTRACTOR shall be responsible for contacting the respective utility of such structures before excavating in the vicinity of these structures and shall be guided by their instructions.

9.7.3 The CONTRACTOR shall provide adequate protection and support for all surfaces and subsurface structures or other facilities encountered during the progress of the work. Whenever such structures or facilities are in the same location as the proposed pipeline or appurtenances thereto, the CONTRACTOR shall relocate or reconstruct or cause to be relocated or reconstructed, the structure or facility to the satisfaction of the DEPARTMENT and utility facility owner. Whenever requested by the DEPARTMENT or utility owner, the CONTRACTOR shall provide drawings and other plans for supporting or otherwise safeguarding surface and subsurface structures or other facilities which, in the opinion of the DEPARTMENT, or utility or facility owner, may be damaged as a result of the CONTRACTOR'S work.

9.7.4 The CONTRACTOR shall not stop or impede the flow in any pipe, sewer, surface or subsurface drain without making provisions for diverting the flow to the satisfaction of the DEPARTMENT.

9.7.5 If any utility facility or structure is damaged during the progress of the work, the CONTRACTOR shall immediately notify the appropriate owner. Repairs shall not be made by the CONTRACTOR without the prior approval of the utility facility or structure owner. The CONTRACTOR shall pay utility owners for the cost of repairing, relocating or replacing any facilities damaged by the CONTRACTOR. In addition, the CONTRACTOR shall provide all assistance available to the utility involved in making repairs under emergency conditions.

9.7.6 The CONTRACTOR shall not operate any control valve or fire hydrant in the existing water distribution system without the approval of the DEPARTMENT.

9.7.7 All existing water mains, services, appurtenances and bends shall be properly restrained in such manner so as to prevent displacement before excavating behind these appurtenances.

9.8 PROTECTION OF VEGETATION

9.8.1 The CONTRACTOR shall not remove or disturb any vegetation except that required for the execution of the work.

9.8.2 Unless otherwise specified in these specifications or in the plans, the CONTRACTOR shall replace all sod, shrubs, bushes, trees, and flowers disturbed or removed, that are located upon improved or landscaped public and private property. The CONTRACTOR shall replant vegetation and re-landscape or cause such to be performed throughout the work area as soon as possible after the water lines and appurtenances have been installed. All vegetation damaged during or after removal shall be replaced with healthy vegetation of the same kind or type. All plants shall be replanted in the original location. The CONTRACTOR shall maintain all such replanted vegetation by the application of water, fertilizers and topsoil. The vegetation shall be cultivated to prohibit the growth of foreign vegetation until a "well developed" root system has been established and transplanted vegetation has overcome the "shock" resulting from transplanting. If any vegetation dies or becomes unhealthy, it shall be replaced by the CONTRACTOR. The contour of the ground shall be left as near the original contour as possible.

9.8.3 The CONTRACTOR shall stabilize all areas where ground surface has been disturbed by water and sewer construction activities to as good or better condition.

9.9 EXCAVATION AND PREPARATION OF TRENCH

9.9.1 The CITY INSPECTOR and "Arkansas One-Call System" shall be contacted before excavation shall begin. Also, excavations shall be in accordance with the Arkansas Department of Labor requirements.

9.9.2 All trench excavation side walls greater than 5' in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by OSHA and ADL.

9.9.3 Before installation of pipe and appurtenances, the trench bottom shall be graded so uniform support of the pipe and appurtenances are provided. Shallow depressions shall be made in the trench bottom to accommodate bell ends. It is a requirement for bell or coupling holes to be excavated where no part of the load is supported by bells, couplings, or fittings.

9.9.4 All trenches shall be backfilled immediately after proper installation of the pipeline, tracer wire, embedment, and appurtenances. It may be necessary to backfill only a portion of the trench in order to allow adequate curing of concrete thrust blocking.

9.9.5 The trench width may vary and depend upon the depth and the nature of the excavated material encountered. The trench shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The minimum width of non-sheeted trench shall be at least 1' greater than the nominal diameter of the pipe. Ledge rock, boulders, large stones, and other rock formation shall be removed to provide a clearance of at least 6" on each side of pipeline and appurtenances up to and including 24" in diameter.

9.9.6 The bottom of the trench shall be prepared so as to provide a uniform and continuous bearing and support for the pipe on solid undisturbed or compacted soil. The trench shall be excavated to at least the depth specified as follows beyond the specified grade when the following described conditions exist:

9.9.7 When the bottom of the trench is at sub-grade and is found to be unstable or includes ashes, cinders, refuse, other organic material, or large pieces of inorganic material, that, in the judgment of the ENGINEERING DEPARTMENT, should be removed, the CONTRACTOR shall remove all such material to the extent required by the ENGINEERING DEPARTMENT

9.9.8 When the excavation is carried below or beyond that specified or required due to conditions described in **Section 9.9.7**, the CONTRACTOR shall backfill the trench to the proper grade with approved backfill material specified by the DEPARTMENT, unless permitted by the DEPARTMENT to install the lines and appurtenances at the undercut grade. The backfill shall be accomplished in accordance with that specified by the DEPARTMENT or elsewhere herein.

9.9.9 The use of trench-digging machinery will be permitted except in places where operations of same will cause damage to trees, buildings, or other existing structures above or below the ground; in which case hand methods shall be employed.

9.9.10 Blasting for excavation will be permitted only after the CONTRACTOR secures the approval of the Fire Department and DEPARTMENT and only when proper precautions are taken for the protection of persons and property. The Fire Department will approve the hours of blasting. Any damage caused by blasting shall be repaired by the CONTRACTOR at their expense. The method of transporting, handling, and storage of explosives and blasting procedure shall conform to Federal Regulations, local and state laws, municipal ordinances and be approved by the Fire Department in advance.

9.9.11 The CONTRACTOR shall comply with all federal, state and local laws or ordinances with respect to obtaining permits, the deposit of bonds and all other provisions of such laws and ordinances.

9.9.12 In order to prevent caving when excavating in sand, gravel, sandy soil, or other unstable material shall be adequately sheeted and braced. Where sheeting and bracing is used, the trench width may be increased accordingly. Trench sheeting shall remain in place until the pipe has been laid and jointed. Where slides or cave-ins occur, the CONTRACTOR shall, at his expense, provide proper bedding and support for the pipe to maintain line and grade.

9.9.13 All excavated material stored on the job site shall be stockpiled in a manner to avoid blocking driveways, streets or sidewalks and will not endanger workers, pedestrians or travelers. Gutters shall be kept clear or other satisfactory provisions shall be made for street drainage. If local conditions permit their re-use, all surface materials suitable for re-use in restoring the surface shall be kept separate from the general excavation material. Excess material and debris shall be removed promptly.

9.9.14 The CONTRACTOR shall maintain all temporary surfaces in good condition until permanent repairs are complete.

9.10 **WORK PERFORMED BY DEPARTMENT**

9.10.1 The intent of these specifications is for the CONTRACTOR to do all installation of new water and sewer infrastructure. All water and sewer taps to the existing Water Distribution or Wastewater Collection Systems shall be made by the DEPARTMENT as outlined in **Section 11.10**.

9.10.2 If damage occurs to the water or wastewater collection systems during construction, the DEPARTMENT, with its labor forces, will make all repairs to these systems. The CONTRACTOR may be requested to assist in the repairs to reduce charges for damages occurred.

9.10.3 If the DEPARTMENT assists the CONTRACTOR for any reason, the CONTRACTOR shall pay for the cost of this assistance, based on the cost of labor, equipment, materials and overhead.

9.11 **CONFINED SPACES**

9.11.1 The CONTRACTOR'S attention is called to the requirements for entry into confined spaces as defined by the Current Edition of the OSHA Standard for Permit Required Confined Spaces which is specifically incorporated herein by reference.

9.11.2 CONTRACTOR'S responsibilities for entry into any Permit Required Confined Space are:

- (a) CONTRACTOR shall obtain from DEPARTMENT any available information regarding any hazards of entry operations for a Permit Required Confined Space.
- (b) When both DEPARTMENT and CONTRACTOR'S personnel are to work in or near a Permit Required Confined Space, CONTRACTOR shall coordinate such work with DEPARTMENT.
- (c) CONTRACTOR shall inform DEPARTMENT of type of Permit Required Confined Space Program used by his employees.
- (d) CONTRACTOR shall inform DEPARTMENT of any hazards confronted or created in a Permit Required Confined Space.
- (e) CONTRACTOR is responsible for having knowledge of and complying with all requirements of OSHA's Standard for Permit Required Confined Spaces.

9.12 **PUBLIC EMPLOYEES RIGHT TO KNOW ACT**

9.12.1 The CONTRACTOR'S attention is called to the requirements of the Hazard Communication Standard adopted by OSHA and State of Arkansas Act 556 of 1991: Public Employees Chemical Right to Know Act.

9.12.2 The CONTRACTOR is reminded that other obligations are imposed upon employers by the above Standard and Act.

9.13 **CLEAN-UP OF JOB SITES**

9.13.1 The CONTRACTOR shall remove all materials, equipment, tools, temporary structures, barricades, trees and other vegetation that have been cut or have died as a result of the work from both public and private property along the job site.

SECTION 10 GENERAL INSTALLATION INFORMATION AND PROCEDURES

10.1 HANDLING PIPELINE MATERIALS

- 10.1.1 The CONTRACTOR shall handle the material with the utmost care and in a manner to prevent damage to the materials, material coating and lining during loading, hauling, unloading, and installation operations. Hooks, chains, or cables shall not come in contact with the exterior/interior of pipeline materials. It is recommended to use approved nylon straps or approved clamps to handle pipeline material. Material damaged shall be replaced at the CONTRACTOR'S expense.
- 10.1.2 Hooks shall not be in contact with the pipe interior and to the extent possible the interior of the pipeline materials shall be kept free from dirt and foreign matter.
- 10.1.3 Pipeline materials, especially valves, hydrants and fittings shall be drained and stored in a manner to protect them from damage by freezing. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
- 10.1.4 Proper implements, tools and facilities shall be provided and used by the CONTRACTOR for the safe and convenient execution of work.
- 10.1.5 All foreign matter or dirt shall be removed from the inside of the pipe and appurtenances before lowering into the trench and the pipe interior shall be kept clean during and after laying. A swab shall be kept in the water line as long as the pipe is being laid. Care shall be taken to prevent dirt from entering the joint space. When pipe laying is not in progress, the open ends of the pipe shall be closed by installing a plug or cap of sufficient design to prevent trench water, foreign matter, and dirt from entering the pipeline.
- 10.1.6 Cutting of the pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or pipe lining. Torch cutting is not permitted. All pipes shall be cut at an angle of 90° to the pipe centerline. Cutting at other angles to provide greater deflections at the joints shall not be permitted. Field welding or welding except by the pipe manufacturer shall not be permitted.
- 10.1.7 Unless otherwise approved or directed by the DEPARTMENT, all pipe shall be laid with bell ends facing the direction of laying; and for lines on an appreciable slope, bells shall face upgrade. Steep slope protection shall be provided in accordance with 10 States Standards.
- 10.1.8 No pipe shall be laid in water, or when the trench condition or the weather is unsuitable for such work, except by permission of the DEPARTMENT.

10.2 PIPE EMBEDMENT

- 10.2.1 This section covers materials used for embedment of water and sewer mains. Unless otherwise specified herein or shown on the plans, embedment materials shall be restricted to Class #67 type bedding as modified and described below with a maximum aggregate size of $\frac{3}{4}$ ". Installation of bedding shall be 6" under pipe and 6" over pipe. CONTRACTOR'S must provide proof of material to match required specifications.

Crushed aggregate conforming to the ASTM C33, gradation 67 and as follows:

Crushed aggregate sized from maximum $\frac{3}{4}$ " to No. 8 sieves:

100% passing the $\frac{3}{4}$ " sieve (maximum aggregate size $\frac{3}{4}$ ")

20 to 55% passing the $\frac{3}{8}$ " sieve

0 to 10% passing the No. 4 sieve

0 to 5% passing the No. 8 sieve

The required modification of the ASTM C33, gradation 67 is the clarification and potential additional requirement of 100% passing the $\frac{3}{4}$ " sieve.

10.3 COMPACTION

- 10.3.1 All pipeline backfill shall be placed in layers of appropriate thickness and compacted using a mechanical, hydraulically-powered vibratory trench compactor or other equivalent equipment. All trench backfill (except under paved areas) shall be compacted to 95% (minimum) standard proctor density of that of the adjacent undisturbed soil. Trench backfill is subject to density test as deemed necessary. In areas where the trench crosses a street, parking lot or driveway, the material shall be compacted as specified in **Section 10.3.2** to a minimum of 95% of that of the adjacent soils.
- 10.3.2 SB-2 crushed stone trench backfill where required shall be compacted to 95% modified proctor density (ASTM D1557). A minimum of one compaction test per crossing is required.
- 10.3.3 Ditch line compaction shall follow immediately after trench backfill. Topsoil shall be placed and shaped leaving the ditch line slightly rounded above existing grade.

10.4 JOINTING PVC & DUCTILE IRON PIPE AND FITTINGS

- 10.4.1 Prior to jointing the pipe and/or fittings, the plain ends of the pipe and the bells of the pipe and fittings shall be thoroughly cleaned using a soapy water and cloth, removing all foreign materials from the bells, especially the gasket seats. Any burrs or imperfections in that part of the plain end or bell, which will be in contact with the gasket, shall be removed.
- 10.4.2 The clean rubber gasket shall be inserted in the bell and a thin film of lubricant shall be applied to the inside surface of the gasket. The cleaned plain end shall initially be entered in the bell straight.
- 10.4.3 The plain end shall be pushed inside the gasket and bell until it strikes the end of the interior of the bell, after which the end of the pipe shall be moved sideways or as specified by the manufacturer's requirements to move it slightly away from home to allow for expansion and to provide flexibility to the completed line.
- 10.4.4 Pipe lubricants specified by the pipe manufacturer shall be used. No substitutes shall be made.
- 10.4.5 When connecting the pipe or fittings according to manufacturer's requirements, care shall be exercised to avoid damage to where the pushing device or machine part contacts the pipe. A wood block or suitable pad shall be placed between the pipe and that part of the pushing device which contacts the pipe and/or fittings.
- 10.4.6 All plain ends that enter a push-on bell shall be beveled as specified by manufacturer requirements. All cut pieces or ends of pipe of other classifications shall be so beveled.

10.5 JOINTING FLANGED PIPE & FITTINGS

- 10.5.1 The faces of all flanges shall be thoroughly cleaned and all burrs or imperfections removed and brushed with a steel brush.
- 10.5.2 Gaskets between flanges shall be AWWA approved of $1/16$ " minimum thickness.
- 10.5.3 Care shall be taken to prevent strain of the flanges. All bolts and nuts shall be cleaned and lubricated prior to tightening. Bolts on opposite sides shall be tightened alternately to the torque listed in **paragraph 10.6.4** herein.

10.6

JOINTING MECHANICAL JOINT PIPE & FITTINGS

10.6.1 Prior to jointing the pipe and/or fittings, the plain ends of the pipe and the bells of the pipe and fittings shall be thoroughly cleaned using a soapy water and cloth, removing all foreign materials from the bells, especially the gasket seats. When a pipe is being installed in a fitting, the factory bevels shall be removed.

10.6.2 The DI retainer glands shall be placed on the plain end of the pipe or fittings, followed by the rubber gasket, which has been thoroughly cleansed and lubricated with the soapy water.

10.6.3 The plain end of the pipe shall be placed in the bell, to which connection is to be made, and shouldered in back of the bell. The rubber gasket shall be advanced into the bell and seated in the gasket seat; the follower ring shall next be brought into contact with the rubber ring, and all bolts entered and nuts started.

10.6.4 Joints shall be made tight by advancing the nuts with a wrench 180° apart until a tight joint is made. The CONTRACTOR shall provide a "torque wrench" suitable for measuring tension on bolts for at least such a time as the workmen making the joints have gotten the "feel" of the required tension. At no time should handles longer than those supplied by the wrench manufacturer be permitted. The torque range shall be as follows or as directed by the manufacturer:

5/8" bolts	45 - 60 ft. lbs.
3/4" bolts	75 - 90 ft. lbs.
1" bolts	85 -100 ft. lbs.
1 1/4" bolts	105 -120 ft. lbs.

10.6.5 The rubber gasket and joint bolts of mechanical joint retainer glands shall be installed in accordance with above section. Set screws shall be tightened evenly to approximately 75-foot pounds or as directed by the manufacturer.

10.6.6 The entire follower, retainer gland and all bolts shall be encased in polyethylene material in accordance with **Section 13.11**.

10.7

PIPE DEFLECTION

10.7.1 During the pipe laying operation, deflections at joints shall not exceed the amounts indicated by the manufacturer's recommendations.

10.8

PIPE MATERIAL

10.8.1 For 12" and larger water and sewer pipes with pipe cover exceeding 14', the DEPARTMENT reserves the right to request geotechnical and design calculations, in accordance with AWWA design manuals. The DEPARTMENT shall be immediately notified if field conditions differ from the design and geotechnical.

SECTION 11 WATER DISTRIBUTION SYSTEM GENERAL INFORMATION

11.1 No water main shall be less than 8" in diameter unless prior approval is obtained in writing from the DEPARTMENT. Variances will be considered, on a case-by-case basis for the reduction of water main sizes.

11.2 The minimum cover over water mains 8" and less shall be 4' minimum. Mains larger than 8" shall have a minimum cover of 5' or as approved by the DEPARTMENT. The minimum cover over water services shall be 24" or as approved by the DEPARTMENT. Minimum cover shall be measured

from the ground surface or the surface of the permanent improvement to the top of the barrel of the pipe, whichever is greater. All depths of water mains shall be approved in advance by the DEPARTMENT.

11.3 In any case of signs, fencing, or structures installed near a water line, at least 5' of separation between the water line and structure must be maintained. In any case of a permanent building installed near a water line, at least 10' of separation must be maintained. Any deviation in separation minimums must get the approval of the DEPARTMENT prior to installation.

11.4 There shall be a 5' minimum separation between the outside edge of a public water main, hydrant lead, fire hydrant, water meter, or other appurtenance to the outside edge of all other utilities within the utility easement. Any deviation must have approval from the DEPARTMENT prior to installation.

11.5 Each component within a project, i.e. water valves, fire hydrants, pipe, etc. shall be homogenous throughout the project and by a single manufacturer. All materials shall be domestically made. All utility mains shall be extended to property lines on all stubbed out streets. Any water main within a project that is stubbed out shall terminate at a fire hydrant assembly with a restrained gate valve connected to the downstream side of the tee. The purpose for the stub-out is to allow for connection to the utility without disturbing the existing development.

11.6 Water easements will be a minimum 20' in width or as directed by the DEPARTMENT. Easements shall be dedicated as utility easements unless required to dedicate for the exclusive use of the water mains. Water lines must be located within the center of the easement or as directed by the DEPARTMENT.

11.7 Fire hydrants shall be installed so that no distance shall be greater than 500' apart within residential areas and 300' apart in commercial or mixed developments or as directed by the Fire Department during plan review. Placement of fire hydrants in rural areas shall be installed so that no distance shall be greater than 1000' apart or as directed by the DEPARTMENT. Densely constructed or industrial sites may need to meet criteria set forth by Fire Department requirements. All considerations involving the physical locations of FDC connections shall be regulated by the Fire Department. New construction of buildings must have a working fire hydrant before structure construction begins. Subject to approval from the Fire Department. Fire hydrants placed in subdivisions need to be installed at the lot line to avoid conflicts with driveways. In a situation where a fire hydrant lead is over 50' an auxiliary gate valve shall be installed at the fire hydrant.

11.8 End of main fire hydrant locations for main extensions shall be approved by the DEPARTMENT during plan review.

11.9 The hydraulic analysis, design flows, residual pressures and static pressure of the proposed mains shall be provided as requested by the DEPARTMENT. Additional design data may be required if, in the opinion of the DEPARTMENT, it is necessary for review prior to approval of the plans.

11.10 Valves should be located not more than 500' intervals within residential areas and 300' intervals within commercial areas or as required by the DEPARTMENT. Valves shall be provided at each quadrant of intersecting mains so as to enable two directions of flow throughout the designed system during times of maintenance or emergencies. Valves shall be installed in a manner that connects them to all fittings with an anchor coupling.

11.11 All taps 12" or smaller on existing mains shall be performed by the DEPARTMENT. Taps larger than 12" must be completed by a DEPARTMENT approved contractor, at the developer's expense, following the procedures outlined in this section. Request for taps to be performed by the DEPARTMENT or approved contractor shall be made at least 24 hours in advance.

CONTRACTOR shall provide material for all taps and shall be responsible for excavation and installation of valve and tapping sleeves unless directed otherwise by the DEPARTMENT. CONTRACTOR shall provide two pressure tests prior to execution of the tap. Two Pressure Tests, as defined herein, at 200 psig with no loss for 15 minutes or in areas of higher pressure test to 1 ½ times the operating pressure with no loss for 15 minutes and shall be witnessed and recorded by the CITY INSPECTOR or DEPARTMENT representative. The first pressure test shall be with the valve closed and without a test plug, and the second pressure test shall be with the valve open and a test plug. Testing equipment shall be inspected by CITY INSPECTOR and shall be in proper working order at time of test. Tap locations on pipe sizes 6" to 12" will be no closer than 24" to the back end of the bell or collar of the pipeline and no closer than 24" from the insertion line on the spigot end of the pipeline. Water lines larger than 12" tap locations will be no closer than 36".

11.12 In no case shall a structure that is independently owned be allowed to connect to the same water service of another independently owned structure. Plumbing systems of two independently owned structures or properties shall not be served by the same water meter. Each individually owned plumbing system will have its own water meter to serve water for its domestic or commercial use. Each independently owned property or structure shall have a direct connection to public water and sewer. A private easement is not an acceptable means to access public water or sewer for new structures or lots. Only when approved as part of the zoning for a planned development shall two properties be served from the same 1" service line supplying water to a double meter set installed on the property line of the adjoining properties. These double meter set installations will only be allowed in these approved developments in cases where no lawns exist and/or a community irrigation system is being provided. All water and sewer service lines shall be inspected by the Bentonville Building Inspection Department.

11.13 All water meter boxes and services shall terminate as indicated on the approved plans or as directed by the DEPARTMENT. The DEVELOPER will provide 1" water service piping to each lot with a minimum single meter set and box. All service lines shall be a minimum size of 1". All 1" service lines shall include 10 gauge solid strand copper tracer wire. All service lines installed shall be backfilled with class 67 bedding as outline in **Detail W02**. Service tap locations on pipe sizes 6" to 12" will be no closer than 24" to the back end of the bell or collar of the pipeline. Water lines larger than 12" service line taps will be no closer than 36".

11.14 All water services shall include a meter yoke, meter box, and lid. All meter sets shall have a minimum 3' service "pig-tail" on the customer's side of the meter connection for each water service. The "pig-tail" shall be placed in such a manner to minimize disturbing meter box in the process of plumber connection. Ensure fiber washers are installed in all meter yokes. All 1" tubing installed for new water services will be one piece installation, no couplings or joining appurtenances permitted unless approved by the DEPARTMENT. In such cases that new 1" water services are to be installed across future streets, 2" conduit shall be installed from 1' back of curb to 1' back of curb on the opposite side of the street. The 1" tubing and 10 gauge tracer wire shall be installed within the conduit. Only one service shall be installed in each conduit. Disclaimer: "pig-tail" belongs to property owner and is not the responsibility of the CITY. Any residential lots in new developments that are 6500 square feet or larger will be required to install a double meter set for the lot and provide a 2 hole lid for the meter box.

11.15 For information related to cross-connection control and backflow prevention rules and regulations, refer to the City of Bentonville's Cross Connection Control Program Manual. **Refer to Cross Connection Control Manual – Sections 20 - 27.**

11.16 The utility main that is stubbed out shall terminate at a manhole for a sewer main or a fire hydrant assembly with a restrained gate valve connected to the downstream side of the tee for a water main. The purpose for the stub-out is to allow for connection to the utility without disturbing the existing development.

SECTION 12 WATER DISTRIBUTION SYSTEM MATERIALS

12.1 ALL MATERIALS SHALL BE DOMESTICALLY MADE

12.1.1 These material specifications are intended to set a standard of quality and design for all materials used in the construction of water mains and appurtenances. Materials shall be of types listed in these specifications. Materials not specifically authorized in these specifications are forbidden for use in the system unless prior approval is obtained in writing from the DEPARTMENT prior to construction.

12.1.2 The DEPARTMENT must approve all material prior to installation. All materials shall meet AWWA specifications.

12.2 PIPE

12.2.1 All pipe furnished shall be designed for the distribution of potable water. Lubricant furnished for lubricating joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart taste or odor to water. The lubricant container shall be labeled with the manufacturer's name. The DEPARTMENT will determine type and size of pipe to be installed within the water distribution system during plan review.

12.2.2 In areas where the static operating water pressure is 150psi or greater or installation of water mains are within 10' of any permanent structure the DEPARTMENT reserves the right to require ductile iron water piping be installed. Request and approval will be made in the plan review process.

12.3 POLYVINYL CHLORIDE (PVC) WATER PIPE (4" – 12") (14" - 48")

12.3.1 PVC pipe in sizes 4" – 12" shall meet the requirements of AWWA C-900 DR-14 and comply with ASTM D1784 pressure classification rated class 305. Pipe joints shall be integrally molded bell ends in accordance with ASTM 3139 with factory supplied elastomeric gaskets meeting ASTM F477. Pipe to bear NSF-61 seal of approval for potable water. The pipe shall be approved by the Underwriter's Laboratories (UL) for use in underground fire protection service. The pipe shall be extruded from PVC meeting the requirements of cell classification 12454-B as defined in ASTM-D-1784, PVC compounds. The pipe shall be manufactured to cast iron size (C.I.) outside dimensions. Pipe shall bear identification markings that will remain legible during normal handling, storage and installation. Marking on pipe shall include the following and shall be applied at intervals of not more than 5':

- (a) Nominal size and OD (DR-14)
- (b) PVC
- (c) Dimension ratio (DR-14)
- (d) AWWA pressure class (for example PVC1120 or PC200)
- (e) AWWA designation numbers (AWWA C-900)
- (f) Manufacturer's name or trademark and production code
- (g) Seal (mark) of the testing agency that verified the suitability of the pipe
Material for potable water service. (for example NSF-61 or ULFM)

12.3.2 PVC pipe in sizes 14" – 60" shall meet the requirements of AWWA C-900 DR-21 and comply with ASTM D 1784 pressure classification rated class 200.

12.4 DUCTILE IRON PIPE (DI)

12.4.1 The pipe shall have a cement mortar lining and seal coat in accordance with ANSI/AWWA C104 A21. The pipe and flanges shall conform to ANSI/AWWA C111/A21, Class 50 rated at 350 psi unless otherwise specified. Tapping DI pipe shall conform to ANSI/AWWA C600.

12.5 DUCTILE IRON PIPE 4" - 54"

12.5.1 DI pipe shall conform to ANSI/AWWA C104/A21 and shall have a cement mortar lining and seal coat conforming to ANSI/AWWA C104/A21. Joints shall conform to ANSI/AWWA C111/A21 and may be mechanical joint or push-on joint unless otherwise specified. The minimum thickness class shall be Class 50 rated at 350 psi unless otherwise specified.

12.6 CROSS-LINKED POLYETHYLENE PRESSURE TUBING (PEX)

12.6.1 Cross-linked Polyethylene Pressure Tubing (PEXa) shall be type A and conform to ANSI/AWWA C904 with an SDR rating of 9 and a MINIMUM pressure class rating of 200 psi. PEXa tubing shall also be certified to standards ASTM F876, NSF 14 and NSF 61, and bear a standard materials designation code of 3306. Shall be standard CTS O.D. and compatible with ANSI/AWWA C800 fittings.

12.7 COATED COPPER PIPE

12.7.1 **Coated** copper service pipe shall be Type "K", soft tempered, seamless, for underground installation, in accordance with ASTM B88 and Federal Specifications WW-T-799. Pipe shall be supplied with a minimum 25 mil polyethylene coating. Coated copper pipe shall meet or exceed NSF-61 requirements.

12.8 ENCASEMENT PIPE

12.8.1 Smooth Wall Steel Encasement Pipe - Pipe shall conform to ASTM A-139, ASTM A-21.11 or AWWA C200. The metal thickness shall be as shown in the Proposal or Plans.

12.8.2 Casing spacer systems shall be manufactured in two pieces, made from heavy gauge T-304 stainless steel with Polymer Plastic Runners (Teflon). Spacers shall be a Cascade Casing Spacer manufactured by Cascade Waterworks Manufacturing Company or equal conforming to ASTM ratings, approved by AWWA and the DEPARTMENT. Casing and utility pipes shall be sealed with synthetic rubber end seals. **Detail GWS01**.

12.8.3 Any bell located within an encasement pipe shall be restrained by an approved method.

12.8.4 Encasement for service lines crossing city streets shall be HDPE SDR9 tubing or schedule 40 pvc, suitable for underground use. End seals or other acceptable means of preventing service tubing from contacting end of conduit and preventing debris from entering the conduit shall be provided. 1-inch service lines shall require 2-inch encasement, and 2-inch service lines shall require 4-inch encasement.

12.9 FITTINGS

12.9.1 DI fittings shall be designed for working pressure of at least 350 psi, shall be DI and shall conform to ANSI/AWWA C153 A21. Joints shall be mechanical joint conforming to ANSI A21.11. All fittings shall be furnished with gaskets and mechanical joint fittings shall be furnished with bolts, nuts and retainer glands. All fittings shall be ANSI/AWWA C550 AND C116 6-8 mil Nominal Thickness Fusion Bonded Epoxy Coated inside and out. Fittings shall be manufactured by U.S.

Pipe "TRIM TYTE", Tyler, Star Pipe Products, or approved equal. Any alternate manufacturer shall require DEPARTMENT approval prior to installation.

12.9.2 Mechanical Joint Retainer Glands shall be installed on all water line valves bends and couplings. Mechanical Joint Retainer Glands for DI shall be made from DI and shall be designed for a working pressure of at least 200 psig. The set screws shall be extended through the outer most part of the gland. Glands shall be designed to standard mechanical joint fittings (AWWA C111). The minimum number and minimum size set screws shall be as follows, or approved equal. Any alternate manufacturer shall require Department approval prior to installation:

<u>Size Gland</u>	<u>Size Set Screw</u>	<u>Number of Set Screws</u>
4"	1/2"	4
6"	5/8"	6
8"	5/8"	9
10"	5/8"	16
12"	5/8"	16
16"	5/8"	24
20"	5/8"	28
24"	5/8"	32

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>	<u>MANUFACTURER</u>
Gland Retainer (Series 1400)	18"	UFR1400-D18	Ford
Gland Retainer (Series 1100)	18"	1118	EBBA
Gland Retainer (Series 1400)	12"	UFR1400-D12	Ford
Gland Retainer (Series 1100)	12"	1112	EBBA
Gland Retainer (Series 1400)	8"	UFR1400-D8	Ford
Gland Retainer (Series 1100)	8"	1108	EBBA
Gland Retainer (Series 1400)	6"	UFR1400-D6	Ford
Gland Retainer (Series 1100)	6"	1106	EBBA
Gland Retainer (Series 1400)	4"	UFR1400-D4	Ford
Gland Retainer (Series 1100)	4"	1104	EBBA

12.9.3 Mechanical Joint Retainer Glands for PVC shall be made from DI and shall be designed for a working pressure of at least 200 psi. The set screws shall be extended through the outer most part of the gland. Glands shall be designed to standard mechanical joint fittings (AWWA C111).

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>	<u>MANUFACTURER</u>
Gland Rtnr.C900 Circle-Lock	18"	UFR1500-C-18	Ford
Gland Retainer (Series 2000 PV)	18"	2018	EBBA
Gland Retainer C900 Circle-Lock	16"	UFR1500-C-15	Ford
Gland Retainer (Series 2000 PV)	16"	2016	EBBA
Gland Retainer C900 Circle-Lock	12"	UFR1500-C-12	Ford
Gland Retainer (Series 2000 PV)	12"	2012	EBBA
Gland Retainer C900 Circle-Lock	8"	UFR1500-C-8	Ford
Gland Retainer (Series 2000 PV)	8"	2008	EBBA
Gland Retainer C900 Circle-Lock	6"	UFR1500-C-6	Ford
Gland Retainer (Series 2000 PV)	6"	2006	EBBA
Gland Retainer C900 Circle-Lock	4"	UFR1500-C-4	Ford
Gland Retainer (Series 2000 PV)	4"	2004	EBBA

12.9.4 Swivel hydrant adapters, anchor couplings, and Tees shall be designed for a working pressure of at least 250 psig and to fit standard mechanical joint fittings (ANSI/AWWA C111 A21). One end of the straight anchor coupling and the branch of the tee shall be provided with a gland that may be rotated 360° on the fitting. Lengths of swivel adapter shall be as specified on plans and conform to standard manufactured lengths.

12.10 **TAPPING SLEEVES (4" TAP & LARGER)**

12.10.1 Tapping Sleeves shall be stainless steel. They shall be designed for a working pressure of at least 200 psig. Steel sleeves shall be stainless steel or coated with high build, Thermo-Set Epoxy. A test plug shall be furnished through the body for hydrostatic pressure testing. The outlets shall conform to ANSI B16.1, Class 125 flanges designed to accept tapping valves described herein. All bolts shall be of corrosion resistant alloy. Sleeves may be designed for a water tight seal by the use of mechanical followers or by the use of a gasket placed in a recess between the sleeve body and the pipe barrel. Only sleeves with mechanical followers or full circle gaskets may be used. If the known working pressure of the pipe to be tapped is greater than 200 psig the DEPARTMENT may require a MUELLER H-615 Series Tapping Sleeve.

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>	<u>MANUFACTURER</u>
<u>Tapping Sleeves: Stainless Steel w/Carbon Steel Flange for AC</u>			
Sleeve	16 x 6	Fast-1900-6A 18.60-1900 OD Rough Barrel AC	Ford Meter
Sleeve	16 x 8	Fast-1900-8A 18.60-1900 OD Rough Barrel AC	Ford Meter
Sleeve	16 x 12	Fast-1900-12A 18.60-1900 OD Rough Barrel AC	Ford Meter
Sleeve	12 x 12	FAST-1440-12A	Ford Meter
Sleeve	12 x 8	FAST-1440-8A	Ford Meter
Sleeve	12 x 6	FAST-1440-6A	Ford Meter
Sleeve	8 x 8	FAST-945-8A	Ford Meter
Sleeve	8 x 6	FAST-945-6A	Ford Meter
Sleeve	6 x 6	FAST-750-6A	Ford Meter
<u>Tapping Sleeves: Stainless Steel w/Carbon Steel Flange for CI/C900</u>			
Sleeve	24 x 4	Fast-2600-4A	Ford Meter
Sleeve	24 x 6	Fast-2600-6A	Ford Meter
Sleeve	24 x 8	Fast-2600-8A	Ford Meter
Sleeve	24 x 12	Fast-2600-12A	Ford Meter
Sleeve	18 x 6	Fast-1992-6A	Ford Meter
Sleeve	18 x 8	Fast-1992-8A	Ford Meter
Sleeve	18 x 12	Fast-1992-12A	Ford Meter
Sleeve	16 x 8	FAST-1780-8A	Ford Meter
Sleeve	16 x 6	FAST-1780-6A	Ford Meter
Sleeve	12 x 12	FAST-1350-12A	Ford Meter
Sleeve	12 x 8	FAST-1350-8A	Ford Meter
Sleeve	12 x 6	FAST-1350-6A	Ford Meter
Sleeve	8 x 8	FAST-945-8A	Ford Meter
Sleeve	8 x 6	FAST-945-6A	Ford Meter
Sleeve	6 x 6	FAST-730-6A	Ford Meter
Sleeve	4 x 4	FAST-620-44A	Ford Meter

Tapping Sleeves: Stainless Steel

Sleeve	4"	SST OR SSTIII	Romac
Sleeve	6"	SST OR SSTIII	Romac
Sleeve	8"	SST OR SSTIII	Romac
Sleeve	10"	SST OR SSTIII	Romac
Sleeve	12"	SST OR SSTIII	Romac
Sleeve	16"	SST OR SSTIII	Romac
Sleeve	18"	SST OR SSTIII	Romac
Sleeve	24"	SST OR SSTIII	Romac

12.11 SLEEVES OR COUPLINGS

12.11.1 Sleeves shall be iron with mechanical joint followers. Couplings shall be steel or iron with gasketed ends. They shall be designed for a working pressure of at least 200 psig and sized to properly fit the type and class of pipe specified. All bolts shall be of corrosion resistance alloy. Steel couplings shall be coated internally and externally with high build, high strength, Thermo-Set epoxy coating. The Thermo-Set epoxy coating shall be 8 - 10 mils DFT and free of voids. Or approved equal, prior to construction.

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>	<u>MANUFACTURER</u>
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Transition Couplings:

Comp Coup AC/CI	16 x 12	442-19201780-400	Smith-Blair
Comp Coup AC/CI	12 x 12	442-14401350-400	Smith-Blair
Comp Coup AC/CI	8 x 12	442-09850945-400	Smith-Blair
Comp Coup AC/CI	6 x 12	442-07650722-400	Smith-Blair

12.12 TAPPING SADDLES OR SLEEVES (FEMALE IRON PIPE OR AWWA CC OUTLET)

12.12.1 Tapping Saddles/Sleeves shall be made from iron, bronze, steel or stainless steel and designed for a working pressure of at least 200 psig. Outlets shall be ANSI B16.1, Class 125 flanged tapping outlets, or as specified. Watertight seal shall be accompanied by the use of a gasket placed in a recess between the sleeve body and pipe barrel. The use of these Strap Saddle/Sleeves is restricted to taps where the branch is at least one size smaller than the run. Coatings on steel sleeves/saddles shall be as specified in **Paragraph 12.10** above.

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>	<u>MANUFACTURER</u>
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Service Saddle, C.I., D.I., A.C.

Saddle	24 x 2 IP Double Strap	FC202-2650xIP7	Ford Meter
Saddle	18 x 2 IP Double Strap	FC202-2050xIP7	Ford Meter
Saddle	16 x 2 IP Double Strap (CI)	FC202-1840xIP7	Ford Meter
Saddle	16 x 2 IP Double Strap (AC)	FC202-1925xIP7	Ford Meter
Saddle	12 x 2 IP Double Strap	FC202-1438xIP7	Ford Meter
Saddle	12 x 2 PVC Only	FC202-1320-IP7 FOR C900	Ford Meter
Saddle	8 x 2 IP Double Strap	FC202-979xIP7	Ford Meter
Saddle	8 x 2 PVC Only	FC202-905-IP7 FOR C900	Ford Meter
Saddle	6 x 2 IP Double Strap	FC202-760xIP7	Ford Meter
Saddle	6 x 2 PVC Only	FC202-690-IP7 FOR C900	Ford Meter
Saddle	4 x 2 IP Double Strap	FC202-526xIP7	Ford Meter

Saddle	24 x 1 CC Double Strap	FC202-2650xCC4	Ford Meter
Saddle	18 x 1 CC Double Strap	FC202-2050xCC4	Ford Meter
Saddle	6 x 1 CC Double Strap (CI)	FC202-1840xCC4	Ford Meter
Saddle	16 x 1 CC Double Strap (AC)	FC202-1925xCC4	Ford Meter
Saddle	12 x 1 CC Double Strap	FC202-1438xCC4	Ford Meter
Saddle	12 x 1 PVC Only	FC202-1320-CC4 FOR C900	Ford Meter
Saddle	8 x 1 CC Double Strap	FC202-979xCC4	Ford Meter
Saddle	8 x 1 PVC Only	FC202-905-CC4 FOR C900	Ford Meter
Saddle	6 x 1 CC Double Strap	FC202-760xCC4	Ford Meter
Saddle	6 x 1 PVC Only	FC202-690-CC4 FOR C900	Ford Meter
Saddle	4 x 1 CC Double Strap	FC202-526xCC4	Ford Meter
Saddle	3 x 1 CC Double Strap	FC202-425xCC4	Ford Meter
Saddle	2 x 1 CC Double Strap	FC202-250xCC4	Ford Meter

Service Saddle with nylon coating:

Saddle	4 x 2 CC Double Strap	202NS	Romac
Saddle	6 x 2 CC Double Strap	202NS	Romac
Saddle	8 x 2 CC Double Strap	202NS	Romac
Saddle	10 x 2 CC Double Strap	202NS	Romac
Saddle	12 x 2 CC Double Strap	202NS	Romac
Saddle	16 x 2 CC Double Strap	202NS	Romac
Saddle	18 x 2 CC Double Strap	202NS	Romac
Saddle	24 x 2 CC Double Strap	202NS	Romac
Saddle	4 x 1 CC Double Strap	202NS	Romac
Saddle	6 x 1 CC Double Strap	202NS	Romac
Saddle	8 x 1 CC Double Strap	202NS	Romac
Saddle	10 x 1 CC Double Strap	202NS	Romac
Saddle	12 x 1 CC Double Strap	202NS	Romac
Saddle	16 x 1 CC Double Strap	202NS	Romac
Saddle	18 x 1 CC Double Strap	202NS	Romac
Saddle	24 x 1 CC Double Strap	202NS	Romac

12.13 SERVICE FITTINGS

12.13.1 Water service fittings shall be those manufactured by the following companies, listed below, or approved equal. The screws and/or nuts shall be of corrosion resistant alloy and shall be of Hex Head configuration. Any deviation must have approval from the DEPARTMENT prior to installation.

12.13.2 Service fittings shall only be used as specified to connect the service line to the tap and meter setter or u-branch. No additional fittings shall be used unless specifically approved in writing by the DEPARTMENT. In no instance shall fittings be used to splice or lengthen a service line. The service line shall be one continuous piece of tubing from tap to setter.

12.13.3 Thermoplastic insert stiffeners shall be used with all compression fittings installed on PEX service lines. In no case shall the stiffener extend past the compression cap of the fitting when fully tightened. Stainless steel insert stiffeners shall not be used in any circumstances.

12.13.4 Corporation and curb stops shall conform to AWWA C800 (curb stops shall have 360° rotation of Tee Head) and shall be those manufactured by the company specified, or approved equal, as follows:

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>	<u>MANUFACTURER</u>
300 Ball Type Corporation Valve	1"	B-25008N 74701BQ 1	Mueller A.Y. McDonald
Valve Ball	1"	FB11-444NL 76101 1	Ford A.Y. McDonald
Valve Ball	2"	B-11-777SWM-NL 76101W 2	Ford A.Y. McDonald

12.13.5 PEX and Copper pipe fittings shall conform to AWWA C800 and shall be those manufactured by the listed manufacturers or approved equal, as follows. Part numbers are provided below allowing the service line to connect to the meter setter or u-branch straight in, at a 45 degree angle, or at a 90 degree angle to minimize deflection of the service line and limit the potential for leaks. The 45 degree connection shall be the standard installation, unless otherwise approved by BWU during plan review or installation of the service.

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>	<u>MANUFACTURERS</u>
U-Branch	1" x 3/4" x 7-1/2"	H-15365N 708UFM	Mueller A.Y. McDonald
CTS x Male Adapter, Straight	1" x 3/4"	H-15428N 74753Q	Mueller A.Y. McDonald
CTS x Male Adapter, Straight	1" x 1"	H-15428N 74753Q	Mueller A.Y. McDonald
CTS x Male Adapter, Straight	2" x 2"	H-15428N 74753Q	Mueller A.Y. McDonald
CTS x Male Adapter, 45	1" x 3/4"	N/A 74750PQ	Mueller A.Y. McDonald
CTS x Male Adapter, 45	1" x 1"	H-15529N 74750PQ	Mueller A.Y. McDonald
CTS x Male Adapter, 45	2" x 2"	H-15529N 74750PQ	Mueller A.Y. McDonald
CTS x Male Adapter, 90	1" x 3/4"	H-15531N 74779MQ	Mueller A.Y. McDonald
CTS x Male Adapter, 90	1" x 1"	H-15531N 74779MQ	Mueller A.Y. McDonald
CTS x Male Adapter, 90	2" x 2"	H-15531N 74779MQ	Mueller A.Y. McDonald

12.13.6 The following meter setters and meter connection fittings shall conform to AWWA C800 and be those manufactured by the following companies, or approved equal:

<u>DESCRIPTION</u>	<u>SIZE</u>	<u>CATALOG NUMBER</u>	<u>MANUFACTURER</u>
Meter Set w/o Dual Check*	5/8" x 3/4" x 7"	B-2404FN 20-207WXLL 33	Mueller A.Y. McDonald
Meter Set w/o Dual Check*	1" x 10"	B-2404FN 20-410WXDD 44	Mueller A.Y. McDonald
Meter Set w/o Dual Check (telescoping)**	2" X 17"	720R712KWFF775 VBB77-12HB-11-77-EXP-NL	A.Y. McDonald FORD
Meter Set w/o Dual Check (non-telescoping)	2" X 17"	720B712WWFF775 VV7712B-1177NL	A.Y. McDonald FORD

*All 5/8" and 1" meter sets shall bebe installed with Mueller End Connection # H-14222N and Mueller End Connection # H-14227N or A.Y. McDonald equal. A fiber washer Mueller # H-48234 or A.Y. McDonald equal shall be set in each end connection of the meter set.

** All new installations of 2" services by contractors shall be the telescoping setter unless approved in writing by the DEPARTMENT during plan review or construction.

12.13.7 Section 12.13 specifically lists all fittings which are allowed for use by contractors in installation of new service lines by part number and size. BWU reserves the right to use additional fittings meeting the general requirements of this section for maintenance and repair of the existing system as necessary. Brass nipples, tees, bell reducers, ells, collars, etc. will be 150# SCH 40 Red Brass with iron pipe threads.

12.14 GATE VALVES

12.14.1 GATE VALVES - 4" THROUGH 18" WITH RESILIENT SEAT

12.14.2 Resilient seat gate valves 4" through 18" shall be designed for a working pressure of 250 psig. Valves shall conform to AWWA C515 (Thin Wall or Lightweight Ductile Spec) with non-rising stem, O-ring stem seals and 2" square operating nut. Valves shall open when the operating nut is turned to the left (counterclockwise). Valve ends shall be as specified. The resilient seat may be bonded or mechanically attached to the gate. All interior metal surfaces shall be coated with a two-part thermosetting epoxy. Gate valves larger than 18" need to be submitted to the DEPARTMENT for approval prior to installation.

12.14.3 Epoxy Coating shall be 8-mils DFT and free of voids.

12.14.4 Tapping valves shall have full size flow way accepting standard size shell cutter.

12.14.5 Valves conforming to these specifications will be accepted from the following manufacturers:

American Flow Control Model # 2500
Clow Valve Company, Model 2638
Mueller Company, Model A2361

12.15 BUTTERFLY VALVES

12.15.1 Butterfly valves shall conform to AWWA C504, having the following features and be approved by the DEPARTMENT prior to installation:

12.15.2 Class 150B

12.15.3 Suitable for complete buried service. Exterior of valve shall be epoxy coated.

12.15.4 Disc may be made from any of the materials as specified in AWWA C504. However, discs made from material other than bronze or stainless steel shall be coated with epoxy material in accordance with **Section 12.15.9**. All other interior surfaces which are not stainless steel or bronze shall also be coated with epoxy material.

12.15.5 Valve resilient seats shall be BUNA-N bonded into a self-retaining recess in the body or a natural rubber molded to an 18-8, Type 304 stainless steel retaining ring secured to the disc by self-setting screws. If the set is attached to the disc, the mating surface to the resilient seat shall be 304 or 316 stainless steel.

12.15.6 Stainless steel shafting. "O-Ring" or split-V shaft seals. Bronze, nylon or Teflon bearings and a "Manual Operator" totally enclosed for buried service shall include the following:

- (a) 2" x 2" operating nut
- (b) Open counter-clockwise
- (c) Operators of the traveling nut type shall not have u-joints on the rods.
- (d) On operators composed of worm gears; worm gears may be either bronze or DI and the worms shall be composed of hardened steel.
- (e) The operator shall satisfy the valve operating torque requirements for Class 150B valves and the operator input requirements of AWWA C504.

12.15.8 Valve ends shall be as specified. If flange ends are specified, they shall conform to Class 125, ANSI B16.1.

12.15.9 Epoxy Coating for Valve Disc. Before application of coating material, all surfaces of the disc shall be thoroughly cleaned to remove dirt, grease, oil and any other substances; all sharp angles, protrusions or irregularities which would interfere with proper coating coverage shall be removed; and the entire surface grit blasted to white metal in accordance with SSPC Specification SP5 resulting in an anchor pattern of at least 1 mil. Thermo-set epoxy material shall be applied to the sand-blasted surfaces before the white metal begins to oxidize (darken in color). The thermoset epoxy shall be approved for exposure to fluids for human consumption by the Federal Food and Drug Administration. The final DFT shall be at least 8 mils DFT and free of voids. The disc shall be post-cured for a sufficient period of time to assure full polymerization. Polymerization shall be checked by a direct impact test at 60-inch-lb. with no cracking or chipping of the coating. The DFT shall be checked using an accurate magnetic DFT gauge. The entire coated surface shall be checked for voids using a wet sponge type holiday detector. Any area where the DFT is found to be less than 8 mils or where voids were detected shall be re-coated and re-checked. Valves shall be packed for shipment in such manner that the disc coating is protected from damage.

12.16 AIR RELEASE VALVES

12.16.1 Air Release Valves shall be APCO No. 200-A, or approved equal, or as specified.

12.17 **VALVE BOXES, LIDS AND EXTENSIONS**

12.17.1 Valve boxes shall be Tyler 6850 series or equal with 5 1/4" shafts. Length variable 10 1/4" OD bottom flange, 8" ID Bottom, 7 3/16" OD top, 6 3/4" ID top of 2 section valve box.

12.17.2 Valve box lids shall have a 7 5/16" outside diameter with 6 1/2" inside diameter for 5 1/4" valve boxes. The lids shall be marked with "WATER" unless located at the tap for a fire line where a post indicator may not be installed. In this case the lid shall be marked "FIRE" and be painted safety red. The "FIRE" lid shall be locking and require only a wrench to open.

12.17.3 Extension shaft shall be required on any valve that exceeds 4' in depth. Valve stem extensions shall be adequate to transmit full torque required to open valve, and shall be secured to the valve operating nut by set screws not clips. The top of the extension shaft shall be a 2" square AWWA nut. Extensions shall be provided to bring the operating nut to within 4' of grade and have disc attached to hold operating nut in the center of valve box and shall be firmly attached to the valve.

12.17.4 Valve boxes in greenspace shall be surrounded by a precast concrete valve pad at ground level. Pads shall be 24" in diameter with a minimum thickness of 2" at the outside edge and shall be constructed of reinforced concrete with a minimum compressive strength of 4,000 psi. The space between the valve box and the pad shall be grouted with a non-shrink grout.

12.17.5 Valve boxes in or directly adjacent to hardscape where a circular pad would not be suitable for use or would require modification for use shall be surrounded by a cast in place concrete valve pad at finish grade. Pads shall be 18" square pads with a minimum thickness of 4" and shall be constructed of reinforced concrete with a minimum compressive strength of 4,000 psi. A 3/8" expansion joint or other means of isolating the pad from adjacent surfaces shall be provided as necessary.

12.18 **METER BOXES, VAULTS AND LIDS**

12.18.1 Water meters 5/8" and 1" shall be installed in 18" Carson Industries Oldcastle Plastic Meter Box Body Part #C22002001 that are domestically manufactured, or as approved by the DEPARTMENT. Covers shall be cast iron touch read covers, East Jordan #32197099 (single set), or #32197200 (double set) that are domestically manufactured, or as approved by the DEPARTMENT.

12.18.2 Water meters 5/8" and 1" that are installed in non-deliberate and incidental traffic shall be installed with a load bearing meter tile. Water meter installations that fit this criteria will use the DFW Plastics #DFW1800F-18-1ET load rated meter tile. Prior approval for water meters installed in potential traffic loaded areas shall be obtained from the DEPARTMENT during the plan review process.

12.18.3 2" meters shall be installed in 30" outside diameter x 36" deep HDPE meter boxes, East Jordan 38003036, that are domestically manufactured, or as approved by the DEPARTMENT. Covers shall be cast iron touch read covers, East Jordan #32143006 with #32243000 outer ring, that are domestically manufactured, or as approved by the DEPARTMENT. Meter box and outer ring may be ordered together as East Jordan #32243000A05.

12.18.4 All meter vault plans and installations shall be approved by the DEPARTMENT prior to the start of construction. Meter vaults shall not be subject to flooding and shall be watertight to prevent intrusion of water and dirt. The walls of the vault shall extend above the finished grade a minimum of 3" to prevent intrusion of water or dirt. Vault to be installed by CONTRACTOR at OWNER'S expense. **Detail W12.**

12.19 FIRE HYDRANTS

12.19.1 All fire hydrants furnished shall be dry barrel hydrants in conformance with AWWA C502, latest revision, for "Dry Barrel Fire Hydrants", and shall be designed for a 250 psig maximum working pressure. All fire hydrants shall be equipped with a safety stem coupling and flange, which are intended to fail upon vehicle impact without damage to the stem or main valve. All fire hydrants shall conform to AWWA C502, the following specifications, and shall be the Traffic Model Fire Hydrant:

Maximum Working Pressure	250 psig
Size of Valve Opening	Minimum 5"
Diameter of Inlet Connection	6"
Type of Inlet Connection	Mechanical Joint
Number & Size of Hose Connections	2 - 2 1/2", 1 - 4 1/2"
Nozzle Arrangement	All in same place
Nozzle Thread ASA	Standard
Nozzle Cap Chains	Three
Nozzle Cap Washers	Rubber
Barrel	Ductile Iron Pipe
Operating Threads	Oil or Grease Lubricated Seals
Lubrication Chamber	Oil or Grease
Seat Rings	Bronze to Bronze
Direction to Turn to Open	Left (Counter-Clockwise)
Shape & Size of Operating & Nozzle Cap Nut	5-Sided, 1 1/2" from flat to point
Operating Nut	Bronze
Hydrant Shoe	Epoxy Coated
Color above ground - barrel and dome	Industrial Safety Yellow
Color, Nozzle Caps & Top Nut, including shield	Industrial Safety Yellow

12.19.2 Seat must be removable, using a short, lightweight wrench which will fit all depths of bury.

12.19.3 The hydrant shall have a 6" mechanical joint inlet in conformance to the dimensions shown in ANSI/AWWA C110 A21, latest revision. The lead pipe from the valve to the fire hydrant shall be an approved Mechanical Joint Swivel Anchor Coupling 6" x 13" Tyler 084150A CL 153 or approved equal for direct connections, or retainer glands as specified by type throughout these specifications. A fire hydrant anchor tee will be required for new main installation as indicated by the DEPARTMENT.

12.19.4 All fire hydrants shall be equipped with a two-piece barrel having a flange at the required elevation to meet the height requirement (18" to 24" from final grade) designated in **Detail WO4**.

12.19.5 All fire hydrant installations shall have 6" gate valve with tracer wire, valve boxes and valve box pads meeting all provisions specified elsewhere in these specifications. Auxiliary gate valves are necessary for fire hydrant leads longer than 50'.

12.19.6 All concrete used for fire hydrant blocking shall be in conformance with the concrete **Section 12.24** of these specifications.

12.19.7 Fire hydrants conforming to these specifications will be accepted from the following manufacturers:

Mueller Super Centurion 250
Clow Medallion.

12.19.8 If a fire hydrant needs to be raised only 1 extension will be approved and all parts shall be manufactured by the same company as the fire hydrant. Generic extension parts shall not be used.

12.20 POLYETHYLENE TUBING MATERIAL FOR PIPE ENCASEMENT

12.20.1 Polyethylene material for the encasement of cast IP (gray or ductile) shall conform to ANSI A21.5 (AWWA C105).

12.20.2 Tape for field application shall be Polyken #900, or Scotchrap #50, or equal, at least 2" wide.

12.21 LOCATOR WIRE

12.21.1 All water mains and sewer force mains, including DI pipe, PEX and copper water services, or other appurtenances installed shall have single #10 gauge type TW (single strand) insulated copper locator wire, on top of pipe and fastened securely with tape every 10' and buried with it. This locator wire shall be installed in conjunction with the main at the same depth as the water main or service.

12.21.2 Locator wire shall not be connected in any way to main or any other underground metal (except other tracer wires). Installation of locator wire shall be tested one time before the first site final. Tracer wire shall be tested after curbs are installed and prior to asphalt. **Section 8**

12.21.3 Wire shall be accessible at all valve boxes and meter boxes and shall extend a minimum of 6" above the valve or meter box, at the main or service, connect all locator wires together so that a continuous electrical path is ensured. Tracer wire shall be installed through the outside of the valve box bottom section then inserted through the inside of the top section of the valve box. A minimum of 6" to maximum of 12" of tracer wire is required to be extended beyond the top of the valve box. **Detail W07.**

12.21.4 To connect locator wires, the wires shall be spliced using a split bolt connector (Blackburn 9H or Kearney KS90) or equal, then covered with electrical plastic tape (Type 3M Scotch 33) so that a waterproof joint is made.

12.22 CONCRETE MATERIAL SPECIFICATIONS

12.22.1 Concrete shall have a 28-day compressive strength of at least 4,000-psi and shall contain not more than six (6) gallons of water per sack of cement, including the water in the aggregates, and not less than six (6) sacks of cement per cubic yard of concrete. A copy of all tickets from concrete company shall be presented to the DEPARTMENT.

12.22.2 Portland cement conforming to ASTM C150, Type 1, shall be used unless the DEPARTMENT approves the use of other types.

12.22.3 Water used shall be clean and free from injurious amounts of oil, acids, alkalis, salt, organic matter, or other deleterious substances.

12.22.4 Fine aggregate shall consist of clean, sound, properly graded sand conforming to ASTM Standard C33 uniformly graded from 100% passing the 3/8" sieve to not more than 8% passing the Number 100 sieve.

12.22.5 Coarse aggregate shall consist of crushed stone, gravel, or other inert material of similar characteristics, having clean, hard, strong, durable, uncoated particles with not more than 5% by weight of soft fragments, 1/4 % by weight of clay lumps, and 1% by weight of material removed by decantation, except that when the material removed by decantation consists essentially of crushed

dirt the maximum amount permitted may be increased to 1 ½ % by weight. Aggregate shall conform to ASTM Standard D289. Coarse aggregate may be either of two sizes, 1 ½" and smaller or ¾" and smaller, and shall be graded within the following requirements.

12.23 PERCENT RETAINED BY WEIGHT

Maximum size mesh screen (sq. mesh)	0 - 3
Half-Maximum size mesh screen (sq. mesh)	30 - 65
No. 4 Sieve	94 - 100

12.23.1 In no case shall the maximum size aggregate exceed 1/3 of the design thickness of any part of a structure. Coarse aggregate for exposed aggregate surfaces shall be as follows:

Total Retained on 1 1/2" Sieve	- 0 %
Total Retained on 3/4" Sieve	25 - 60%
Total Retained on 3/8" Sieve	70 - 90%
Total Retained on #4 Sieve	95 - 100%

12.24 CONCRETE PROPORTIONS AND CONSISTENCY

12.24.1 The proportions of the concrete shall produce a mixture that will work readily, with the placement method most used, into the corners and angles of the forms and around reinforcement. Segregation of materials in the mixture shall not be permitted nor the collection of excess free water on the surface.

12.24.2 The slump of the concrete shall be the minimum that is practicable. When vibrators are used to consolidate the concrete, the slump shall not exceed 4"; otherwise, the slump shall not exceed 6".

12.24.3 The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked. Measurement of materials for ready-mixed concrete shall conform to Specifications for Ready-Mixed Concrete (ASTM C94).

12.24.4 Ready-mix concrete shall be required and shall conform to ASTM Standard C94 and to applicable portions of these specifications for on-site mixing. The concrete shall be delivered and placed within 1-hour after all materials, including mixing water, shall have been placed in the mixing drum. The CONTRACTOR shall obtain from the supplier of the ready-mixed concrete, the supplier's agreement to inspection by the DEPARTMENT, to the full extent deemed necessary by the DEPARTMENT.

12.25 CONCRETE TESTING

12.25.1 As the placement of concrete progresses, the DEPARTMENT may take samples of the concrete for testing. The CONTRACTOR shall provide whatever assistance required by the DEPARTMENT in collecting and preparing samples for testing. Sampling shall be in accordance with ASTM Standard C172.

12.25.2 An independent laboratory in accordance with ASTM Standard C143 shall conduct slump tests.

12.25.3 Compression test specimen shall be prepared and cured in accordance with ASTM Standard C31. Specimens shall be tested in accordance with ASTM Standard C39.

12.25.4 All reinforcing bars shall be "Billet-Steel Concrete Reinforcement Bars" conforming to ASTM Designation A15 or "Rail-Steel Concrete Reinforcement Bars" conforming to ASTM Designation A16. Billet-Steel bars shall be intermediate grade with minimum yield point of 60,000 psi.

12.25.5 All reinforcing bars shall be deformed bars. Deformation shall comply with "Minimum Requirements of the Deformation of Deformed Steel Bars for Concrete Reinforcement - ASTM Designation A305".

12.25.6 When the volume of concrete required at the work site is less than 1/3 cubic yard, mixing may be accomplished by hand tool methods. The concrete shall be mixed in a clean, watertight vessel to the extent necessary to assure that the cement; aggregate and water are thoroughly integrated. The mix shall be at least 1 part Portland cement to 2 parts coarse aggregate, as specified in **Section 12.22.5** and 2 parts sand, as specified in **Section 12.22.4**. Only that amount of water required to provide a stiff, workable mix shall be used. The strength requirements specified in **Section 12.22.1** herein, apply.

SECTION 13 INSTALLATION CRITERIA FOR WATER MAINS AND APPURTENANCES

13.1 CONNECTIONS TO WATER DISTRIBUTION SYSTEM

13.1.1 All connections to or any operations of appurtenances to the existing distribution system must be accomplished in the presence of the CITY INSPECTOR or DEPARTMENT representative.

13.1.2 In cases where completing the connection will disrupt service to customers, the CONTRACTOR shall notify the DEPARTMENT at least 5 days in advance of the work. The customers whose service will be disrupted shall be notified by the CONTRACTOR a minimum of 24 hrs prior to disruption of services. The CONTRACTOR shall plan the work so that disruption of service is held to a minimum. The schedule shall be approved by the DEPARTMENT. **Section 9.3.1**

13.1.3 After connections have been completed, the valves shall be tightly closed. All valve operation shall be performed by the CITY INSPECTOR or DEPARTMENT personnel. At no time shall the CONTRACTOR operate valves or fire hydrants within the water distribution system.

13.1.4 A minimum horizontal distance of 10' should be maintained between water lines, and sewer lines, including edges of manholes or other sources of contamination. Water lines and sewer lines shall not be laid in the same trench except on the written approval of the ADH. Water mains necessarily in close proximity to sewers must be placed so that the bottom of the water line will be at least 18" above the top of the sewer line at its highest point. If this distance must unavoidably be reduced, the water line or the sewer line must be encased in watertight pipe with sealed watertight ends extending at least 10' either side of the crossing. Where a water line must unavoidably pass beneath the sewer line, at least 18" of separation must be maintained between the outside of the two pipes in addition to the preceding encasement requirement. Exceptions to this must be approved in writing by the ADH.

13.2 INSTALLATION OF VALVES

13.2.1 Valves shall be joined in accordance with the methods of jointing pipe as specified elsewhere herein. Valve stems shall be plumb and there shall not be any obstructions which will prohibit the installation of valve boxes directly over the stem. For dead-end lines, concrete anchor collars shall be provided around an adjoining length of pipe for all valves. Mechanical joint retainer glands shall be installed on all valves with mechanical joint ends. Valves shall be installed and anchored on all sides of any Cross or Tee application. All valves shall be firmly supported on well compacted approved bedding and completely wrapped in polyethylene tubing material as specified in **Section 13.11**.

13.2.2 Valve boxes shall be installed over the operating nut of each valve and be of adequate length to reach the finished grade. The box cover shall be flush with the final grade. Tracer wire shall be installed through the outside of the valve box bottom section then inserted through the inside of the top section

of the valve box. A minimum of 6" to maximum of 12" of tracer wire is required to be extended beyond the top of the valve box. **Detail W07**.

13.2.3 When the distance between the valve operating nut and the finished surface exceeds 4', a valve stem extension shall be provided. The stem shall be round steel bar stock or steel pipe with a 2" square bar steel operating nut (except 2" valve) attached to the upper end. The stem extension shall be of adequate length to reach from the valve operating nut to a point within 4' of the final grade. A box wrench, 2 1/8" ID square, made from high grade steel 3/16" thick shall be welded * to the lower end of the stem extension which will fit over the valve operating nut. A round center guide made from 3/16" or 1/4" steel plate shall be placed on the valve stem extension approximately 6" from the upper end. The diameter of the guide shall be slightly less than the ID of the valve box. The guide shall be affixed to the stem extension in such a way that it can rotate freely on the stem. A bituminous coating shall be applied to all stem extension pieces.

13.2.3.1 ***NOTE:** Welds on stem extensions (top and bottom nut) shall be 1/8" - 3/16" fillet weld around full circumference, small - large valve stem extension.

13.2.4 Valve stem extensions shall be manufactured by Clow, or equal. Shop drawings shall be submitted to the DEPARTMENT for approval prior to installing the stem extension pieces.

13.3 INSTALLATION OF TAPPING SLEEVES & TAPPING SADDLES

13.3.1 The pipe shall be free of dirt and other debris before attaching tapping sleeve or tapping saddle. That part of the pipe barrel, which will be in contact with the gasket of tapping saddles, shall be smooth.

13.3.2 Tapping saddles or sleeves shall be bolted securely to the pipe. The face of the outlet shall be plumb. Mechanical joint glands for tapping sleeves shall be installed in accordance with **Section 12.9.3** herein. The strap bolts for tapping saddles shall be alternately tightened "snug" and then alternately tightened to a torque as required by manufacturer's requirements.

13.3.3 The tapping valve shall be bolted securely to the tapping sleeve or tapping saddle outlet flange. The tapping valve shall be supported by concrete cap blocks to remove weight from the valve and sleeve or saddle.

13.3.4 After installation of the tapping sleeve or saddle and the tapping valve, the assembly shall be hydrostatically tested at 200 psi for 15 minutes by introducing water through the sleeve or saddle test tap.

13.3.5 All tapping sleeves shall have poured-in-place concrete thrust blocking installed after pressure testing prior to tapping. **Detail GWS02**.

13.3.6 Polyethylene material shall be placed in accordance with **Section 13.11** herein.

13.4 FIRE HYDRANT INSTALLATION

13.4.1 All fire hydrants must have placement approval from the DEPARTMENT.

13.4.2 Hydrants shall be thoroughly cleaned before setting, removing all dirt and foreign matter from the barrel and bottom section up to the main valve. The main valve shall be in the "closed" position and the waste outlet shall be free of any obstructions.

13.4.3 Hydrants shall be located a safe distance from driveways, roadways and sidewalks and in a manner to provide complete accessibility. They shall stand plumb with nozzles at proper elevation and the

steamer/pumper nozzle pointed perpendicular to traffic when hydrant is adjacent to a street, roadway or parking lot drive or toward the protected building unless otherwise directed by the DEPARTMENT. **Detail W04.**

- 13.4.4 The large diameter nozzle shall be at right angles to the street or fire lane, with the nozzle cap at a minimum of 3' to maximum of 9' from back of curb or edge of any driving surface (measured from the steamer cap nut) or as directed by the DEPARTMENT. Under no conditions will fire hydrants be allowed in the sidewalk or radius, unless otherwise directed by the DEPARTMENT. Fire hydrants placed in subdivisions need to be installed at the lot line to avoid conflicts with driveways.
- 13.4.5 The CONTRACTOR shall, if necessary, rotate the hydrant barrel or nozzle section at the flanged joint to obtain the desired nozzle position as specified by the DEPARTMENT.
- 13.4.6 The fire hydrant shoe shall be supported firmly on the bottom and shall be well braced against unexcavated earth with formed and poured concrete blocking on the backside. If considered necessary by the DEPARTMENT, the fire hydrant shall be tied to the branch pipe with suitable rods or clamps. Rods or clamps are to be furnished by the CONTRACTOR without additional compensation.
- 13.4.7 All mechanical joint fittings shall be properly protected by polyethylene tubing as described in **Section 13.11.**
- 13.4.8 A drainage bed shall be provided under and around the base of the hydrant of at least 6 cubic feet in volume and extending at least 6" above the weep hole drain outlet and shall consist of Class #67 gravel. As defined in **Section 10.2.1.** Under no circumstances shall the waste outlet on the hydrant or the drainage bed be connected to sewer or storm drainage.
- 13.4.9 Backfilling and tamping around hydrant barrels shall be continuous in operation.
- 13.4.10 After installation, it is required that all fire hydrants shall be covered with a water resistant sack to indicate out-of-service. These may be removed after the CITY INSPECTOR or DEPARTMENT has placed the line in service.

13.5 CONCRETE PLACEMENT & FINISHING

- 13.5.1 All placement of concrete must be in the presence of the DEPARTMENT or representative. The CONTRACTOR is cautioned that he may be required to remove, without compensation, any concrete placed in the absence of the DEPARTMENT or representative.
- 13.5.2 Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete at the delivery end without separation of materials. All concrete in reinforced walls and columns shall be poured through tremies unless otherwise permitted by the DEPARTMENT. The free fall of concrete shall be 5' maximum.
- 13.5.3 Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing. The placing of concrete shall be carried on at such a rate that concrete is at all times plastic and flows readily into the spaces between the bars. Concrete that has been contaminated by foreign material shall not be used, nor shall re-tempered concrete be used.
- 13.5.4 When placing is once started, it shall be carried on as a continuous operation until placement of the panel or section is complete.

13.5.5 In placing concrete, care shall be taken that the freshly placed mass is so placed and vibrated that there is no tendency for the coarse aggregate to segregate from the mortar, that no rock pockets are left, that the concrete flows readily around the steel and into the extremities of the forms, and the whole freshly-placed mass becomes a plastic jelly-like mass but without free water in appreciable quantity on its surface. No concrete shall be poured without vibration with mechanical or magnetic internal vibrators.

13.5.6 Water shall be removed from place of deposit before concrete is placed unless otherwise permitted by the DEPARTMENT.

13.5.7 Concrete placed directly on the ground shall be placed in the forms on a compacted moist sub-grade and shall be vibrated until mortar covers the entire surface. Vibrating shall be given special attention in order to prevent voids in the concrete.

13.5.8 Concrete after placement and finishing shall be protected from damage while curing. Provisions shall be made for maintaining concrete in moist condition for a period of at least 72 hours after placement.

13.5.9 After removal of forms and finishing, as specified elsewhere herein, backfill shall be placed around the structure and thoroughly compacted.

13.5.10 Forms shall be constructed before placement of any concrete ^{*} unless otherwise authorized by the DEPARTMENT.

13.5.10.1 ***NOTE:** Concrete utilized for thrust blocking to be poured against undisturbed earth.

13.5.11 Forms shall conform to shapes, lines, and dimensions of the members as specified on the Plans, or as required to conform to the original shape and dimensions in the case of replacement structures, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or joined together so as to maintain position and shape. They may be constructed of any material with sufficient strength, which will provide the finished work a satisfactory surface and alignment.

13.5.12 Forms shall be removed in such a manner as to insure the complete safety of the structure. When the structure is supported on shores, the removable floor forms, beams and girder sides, and column and similar vertical forms may be removed after 72 hours, providing the concrete will not be injured. In no case shall supporting forms or shoring be removed until members have acquired sufficient strength to support their weight and imposed loads safely.

13.5.13 Forms shall be coated with a form oil before placement of reinforcing steel or concrete. Excessive coating material shall not be allowed to form or stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete or reinforcing bars will be placed.

13.6 CONCRETE REINFORCEMENT

13.6.1 At the time concrete is placed, metal reinforcement shall be free from rust scale or other coatings that will destroy or reduce the bond. All bars shall be shop bent, unless otherwise permitted by the DEPARTMENT. No bars partially embedded in concrete shall be field bent except as shown on Plans or as specifically permitted by the DEPARTMENT. Field bonding of rail steel bars will not be permitted.

13.6.2 Metal reinforcement shall be accurately placed according to the Plans or as specified herein and adequately secured in position by concrete, metal, or other approved chairs, spacers or ties.

13.6.3 No splices of reinforcement shall be made except as shown on the Plans, or as specified, or as authorized by the DEPARTMENT. All welding shall conform to the American Welding Society's Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction (AWS D12.1), unless otherwise authorized by the DEPARTMENT. All laps and splices shall be in accordance with ACI 318, using $f_c = 3,000$ psi and $f_y = 60,000$ psi unless otherwise shown on the Plans.

13.6.4 The reinforcement shall be protected by the thickness of concrete indicated in the Plans. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

- (a) Where concrete is deposited against the ground without the use of forms not less than 3", except wire mesh reinforcement for concrete slabs which may be within 1 1/2" of the ground.
- (b) Where concrete is to be exposed to the weather or to the ground but placed in forms not less than 2" for bars larger than No. 5 and 1 1/2" for No. 5 bars or smaller.
- (c) In slabs and walls not exposed to the ground or to the weather - not less than 3/4".
- (d) In all cases - at least equal to the diameter of the bars.

13.7 CONCRETE COLD-WEATHER REQUIREMENTS

13.7.1 Concrete may be placed when the ambient temperature is at least 35°F and rising, and the concrete is not likely to be subjected to freezing temperatures before final set has occurred. Concrete shall not be placed when the ambient temperature is 40°F and falling, or when the concrete is likely to be subjected to freezing temperatures before final set has occurred. Concrete footings or slabs shall not be placed over frozen ground. The temperatures of the concrete when placed shall not be less than 45°F. Heated materials shall be free of ice, snow and frozen lumps before entering the mixer. Methods and equipment for the heating of materials shall be subject to the DEPARTMENT'S approval. Suitable means shall be provided for maintaining the concrete at a temperature of at least 45°F for not less than 96 hours after placing.

13.7.2 Any and all concrete damaged by freezing shall be removed to the satisfaction of the DEPARTMENT, and replaced, all at the expense of the CONTRACTOR.

13.8 CONCRETE HOT-WEATHER REQUIREMENTS

13.8.1 In hot weather, suitable precautions shall be taken to avoid drying of the concrete prior to finishing operations. Use of windbreaks, sunshades, fog sprays, or other devices shall be provided as directed by the DEPARTMENT.

13.8.2 Concrete deposited in hot weather shall not have a placing temperature that will cause difficulty from loss of slump, flash set, or cold joints. Concrete temperatures shall be less than 90°F unless higher temperatures are permitted by the DEPARTMENT.

13.8.3 The use of additives shall be prohibited unless written approval of its use has been secured, in advance, from the DEPARTMENT.

13.9 CONCRETE THRUST BLOCKS & ANCHOR COLLARS

13.9.1 Concrete thrust blocks and anchors shall be provided along the pipeline in accordance with the construction details, plan sheets, or as directed by the DEPARTMENT. The concrete shall have a 28 day compressive strength of 4,000-psi.

13.9.2 Concrete for thrust blocks shall be placed against undisturbed soil. The excavation shall be hand shaped and free of loose material. Forms shall be used to confine the concrete in areas other than that part that is in contact with undisturbed soil in the direction of the thrust.

13.9.3 No concrete shall be placed around any part of a joint or placed so that it interferes with the removal of any joint accessories such as bolts, followers, threads, collars, couplings, etc. Fire hydrant weep hole drain outlets shall not be restricted.

13.9.4 The top of the concrete thrust block or anchor collar shall be struck off with a wood straight edge or float.

13.9.5 Admixtures are not to be used without the approval of the DEPARTMENT.

13.9.6 All placement of concrete must be in the presence of the CITY INSPECTOR or DEPARTMENT representative. The CONTRACTOR is cautioned that he may be required to remove, without compensation, any concrete placed in the absence of the CITY INSPECTOR or DEPARTMENT representative.

13.9.7 Backfill over concrete thrust blocks or anchor collars shall not be placed before the concrete has attained initial set.

13.9.8 No thrust blocks shall be less than 12" thick between the pipeline or appurtenances and undisturbed soil in the direction of thrust.

13.9.9 The excavation shall be free of water before concrete is placed. Steel reinforcement, as specified on the plans, shall be placed in accordance with **Section 13.6** herein.

13.9.10 The pipe or appurtenances shall be cleaned before placing concrete when the concrete is to be in direct contact with the pipe or appurtenance. Polyethylene plastic shall cover all pipes or appurtenances subject to direct contact with concrete.

13.9.11 The area of contact of the thrust blocks and anchor collars shall be sufficient to resist the thrust. This area will vary depending on the safe bearing value of the soil. Suggested safe soil bearing values are as follows:

TYPE OF SOIL	SUGGESTED SAFE BEARING VALUES (TONS\SQ.FT.)
Solid Rock	25
Hard Slate	6
Medium Shale	4
Soft Shale	2
Dry Clay Gravel	4
Soft Clay	1.5
Dry Sand or Loam	2.5
Wet Clay	0.75

13.9.12 The above values are approximate and will vary considerably and are intended to be used only as a reference. The CONTRACTOR is responsible for determining the soil bearing value or taking other action to assure that the bearing area is adequate to restrain the pipe or appurtenances.

13.9.13 Where the soil is unstable or in the case of recent fill areas, the following procedures shall apply either individually or in a combination:

- (a) Thrust blocks shall be of adequate size to restrain pipe or appurtenances by mass alone without depending on horizontal bearing of the soil.
- (b) The excavation shall extend deep enough to contact firm soil and the block brought up to the pipe or appurtenances and constructed so that the block acts as a beam and will provide restraint required. Such block shall be reinforced with steel reinforcing bars. **Detail GWS04**.
- (c) Anchor blocks shall be constructed in a firm soil and tie rods extended to the pipe or appurtenances. **Detail GWS04**.

13.9.14 Thrust blocks for vertical bends shall be adequate to resist the thrust by mass alone when the thrust is upward.

13.9.15 Thrust blocks and anchor collars shall be adequate to restrain the pipeline and appurtenances at the specified test pressure. The following table lists the resultant thrust at certain fittings at a pressure of 100 psi. In order to determine the thrust at the test pressure these values are to be multiplied by a factor equal to the test pressure divided by 100.

13.10 PRESSURE TABLE

Thrust per 100 psi Pressure

Pipe Diameter	Tees Sq. Ft.	90 Bend Sq. Ft.	45 Bend Sq. Ft.	22½ Bend Sq. Ft.	11¼ Bend Sq. Ft.
4"	1.0	1.0	1.0	1.0	1.0
6"	1.5	2.0	1.0	1.0	1.0
8"	2.5	3.5	1.8	1.0	1.0
12"	6.0	8.0	4.0	2.0	1.5
16"	10.0	14.2	7.0	4.0	3.0
18"	21.0	21.0	12.0	6.0	4.0

13.10.1 Concrete thrust blocks or anchor collars that fail to restrain the pipe or appurtenances shall be replaced by the CONTRACTOR at his expense.

13.11 INSTALLATION OF POLYETHYLENE PROTECTION MATERIAL

13.11.1 Polyethylene material ANSI A21.5 (AWWA C105), shall be in tubing form or in the form of flat sheet or rolls, as specified herein, shall be placed around all mechanical joints of pipe and fittings; all valves and fire hydrants with mechanical joint ends and all saddles, sleeves, and couplings, tapping saddles and any other appurtenances with exposed bolts.

13.11.2 Pipe-shaped appurtenances - bends, reducers, offsets and other pipe-shaped appurtenances shall be covered with polyethylene in the same manner as the pipe.

13.11.3 Odd-shaped appurtenances - valves, tees, crosses and other odd-shaped pieces which cannot practically be wrapped in a tube, shall be wrapped with a flat sheet or split length of polyethylene tube. The sheet shall be passed under the appurtenance and brought up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Tape polyethylene securely in place at valve stem and other penetrations.

13.11.4 Where specified in the Plans, DI pipe and appurtenances shall be completely encased in polyethylene tubing material. It is not the intent that the material form an enclosure that is absolutely air or water tight, but to prevent pipe to soil contact.

13.11.5 Polyethylene tubing, when required, shall be applied to water lines by one of the following methods:

- (a) Method "A" - Cut polyethylene tube to a length approximately 2' longer than the length of the pipe section. Slip the tube around the pipe centering it to provide a 1' overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube. After assembling the pipe joint, take bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe and secure in place. Then slip the end of the polyethylene from the new pipe section of the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width to make snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points with tape.
- (b) Method "B" - Cut polyethylene tube to a length approximately 1' shorter than the length of the pipe section. Slip the tube around the pipe, centering it to provide 6" of bare pipe at each end. Make polyethylene snug, but not tight; secure ends. Before making up a joint, slip a 3' length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion lengthwise. After completing the joint, pull the 3' length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least 1'; make snug and secure each end.

13.11.6 Openings in Tubing Material - openings for branches, service taps, blow-offs, air valves, and similar appurtenances shall be made by making a x-shaped cut in the polyethylene and temporarily folding the film back. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene with tape.

13.11.7 Junctions between Wrapped and Unwrapped Pipe - Where polyethylene wrapped pipe joins a pipe, which is not wrapped, extend the polyethylene tube to cover the unwrapped pipe a distance of at least 2' and secure the end.

13.11.8 The polyethylene material shall be secured around the pipe and appurtenances by at least 3 circular wraps of tape. Tape for field application shall be Polyken #900, or Scotchrap #50, or equal, at least 2" wide.

13.11.9 All tongs, cables or chains that are used for lifting pipe and appurtenances that have been encased in polyethylene material shall be adequately padded to prevent damage to the material.

13.11.10 Repair any rips, punctures, or other damage to the polyethylene with tape or with a short length of polyethylene tube cut open, wrapped around the pipe and secured in place.

13.11.11 Polyethylene material shall be stored on the job site in such a manner that it is not exposed to direct sunlight. Exposure during installation shall not exceed 48 hours.

13.11.12 Backfill material shall be the same as specified for pipe without polyethylene wrapping. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones and/or other material that could damage polyethylene.

13.12 METER CONNECTIONS

- 13.12.1 All meter sets shall be provided with approved washers at both ground union connections.
- 13.12.2 All fittings shall be sealed using approved pipe sealant or Teflon tape.

13.13 FILLING WATER LINES

- 13.13.1 After the water lines and appurtenances have been installed, all concrete thrust blocking has cured adequately and upon approval of the CITY INSPECTOR or DEPARTMENT, the water lines shall be filled with water.
- 13.13.2 In order to prevent circulation of water through the new water lines back into the distribution system, only one valve shall be opened to allow water to flow into the new water lines. This valve will be tightly closed after the filling operation has been completed.
- 13.13.3 The valve operated to fill the water lines shall be operated slowly and shall not be fully opened. All water valve and fire hydrant operation shall be performed by the CITY INSPECTOR or DEPARTMENT representative.
- 13.13.4 All air shall be expelled from the pipeline by opening fire hydrants and/or other openings installed at the pipeline crests by the CONTRACTOR. The location and number of such openings shall be as shown on the Plans or as directed by the DEPARTMENT.

13.14 HYDROSTATIC PRESSURE AND LEAKAGE TESTS

- 13.14.1 All water lines and appurtenances shall be tested by a hydrostatic pressure test after all trenching or boring has been completed in area of water main or water services, this includes the installation of electric conduit. The hydrostatic test pressure shall not be less than 1.25 times the stated anticipated maximum sustained working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the stated sustained working pressure at the lowest elevation of the test section, in accordance with AWWA standards. In no case shall the test pressure exceed the rated working pressure for any joint, thrust restraint, valve, fitting, or other connected appurtenance of the test section. The ENGINEER shall specify the appropriate minimum test pressure on the utility plan.
- 13.14.2 After the water lines or isolated sections of the pipeline have been filled with water, the pressure shall be increased to the test pressure by means of a pump. The leakage test shall be in accordance with the AWWA Manual of Water Supply Practice. The manual shall be chosen based on pipe material being tested. Concrete Pressure Pipe (M9), Steel Pipe (M11), PVC Pipe (M23), Ductile-Iron Pipe (M41), and PEX Pipe (M55).
- 13.14.3 The CONTRACTOR shall furnish a pump with meter on discharge side of pump and a 4" gauge in 2 lb. increments, and all labor for conducting the tests.
- 13.14.4 The duration of the hydrostatic leakage test shall be 2 hours or as specified by the CITY INSPECTOR or DEPARTMENT representative.
- 13.14.5 The source of water for the pump suction shall be potable water from the DEPARTMENT'S distribution system. The vessel used must be approved by the CITY INSPECTOR or DEPARTMENT representative.
- 13.14.6 All interior valves including valves on fire hydrants and other appurtenances shall be open during all tests.

13.14.7 The maximum leakage per hour for DI and PVC shall be as calculated from the following formula (All rubber gasket or O-ring joints):

$$L = \frac{SD \sqrt{(P)}}{148,000}$$

L = allowable leakage, (gallons per hour)

S = Length of pipe tested, in feet

D = nominal diameter of pipe, (inches)

P = average test pressure during leakage test, (psig)

13.14.8 After the specified test pressure has been applied the entire pipeline shall be checked in the presence of the CITY INSPECTOR or DEPARTMENT representative. After the CONTRACTOR has taken the necessary action to repair or replace any part of the pipeline or appurtenances where leaks were apparent or if no leaks were apparent, the water lines shall be subjected to a leakage test at the pressure specified with a meter inserted in the test pump discharge line.

13.14.9 If any test of pipe laid discloses leakage greater than the allowable leakage as calculated from above formula or table, the CONTRACTOR shall, at his expense, locate the leak or leaks and perform whatever work and/or replace whatever material that is required in order to remedy the defect and stop the leak. After corrective work has been completed, the section of line replaced or repaired shall be re-tested. All corrective work must be approved by the DEPARTMENT.

13.14.10 Prior to the pressure test, the ENGINEER shall present an allowable leakage report to the CITY INSPECTOR.

13.15 DISINFECTING WATER LINES AND APPURTENANCES

13.15.1 Disinfection of water lines shall be performed in accordance with AWWA C651.

13.15.2 The CONTRACTOR shall construct blow-offs and sample points, as shown on the Plans or as directed by the CITY INSPECTOR or DEPARTMENT. Temporary blow-offs shall be utilized as sample points. Openings for sample points shall be 1" with polyethylene riser pipe that extends well above the surface, **Detail W01**. The lines shall not be considered acceptable until 2 consecutive samples are negative of bacteria. Water samples are only taken on Monday's, Tuesday's, Wednesday's and Thursday's.

13.15.3 The continuous feed method is the only acceptable method for disinfection and sterilization. The DEPARTMENT shall approve any method other than the continuous feed method. The continuous feed method using liquid chlorine or granulated minimum of 60% available chlorine calcium hypochlorite. Liquid chlorine shall be used only when the CONTRACTOR has suitable equipment available and employees who are familiar with the physiological, chemical and physical properties and who are properly trained and equipped to handle any emergency that may arise. If, in the opinion of the CITY INSPECTOR or DEPARTMENT, the equipment is inadequate or the personnel are not qualified, this method shall not be used.

13.15.4 When the continuous feed method is to be used, the pipelines and appurtenances shall be thoroughly flushed prior to disinfecting. The flushing plan shall be approved by the CITY INSPECTOR or DEPARTMENT. The DEPARTMENT may halt or reduce flushing when required.

13.15.5 The operation of valves or fire hydrants for this method shall be performed by the CITY INSPECTOR or DEPARTMENT Representative.

13.15.6 The CONTRACTOR is reminded that chlorine is a powerful oxidant and reacts readily with foreign substances. All chlorine compounds shall be handled and stored in accordance with manufacturer's recommendations. Breathing of chlorine gas can be fatal. Hypochlorite solutions should not come into contact with skin or clothing. Containers used for mixing hypochlorite solution shall be clean and dry.

13.15.7 When the continuous flow method is used, the final concentration of chlorine inside the main shall be 50 parts per million and remain at this strength for a period not less than 24 hours. Calcium hypochlorite shall contain minimum 60% available chlorine by weight in granular form.

13.15.8 During application of any chlorine solution, The CITY INSPECTOR or DEPARTMENT Representative shall be present to operate valves to ensure that the solution does not flow back into the distribution system.

13.15.9 The procedure for disinfecting by the continuous flow method shall be as follows:

- (a) The flow through the pipeline and the solution flow shall be regulated so that the required concentration of chlorine is attained. The flow through the main shall be measured by using a pitot gauge or meter.
- (b) The introduction of the solution shall be continuous until the desired concentration is attained throughout the pipeline system. The concentration shall be checked by the Drop Dilution Method.
- (c) After the required concentration has been attained all internal valves shall be operated in order to assure that the solution comes in contact with all appurtenances.
- (d) The solution shall remain in the pipeline system for 24 hours after which the pipelines shall be thoroughly flushed. The chlorine concentration shall be checked before flushing. If the concentration is less than 25 parts per million, the disinfecting procedure shall be repeated if directed by the CITY INSPECTOR or DEPARTMENT representative. Extreme caution shall be taken to ensure solution does not run into a stream or pond.

13.15.10 If any of the samples collected are positive of bacteria, the disinfecting procedures shall be repeated as directed by the DEPARTMENT until negative samples are collected and approved by the ADH.

13.15.11 The cost of continuous sampling and flushing of water may be charged to the CONTRACTOR.

13.16 CLEANING LARGE PIPELINES

13.16.1 Before disinfection, hydrostatic pressure and leakage testing - **Sections 13.14 & 13.15**, water lines 16" in diameter and larger or any other water line required by the DEPARTMENT shall be cleaned by forcing a resilient high density Polyurethane foam "cleaning pig" through each segment of the pipeline by water pressure to remove any dirt or other foreign matter from the pipeline. The "pig" shall be Style III, Type C (blue, plain criss-cross), manufactured by Knapp, Inc., Houston, Texas, or equal, in good condition and shall be at least 2% larger in diameter than the ID of the pipeline being cleaned.

13.16.2 The "pig" shall be inserted in the first length of pipe installed in each segment of pipeline. After installation of the pipeline segment to be cleaned, the pipeline shall be filled at a point downstream of the "pig". The "pig" shall be forced through the pipeline by applying water pressure to the rear of the "pig" and opening blow-off valves or fire hydrants downstream of the "pig". Valve at blow-off points shall be closed immediately prior to the "pig" passing.

13.16.3 Based on past experience, the "pig" will negotiate bends and tees in the pipeline and may also be forced through the pipeline backward after a pass forward. Openings in the pipeline, as shown on the Plans for removing the "pig", are based on this assumption. If the CONTRACTOR is unable to

clean the pipeline, utilizing the openings provided, additional openings shall be provided by the CONTRACTOR, upon approval of the DEPARTMENT, at the expense of the CONTRACTOR.

- 13.16.4 If the need for more than one pass of the "pig" through the pipeline is indicated, the CONTRACTOR shall make additional passes as directed by the DEPARTMENT.
- 13.16.5 Drainage at blow-off points shall be provided so as not to create a nuisance and to avoid property damage.

SECTION 14 WASTEWATER COLLECTION SYSTEM GENERAL INFORMATION

- 14.1 No gravity sewer main conveying raw sewage shall be less than 8" in diameter unless prior approval is obtained from the DEPARTMENT and the ADH.
- 14.2 There shall be a 5' minimum separation between the outside edge of a public sewer main to the outside edge of all other utilities within the utility easement. There shall be a 3' minimum separation from the outside edge of a manhole barrel to the outside edge of any other utility within the utility easement. Any deviation must have approval from the DEPARTMENT prior to installation. Sewer STEP systems are prohibited in the City of Bentonville. There shall be no case that a property has an active septic tank directly or indirectly tied to the public sewer system.
- 14.3 Where the difference in invert elevation between two pipes entering a manhole is 2' or more, and no alternative exists, a drop connection shall be utilized as shown on the standard detail sheets. Internal drop connections may be utilized if top to invert elevation is greater than 15' with the DEPARTMENTS approval. For new manholes and pipes 8" and larger, drop manholes shall have a larger inside dimension than specified as directed by the DEPARTMENT. External drop connections are not permitted for manholes greater than 13' deep.
- 14.4 The minimum earth cover for sanitary sewer mains shall not be less than 36" from final grade unless there is prior approval from the DEPARTMENT.
- 14.5 In any case of signs, fencing or structures installed near a public sewer main, at least 5' of separation must be maintained. In any case of a permanent building built near a public sewer main at least a 10' separation must be maintained. Any deviation in separation minimums must get approval from the DEPARTMENT prior to installation or construction.
- 14.6 Sewer pipe material shall be of the types listed in these specifications. Materials not specifically authorized in these specifications are forbidden for use in the system unless otherwise approved by the DEPARTMENT in writing.
- 14.7 For maintenance purposes, an access road shall be provided for all off-site sanitary sewer manholes. For the purpose of this section, off-site manhole refers to manholes which are not located within 25' of a public street.
- 14.8 Access roads shall be a minimum of 12' wide and located within a minimum 20' wide utility and/or access easement. Street curb sections shall be modified to allow access for large vehicles including adequate turning radii. Turning radii shall also be provided to accommodate Department vehicles at any change of direction. Turn-arounds shall be provided at dead-end access roads which change direction and at any point where the slope of the road increases to 10% or steeper. Access roads with slopes up to 10% shall be minimum 6" of ARDOT Class 7 granular base compacted to 95% of standard proctor maximum dry density. Access roads steeper than 10% shall include a minimum 2" thick asphalt surface course in addition to the 6" of granular base mentioned above. Asphalt surface course shall meet the requirements of the current City of Bentonville's Minimum Standards for Streets. A rigid pavement section with equivalent structural number will

be allowed on sections steeper than 10%. Erosion and storm water controls shall be installed to prevent erosion and other road impairment.

14.9 The utility main that is stubbed out shall terminate at a manhole for a sewer main or a fire hydrant assembly with a restrained gate valve connected to the downstream side of the tee for a water main. The purpose for the stub-out is to allow for connection to the utility without disturbing the existing development.

14.10 Location of main extensions to service parcels of property shall be planned so as to minimize the length of building sewer, which must be maintained by the property owner. If sewer stub-outs are provided for each lot in a new development, said stub-out shall be placed on the lowest elevation corner of property.

14.11 In no case shall a residential building be allowed to connect to the same sewer service or building sewer of another private residential building. Each building structure shall have a separate sewer line service from the point of the utility source and in no case be interconnected with the plumbing system of another privately owned property.

14.12 All gravity sewer main extensions without regard to length shall terminate in a standard manhole. Manholes are to be spaced no greater than 400' and shall occur at all changes in direction or grade.

14.13 Sewer easements will be a minimum 20' in width. Easements shall be dedicated as utility easements unless required to dedicate for the exclusive use of the sewer lines. Sewer lines must be located within the center of the easement or as directed by the DEPARTMENT. Recorded utility easement shall be provided to the DEPARTMENT. There shall be a 5' minimum separation between the outside edge of a public sewer main to the outside edge of all other utilities within the utility easement. Any deviation must have approval from the DEPARTMENT prior to installation. Recorded utility easement shall be provided to the DEPARTMENT.

14.14 Sewer services shall terminate at the building setback or easement. Services shall be located from lot lines as directed by the DEPARTMENT. Placement of service stub-outs should be located on lowest elevation lot corner. Termination of all stub-outs shall be clearly marked 36" above ground with a single 6' T-Post (painted green) driven in the ground at a minimum of 36". GPS coordinates for the end of each service shall be provided in a chart on the final as-builts plans. **Section 5.**

14.15 All efforts shall be made to design sewer systems that are accessible for future maintenance. Manholes should be located on or near streets in order to minimize difficulty of routine maintenance and all efforts should be made to eliminate manholes in ditches or drainage areas. Prior approval to locate manholes in surface runoff areas, such as drainage ditches, shall be approved by the DEPARTMENT prior to construction. All manholes located in drainage areas shall be equipped with watertight manhole rings and covers.

14.16 Access to sewer easements shall be reviewed on a case by case basis during plan review.

14.17 Sewer service lines from buildings to sewer mains shall be placed so as not to cross driveways, walks and so as to avoid permanent objects over them.

14.18 The DEPARTMENT shall perform all 4" taps on existing main lines. All 4" services tying into existing sewer infrastructure shall tie into sewer main lines and not manholes. The tap must be located no closer than 18" to the back end of the bell or collar of the pipeline and no closer than 18" to the insertion line on the spigot end of the pipeline. The excavation for a sewer tap must be safe for entry by City Crews and provide at a minimum 12" clear around the tap location in all directions. A 24 hour notice is required for sewer taps.

14.19 All services 6" and larger must tie into a manhole. All expenses for tying sewer services into existing manholes or constructing a new manhole on an existing sewer main for service access are at CONTRACTORS cost. All connections to existing manholes must be completed in accordance with requirement throughout this specification.

14.20 All customers are solely responsible for the maintenance and repair of their property's sewer privately owned service beyond the connection to the city's public sanitary sewer main or manhole, including clearing of any blockages within the service line. The City is responsible only for the public sewer main and the service tap connection; However, reserves the right to access and inspect private sewer services to ensure compliance with applicable specifications and codes in order to protect the integrity of the public sewer system.

14.21 Minimum Slope for Sewer Line Installation Table

Nominal Sewer Main Size	Minimum Slope in Feet Per 100 Feet (m/100 m)
8 inch (200 mm)	0.40
10 inch (250 mm)	0.28
12 inch (300 mm)	0.22
14 inch (350 mm)	0.17
15 inch (375 mm)	0.15
16 inch (400 mm)	0.14
18 inch (450 mm)	0.12
21 inch (525 mm)	0.10
24 inch (600 mm)	0.08
27 inch (675 mm)	0.067
30 inch (750 mm)	0.058
33 inch (825 mm)	0.052
36 inch (900 mm)	0.046
39 inch (975 mm)	0.041
42 inch (1050 mm)	0.037

SECTION 15 WASTEWATER COLLECTION SYSTEM MATERIALS

15.1 ALL MATERIALS TO BE DOMESTICALLY MADE.

15.1.1 All gravity or force sanitary sewer pipe shall be PVC. If it is deemed necessary to install DI pipe, the use of DI pipe shall be subject to approval by the DEPARTMENT prior to installation. The minimum acceptable size of all gravity sewer mains is 8" diameter, unless prior approval is obtained from the DEPARTMENT and the ADH. All pipe installed shall be of the type, size, class and thickness as indicated in these specifications and on the design plans. The design strength of pipe used shall be based on standard Engineering design principles and manufacturer or trade association recommendations. Only pipe materials listed in this section shall be used for sanitary sewer mains and service lines unless specifically authorized by the DEPARTMENT.

15.2 POLYVINYL CHLORIDE (PVC)

15.2.1 Pipe shall meet the requirement of SDR-26 Heavy Wall Sewer Pipe and comply with ASTM-3034 and Cell Classification 12454. Pipe joints shall be integrally molded bell ends per ASTM D-3034 Type PSM with factory supplied elastomeric gaskets and lubricant. Pipe shall be continually marked with the following:

- (a) Nominal OD
- (b) Dimension Ratio (SDR-26)
- (c) Notation "Heavy Wall Sewer Pipe"
- (d) Cell Classification: 12454
- (e) SDR Rating ASTM-D3034
- (f) Manufacturer's name or trademark and production code
- (g) Seal (mark) of the testing agency that verified the suitability of the pipe. (such as: "PSP")

15.2.2 The DEPARTMENT prohibits all A2000 type or any "profile pipe" use.

15.2.3 Pipe joints shall be integrally molded bell ends per ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

15.3 DUCTILE IRON PIPE

15.3.1 Installation of DI pipe shall be installed under the direction of the DEPARTMENT. DI pipe that meets ASTM A746, extra heavy type, inside nominal diameter as specified on plans, bell and spigot end shall be used. Jointing devices ASNI A21.11, rubber gasket joint devices.

15.3.2 All DI pipe and fittings for sewer service shall have an interior epoxy lining. The lining system shall be either Protecto 401 Ceramic Epoxy as manufactured by Vulcan Painters, Inc or Perma-Shield Series 431 manufactured by Tnemec. The lining applicator shall have a successful history of applying linings to the interior of DI pipe.

15.4 PIPE ACCESSORIES

15.4.1 If any pipe accessories are necessary the material being used shall be submitted to the DEPARTMENT for approval prior to installation. If approval has not been obtained in writing, the contractor is at risk of removing any accessory at the DEPARTMENT's discretion.

15.5 FITTINGS

15.5.1 All fittings shall be made of the same material as the sewer main whether it is Ductile Iron or Heavy Wall SDR-26. Fittings shall have a push-on gasket seal that will allow for a passing air test. All fittings shall be submitted to the DEPARTMENT for approval prior to installation.

15.6 CLEANOUTS

15.6.1 Cleanouts are strictly prohibited as a point of entry or maintenance for use in the municipal sewer system. Clean-outs shall be installed on private plumbing only. Entry into the sewer main shall be facilitated by the use of manholes only or as directed by the DEPARTMENT.

15.7 FORCE MAINS

15.7.1 All force mains will have a 3' minimum cover of bedding material installed according to **Detail LS09**. The installation of the force main will include a 10 gauge solid strand copper tracer wire with locator ports. The pipe material that is to be used is C900 Pressure Class 235 psi (DR18)

PVC. Warning tape will need to be installed approximately 6" above the pipe. The warning tape will have "Force Main" written on it in order to identify the pipe. Pipe size shall be a minimum of 4".

15.7.2 Fittings shall be ductile iron, designed for working pressure of at least 350 psi, and shall conform to ANSI/AWWA C153 A21. Joints shall be mechanical joint conforming to ANSI A21.11. All fittings shall be furnished with gaskets and mechanical joint fittings shall be furnished with bolts, nuts and retainer glands. Fittings shall be manufactured by U.S. Pipe "TRIM TYTE", Tyler, Star Pipe Products, or approved equal. Any alternate manufacturer shall require DEPARTMENT approval prior to installation. All fittings shall be provided with a standard exterior asphaltic coating, and lined on the interior with either Protecto 401 Ceramic Epoxy as manufactured by Vulcan Painters, Inc or Perma-Shield Series 431 manufactured by Tnemec.

15.7.3 All manholes at or within 1000' downstream of a force main discharge, or within 500' upstream of a lift station wet well shall be lined with an approved product, and fitted with a composite ring and lid to prevent degradation of the manhole. Refer to manhole material specifications for approved products.

15.8 TRACER WIRE PORTS FOR FORCE MAINS

15.8.1 Tracer wire ports will be located no further apart than 500' and placed at every change in direction. The ports are to be laid out so that they are located by a manhole whenever possible for ease of locating in the event that they get buried. The tracer wire ports will consist of a 4" pipe resting on the bedding material and extending to the final grade elevation. The tracer wire port will include a cast iron lid and an 18" pre-cast concrete pad. The tracer wire will be brought up through the 4" pipe and extend a minimum of 12" out of the top of the pipe. The tracer wire will be installed in a manner that will allow the force main to be located in both directions from the tracer wire port.

15.8.2 Valve boxes shall be Tyler 6850 series or equal with 5 1/4" shafts. screw type, 5 1/4" drop lid with "SEWER" on lid. All valve box material shall be domestically made.

15.9 AIR/VACUUM COMBINATION VALVES FOR FORCE MAINS

15.9.1 Combination Air valves shall be heavy-duty "Universal" style single body units incorporating the functions of an air and vacuum valve with an air release valve in a single housing. Combination Air valves shall release accumulations of air at high points within a pipeline by exhausting large volumes of air as the pipeline is being filled, and then by releasing accumulated pockets of air while the pipeline is in operation and under pressure. Combination air valves shall also be designed to permit large volumes of air to enter the pipeline during pipeline drainage. The air release valves shall be specifically designed to operate with liquids carrying solid particles such as sewage and effluent. The valve body internal metal components shall be cast or fabricated 316 stainless steel. The internal float shall be of 316 stainless steel. No plastic or fiberglass components will be acceptable. The valve shall incorporate an air release orifice of 3/16" or 5/32" for use at 20-200 psi. This orifice shall be located on the outlet of the valve, and shall be drilled in a 316 stainless steel orifice plate that seals against a Buna-N rubber seat. The inlet and outlet size must be nominal, having NPT connections. The valve shall be Crispin "UX Series," or approved equal.

15.9.2 All associated plumbing for installation of air and vacuum release valves shall be 316 stainless steel.

15.10 ENCASEMENT PIPE

15.10.1 Smooth Wall Steel Encasement Pipe - Pipe shall conform to ASTM A-139, ASTM A-21.11. The metal thickness shall be as shown in the Proposal or Plans.

15.10.2 Casing spacer systems shall be manufactured in two pieces, made from heavy gauge T-304 stainless steel with Polymer Plastic Runners (Teflon). Spacers shall be a Cascade Casing Spacer manufactured by Cascade Waterworks Manufacturing Company or equal conforming to ASTM ratings, approved by AWWA and the DEPARTMENT. Encasement spacers shall be sized to eliminate the potential for the sewer main inside the encasement pipe to float. Casing and utility pipes shall be sealed with synthetic rubber end seals. **Detail GWS01**.

SECTION 16 SEWER MANHOLE INFORMATION AND MATERIALS

16.1 This section covers materials to be used in the construction or modification of standard manholes, drop manholes, watertight manholes, and air/vacuum valve manholes.

CONCRETE CURING AND COMPOUNDS

16.2.1 Concrete used in the construction of manholes shall conform to the requirements in **Section 12.22**. Curing compounds or covers must be approved by the DEPARTMENT. It is the responsibility of the CONTRACTOR to protect the concrete to prevent cracking during the curing process and to protect the manhole during freezing temperatures. The CITY INSPECTOR shall, at their discretion, prohibit pouring concrete during periods of extreme cold or inclement weather.

CAST-IN-PLACE-MANHOLES

16.3.1 Cast-in-place manholes shall be constructed of 4,000 psi concrete with the concrete base a minimum thickness of 8" below the invert and shall be poured on undisturbed earth. The base shall extend a minimum of 24" in all directions from the exterior of the manhole barrel. **Detail SS01**.

16.3.2 Concrete shall be deposited evenly distributed in a continuous pour in maximum layers of 18", with each layer vibrated to bond it to the preceding layer.

DROP TYPE MANHOLES

16.4.1 Drop type manholes installations shall be approved during plan review. **Detail SS02** for interior drop type manholes and **Detail SS03** for exterior drop type manholes.

16.4.2 Internal drops may be constructed in existing manholes if top to invert elevation is 15' or greater. All requests for internal drop construction shall be approved by the DEPARTMENT. Point of intrusion shall be re-sealed with an approved water stop and grouted in place, the top section fitting shall be an all Hub SDR 26 double sanitary tee with direction of flow pointing downward. Vertical piping will be attached to concrete with 1 3/4" stainless steel bands by 5/8" X 3" stainless steel bolts with expansion anchors. Piping will terminate with a 90° long sweep bend resting on original invert base, fitting will be grouted in place on both sides to support assembly while forming new invert trough. Minimum pipe size for internal drop shall be 6".

AIR/VACUUM COMBINATION VALVE MANHOLES

16.5.1 Manholes for air/vacuum combination valves shall be 5" ID cast-in-place manholes with a 30" composite lid, and shall be lined with an approved product to prevent degradation of the manhole. The manhole shall be centered over the valve and constructed by pouring the walls centered on top of an 18" wide by 12" deep footing of compacted class 7 base. #67 stone bedding shall be provided from a minimum of 12" below the forcemain up to the top of pipe. All other aspects of the manhole not specifically listed in this section shall meet all requirements found elsewhere in these specifications including, but not limited to materials and construction requirements. **Detail LS08**.

16.6

SANITARY SEWER MANHOLE ABANDONMENT

The DEPARTMENT requires the entire removal of the manhole if 5' deep or less. Upon removal of the manhole, all lines going into the manhole are to be cut and filled with 4,000 psi concrete until pipe is full, to not allow any infiltration.

Any manhole that is deeper than 5' is to be abandoned according to **Detail SS07**.

16.7

MANHOLE RINGS AND LIDS

16.7.1

All cast iron manhole rings and lids must be of the best quality gray cast iron, free from cracks, holes, scale, shrinkage, distortion and other defects which might make them unfit for their intended use. They shall have a workmanlike finish, shall be non-rocking, shall have all bearing surfaces machined smooth and shall be of such quality that a blow from a hammer will produce an indentation on a rectangular edge of casting without flaking the metal. Manhole rings and lids shall have a minimum access diameter of 24". The manhole lids shall be of solid construction without any openings other than 2 concealed pick holes which shall be located on direct opposite sides of the manhole lid. The concealed pick holes shall be of such design as not to allow infiltration into the manhole. Manhole lids shall have "SANITARY SEWER" or "CITY OF BENTONVILLE SANITARY SEWER" cast on the lid. Standard manhole rings and lids shall be East Jordan Iron Works Product 00134865A01 or approved equal determined by Bentonville Water Utilities, and shall have a combined weight of ring and lid equaling 250 pounds or greater. All rings and lids shall be domestically made. **Detail SS04**.

16.7.2

All composite manhole rings and lids shall be made of fiber-reinforced polymer/composite materials and must pass proof-load testing in accordance with AASHTO M306 standard specifications. Manhole rings and lids shall have a minimum access diameter of 24" or as specified on the plans. The manhole lids shall be of solid construction without any openings other than a concealed pick hole. Concealed pick holes shall be of such design as not to allow infiltration into the manhole. Manhole lids shall have "SANITARY SEWER" molded on the lid. Manhole lids shall be equipped with stainless steel quarter turn latches with a hex head. A neoprene or o-ring gasket shall be provided. Composite rings and lids shall be as manufactured by Composite Access Products or East Jordan, or equal as approved by the DEPARTMENT.

Size	Manufacturer	Product Number
24"	CAP	A-1BK24H2-C01DMDS-H1
	EJ	COM260262A01
30"	CAP	A-1BK30H2-C01DMDS-H1
	EJ	COM320131A01
36"	CAP	A-1BK36H2-C01DMDS-H1
	EJ	COM380278A01

16.8

PRIVATE MANHOLE LIDS

16.8.1

The manholes along private sewer lines shall require lids with "PRIVATE SANITARY SEWER" cast or molded on the lid in addition to meeting all other manhole lid requirements elsewhere in these specifications.

16.9

WATERTIGHT MANHOLE RINGS AND LIDS

16.9.1

Watertight manhole rings and lids where required on the plans by DEPARTMENT, shall be East Jordan Iron Works, Product 00124855W02 or approved equal determined by Bentonville Water Utilities and be domestically made. **Detail SS05**.

16.10 MANHOLE STEPS

16.10.1 Manhole steps are strictly prohibited within the Bentonville Wastewater Collection System.

16.11 WATER STOPS

16.11.1 Water stops for cast in place pipe connections to new manholes shall be Fernco Concrete Manhole Adapters, or approved equal determined by Bentonville Water Utilities, furnished in the appropriate size for the type and class pipe used. Water stops are required for all sewer pipes entering manhole walls or bases.

16.11.2 Connections to existing manholes shall utilize a domestic Kor-N-Seal wedge style Pipe-to-Manhole connector as manufactured by Trelleborg, or DEPARTMENT approved equal. The connector shall be installed in accordance with the manufacturer's requirements and procedures.

Pipe Size	Series
6" to 15".....	106/406
18" +	206

16.12 MANHOLE CONFIGURATIONS AND CONSTRUCTION

16.12.1 Manholes shall be of such construction so that the finished manhole will have an ID of 4' 0" plus or minus $\frac{1}{2}$ ". Concrete used to pour the manhole shall be 4,000 psi with a slump of approximately 3". Wall thickness shall be a minimum of 6". **Detail SS01**

16.12.2 Before the forms are set in place, any water that may have accumulated in the excavated area shall be pumped out.

16.12.3 All manholes shall be a monolithic pour. Pouring the base and walls with one continuous pour. The manhole shall not be backfilled less than 24 hours after the forms have been removed. Extra care shall be taken to compact all backfill to the top of the highest pipe entering the manhole. After these pipes have been put in place, the barrel shall be repaired using a grout mixture. If honeycombing of the barrel is found to be present after removal of the forms, they shall be repaired as directed by the ENGINEER, DEPARTMENT or CITY INSPECTOR.

16.12.4 Manholes greater than 10 feet deep may be poured in two sections with prior approval from the DEPARTMENT. A 3" X 3" construction joint with water stop and #4 rebar on 12" centers shall be provided. Manhole is to be inspected by CITY INSPECTORS before additional pour is done.

16.13 MANHOLE SHAPE AND INSIDE DIMENSIONS

16.13.1 Manhole shapes shall be cylindrical and 48" diameter for sewer mains 12" and less, 60" diameter for sewer mains larger than 15" to 24", and 72" diameter for sewer mains larger than 24".

16.14 MANHOLE DESIGN DEPTH, HEIGHT AND PLACEMENT

16.14.1 Manhole depth shall be as indicated on plans. The DEPARTMENT requires accessibility to all manholes, the responsible ENGINEER shall design the sanitary sewer system in a manner so as to eliminate backyard placements between buildings, behind permanent structures, or other locations not accessible for normal street side maintenance.

16.14.2 Street side manhole rim elevations shall be 4" above the proposed final grade and offsite or non-street side manhole top rim elevations shall be 12" above proposed final grade. Manhole risers used in vertical adjustment must have Ram-Nek installed with the new riser. It must be heated in

a manner that allows workability so it can be pressed into the receiving ring or inset of additional risers used to achieve proper rim elevation. Any risers added must be seated fully, “squeeze out” is proof of a water tight joint and a proper installation. All manhole rim elevations shall be shown as such on the sewer profile sheet and noted in the general construction notes. The DEPARTMENT, during site final, will address finished manhole elevations and may require additional height elevations. All manholes constructed in ravines, drainage or runoff areas will require the installation of a watertight ring and lid or rim shall be 12" above 100 year flood.

16.14.3 After sewer construction is complete, the vertical adjustment shall be no more than 24" plus the lid. A maximum of (2) risers may be utilized to achieve the 24" of adjustment. Adjustments greater than 24" require the reconstruction of the manhole cone. A cold joint requires installation of a water stop and application of an acceptable lining product extending 1' either side of the joint to prevent infiltration. Refer to manhole lining specifications for approved products.

16.15 **MAIN AND SERVICE PIPES**

16.15.1 All main and service pipes shall be neatly cut flush with inside of manhole or inlet where they enter structure walls, and correct irregularities and rough edges with non-shrinking grout.

16.16 **CONNECTIONS TO MANHOLES**

16.16.1 To ensure that pipe will not sag or break immediately adjacent to the manhole, care shall be taken that excavation for the manhole bottom is limited to the area to be filled with concrete. The CONTRACTOR shall support pipe entering the manhole all the way to solid bedding by placing approved backfill under the pipe and up to the mid spring-line with Class B concrete.

16.16.2 Connection of new sewer mains and services to existing manholes in acceptable condition shall be completed by core-drilling the manhole wall and utilizing a Kor-N-Seal connector and non-shrink grout to repair the intrusion. The manhole shall also be lined from invert to 1 foot above the top of the highest intrusion with an acceptable lining product. In the case that a manhole being cored is already lined, the lining shall be repaired in accordance with the original product manufacturers requirements and recommendations. Refer to manhole lining specifications. Manholes core-drilled for new connections shall undergo vacuum testing after installation of the Kor-N-Seal, but prior to installation of non-shrink grout or lining. A vacuum test on the existing manhole is also recommended prior to starting work. A manhole with a passing test prior to work, or where a pre test was not completed will be required to pass a vacuum test when work is complete.

16.17 **INVERTS**

16.17.1 The invert of the manhole shall be hand-placed and shaped using the same 4,000-psi concrete mixture used to pour the base and walls of the manhole. The invert shall be shaped and smoothed so that the manhole will be self-cleaning and free of areas where solids may be deposited as sewage flows through the manhole and from service lines that enter the manhole base. Inverts shall be shaped, formed and brushed smooth from the concrete poured for the base prior to the initial set of the base. In all cases the diameter of each pipe entering the manhole barrel shall be cut smooth with the inside edge of the manhole barrel and the invert shaped throughout from all inlet pipes to the outside pipe. Shape inverts for smooth flow across structure floor as shown on drawings.

16.18 **MANHOLE LINING**

16.18.1 When specified, manholes shall be lined with a product or system designed and proven to stop infiltration and prevent biological corrosion in sanitary sewer manholes. The lining shall be applied in accordance with the manufacturer's recommendations, including the preparation and

restoration of the existing structure as necessary. The lining product or system to be used shall be approved in writing by the DEPARTMENT prior to application.

16.18.2 CONTRACTOR shall at its own expense supply the DEPARTMENT with industry standard test results as requested.

16.18.3 All manholes requiring lining shall be constructed with a composite ring and lid. In the event that existing manholes are being lined that do not meet this requirement, it shall be the contractor's responsibility to remove the manhole cone and reconstruct with a composite lid. This remediation shall conform to all requirements in this specification.

16.18.4 The DEPARTMENT reserves the right to require remediation or rehabilitation of existing structures including, but not limited to invert and wall repair, application of cementitious lining, and replacement of ring and lid as deemed necessary by the department prior to application of any approved lining. In cases where the manhole cannot feasibly be rehabilitated, replacement may be required.

SECTION 17 SEWER SYSTEM GENERAL INSTALLATION INFORMATION

17.1 ALL MATERIALS SHALL BE DOMESTICALLY MADE

17.2 FIELD QUALITY CONTROL

17.2.1 Compaction testing will be performed in accordance with ANSI/ASTM D698, ASTM D2922, ASTM D3017 or ASTM D1557.

17.2.2 Test sanitary sewer pipe system installed below grade and outside building in accordance with the following procedures:

- (a) The CONTRACTOR shall perform the testing of manhole construction, pipe materials and/or other materials incorporated into the construction of the sanitary sewer system to determine leakage and water tightness. Testing to be supervised by design ENGINEER and inspected by the CITY INSPECTOR.

17.3 AIR TESTING OF GRAVITY SEWER LINES

17.3.1 All gravity sewer lines shall be tested in accordance with the following procedures after all trenching and boring in area of sewer mains and sewer services:

- (a) Plug all pipe outlets with suitable test plugs. Brace each plug securely.
- (b) Pipe air supply to the pipeline to be tested in such a manner that the air supply may be shut off, pressure observed and air pressure released from the pipe without workmen entering the manhole.
- (c) Add air slowly to the portion of pipe under test until the internal pressure of the line is raised to approximately 4 psig but less than 5 psig.
- (d) Shut the air supply off and allow at least 2 minutes for the air pressure to stabilize.
- (e) When the pressure has been bled down to 3 1/2 psig and stabilized, start the test.
- (f) If the pipe section does not decrease from 3.5 psi to 2.5 psi in less time than is allotted the section passes the test.

17.4

GRAVITY SEWER AIR TESTING TIME REQUIREMENTS

Table 1 - Minimum Specified Time Required for a 1.0 psig Pressure Drop for Size and Length of Pipe Indicated for $Q = 0.0015$

Pipe Diameter, In.	Minimum time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for length (L) Show, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

Table 2 - Minimum Specified Time Required for a 0.5 psig Pressure Drop for Size and Length of Pipe Indicated for $Q = 0.0015$

Pipe Diameter, In.	Minimum time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for length (L) Show, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	0.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	0.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	43:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

17.5

HYDROSTATIC PRESSURE AND LEAKAGE TEST OF FORCE MAINS

17.5.1 All force mains and appurtenances shall be tested by a hydrostatic pressure test after all trenching or boring has been completed in area of the force main. The hydrostatic test pressure shall not be less than 1.25 times the stated anticipated maximum sustained working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the stated sustained working pressure at the lowest elevation of the test section, in accordance with AWWA standards. In no case shall the test pressure exceed the rated working pressure for any joint, thrust restraint, valve, fitting, or other connected appurtenance of the test section. The ENGINEER shall specify the appropriate minimum test pressure on the utility plan.

17.5.2 After the sewer force mains have been filled with water, the pressure shall be increased to the test pressure by means of a pump. The leakage test shall be in accordance with AWWA M23.

17.5.3 The CONTRACTOR shall furnish a pump, and all labor for conducting the test.

17.5.4 The duration of the hydrostatic leakage test shall be 2 hours or as specified by the CITY INSPECTOR or DEPARTMENT representative.

17.5.5 The source of water for the pump suction shall be potable water from the DEPARTMENT'S distribution system. The vessel used must be approved by the CITY INSPECTOR or DEPARTMENT representative.

17.5.6 The maximum leakage per hour for DI and PVC shall be as calculated from the following formula (All rubber gasket or 0-ring joints):

$$L = \frac{SD \sqrt{(P)}}{148,000}$$

L = allowable leakage, (gallons per hour)

S = length of pipe tested, in feet

D = nominal diameter of pipe, (inches)

P = average test pressure during leakage test, (psig)

17.5.7 After the specified test pressure has been applied the entire pipeline shall be checked in the presence of the CITY INSPECTOR representative giving particular attention to that part of the pipeline and those appurtenances that are exposed. After the CONTRACTOR has taken the necessary action to repair or replace any part of the pipeline or appurtenances where leaks were apparent or if no leaks were apparent, the sewer force mains shall be subjected to a leakage test at the pressure specified with a meter inserted in the test pump discharge line.

17.5.8 If any test of pipe laid discloses leakage greater than the allowable leakage as calculated from above formula or table, the CONTRACTOR shall, at his expense, locate the leak or leaks and perform whatever work and/or replace whatever material that is required in order to remedy the defect and stop the leak and re-test the line. All corrective work must be approved by the DEPARTMENT.

17.5.9 Prior to the pressure test, the ENGINEER shall present an allowable leakage report to the CITY INSPECTOR.

17.6 TESTING SAFETY PRECAUTIONS

17.6.1 The low-pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, a line is over pressurized or plugs are installed improperly. It is extremely important that the various plugs be installed so as to prevent the sudden expulsion of a poorly inflated plug. As an example of the hazard, a force of 250 pounds is exerted on an 8" plug by an internal pressure of 5 psi. Observe the following safety precautions:

- (a) No person shall be allowed in the manholes during the test or when a plugged pipe is under pressure.
- (b) Gauges, air piping manifolds and valves shall be located at the top of the ground. Install and brace all plugs securely.

17.7 GROUND WATER ELEVATION

17.7.1 If the pipeline to be tested is below the ground water level, the starting test pressure shall be increased by 0.433 psi for each foot the groundwater level is above the invert of the sewer pipe. In no case shall the starting test pressure exceed 9.0 psig.

17.8 TEST EQUIPMENT

17.8.1 All necessary equipment to perform the air test in accordance with this specification shall be provided by the CONTRACTOR. The test gauge shall be 4" and have incremental division of 0.10 psig and have an accuracy of at least \pm 0.04 psig. In no case shall a test gauge be used which has incremental divisions of greater than 0.25 psig. The gauge shall be of sufficient size in order to determine this accuracy.

17.8.2 The ENGINEER shall furnish one copy of gravity sewer and manhole test results to the DEPARTMENT upon completion of gravity sewer system approval by the CITY INSPECTOR.

17.9 **MANDREL TEST**

17.9.1 Flexible sewer pipe shall be mandrel tested with a rigid device sized to pass 5% or less deflection (deformation) of the pipe. The base inside diameter, as set forth in Table X1.1 of ASTM D3034 or Table X2.1 of ASTM F679, shall be used to compute the mandrel dimensions. Allowances for ovality (from shipment, heat, shipping loads, poor production, etc.) shall not be deducted from the base ASTM data but shall be counted as a part of the 5% or less deflection allowance. The OD of the mandrel shall be set according to the following table:

<u>NOMINAL</u>	<u>DIAMETER (IN) MANDREL OD (IN)</u>
8"	7.11"
10"	8.87"
12"	10.55"
15"	12.90"
18"	15.85"
21"	18.68"
24"	21.00"
27"	23.65"
30"	27.10"

17.9.2 The mandrel (go/no-go) device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. The contact length of the mandrel's arms shall equal or exceed the nominal ID of the sewer to be inspected. Critical mandrel dimensions shall carry a tolerance of $\pm 0.01"$. The mandrel and all necessary equipment for the mandrel test shall be provided by the CONTRACTOR. No handmade mandrel devices shall be used for testing unless prior permission is given by the DEPARTMENT or the CITY INSPECTOR.

17.9.3 The mandrel shall be hand-pulled by the CONTRACTOR through all flexible pipe sewer lines no earlier than 30 days after the trench has been completely backfilled. Any sections of the sewer not passing the mandrel shall be uncovered and the CONTRACTOR shall re-bed, re-round or replace the sewer to the satisfaction of the DEPARTMENT. Any repaired section shall be re-tested.

17.10 **MANHOLE VACUUM TESTING**

17.10.1 The manhole vacuum test shall be performed with suitable apparatus made for such purpose and shall draw a vacuum of 10" of mercury (Hg). The test shall pass if the vacuum remains at 10" of mercury (Hg) or drops to not less than 9" of mercury (Hg) in one minute. Vacuum test will be performed by construction CONTRACTOR. Test shall be witnessed and documented by CITY INSPECTOR. Responsible ENGINEER shall furnish test result information to the DEPARTMENT. If, after 2 attempts to perform a satisfactory vacuum test have failed, the DEPARTMENT may require that the manhole be removed and re-poured. All sewer services entering the manhole shall be vacuum tested with the manhole.

17.10.2 If existing manhole is to be adjusted – either lowered or raised – and cone is removed – manhole will require a passing vacuum test.

17.10.3 Pre-vacuum testing is recommended on existing manholes. If manhole is cored, a post vacuum test shall be required except for the below circumstances:

If pre-vacuum test passes – a post vacuum test shall pass.
If pre-vacuum test fails – a post vacuum test will not be required.

17.11 CLOSE CIRCUIT TELEVISION INSPECTION – (CCTV)

17.11.1 All sewer mains that are installed as part of a new subdivision or large scale development and for the purpose of becoming part of a public sewer system, maintained by the City of Bentonville will require a Close Circuit Television Inspection (CCTV). The inspection will be performed by City personnel after all other required sewer main line testing has been completed. The inspection consists of hydro-jet cleaning the sewer main line and allowing it to drain for a period of not less than one hour. After the sewer main line has been allowed to drain the CCTV inspection will begin. Defects that will be documented are: Pipe bell ends facing downstream, narrow or rough manhole inverts, misaligned or backward service wyes, loose or missing pipe joint gaskets, pipe joints not fully seated, crushed, or out-of-round pipe and the pooling of water in the pipe and at service wyes, joints and manhole inverts. The camera has been fitted with a measuring device that can determine the depth of the water in the event of any pooling. Any pooling of water that is deeper than $\frac{3}{4}$ " will require the sewer main line to be adjusted to eliminate the problem. The only personnel allowed in the CCTV vehicle during the inspection are City of Bentonville employees.

17.11.2 A pass or fail decision is not made in the field. The camera inspection is recorded on video recording software and then reviewed at the DEPARTMENT. After review of the recording, the comments will be made available to the responsible ENGINEER for the project indicating approval of the sanitary sewer mains or a list of defects that require repair.

17.11.3 All CCTV inspections or re-inspections that are necessary are to be requested in written form by email to the DEPARTMENT by the responsible ENGINEER for the development project. The responsible ENGINEER shall provide accurate record drawing of sewer system, with profiles, at time of CCTV request.

17.11.4 One attempt will be made by City staff to adequately clean new sewer mains for proper CCTV inspection. If during construction sufficient care is not taken to keep rocks, dirt or debris from entering new sewer mains and extra cleaning is necessary, CCTV staff will not complete the inspection. Department personnel will then advise the ENGINEER of record of the condition of the pipe. The contractor shall be responsible for the additional cleaning needs. It will be the ENGINEER of record's responsibility to communicate to the contractor why the inspection was stopped and why they are now responsible for cleaning and removing obstructions in the sewer main. After the contractor has completed the necessary cleanings, the ENGINEER of record will contact the DEPARTMENT and request continuation of the CCTV inspection.

17.11.5 After the completion of the required repairs by the CONTRACTOR, a re-inspection must be performed using the same procedures as for the initial inspection. All re-inspections will be billed to the OWNER/DEVELOPER according to current fee ordinance.

17.11.6 Full CCTV inspection shall be completed and 1st tracer wire inspection shall be completed before site final.

17.12 ACCEPTANCE OF INSTALLATION

17.12.1 No gravity sewer or manhole will be accepted that does not comply with the minimum requirements of tests described within these specifications.

17.13 WARRANTY

17.13.1 The DEPARTMENT reserves the right to inspect by mandrel test or camera inspection any sewer line before acceptance, and also prior to expiration of the first year of operation. If a previously accepted line fails an inspection during the first year of operation, the defects must be corrected at the CONTRACTOR/DEVELOPER'S expense.

SECTION 18 SEWER LIFT STATIONS

18.1 The Wastewater Department must approve all plans.

18.1.1 The Wastewater Department lift station details contained in this specifications book are to be used as a guide only. **These details are not to be used as construction plans.**

18.2 FINAL ACCEPTANCE

18.2.1 The Wastewater Department, at the DEVELOPER'S expense, will purchase an alarm system at current market price. **This fee is required** and must be paid prior to the final inspection and acceptance of the lift station.

18.2.2 A spare pump must be furnished with each sewer lift station and delivered to the Wastewater Department prior to lift station final inspection and acceptance.

18.2.3 The electric and water meters shall be installed before a final inspection is requested.

18.2.4 A final lift station inspection shall be conducted at the DEVELOPER'S request once lift station construction has been completed, a pump startup has been performed and the alarm fee has been paid. Wastewater Department maintenance personnel must be present at the pump start up session. The lift station final inspection and development final inspections are separate inspections and will take place at separate appointments.

18.2.5 The DEVELOPER/CONTRACTOR shall be responsible for supplying alternate means of power for the pump start-up during final inspection.

18.2.6 Before final acceptance, 1 paper and 1 pdf copy of as-built drawing must be supplied to the Wastewater Department.

18.3 BASIC CONTROL PANEL SPECIFICATIONS

18.3.1 All electrical services shall meet City and State Codes.

18.3.2 A portable generator connector is required on lift station control panels. It must be an Appleton 200 Amp 4-W, 4-P style -1 type connector Cat # ADR20044 for 3Ø stations only

18.3.3 Control panel shall be NEMA 4X stainless steel mounted on a 6" X 6" stainless steel pedestal on the wet well and shall be sealed to prevent fumes from rising into control panel. Control panel and pedestal door shall open away from wet well hatch.

18.3.4 One combination circuit breaker/overload disconnect unit with magnetic trip elements sized for individual protection shall be provided for each pump. **Detail LS01 and LS02.**

18.3.5 One across the line magnetic contactor shall be provided per pump and sized in accordance with the maximum NEMA horsepower standards.

18.3.6 Control panels shall incorporate the following features as a minimum:

- (a) Alternator shall be provided for duplex controls.
- (b) Individual selector switches to provide "hand-off-auto" control of each pump.
- (c) HAND POSITION - In this position, the pump controlled by the switch will run regardless of the wet well level. The pump will continue to run until the switch is turned to "off" or "auto" position.
- (d) AUTO POSITION - In this position, the operation of the pumps is controlled automatically by the level sensors in the wet well. The control center will be designed to provide automatic operation, while maintaining motor protection.
- (e) 24 or 120 volt AC control transformer protected on both the primary and secondary control circuit.
- (f) Terminals shall be provided for connection of the level sensors.
- (g) A hinged, removable dead-front panel is required.
- (h) Pump running pilot lights (green) mounted on operator's control panel.
- (i) Totalizer for each pump must be mounted on operator's control panel.

18.3.7 All operator controls, toggle switches, circuit breakers, etc., shall be accessible without removing the dead-front panel.

18.3.8 NEMA 4X stainless steel enclosures with draw pull catch, provisions for padlocking and suitable for indoor or outdoor mounting.

18.3.9 **Electrical connections in the wet well are not allowed.**

18.3.10 Coordinate with Bentonville Electric Department prior to project start to determine type of electrical service. Three-phase 480 VAC power must be used when available.

18.3.11 An approved lightning arrester must be installed.

18.3.12 3-phase power monitor must be installed to protect pump from low voltage, single phasing and phase reversal.

18.3.13 The level control system sensors must be submersible transducer, floats or equivalent. If a transducer control is installed the system shall have a float backup.

18.3.14 Electrical terminal strip must be a minimum of 4" above the bottom of the control panel.

18.4 **LEVEL CONTROLS**

18.4.1 Provide a switch control system incorporating a hermetically sealed liquid level indicator as a level sensing and signal control device for automatic control of lift station. The system shall monitor and control wet well level at each station as follows:

SWITCH 1 – All Stop
SWITCH 2 – Energize Lead Pump
SWITCH 3 – Energize Lag Pump
SWITCH 4 – High Level Alarm

18.4.2 **High level alarms are required. A red warning light with flasher and audible alarm shall be installed on the control panel.**

18.4.3 Contingent upon wet well level, float system shall cause indicator/controller to energize appropriate control contacts.

18.5 ACCESS ROAD

- 18.5.1 A paved access road shall be provided from the curb to the lift station.
- 18.5.2 The road leading to the lift station shall be asphalt, a minimum of 12' wide and no greater than a 10% slope. A minimum of 6" of compacted base material is required. Base material and compaction shall be in accordance with the latest edition of ARDOT Standard Specifications (Division 300). A minimum of 4" of asphalt is required. Paving materials and construction methods shall be in accordance with the latest edition of the ARDOT Standard Specifications (Division 400).

18.6 LIFT STATION AND SITE

- 18.6.1 Lift station site and access road shall be deeded to the City of Bentonville.
- 18.6.2 Minimum lot size shall be 50' X 50'.
- 18.6.3 Lift station lot shall be 2' above surrounding project area. Wet wells shall be 8" above the asphalt.
- 18.6.4 Lift station lot shall be asphalt. A minimum of 6" of compacted base material is required. Base material and compaction shall be in accordance with the latest edition of the ARDOT Standard Specification (Division 300). A minimum of 4" of asphalt is required. Paving materials and construction methods shall be in accordance with the latest edition of the ARDOT Standard Specifications (Division 400).
- 18.6.5 Based on the location of the lift station, the City of Bentonville Wastewater Department will determine the type of 8' fence requested to be installed. All fence poles or columns will be set 1' inside the asphalt with 14' roll back or swing type gates.
- 18.6.6 A pole mounted LED photocell light that conforms to the Subdivision Code for outdoor lighting shall be provided to adequately illuminate the control panel and site.
- 18.6.7 There shall be a frost free, 2' min bury water hydrant, at each lift station. The hydrant shall be protected by a reduced pressure zone backflow prevention device. The device must be protected from freezing by an approved enclosure. See Cross Connection Control Program Specifications. **Detail W14**

18.7 PUMP REQUIREMENTS

- 18.7.1 All lift stations require rail mounted submersible pumps as manufactured by Flygt or Hydromatic, or HCP and interchangeable without alteration to the piping or electrical system. **Details LS04 and LS05.**
- 18.7.2 Lift stations requiring less than 5-HP pumps must be grinder pumps. Larger pumps should have shredder type impellers when possible. **Detail LS05.**
- 18.7.3 All pumps will meet or exceed the requirements to pump the anticipated flow for the known number of houses, units, or number of persons. The pumps will meet or exceed required head values based on ENGINEERS design. At a minimum, all lift stations shall be duplex, two pumps of the same size that alternate pumping.
- 18.7.4 Any time it is determined through an analysis that a development or subdivision impacts or exceeds the capacity or the flow of an existing lift station, the existing lift station shall be upgraded. The

existing lift station shall be upgraded with equipment including pumps, piping and control panel components that are consistent with the existing equipment.

18.8 LIFT STATION PLUMBING

- 18.8.1 Plumbing shall be constructed in such a manner that the force main velocity is never below 2' per second and never above 8' per second. All lift station mounting rails, cables, chains and hardware shall be 316 stainless steel. All lift station piping shall be Type 316L stainless steel (in accordance with ASTM A312 and 150 psi minimum), and stainless steel piping shall extend from the pump to three feet outside the valve vault.
- 18.8.2 All lift station wet wells and valve vaults shall be concrete with aluminum hatches to allow access to pumps and valves. Wet well hatch shall open toward the control panel.
- 18.8.3 The lift station will be constructed of concrete with reinforcement material. All plumbing entering or leaving the wet well shall be grouted to prevent infiltration.
- 18.8.4 Piping shall be sized to meet flow needs.
- 18.8.5 Gate Valves and Check Valves are required on both discharging lines.
- 18.8.6 A stainless steel chain shall be hooked to each pump for removal.
- 18.8.7 All lift station wet wells shall be vented by a 4" stainless steel pipe with bird screen.

18.9 VALVE VAULTS AND WET WELLS FOR LIFT STATIONS

- 18.9.1 Wet wells shall be a minimum of 8' in diameter and a minimum of 10' in depth. Alternate Storage (i.e. equalization basin) may be required at certain locations, which will be determined by the Wastewater Department. EQ shall be the same size as the wet well.
- 18.9.2 Wet wells shall be 8" above the asphalt.
- 18.9.3 Wet well walls shall be a minimum of 8" thick with #4 rebar on 12" centers. The base of the wet well shall be designed to resist the buoyance/floating with the wet well empty.
- 18.9.4 Wet well bottom rebar spacing - #4 bar on 6" centers.
- 18.9.5 Wet well top shall be a minimum of 6" thick with # 4 rebar on 6" centers.
- 18.9.6 Wet well access shall be cast-in-place, grout will not be accepted.
- 18.9.7 All interior concrete walls of new lift station wet wells will be epoxy coated prior to lift station approval and being brought into service. Epoxy coating will be 100% epoxy at a minimum application thickness of 125 mils after the installation of a 1/2" of cementitious lining has been applied . Epoxy is added to extend the service life of the concrete wet well walls.
- 18.9.8 Valve vault walls shall be a minimum of 6" thick.
- 18.9.9 Valve vault base shall be a minimum of 6" thick.
- 18.9.10 Valve vault top shall be a minimum of 6" thick with # 4 rebar on 6" centers.

18.9.11 Vaults and wet wells shall be of all concrete construction incorporating a double aluminum access lid. Door shall open to 90°, lock automatically in position; have closed position lock hasp and retractable grip for opening and closing with one hand. Lid shall support a minimum live load of 150 pounds per square foot. **Details LS06 and LS07.**

18.9.12 Vaults and wet wells shall be constructed on a minimum of 6" of SB2 base material. Steps shall not be incorporated. Maximum vault depth shall be 5' from access hatch to base.

18.10 **VALVES**

18.10.1 Check valves shall be swing type with iron body and flanged ends mounted in the horizontal position only and shall be located in a valve vault not exposed to wastewater. 2" check valves may be IPT.

18.10.2 Gate valves 4" and larger shall be of the resilient seat type and meet the requirements of AWWA C515 latest revision. Valves shall have non-rising stems and close right (clockwise). Valves shall have flanged ends and have a 2" operating nut or hand wheel. Valves smaller than 2" shall meet AWWA C500. Acceptable manufacturers for all sizes include; American Darling, Clow, Kennedy, Mueller or equal. Gate valves shall be mounted horizontally in valve vault with no exposure to wastewater.

18.10.3 Plug valves are an acceptable means for isolation and shall be flanged DeZurik or Pratt equal.

SECTION 19 SEWER LIFT STATIONS – PRIVATE

19.1 Plans shall be provided to the DEPARTMENT for approval before construction begins.

19.2 **LIFT STATION SITE**

19.2.1 An unobstructed access to the lift station shall be provided and maintained.

19.2.2 The lift station shall have a minimum wet well diameter of 2' and a minimum depth of 6'.

19.3 **BASIC CONTROL PANEL SPECIFICATIONS**

19.3.1 The lift station shall have a control center to provide automatic and manual operation. A Hand – Off – Automatic switch shall be included for each pump.

19.3.2 Station shall operate on a minimum of 220 V AC.

19.3.3 One "across the line magnetic contactor" per pump sized to HP and NEMA standards shall be provided and installed.

19.3.4 Control center shall have a locking hasp.

19.3.5 Alternator shall be provided for duplex units.

19.3.6 A lighting arrester shall be installed for pump protection.

19.3.7 High level alarms are required. A red warning light with flasher and audible alarm shall be installed on the control panel for easy monitoring.

19.3.8 An identification plate listing contact information, name, address and phone number of responsible party will be attached to the control panel and a copy issued to the Wastewater Department.

19.4 PUMP REQUIREMENTS

- 19.4.1 Pumps shall be Flygt, Hydromatic, or HCP and must be approved in writing by the Wastewater Department.
- 19.4.2 Pumps shall be mounted on stainless steel slide rails and use Campbell type pump connector or equivalent.
- 19.4.3 Pumps shall have stainless steel lifting chains or stainless steel lifting cables for pump removal and installation.
- 19.4.4 All pumps shall meet or exceed the minimum requirements to pump the anticipated flow for the known number of units or number of persons. The pumps shall meet or exceed required head values based on ENGINEER's design.
- 19.4.5 Pump impellers shall be grinder type impellers.
- 19.4.6 Before final acceptance, 1 paper and 1 pdf copy of as-built drawing with contact information must be supplied to the Wastewater Department.

SECTION 20 CROSS-CONNECTION CONTROL PROGRAM MANUAL

20.1 GENERAL

This document sets forth the Bentonville Water Utilities Cross-Connection Control Program, and is adopted within the water and sewer specifications for the purpose of regulating cross-connection hazards by the operating staff and management of the DEPARTMENT.

20.2 INTRODUCTION

This program prohibits uncontrolled cross-connections within the water distribution system of the Bentonville Water Utilities, authorizes the DEPARTMENT to conduct inspections of the consumers' property, requires that cross-connection hazards be corrected or controlled and provides for enforcement.

20.3 PURPOSE

The purpose of this program is to:

- 20.3.1 Protect the public potable water supply of the City of Bentonville from the possibility of contamination or pollution from backflow into the Water System.
- 20.3.2 Promote the elimination or control of existing cross-connections, actual or potential, between the customer's potable water system(s) and nonpotable water systems, plumbing fixtures, and industrial piping systems.
- 20.3.3 Provide for a continuing program of cross-connection control that will systematically and effectively prevent the contamination or pollution of potable water systems.

20.4 **DEFINITIONS**

The following terms shall have the stated meanings:

- 20.4.1 **APPROVING AUTHORITY**: the DEPARTMENT or its designated agent(s).
- 20.4.2 **AUXILIARY WATER SUPPLY**: any water supply, on or available to the property other than the Water System.
- 20.4.3 **BACKFLOW**: flow of water or other liquids, mixtures or substances, under positive or reduced pressure in the distribution pipes of a potable water supply from any source other than its intended source.
- 20.4.4 **BACKFLOW PREVENTION ASSEMBLY** (“**BACKFLOW PREVENTION ASSEMBLY**” OR “**ASSEMBLY**”): a mechanical backflow preventer assembly constructed with shut-off valves, and provided as a complete assembly by a single manufacturer, used to prevent the flow of contaminants or pollutants into the Water System. **The assembly must have the approval of the FCCCHR, ADH, and the DEPARTMENT.**
- 20.4.5 **BACKFLOW PREVENTION DEVICE**: a mechanical back-flow preventer without shut-off valves on any side of the backflow prevention mechanism.
- 20.4.6 **BYPASS**: any arrangement of pipes, plumbing, or hoses designed to divert the flow around an installed device or assembly through which the flow normally passes.
- 20.4.7 **CERTIFIED ASSEMBLY TESTING TECHNICIAN**: a person certified by the Arkansas Department of Health as an Assembly Testing Technician.
- 20.4.8 **CERTIFIED ASSEMBLY REPAIR TECHNICIAN**: a person certified by the ADH as an Assembly Repair Technician.
- 20.4.9 **CITY**: the City of Bentonville, Arkansas.
- 20.4.10 **CONSUMER**: a “person” or facility receiving service from a potable water system.
- 20.4.11 **CONTAMINANT**: a biological agent or chemical compound, which can cause disease or threat to health.
- 20.4.12 **CROSS CONNECTION**: any actual or potential connection between the Water System and a source of contamination or pollution.
- 20.4.13 **CROSS CONNECTION CONTROL**: the use of backflow prevention assemblies, methods and procedures to prevent contamination or pollution of a potable water supply through cross connections.
- 20.4.14 **DIRECT CROSS-CONNECTION**: a cross-connection which is subject to both backsiphonage and backpressure.
- 20.4.15 **DOMESTIC WATER SERVICE**: refers to plumbing as defined by the State of Arkansas Plumbing Code that is not associated with designated fire protection water service lines and systems.

20.4.16 **DOUBLE CHECK VALVE ASSEMBLY (DCVA):** a backflow prevention assembly consisting of two (2) independently operating check valves, four (4) test cocks, and two (2) shut-off valves. DCVA's are only appropriate for use against non-health hazards.

20.4.17 **DETECTOR DOUBLE CHECK VALVE ASSEMBLY (DDCVA):** a DCVA with an additional smaller DCVA with a flow detector meter in parallel, used to detect system leaks and unauthorized use.

20.4.18 **DETECTOR REDUCED PRESSURE ZONE ASSEMBLY (DRPZA):** an RPZA with an additional smaller RPZA with a flow detector meter in parallel, used to detect system leaks and unauthorized use.

20.4.19 **FIRE PROTECTION SYSTEM:** a fire protection system consisting of one or more of the following: pipes, sprinklers, valves, fixtures, fittings, ponds, tanks, water storage vessels and fire hydrants that are intended and used exclusively for fire protection.

20.4.20 **HAZARD:** any contaminant or pollutant which if it enters the potable water system causes a risk to public health or has an adverse effect on the public potable water system.

20.4.21 **INDIRECT CROSS-CONNECTION:** a cross-connection which is subject to backsiphonage only.

20.4.22 **INSPECTOR:** a person authorized by the APPROVING AUTHORITY to perform inspections of consumer's facilities to determine compliance with the Program.

20.4.23 **MULTIPLE SERVICES:** two or more water service connections. When two or more water suppliers are involved, the multiple service connections constitute an "auxiliary source" of water on the property.

20.4.24 **NEW CONSTRUCTION:** construction of a new facility, alteration of or addition to an existing facility, or modification of or addition to existing plumbing and fire protection systems.

20.4.25 **PERMIT:** a document issued by DEPARTMENT that allows the use of a backflow prevention assembly at the Consumer's service connection.

20.4.26 **PERSON:** any individual, partnership, company, public or private corporation, political subdivision or agency of the United States or any other legal entity.

20.4.27 **POLLUTANT:** a biological or chemical substance which do not pose a health hazard, but reduces the aesthetic quality of water.

20.4.28 **POTABLE WATER:** any water which, according to recognized standards, is safe for human consumption.

20.4.29 **PROGRAM:** the Bentonville Water Utilities Cross-Connection Control Program.

20.4.30 **RESPONSIBLE MANAGING EMPLOYEE (RME):** an individual or individuals who shall be designated by each company that plans, sells, installs, maintains, or services a fire protection sprinkler system on a full time basis to assure that each fire protection sprinkler system as installed, maintained, or serviced, meets the standards as provided by state law.

20.4.31 **REDUCED PRESSURE ZONE ASSEMBLY (RPZA):** a backflow prevention assembly consisting of four (4) test cocks, two (2) shutoff valves, two (2) independently operating, spring-loaded check valves with a reduced pressure zone between the checks valves. The zone contains a relief port, which will open to atmosphere if the pressure in the zone falls within two (2) psi of

the supply pressure. The assembly provides protection against both backpressure and backsiphonage.

20.4.32 **RETROFIT:** replacement of an existing device or backflow prevention assembly when the specifications or condition of the device or assembly are not adequate for the degree of hazard found on the property as defined by this program.

20.4.33 **SERVICE CONNECTION:** a piping connection between the water main of the Water Utilities and a consumer's system.

SECTION 21 ADMINISTRATION

21.1 AUTHORITY OF APPROVING AUTHORITY

21.1.1 APPROVING AUTHORITY is hereby authorized to:

21.1.2 Protect the public water distribution system from contamination or pollution due to the backflow or backsiphonage through the water service connection.

21.1.3 Conduct a program, which includes routine survey of commercial, institutional and industrial establishments for possible contamination or pollution.

21.1.4 Review construction plans and determine requirements for backflow prevention assemblies. This shall apply to new construction, alteration or additions, as well as, modification of existing fire protection systems.

21.1.5 Provide installation criteria for backflow prevention assemblies and issuance of permits prior to construction.

21.1.6 Conduct a final inspection of backflow prevention assembly installations to verify conformance with approved installation plans.

21.1.7 Ensure that RPZA's used for fire hydrants are performance tested and have a backflow prevention assembly permit.

21.1.8 Maintain RPZA's and meters for issue to water users needing temporary water service from fire hydrants.

21.1.9 Ensure RPZA's used by customers are tested annually and before issue/use. (Within ten (10) days of installation)

21.1.10 Verify collection of fees for permits.

21.1.11 Verify fire hydrant RPZA's and meters are set and removed by DEPARTMENT Personnel.

21.1.12 Submit all required reports, maintain a database, coordinate with other agencies to accomplish the goals of the Program and maintain the following records:

- (a) Master files on customer Cross-Connection Tests.
- (b) Master files on Cross-Connection Permits.
- (c) Copies of permits and permit applications.
- (d) Copies of lists and summaries supplied to the ADH.
- (e) Number of annual tests conducted on backflow prevention assemblies.
- (f) Number of cross-connection control surveys performed.

(g) Total number of each type of backflow prevention assemblies installed.

(h) The following information is required per assembly: DDCVA and DRPZA are made up of two (2) assemblies, each requiring record data.

- (1) Organization or Customer's name, mailing address, phone #, contact name, assembly address, permit # and account number.
- (2) Type installation, problem history, location on property, installed by, phone # and type of service.
- (3) Name of the manufacturer, model number and serial number of assembly.
- (4) Type of assembly, date of installation and installation specifications.
- (5) Number of the DEPARTMENT meter, if any.
- (6) Date of initial cross-connection survey, survey results and type of actual or potential hazard.
- (7) Date of initial permit and current permit number.
- (8) Test results before and after repair or maintenance and date of latest retest.
- (9) Maintenance performed, repairs made, replacement parts, part numbers and date repairs were made.
- (10) Information on backflow through the assembly.

21.1.13 Maintain an inventory of all commercial, institutional and industrial locations with complete information on cross connection devices or assemblies installed.

21.1.14 Ensure meters on fire protection assemblies are read and consumer advised of water usage.

21.1.15 Coordinate repairs on any damage resulting from vandalism or flooding of backflow prevention assemblies.

21.1.16 Ensure a Certified Assembly Repair Technician is responsible for all repairs performed on an assembly. A Journeyman or Master Plumber's License shall be required when installing backflow prevention assemblies within the scope of the plumbing system.

21.1.17 Verify only Certified Assembly Testing Technicians perform testing on backflow prevention assemblies.

21.2 POWERS AND AUTHORITIES OF INSPECTORS

21.2.1 The APPROVING AUTHORITY or duly authorized employees of the DEPARTMENT or the City bearing proper credentials and identification shall be permitted to enter all properties for the purposes of inspection, observation and testing to verify adherence to the provisions of this program. Authorized personnel shall have authority to inspect and copy records pertaining to the threat of a hazard to the Water System.

21.2.2 The consumer's property shall be available for inspection at all reasonable times to authorized representatives of the APPROVING AUTHORITY to determine whether cross connections or other structural or sanitary hazards, including violations of the Program, exist.

21.2.3 On request by the APPROVING AUTHORITY, the consumer shall furnish information on water use practices within the consumer's premises.

21.3 **CROSS-CONNECTION SURVEYS**

21.3.1 Personnel authorized by the APPROVING AUTHORITY will survey the property of consumers considered likely to have cross-connections to determine if backflow can occur. Routine surveys will be made periodically to determine if backflow prevention measures are maintained, are functioning properly and new cross-connections have not been created.

21.4 **SCHEDULING SURVEYS, PRIORITIES**

21.4.1 The selection of existing property for cross-connection surveys will be made on the basis of suspected hazard. Those customers suspected of having the most hazardous cross-connections will be surveyed first. Surveys shall continue until all property considered likely to have cross-connection problems have been surveyed. Information for the review process will be obtained from questionnaires sent to industrial, commercial and institutional establishments.

21.5 **OTHER SURVEYS**

21.5.1 Cross-connection surveys will continue with the aim being to survey all industrial, commercial or institutional type customers and agricultural operations that may pose a hazard. Prompt attention will be given to identifying residential type customers that may have significant cross-connection problems.

21.6 **FOLLOW-UP SURVEYS**

21.6.1 Follow up surveys shall be made on a frequency established by the Minimum Standards for a Cross-Connection Control Program from the ADH – Division of Engineering.

21.7 **ENFORCEMENT ACTION**

21.7.1 Where backflow prevention is required, the APPROVING AUTHORITY shall require the problem to be eliminated or controlled by a properly installed, approved backflow prevention assembly. Such protective measures may include but not be limited to a backflow prevention assembly on the consumer's water service line. Every effort will be made to secure the voluntary cooperation in correcting cross-connection hazards. If voluntary corrective action cannot be obtained within a reasonable period of time, the water service shall be terminated.

SECTION 22 PUBLIC WATER SYSTEMS

22.1 **AUXILIARY PUBLIC WATER SYSTEMS**

22.1.1 The Water System shall be protected as outlined in the **Arkansas Department of Health publication, “Policies and Procedures for Backflow Prevention Devices Location and Installation”** by an approved method of backflow prevention at the point of connection to the Water System if a public water supply other than the Water System is available to the premises. Backflow prevention is required regardless of actual development or cross-connection between the Water System and the other public water system.

22.1.2 RPZA Containment is required if the auxiliary water supply is not operating under the authority of the ADH.

22.1.3 Backflow prevention is not required if the auxiliary water supply is being operated under the authority of the ADH, and has properly conducted sanitary control and cross-connection control programs, and provides potable water to the Water System.

SECTION 23 DOMESTIC WATER SERVICE LINES

23.1 GENERAL

23.1.1 The information on backflow preventers described in this section is extracted from the ADH publication, "Policies and Procedures for Backflow Prevention Devices Location and Installation".

23.2 **COSTS**

23.2.1 The consumer of a property shall bear the expense and burden of protecting the Water System from the potential hazard through approved backflow prevention methods and procedures.

23.3 RPZA CONTAINMENT

23.3.1 Any building strictly consisting of commercial use or mixed-use shall be protected from cross-connection backflow by an approved RPZA containment assembly.

23.3.2 Any multi-story building, hotel, apartment house or private structure when a booster pump is used that furnishes water to all or part of the property, or where there is the potential for a cross-connection; it shall be protected from cross-connection backflow by an approved RPZA containment assembly.

23.3.3 Any Establishment's use such as, but not limited to the following that contain a risk to cross-connection on the premises:

Aircraft Plants (with industrial water)	Health Clinics
Asphalt Plants	Health Clubs and Fitness Centers
Automotive Plants	Hospitals
Autopsy Facilities	Laboratories
Baking Facility	Landfills
Battery Manufacturer	Laundries (excluding Laundromats)
Breweries	Liquid Gas Handling Facilities
Beverage Bottling Plants	Livestock Operations (excluding small non-commercial operations without industrial fluids)
Blood Banks	Lumber Processing Plants
Bottled Water Manufacturing	Medical Facilities, Health, Chiropractic, Veterinary
Broiler Houses	Metal Plating, Etching, Passivation or Pickling Plants
Canneries (except small plants without industrial fluids)	Mines and Quarries
Car Wash Facilities	Missile Plants (with industrial water)
Chemical Plants	Morgues
Cleaners (processing plant)	Mortuaries
Cold Storage Plants	Motion Picture Studios (with industrial water)
Colleges (with laboratories)	Natural Gas Handling Facilities
Compressed Gas Handling Facilities	Nursery, Shrubbery or Garden Centers
Concrete Mixing Plants	Nursing Homes or convalescent homes
Crime Laboratories	Oil Handling Facilities
Dairies and Milk Distributors	Packing Houses (except small plants without industrial fluids)
Dental Facilities	Pesticide Processors or Applicators
Dye Works	Paper and Paper Product Plants (with industrial fluids)
Film Laboratories	
Food Processing Plants	
Funeral Homes	
Golf Courses	
Gravel Processing Plants	
Hazardous Waste Processing	

Poultry Operations (excluding small non-commercial operations without industrial fluids)

Power Plants (excluding small heating or compressing systems)

Pressure Vessel Repair, Testing and Maintenance Facilities

Propane or Butane Gas Handling Facilities

Radioactive Material Plants and Handling Facilities

Railroads

Recycling Facilities

Reduction Plants

Restricted, Classified or Other Closed Facilities

Rubber Manufacturing Plants (excluding small plants)

Sand Processing Plants

Sanitariums

Schools (with laboratories)

Sod Farms

Steel Manufacturers (using Industrial Fluids)

Swimming Pools

Tank Repair, Cleaning, Testing and Maintenance Facilities

Taxidermist

Wastewater Plants and Pump Stations

Water Front Facilities and Industries, excluding:
(premises without docks-cafes, comfort stations, concessions, office buildings, or private residences)

Water Treatment Plants and Pump Stations

Zoos

23.3.4 **Multiple Water Services:** If there is a potential for two or more water service lines being interconnected; and there is a potential high hazard on the premises, or the water is used for other than domestic purposes.

23.3.5 **Private Water System:** If there is an auxiliary water supply on or available to the premises that is a potential high hazard, including a fire protection system.

23.3.6 **Used Water and Industrial Fluids:** If there is a used water or industrial fluid system on the premises that is a potential high hazard.

23.3.7 **Solar Heating Systems:** If there is a solar heating system on the premises, and chemicals are added to the solar heating system or the solar heating system is not used exclusively for once through heating (i.e. domestic hot water.)

23.3.8 **Chemically Contaminated Water Systems:** If chemicals are used as an additive to the water, or the water is subjected to additional treatment, or water is used on the premises to transport chemicals or chemicals are used with water on the premises in compounding or processing.

23.3.9 **Sewers and Storm Drains:** Any premises used for handling sewage or storm water (e.g. treatment and processing facilities, pumping plants, gauging stations, lift stations, ejector plants.)

23.3.10 **Public Fire Hydrants as Temporary Water Services:** The Water System shall be protected by an approved RPZA on the outlet of any fire hydrant when it is used as a water supply, except when used to extinguish a fire.

23.3.11 **Irrigation System:** If there is an irrigation system on the premises.

23.3.12 All RPZ backflow devices used for domestic water service will need to be a low lead device to meet the current Safe Water Drinking Act section 1417.

23.3.13 All new structures in a mixed use zoning based on the City of Bentonville zoning map that allows for a mix of uses including but not limited to commercial and industrial uses accompanied with a residential use, shall be required to have a backflow permit and an RPZ backflow assembly.

23.3.14 At the time of construction all structures within the mixed use zone may utilize a spool or like method and floor drain in lieu of installation of the backflow device if all current uses are strictly residential. In the event of a shared meter the spool or like method must be removed and an appropriate backflow assembly be installed at the first change of use within the structure.

23.3.15 All new structures shall depict the location and type of backflow assembly on the construction plans. In the event of a spool or like method, the construction plans shall depict the location. The construction plans shall be reviewed and approved by the City of Bentonville Water Utilities Department prior to construction.

23.3.16 All current buildings that change their use and are allowed commercial uses doing a remodel or renovation that requires a building or plumbing permit that does not have a current RPZ will be required to bring the existing building (or suite if metered separately) up to meet current specifications.

23.4 **CONTAINMENT NOT REQUIRED**

23.4.1 **Residential Systems:** Used exclusively for domestic purposes (without irrigation).

23.4.2 **Solar Heating Systems:** Used exclusively for once through heating (i.e. domestic hot water), and no chemical additives are used in the system.

23.5 **RETROFIT**

23.5.1 All presently installed backflow prevention assemblies and devices that do not meet the requirements of this program but were approved assemblies for the purposes described herein at the time of installation and have been properly maintained, shall, except for the inspection, testing

and maintenance requirements, be excluded from the requirements of these rules so long as the APPROVING AUTHORITY is assured that they will satisfactorily protect the Water System.

23.5.2 If the existing assembly is moved or requires more than the minimum maintenance or, the APPROVING AUTHORITY determines that the operation or maintenance of this assembly constitutes a hazard, the assembly shall be replaced by an approved backflow prevention assembly.

SECTION 24 FIRE PROTECTION SERVICE LINES

24.1 CLASSES OF FIRE PROTECTION SYSTEMS

24.1.1 Class 1 - A fire protection system directly connected to the Water System as the only water supply - no pumps, tanks or reservoirs; no physical connection to auxiliary water supplies; no antifreeze or other additives of any kind; all fire protection system drains discharging to atmosphere, dry wells or other safe outlets.

24.1.2 Class 2 - A fire protection system that is the same as a Class 1 system; except that a booster pump is installed in the fire protection system, and no outlet is located between the booster pump and the Water System. (Note - Booster pumps alone do not affect the potability of the system. In Class 2 fire protection system, it is necessary to avoid low or negative pressures that can occur by excessive flow through the booster pump. A minimum pressure of 20 psig on the inlet side of the booster pump shall be maintained through proper design, construction, operation and maintenance in addition to the use of a low pressure cutoff switch, pump modulating valve, or other automatic device.)

24.1.3 Class 3 – Direct connection from public water supply mains, plus one or more of the following: elevated storage tank, fire pump taking suction from above ground covered reservoir, tank, or pressure tank. Such storage facilities are filled or connected to public water only and the water in the tank is to be maintained in a potable condition. (Note: Unless the storage tank is owned and operated by the public water system, the assumption will be made that the water in the tank is non-potable, making it a Class 4 installation).

24.1.4 Class 4 - A fire protection system that is the same as a Class 1 or Class 2 system; except that an auxiliary water supply is on or available to the properties, or there is an auxiliary water supply designated by the DEPARTMENT within a radius of 1,700-feet from a pumper connection to the fire protection system. (Note - Connection to an auxiliary water supply cannot exist in a Class 4 fire protection system.)

24.1.5 Class 5 - A fire protection system that is connected to an auxiliary water supply which could be exposed to a high hazard (e.g. non-potable reservoirs, rivers, ponds, wells, industrial water), or that uses additives (e.g. antifreeze, wetting agents, “Foamite”), or that does not maintain a minimum pressure of 20 psig on the inlet side of a booster pump as defined for a Class 2 fire protection system.

24.1.6 Class 6 - A fire protection system that is connected to a water service line from the Water System if the water service line is not used exclusively for fire protection.

24.2 BACKFLOW PREVENTION ON FIRE PROTECTION SYSTEMS

24.2.1 The Water System shall be protected by an approved method of backflow prevention in water service lines to fire protection systems, regardless of backflow prevention requirements in other water services on the premises.

24.2.2 Classes 1, 2 & 3: An approved DDCVA is required as the minimum backflow prevention in the water service line to a Class 1, 2 or 3 fire protection system. An approved DRPZA shall be required on any system with hose drops or standpipe outlet.

24.2.3 Classes 4, 5 & 6: An approved DRPZA is required in the water service line to a Class 4, 5 or 6 fire protection system.

24.2.4 Strainers are not required to be installed on fire protection systems.

RETROFIT OF EXISTING SYSTEMS

24.3.1 This applies to an existing fire protection system, which is modified, extended, or enlarged. Such systems include a modification or extension to an existing network (distribution piping, sprinkler heads control valves, etc. are added to or replaced in an existing system), or where an additional fire protection system (new feed line, riser, control valve, distribution piping, sprinkler heads, etc.) will connect to a fire main which has an existing cross-connection control device.

24.3.2 If the existing assembly is moved, or requires more than the minimum maintenance or the APPROVING AUTHORITY determines that the operation or maintenance of this assembly constitutes a hazard, the assembly shall be replaced by an approved backflow prevention assembly.

24.3.3 The minimum protection for cross-connection control for existing systems is the same as listed for new systems, except as noted for Class 1 and 2 systems only.

24.3.4 The installation of a properly sized assembly may cause an excessive pressure loss in some altered Class 1 and 2 systems. Such loss could make the system non-compliant with **NFPA Pamphlets 13 and 14 as adopted.**

24.3.5 The RME shall document to the APPROVING AUTHORITY that reasonable modifications will not compensate for the additional loss.

24.3.6 The documentation shall contain a listing of the minimum flow and pressure, headloss summary, desired and calculated sprinkler head output and a summary of the options examined to reduce headloss.

24.3.7 For these installations, if not already installed, the existing cross-connection control device will be replaced with two check valves in series (one of which can be the alarm valve), each valve meeting AWWA C510, UL 312-88, or UL 193-88, or the latest versions thereof, and equipped with a resilient seating surface. Valves on assemblies for fire protection services shall meet the appropriate recognized standard of UL and FM Global listed or approved for use in Fire Protection Systems. The valves or adjacent piping shall be equipped with a sufficient number of resilient seated test cocks (minimum diameter of one quarter to one-half inch) to determine the effectiveness of each valve (there shall be no leakage past any check valve). Sufficient isolation valves-one valve upstream of the valves and one valve downstream of the valves - shall be present or added to the system to permit this testing.

24.3.8 Existing fire protection systems which are not being modified, enlarged, or expanded are not required to upgrade to comply with this policy unless a hazard is found within the fire protection system.

24.3.9 For Class 1 and 2 systems, if the hydraulic analysis for the modified, extended, or enlarged system demonstrates that the installation of a properly sized cross-connection control device will increase the pressure loss so as to make the system noncompliant with the Rules and Regulations for Sprinkler Systems of the Arkansas Fire Protection Licensing Board (less than the minimum flow required by state fire sprinkler regulations), and that reasonable modifications to the system cannot compensate for the additional losses, the Responsible Managing Employee (RME) of the fire protection firm will document¹ that as part of the submittal to the ADH. (¹Refer to Section 24.7.2)

24.4 ASSEMBLY INSTALLATION

24.4.1 **The following conditions apply to Class I through Class 6 systems:**

24.4.2 Backflow preventers must be tested within 10 days of placing the fire sprinkler system “on stream” and annually thereafter by a state certified Assembly Test Technician. A copy of the test report must be sent to the local water utility.

24.4.3 Reduced pressure type backflow prevention assemblies shall not be installed in pits or vaults. Double check valve assemblies must be installed above ground, if possible. However, if review and approval by the ADH permits below grade installation of a double check valve assembly because of unique conditions at the job site then the below grade unit must be placed in a vault which is located in a well drained area.

24.4.4 Installers of fire protection equipment must be licensed by the Fire Protection Licensing Board.

24.5 PLAN APPROVAL

24.5.1 All plans submitted to the ADH for approval shall indicate the name and license number of the RME. **Section 5**

24.5.2 There shall be no deviation from backflow prevention assembly installation plans and specifications once approved by the ADH and the DEPARTMENT unless revised plans and specifications have been first re-submitted for review and re-approval and written consent given by said authorities.

24.5.3 Plans for connection to fire protection systems must be submitted to the ADH and the local water utility for review and approval prior to beginning installation work. Submittals must include the following elements (include the elements appropriate to the project):

- (a) A utility plan showing location of the fire main, property lines, and easements.
- (b) Material of construction of the fire main.
- (c) Pressure class of the fire main.
- (d) Fire sprinkler connection details; including the following:
- (e) Test flow information at the job site; including flow rate, static and residual pressures.
- (f) Location of the backflow preventer.
- (g) Make, model number, size, and type DC, RP, DCDA, or RPDA.
- (h) Show where the FDC line takes off from the riser or verbally describe the location.
- (i) Show flow calculations or certify that the flow through the backflow preventer will not exceed the maximum rated flow for the unit as indicated in the table show below.

24.5.4 Reduced pressure type backflow prevention assemblies shall not be installed in the vertical position unless approved by the Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR), University of Southern California, Los Angeles, CA.

24.6 DEFINITIONS

24.6.1 **Double check valve assembly (DCVA):** a complete assembly meeting University of Southern California and ADH standards and approval or the latest version thereof consisting of two (2) internally loaded, independently operating check valves between two (2) tightly closing resilient-seated shutoff valves, with four (4) properly placed resilient seated test cocks.

24.6.2 **Reduced-pressure principle backflow-prevention assembly (RP):** a complete assembly meeting University of Southern California and ADH standards and approval or the latest version thereof

consisting of a mechanical, independently operating, hydraulically dependent relief valve located between two (2) independently operating, internally loaded check valves that are located between two (2) tightly closing resilient seated shutoff valves with four (4) properly placed resilient-seated test cocks.

24.7 FLOW/PRESSURE LOSS TABLE

24.7.1 DCVA's and RP's are to be sized according to the following table:

Maximum Flow Rate - gpm	Minimum DCA/RPBP Size - inches	Maximum DCA Pressure Loss - psi	Maximum RPBP Pressure Loss - psi
50	1	10	18
75	1 ¼	10	18
100	1 ½	10	16
160	2	10	16
225	2 ½	10	15
320	3	10	14
500	4	10	14
1000	6	10	14
1600	8	10	14
2300	10	10	14
3000	12	10	14

24.7.2 **NOTE: 1** The sprinkler flow and pressure on which the calculation is based is to be the minimum required by NFPA as defined in the latest regulation of the Arkansas Fire Protection Licensing Board. Documentation to the ADH is to include a listing of that minimum flow and pressure, a headloss summary, the desired and calculated sprinkler head output, and a summary of the options examined to reduce headloss. As required per **Section 24.3.9**

SECTION 25 CONSUMER RESPONSIBILITIES

25.1 GENERAL

The consumer shall:

- 25.1.1 Eliminate all cross connections or install an approved backflow prevention assembly on the water service line.
- 25.1.2 Immediately correct any malfunction of the backflow prevention assembly.
- 25.1.3 Inform the APPROVING AUTHORITY of any proposed or modified cross connections and of any existing cross connections of which the consumer is aware.
- 25.1.4 Prior to start of construction have plans approved and permit obtained for any domestic plumbing or fire service installation requiring an approved backflow prevention assembly. Failure, refusal, or inability on the part of the customer to install, maintain, and have tested, any backflow prevention assembly on the consumer's property shall constitute grounds for discontinuing water service until such requirements have been satisfactorily met.
- 25.1.5 Have the type of backflow prevention assembly and manner of installation approved by the APPROVING AUTHORITY.
- 25.1.6 Install a backflow prevention assembly if a private water source is operational even if it is not cross-connected to the Water System.
- 25.1.7 Install two (2) backflow prevention assemblies in parallel if uninterrupted water service is desired during testing or repair.
- 25.1.8 Not install a by-pass around any backflow prevention assembly unless there is a backflow prevention assembly of the same type in the bypass.
- 25.1.9 Have a certified operational test within ten (10) days of installation and at intervals not to exceed one year thereafter. In those instances where the APPROVING AUTHORITY deems the degree of hazard to be great, an operational test may be required at more frequent intervals.
- 25.1.10 Have only personnel authorized by the ADH perform repairs, installation, maintenance and testing of domestic backflow prevention assemblies.
- 25.1.11 Have only personnel authorized by the ADH perform repairs, maintenance, and testing of designated fire protection service line backflow prevention assemblies.
- 25.1.12 Make repairs immediately upon notification by the tester that repairs are needed. Overhaul shall be performed at intervals not to exceed five (5) years.

SECTION 26 ASSEMBLY SPECIFICATIONS

26.1 GENERAL

- 26.1.1 Specifications for backflow prevention assemblies are essential, since no two assemblies are always reliable under every condition.

26.2 **BACKFLOW PREVENTION ASSEMBLIES**

26.2.1 **NOTE: Only those assemblies that are approved by the DEPARTMENT shall be used for backflow prevention in water service lines:**

26.2.2 **Approved Assembly:** Assemblies that have been tested and approved by the FCCCHR and certified by the ADH are approved by the DEPARTMENT.

26.2.3 Double check valve assembly (DCVA): a complete assembly meeting FCCCHR and the ADH standards and approval or the latest version thereof consisting of two (2) internally loaded, independently operating check valves between two (2) tightly closing resilient-seated shutoff valves, with four (4) properly placed resilient seated test cocks.

26.2.4 **Reduced-pressure principle backflow-prevention assembly (RP):** a complete assembly meeting FCCCHR and the ADH standards and approval or the latest version thereof consisting of a mechanical, independently operating, hydraulically dependent relief valve located between two (2) independently operating, internally loaded check valves that are located between two (2) tightly closing resilient seated shutoff valves with four (4) properly placed resilient-seated test cocks.

26.2.5 The following information shall be distinctly marked on every RPZA, DCVA, DDCVA and DRPZA by cast in the metal, stamped in the metal, or stamped on a brass or stainless steel nameplate permanently affixed to the assembly:

- (a) Name or trademark
- (b) Type (RPZA, DCVA, etc.)
- (c) Size
- (d) Model number
- (e) Direction of flow (indicated by an arrow)
- (f) Serial number
- (g) Maximum working water pressure
- (h) Maximum water temperature for which designed (designate degree F or degree C).

26.2.6 Every RPZA, DCVA, DDCVA and DRPZA shall be shipped completely assembled.

26.2.7 Any frost free bury hydrant installation is subject to a degree of hazard assessment to determine the required backflow prevention device(s) that shall be installed. High hazard conditions require a reduced-pressure principle backflow preventor assembly. Low hazard conditions require a hose-bib atmospheric vacuum breaker with set screw (freeze proof is recommended), and a dual in-line check valve. The appropriate backflow prevention device(s) shall be installed in a location accessible for inspection prior to installation of a water meter.

SECTION 27 ASSEMBLY INSTALLATION, RECORDS AND REPORTS

27.1 **GENERAL**

27.1.1 Proper installation of backflow prevention assemblies is necessary to adequately protect the Water System from backflow.

27.2 **AUTHORIZED INSTALLERS & TESTERS**

27.2.1 Installation of backflow prevention assemblies on domestic water service lines shall be provided by personnel licensed or certified by the ADH.

- 27.2.2 Installation of backflow prevention assemblies on fire protection services shall be provided by personnel licensed or certified by the Arkansas Fire Protection Licensing Board.
- 27.2.3 Testing of backflow prevention assemblies on domestic and fire protection services shall be provided by personnel licensed or certified by the ADH.

27.3 PERMITS

- 27.3.1 Consumers shall possess a permit from the APPROVING AUTHORITY prior to beginning installation of an assembly. All permits shall be obtained by Licensed Plumber installing the device.
- 27.3.2 A permit authorizes the use of the backflow prevention assembly and is necessary for continuing water service. Permits are non-transferable and may be revoked if the consumer fails to adhere to the conditions of the permit. Adequate records and documentation are required for continued permit usage. Consumer shall secure and hold one backflow prevention assembly “use” permit per address. Water meter shall not be set until permit is purchased and recorded at the **Bentonville Water Utilities Office** and the inspection completed.

27.4 INSTALLATION DETAIL

- 27.4.1 Assembly Installation
 - 27.4.1.1 A backflow prevention assembly shall be installed in accordance with the manufacturer's instructions.
 - 27.4.2 An assembly shall be installed on the owner's side of the water meter prior to first outlet.
 - 27.4.3 Piping connected to the assembly shall not be used for electrical grounding.
 - 27.4.4 Piping for risers on irrigation BFP assemblies shall be hard copper (per plumbing code) with two ground unions, one on the upstream riser and one on the downstream riser, for repair and replacement. No plastic allowed.
 - 27.4.5 Piping connected to the assembly shall be thoroughly flushed before installing the assembly.
 - 27.4.6 An adequate and permanent method of test water disposal shall be provided.
 - 27.4.7 A pressure relief valve and a thermal expansion tank shall be properly installed and maintained on all water heating apparatus served by the assembly.

27.4.8 Examples of approved enclosures:



With Regulator



Standard



27.4.8.1 **IMPORTANT! Thermal Expansion Notice-**

Water expands as it heats up and is ordinarily not a problem in an open water system. However, the installation of a backflow preventer into the water system creates a closed system. This can create a potentially dangerous and/or costly situation in the water system if a provision is not allowed for the safe expansion of the heated water.

- 27.4.8.2 The installation of Thermal Expansion Tanks or other approved methods or devices are recommended in domestic water systems requiring backflow prevention assemblies.
- 27.4.8.3 Please refer to current Arkansas State Plumbing Codes or call the Bentonville Water Utilities office at 271-3140 if you have any questions.
- 27.4.9 The assembly installation shall be protected from vandalism and freezing. Heating and electrical wiring shall meet ASSE 1060 Standards.
- 27.4.10 Backflow prevention assemblies installed outdoors and subject to freezing shall be protected by an 'enclosure' which complies with the standards and specifications set forth by the American Society of Sanitary Engineering (ASSE), Code 1060.

- 27.4.11 Adequate support, excluding water lines, shall be provided for assemblies that are 3" or larger.
- 27.4.12 If not part of the approved assembly, an approved strainer shall be installed on the inlet side of the assembly prior to the assembly isolation valve, so that all water must pass through the strainer immediately before entering the assembly.
- 27.4.12.1 **NOTE:** On backflow prevention assemblies 2" and smaller, utilizing outdoor enclosures, width of enclosure and location of Y-strainer must be taken into account to allow for proper fit of enclosure. Strainers are not required on Fire Protection Systems.
- 27.4.13 An approved blow-off shall be installed in the water line immediately after the assembly, to allow for flushing the assembly and to allow for usage of water that is not charged a sewer fee.
- 27.4.13.1 **NOTE:** On backflow prevention assemblies 2" and smaller utilizing outdoor enclosures, the Blow-off shall be installed on the downstream riser, keeping width of assembly to a minimum to allow for proper fit of enclosure. 2" through 10" assemblies shall have a blow-off not less than 2" in diameter. Assemblies larger than 10" shall have a minimum 4" blow-off. Blow-offs installed in vaults shall have piping into the existing vault drain to prevent splashing.
- 27.4.14 Blow-offs in vaults may also be routed above grade and away from the vault, however, a self draining feature must be incorporated to prevent freezing damage to the blow-off piping.
- 27.4.15 If the assembly cannot be installed in the prescribed manner for any reason, the proposed deviations shall be submitted to the DEPARTMENT for review and approval before installation.
- 27.4.16 No backflow preventer assembly shall be installed above or inside a ceiling or over head in any manner, between a ceiling and sub floor or within a wall structure (between wall boards), without the express authorization of the Cross-Connection Control Program manager/agent.

27.5 RPZA & DRPZA INSTALLATION

- 27.5.1 The assembly shall not be buried or shall not be installed in a vertical position unless the assembly is approved for use in that position by the FCCCHR.
- 27.5.2 The assembly may be contained in an approved enclosure. If a shelter is desirable, plans will be reviewed on a case by case basis.
- 27.5.3 An adequate and permanent method of handling relief vent discharge and test water discharge shall be provided.
- 27.5.4 Clear unobstructed space for the relief vent shall be provided to prevent the vent from becoming blocked or flooded.
- 27.5.5 This discharge and drainage method shall meet all applicable codes and regulations per the ADH and the Bentonville Cross-Connection Control Program.

27.6 DDCVA & DCVA INSTALLATION

27.6.1 The assembly shall not be installed below grade, unless the following criteria can be met and accepted by the APPROVING AUTHORITY:

- (a) The vault and its installation shall be approved by the DEPARTMENT before the start of construction.
- (b) The vault shall not be subject to flooding.
- (c) The walls of the vault shall extend above the finished grade a minimum of 3" to prevent intrusion of water or dirt.
- (d) The vault shall be water-tight to prevent intrusion of water or dirt.
- (e) The vault shall drain to daylight through an adequate and permanent gravity drain with a slope of at least 1°. Installation plans shall show the elevation of the vault floor and the area the water will drain to. Plans shall show drainage pipe depth and location. Drainage pipe size shall be 2" larger than the blow-off. Protection on the drainage outlet shall be provided to prevent undesirable creatures from entering.
- (f) The vault cover shall be removable to allow full access to the vault. A minimum of two lifting points shall be provided.
- (g) An access door will be installed in the vault cover on the testable side of the assembly. Approved doors shall be similar or equal to Bilco or Halladay and shall be a minimum of 24" x 24".
- (h) Directly below the access door, steps shall be provided in the vault wall similar or equal to ICM Plastic Manhole Steps. Steps are $\frac{1}{2}$ " steel reinforced rod encapsulated in special polypropylene plastic.
- (i) Minimum installation clearance dimensions shall be 30" between the assembly and corresponding wall and 12" on the opposite side, 8" on each end, 6" above the highest point and 12" under the assembly. Top of assembly shall not exceed 72" above finished grade.
- (j) Manufactured enclosures shall be equal to or the equivalent of a "Hot Box". Enclosures shall be placed on a wire reinforced concrete pad a minimum of 4" thick and shall be removable.

27.7 TEMPORARY USE ASSEMBLIES

27.7.1 A public fire hydrant used as a temporary water source shall be protected by a check valve or air gap and metered by a flow meter which shall be obtained from and installed by the APPROVING AUTHORITY. **Refer to current fire hydrant meter contract.**

27.8 REPORTING REQUIREMENTS

27.8.1 The consumer shall be responsible for properly filing reports with the APPROVING AUTHORITY for each required backflow prevention assembly. DDCVA's and DRPZA's are composed of two (2) unique assemblies, each requiring report submission. In addition to the administrative reports, any failure, removal, modification or replacement of an assembly or suspected backflow shall be reported immediately to the APPROVING AUTHORITY. Performance tests, replacement, repair and maintenance reports shall be filed within 14 calendar days.

27.9 RECORDS

27.9.1 The consumer shall keep records for each assembly. Installation drawings, installer, test reports, manufacturer, model, serial number, date installed, copy of current permit, schedule of preventive maintenance, test reports and technical data are the minimum record requirements. These records shall be maintained for a period not less than five years.

27.10 PROTECTION OF ASSEMBLIES

27.10.1 No person shall maliciously, willfully, or negligently break, damage, destroy, deface or tamper with any structure, appurtenance or equipment which is a part of the backflow prevention assembly.

27.10.2 No person shall cover a backflow prevention assembly vault with earth or pavement, or otherwise render it inaccessible.

27.11 PENALTIES

27.11.1 The DEPARTMENT shall, within an approximate period of forty five (45) days prior to the annual test date, mail a notification letter to customers operating a backflow prevention assembly (BFP) on that customer's premises, informing them of the annual test due date of said assembly. Included in the notification letter shall be identifying information connected with the BFP assembly, i.e.; brand, model, serial number and approximate location of the BFP assembly(s). The City may also include with the notification a test form and a list of Licensed Assembly Tester Technicians that the customer may use to have the BFP assembly tested. The Licensed Assembly Tester Technician list is also available on the City of Bentonville website. The period of approximately forty five (45) days allows adequate time to secure a satisfactory test report of the BFP assembly(s) and to have a copy of the report sent to the DEPARTMENT.

27.11.2 In the event the DEPARTMENT has not received a copy of a satisfactory test report approximately fifteen (15) days prior to the due date, a second notice letter will be mailed to the customer. This letter is a reminder to the customer of the approaching due date.

27.11.3 The second notice shall also contain the same BFP assembly information.

27.11.4 If the DEPARTMENT has not received a satisfactory test result within five (5) days after the due date, the customer shall be notified by mail, hand delivery or in some cases certified mail that they are in violation of current ordinance and have 15 days to complete a satisfactory test and deliver a copy of the test report to the DEPARTMENT, or water service to this address shall be discontinued until such time a copy of said test report shall be delivered to the DEPARTMENT office.

27.11.5 Any consumer found in violation of any of the provisions of the Program, shall be served by the APPROVING AUTHORITY with written notice stating the nature of the violation, describing the penalty applicable to the violation and providing a reasonable time limit for the satisfactory correction thereof. The offender shall, within the period of time stated in such notice, permanently cease all violations. The consumer may deliver by certified mail to the APPROVING AUTHORITY, within 5 days of receipt of such notice a written request for a "just cause" meeting with the APPROVING AUTHORITY. At this meeting the consumer shall be given the opportunity to show "just cause" for the notice to be rescinded or modified.

27.11.6 Any notice issued pursuant to this sub-section may provide one or more of the following penalties:

- (a) A compliance directive mandating procedures to bring the consumer into compliance with the Program within the designated time; failure to comply with the compliance directive shall result in termination of water service.
- (b) A withdrawal of the Consumers backflow prevention assembly permit and termination of water service to the consumer.

27.11.7 No action to withdraw a consumer's permit shall be final until the APPROVING AUTHORITY has given notice described herein held a "just cause" meeting, if requested.

- 27.11.8 However, if the APPROVING AUTHORITY determines that to continue to provide water service will endanger the public health, due to possible contamination of the Water System, water service to the property shall be immediately terminated.
- 27.11.9 Any person violating the provisions of this Program shall become liable to the DEPARTMENT for any expense, loss or damage occurred to the DEPARTMENT by reason of such violation.
- 27.11.10 The listing of penalties in this Section shall not preclude other appropriate judicial remedies available to the DEPARTMENT for any violation of the Program. The DEPARTMENT may petition any Court of competent jurisdiction to grant injunctive or other legal or equitable relief by reason of a violation.

Detailed Drawings

General Water/Sewer Details

GWS01	Encasement Detail
GWS02	Thrust Blocking
GWS03	Reaction Backing Table
GWS04	Anchor Collar Specifications
GWS05	Encasement Crossing
GWS06	Subdivision Utility Placement – Black/White and Color
GWS07	Typical Bedding Detail – Per Street Department Specs

Water Details

W01	1" Temporary Blow-off Assembly/Sample Point
W02	1" Water Service
W03	5/8" Water Service
W04	Fire Hydrant with Retainer Glands
W05	Fire Hydrant with Swivel Anchor Coupling
W06	Deep Bury Fire Hydrants
W07	Valve Box Valve Stem and Tracer Wire Installation
W08	Restrained Gate Valve
W09	2" Combination Air/Vacuum Valve
W10	1" Combination Air/Vacuum Valve
W11	Swing Connection - New Main to Existing Main
W12	Meter Vault 4" – 8" Meters (Typical)
W13	Cut and Cap Detail
W14	Frost Free Hose Bibb with Vacuum Breaker
W15	Reduced Pressure (RP) Backflow Device – Exterior Irrigation Only
W16	Reduced Pressure (RP) Backflow Device – Interior Domestic or Irrigation
W17	Waterline Obstruction Crossing
W18	2" Water Service

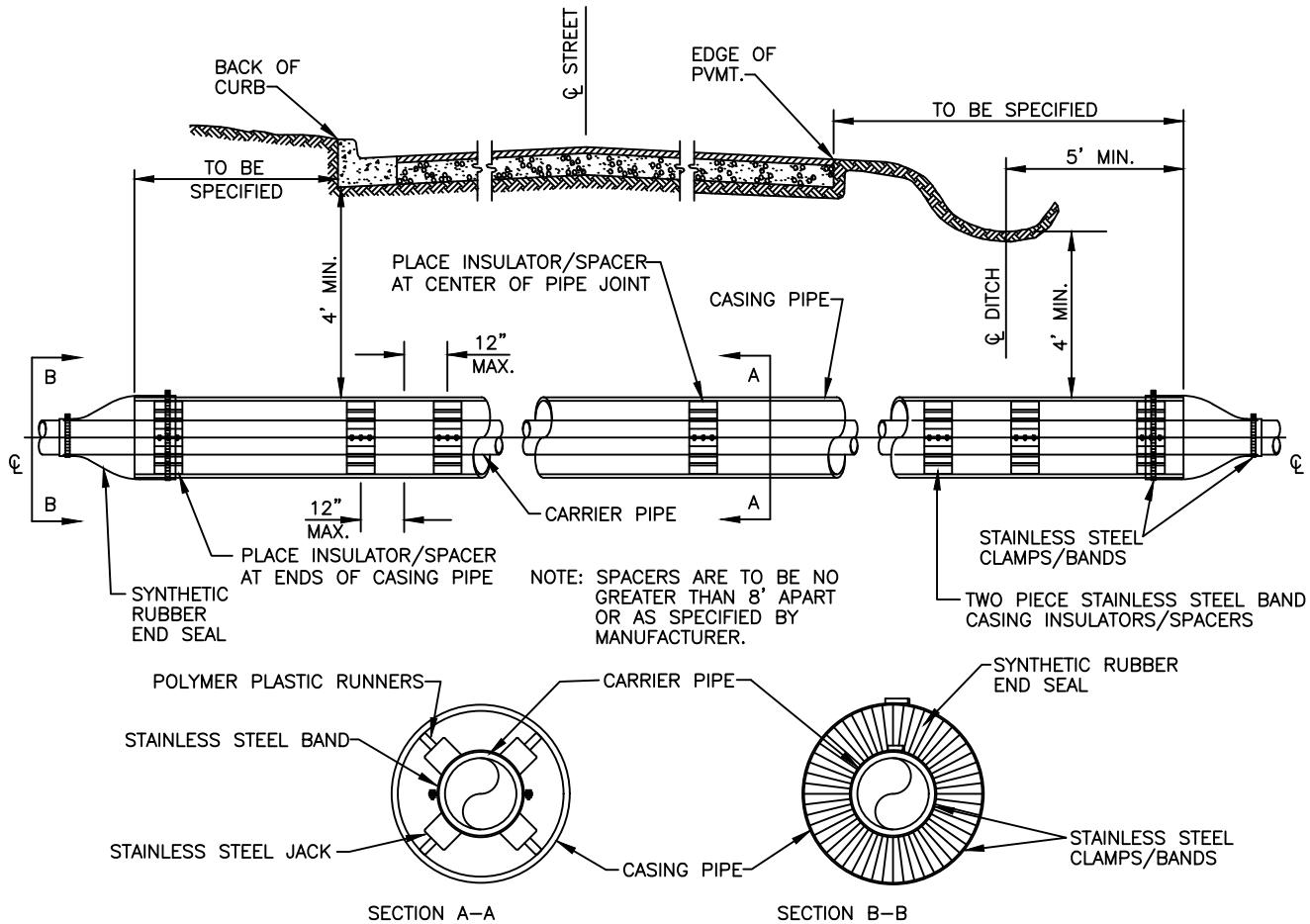
Sanitary Sewer Details

SS01	Sanitary Sewer Manhole - Cast-In-Place
SS02	Sanitary Sewer Manhole - Interior Drop
SS03	Sanitary Sewer Manhole - Exterior Drop
SS04	Heavy Duty Manhole Lid and Frame
SS05	Water Tight Bolted Lid and Frame
SS06	Sanitary Sewer Service Wye
SS07	Existing Manhole Abandonment – 5' or deeper
SS08	Private Sewer Manhole – Ring and Lid
SS09	Manhole Adjust to Grade

Lift Station Details

LS01	Duplex Pump Control Panel 480V 3-Phase
LS02	Duplex Pump Control Panel 230V Single Phase
LS03	Lift Station Site
LS04	Lift Station Non-Clog Pumps above 5-HP
LS05	Lift Station Grinder Pumps 5-HP and Less
LS06	Lift Station Wet Well
LS07	Lift Station Valve Vault
LS08	Air Vacuum /Release Manhole for Force Main
LS09	Typical Bedding Detail for Force Main
LS10	Tracer Wire Port

ENCASEMENT DETAIL



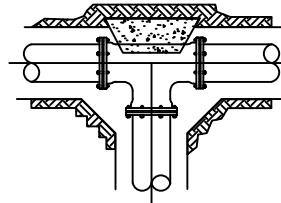
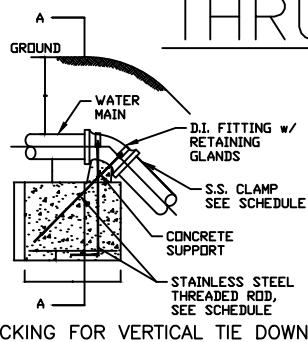
CARRIER & CASING SIZES										
CARRIER	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
CASING	16"	16"	16"	18"	24"	24"	30"	30"	36"	36"
CASING/WALL THICKNESS	.219	.219	.219	.250	.281	.344	.406	.406	.500	.500

*ALL BELLS SHALL BE RESTRAINED INSIDE ENCASEMENT BY APPROVED METHOD.

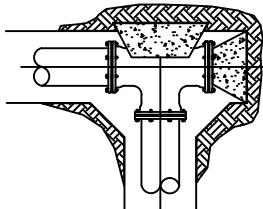


DRAWN BY: JS	CHECKED BY: AW
GEN WATER/SEWER DETAIL: GWS01	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

THRUST BLOCKING

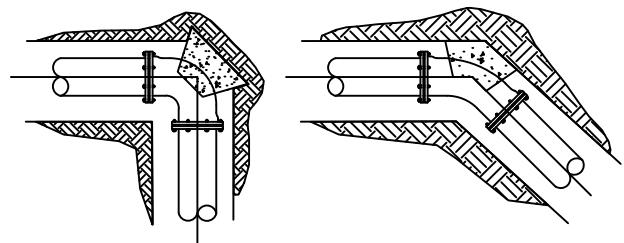
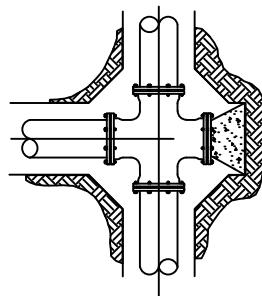


BLOCKING FOR TEE



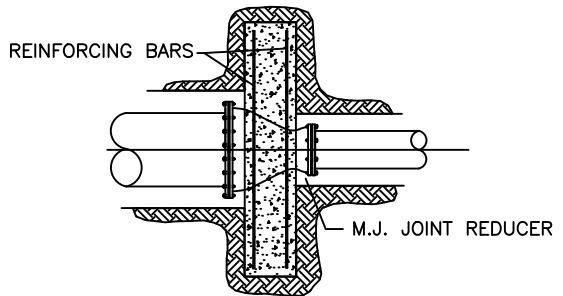
SPECIAL BLOCKING OF TEE & PLUG
(WHEN DIRECTED BY WATER DEPT.)

TYPICAL SECTION OF CROSS & 2 PLUG BLOCKING
(WHEN DIRECTED BY WATER DEPT.)



TYPICAL BLOCKING
FOR HORIZONTAL BENDS

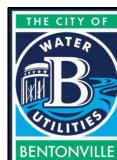
TYPICAL SECTION OF CROSS & PLUG BLOCKING
(WHEN DIRECTED BY WATER DEPT.)



THRUST SUPPORT FOR REDUCER
(SIZE TO BE DETERMINED BY WATER DEPT.)

NOTES

1. ALL BLOCKING SHALL BE AGAINST UNDISTURBED SOIL USING 4,000 PSI CONCRETE.
2. WHERE SOIL CONDITIONS MAKE IT NECESSARY TO POUR CONCRETE OVER JOINTS, THE ENDS OF THE ADJACENT PIPES MUST HAVE A THRUST BLOCK TO RESIST MOVEMENT OF THESE JOINTS.
3. WEIGHT CALCULATIONS TO BE BASED ON REACTION BACKING TABLE (SEE GWS03).
4. WHEN BLOCKING AGAINST FITTINGS, FITTINGS SHALL BE COVERED WITH POLYETHYLENE WRAP TO PREVENT BONDING OF CONCRETE.
5. WHERE SHEAR BECOMES A PROBLEM PROPER REINFORCING MUST BE INSTALLED INTO THE BLOCKING.
6. CLEARANCE SHALL BE A MINIMUM OF 6" BETWEEN PIPE AND OBSTRUCTIONS.
7. CLEARANCE ON PIPES BELONGING TO OIL/GAS COMPANIES SHALL BE 18" UNLESS SPECIAL PERMISSION IS GIVEN BY THESE COMPANIES AND THE DEPARTMENT.
8. 12" OF ALL THREAD EMBEDDED IN CONCRETE
9. MIN. 5/8" ALL THREAD FOR SECTIONS 10FT OR UNDER



DRAWN BY: JI	CHECKED BY: PN
GEN WATER/SEWER DETAIL: GWS02	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

REACTION BACKING TABLE

BLOCKING SCHEDULE					
PIPE SIZE	BENDS				
		45°	22 1/2°	11 1/4°	ROD DIA.
8"	VOLUME REQ'D (CU. FT.)	98.5	50.2	25.2	3/4 IN.
	A (FT.)	5.00'	4.00'	3.00'	
	B (FT.)	4.00'	3.20'	2.80'	
	C (FT.)	5.00'	4.00'	3.00'	
	MIN. CLAMP (2 EA.)	3/8 IN. x 2		IN.	
12"	VOLUME REQ'D (CU. FT.)	209.5	106.8	53.7	3/4 IN.
	A (FT.)	6.00'	5.00'	4.00'	
	B (FT.)	6.00'	4.25'	3.50'	
	C (FT.)	6.00'	5.00'	4.00'	
	MIN. CLAMP (2 EA.)	1/2 IN. x 2		IN.	
18"	VOLUME REQ'D (CU. FT.)	457.2	233.1	117.1	1 IN.
	A (FT.)	8.00'	6.50'	5.00'	
	B (FT.)	7.25'	5.50'	4.75'	
	C (FT.)	8.00'	6.50'	5.00'	
	MIN. CLAMP (2 EA.)	5/8 IN. x 3		IN.	
24"	VOLUME REQ'D (CU. FT.)	800.3	408.0	205.0	1 1/4 IN.
	A (FT.)	9.50'	7.50'	6.00'	
	B (FT.)	9.00'	7.25'	5.75'	
	C (FT.)	9.50'	7.50'	6.00'	
	MIN. CLAMP (2 EA.)	5/8 IN. x 3		IN.	
VOLUME CALCULATED ON THE BASIS OF CONCRETE REACTING THRUST ON THE RESPECTIVE BENDS UNDER AN INTERNAL PRESSURE OF 250 PSI, 50 PSI SURGE AND THE WEIGHT OF CONCRETE IS 150 POUNDS PER CU. FT.					

NOTES:

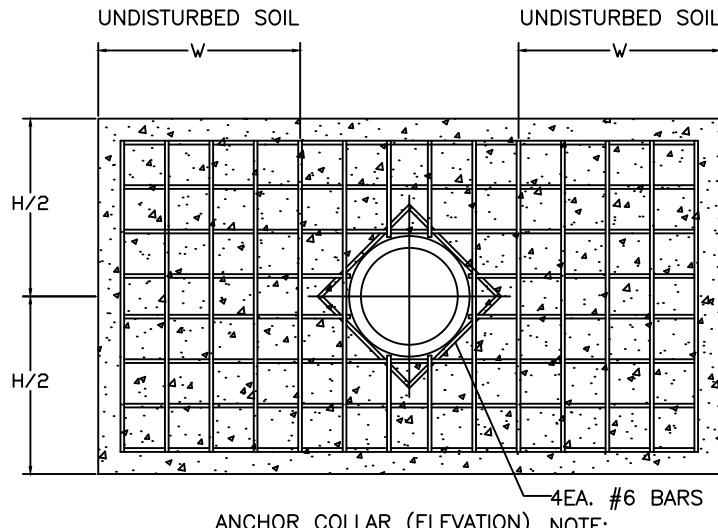
1. ALL FITTINGS SHALL BE MECHANICAL JOINTS.
2. DO NOT COVER BELLS OR FLANGES WITH CONCRETE.
3. WRAP ALL FITTINGS WITH POLY WRAP.
4. BACK ALL TEES ACCORDING TO SIZE OF BRANCH.
5. BACKING FUTURE LINE EXTENSIONS SHALL BE SUCH
THAT LATER REMOVAL IS POSSIBLE.
6. ALL BENDS WHERE FITTINGS ARE USED, BOTH
HORIZONTAL OR VERTICAL, SHALL BE BACKED
WITH CONCRETE.
7. REACTION BACKING TABLE IS BASED ON 150 PSI AND
SOIL BEARING PRESSURE OF 2,000 LB/SQ. FT.
ADDITIONAL BACKING MAY BE REQUIRED IN SOME
AREAS AS REQUIRED BY CITY WATER DEPARTMENT.



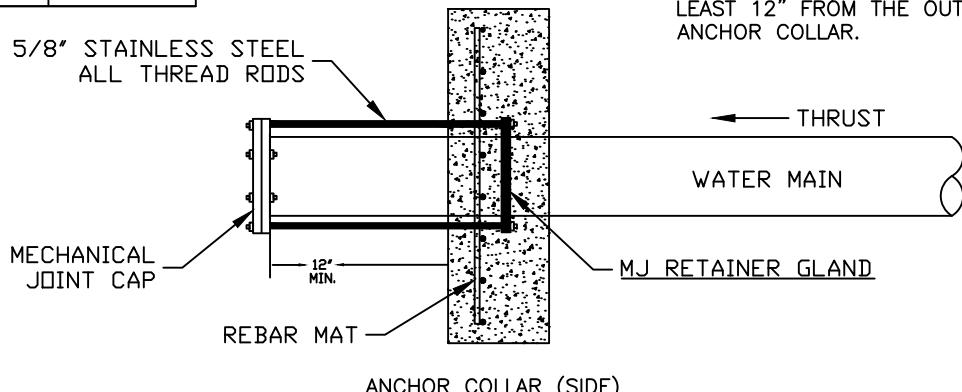
DRAWN BY: JI	CHECKED BY: PN
GEN WATER/SEWER DETAIL: GWS03	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

ANCHOR COLLAR SPECIFICATIONS

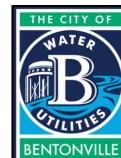
PIPE SIZE	ANCHOR COLLAR SCHEDULE				REINFORCING BARS	
	W	H	T	M	"A" BARS	"B" BARS
6"	1.5'	2.0'	1.0'	M.J. RETAINER GLAND	#6@6"	#6@6"
8"	1.5'	2.5'	1.0'	M.J. RETAINER GLAND	#6@6"	#6@6"
12"	2.0'	4.0'	1.5'	M.J. RETAINER GLAND	#6@6"	#6@6"
16"	3.0'	4.5'	1.5'	M.J. RETAINER GLAND	#6@6"	#6@6"
20"	3.0'	5.0'	2.0'	M.J. RETAINER GLAND	#6@6"	#6@6"
24"	3.5'	5.5'	2.0'	M.J. RETAINER GLAND	#7@6"	#6@10"
30"	6.5'	6.0'	2.5'		#8@6"	#7@10"
36"	7.0'	7.0'	2.5'		#8@6"	#7@10"



ROD REQUIREMENTS	
MAIN SIZE	NO. OF RODS
6"	2
8"	4
12"	4
16"	6
24"	6
30"	8
36"	8



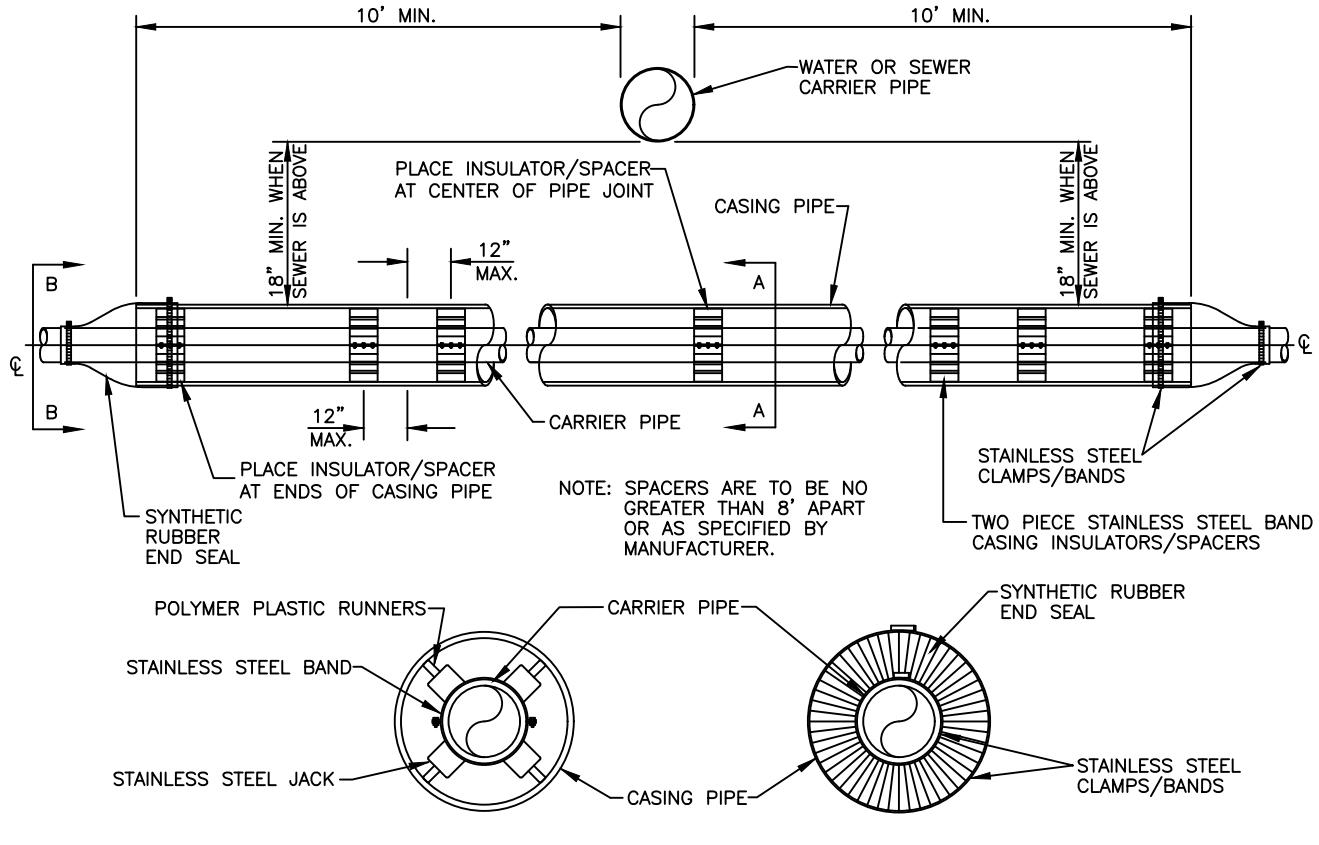
NOTE:
ALL-THREAD STEEL RODS SHALL BE
5/8" STAINLESS STEEL WITH STAINLESS
STEEL HARDWARE.



DRAWN BY: JI	CHECKED BY: PN
GEN WATER/SEWER DETAIL: GWS04	
LAST REVISION DATE: 01/27/2020	

APPROVED: 06/22/2021

ENCASEMENT CROSSING DETAIL



CARRIER & CASING SIZES										
CARRIER	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
CASING	16"	16"	16"	18"	24"	24"	30"	30"	36"	36"
CASING/WALL THICKNESS	.219	.219	.219	.250	.281	.344	.406	.406	.500	.500

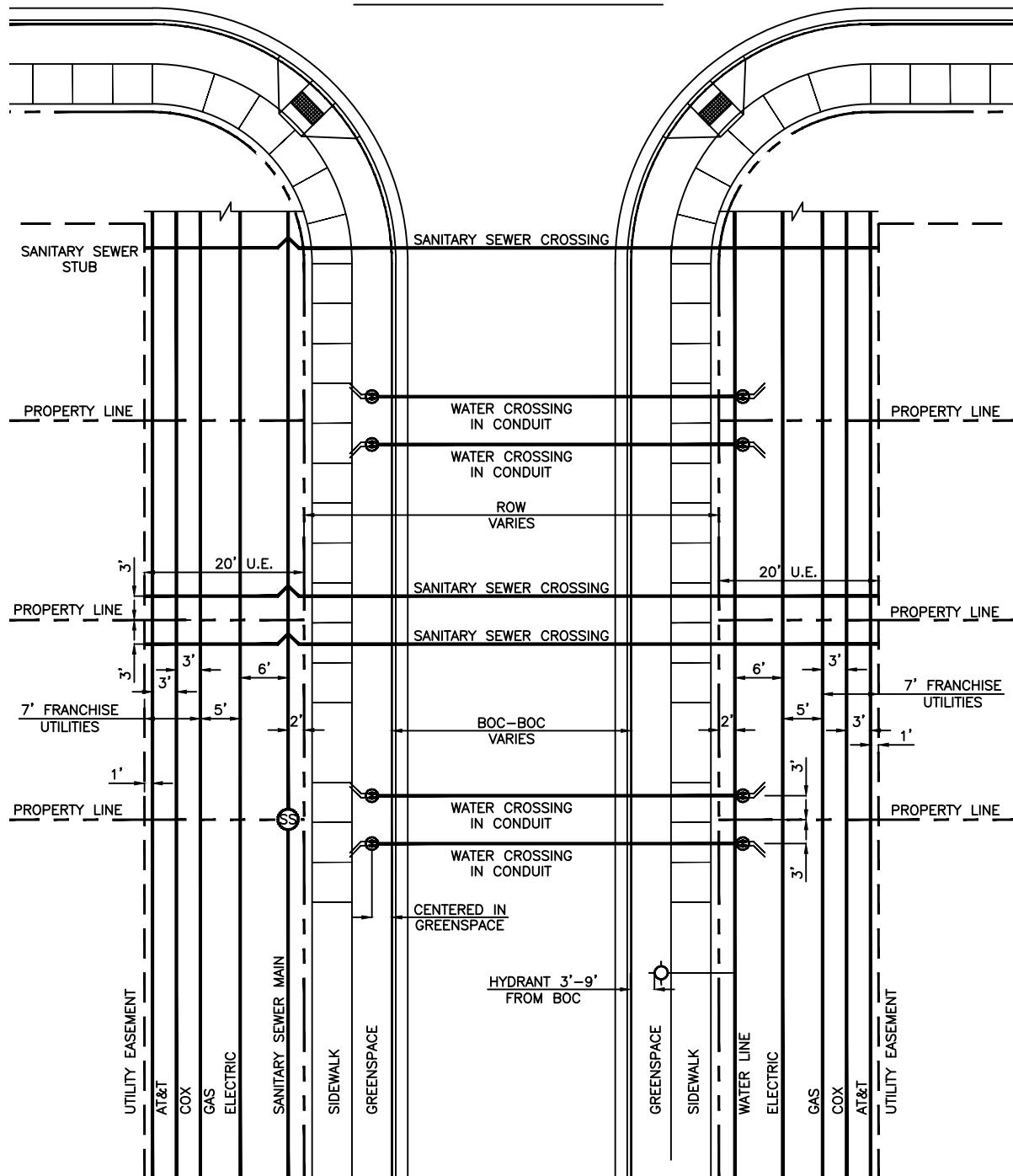
NOTE: DUCTILE IRON, OR PVC PIPE REQUIRED FOR WATER, OR SEWER.

*ALL BELLS SHALL BE RESTRAINED BY APPROVED METHOD.



DRAWN BY: JS	CHECKED BY: AW
GEN WATER/SEWER DETAIL: GWS05	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

SUBDIVISION UTILITY PLACEMENT



UTILITY SEPARATIONS:

10' HORZ. BETWEEN WATER & SEWER

18" VERT. BETWEEN WATER & SEWER

5' HORZ. BETWEEN ELECTRIC & WATER OR SEWER(MAINS)

18" MIN. VERT. BETWEEN ELEC. & WATER OR SEWER

12" MIN. HORZ. BETWEEN ELEC. & FRANCHISE UTIL.

12" MIN. VERT. BETWEEN SECONDARY CONDUIT AND WATER & SEWER



DRAWN BY: JS

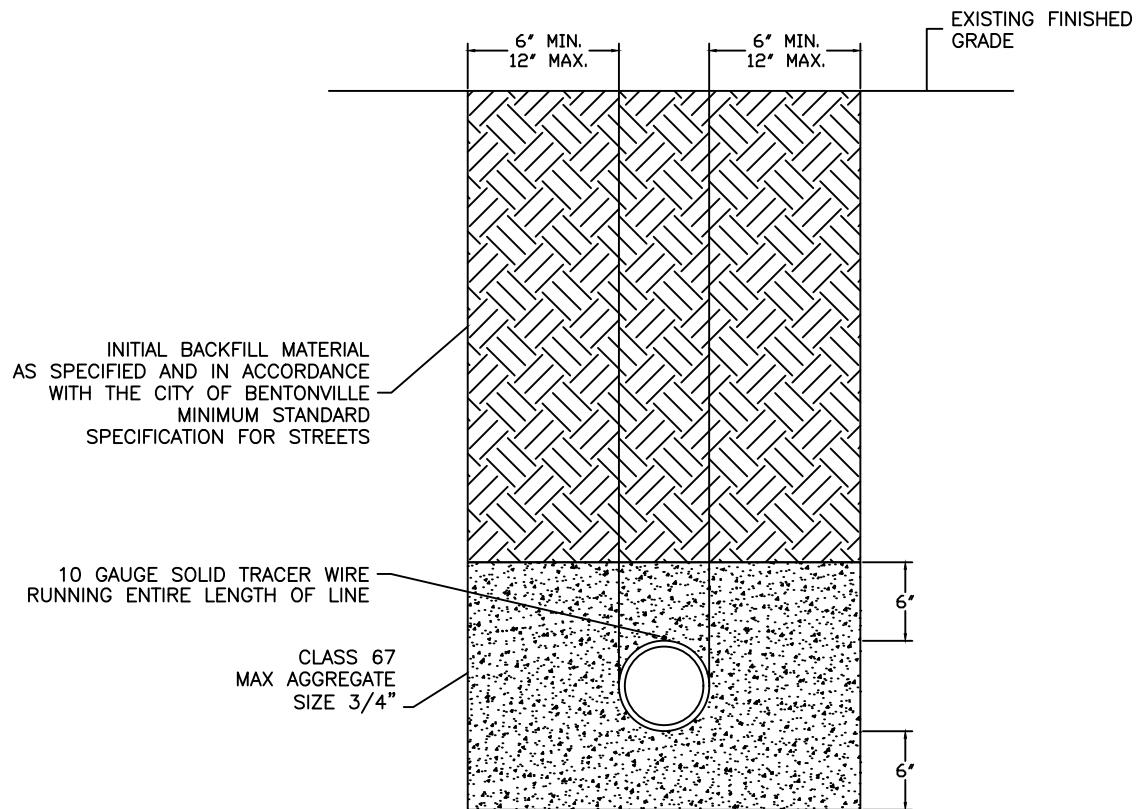
CHECKED BY: AW

GEN WATER/SEWER DETAIL: GWS06

LAST REVISION DATE: 08/27/2024

APPROVED: 10/01/2024

TYPICAL BEDDING DETAIL



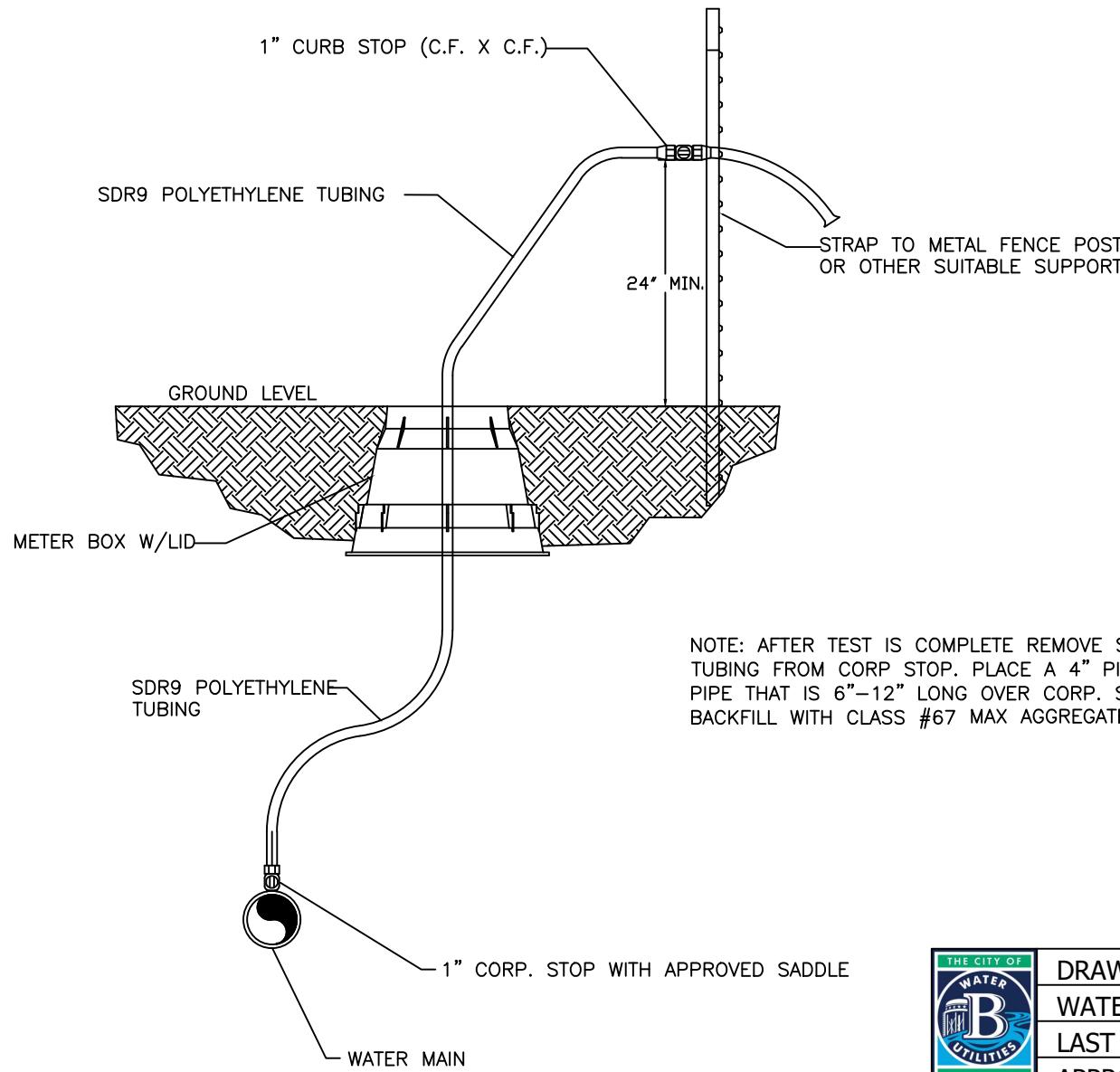
* REFER TO STREET SPECIFICATIONS FOR STREET REPAIR INFORMATION



DRAWN BY: JI	CHECKED BY: PN
GEN WATER/SEWER DETAIL: GWS07	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

TEMPORARY 1" BLOW OFF ASSEMBLY

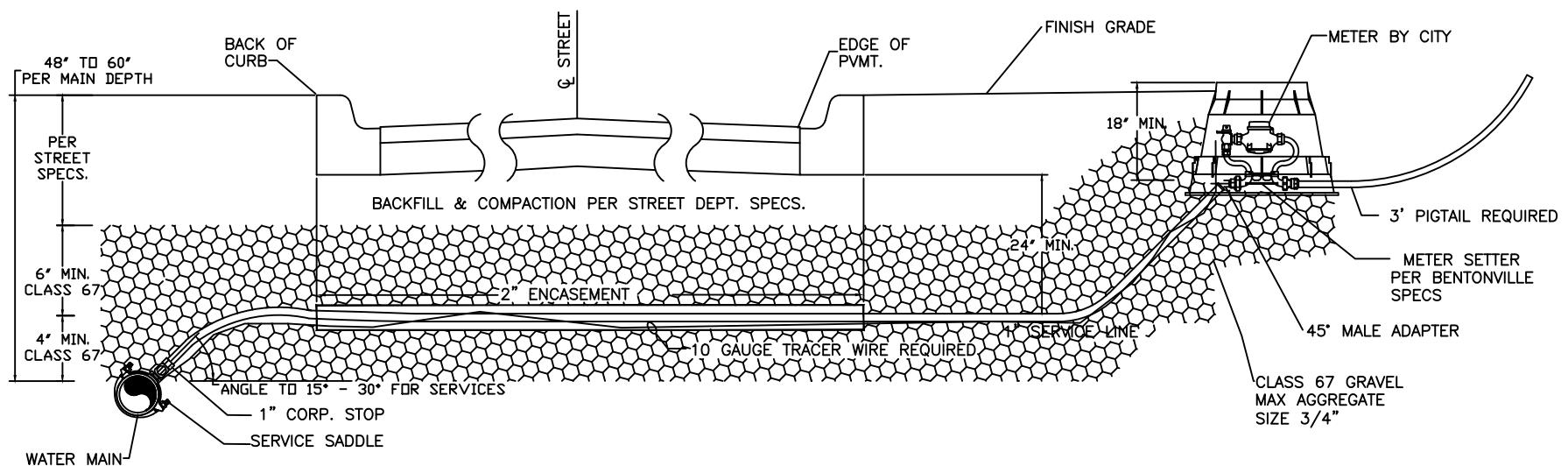
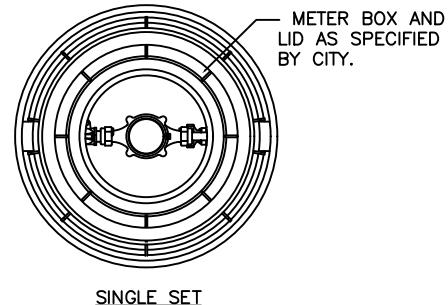
SAMPLE POINTS



DRAWN BY: JI	CHECKED BY: PN
WATER DETAIL: W01	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

WATER SERVICE DETAIL 1"

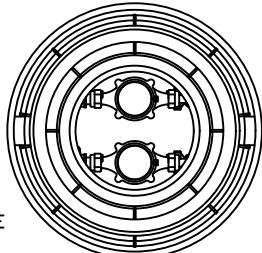
NOTE:
1" TUBING WILL
SUPPLY WATER ONLY TO A SINGLE
1" METER SERVICE.



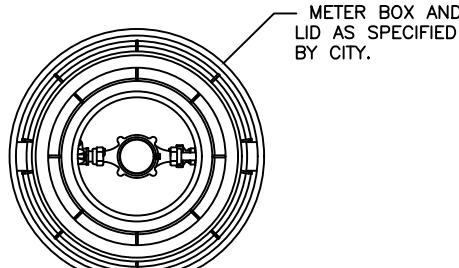
DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W02	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

WATER SERVICE DETAIL 5/8"

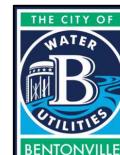
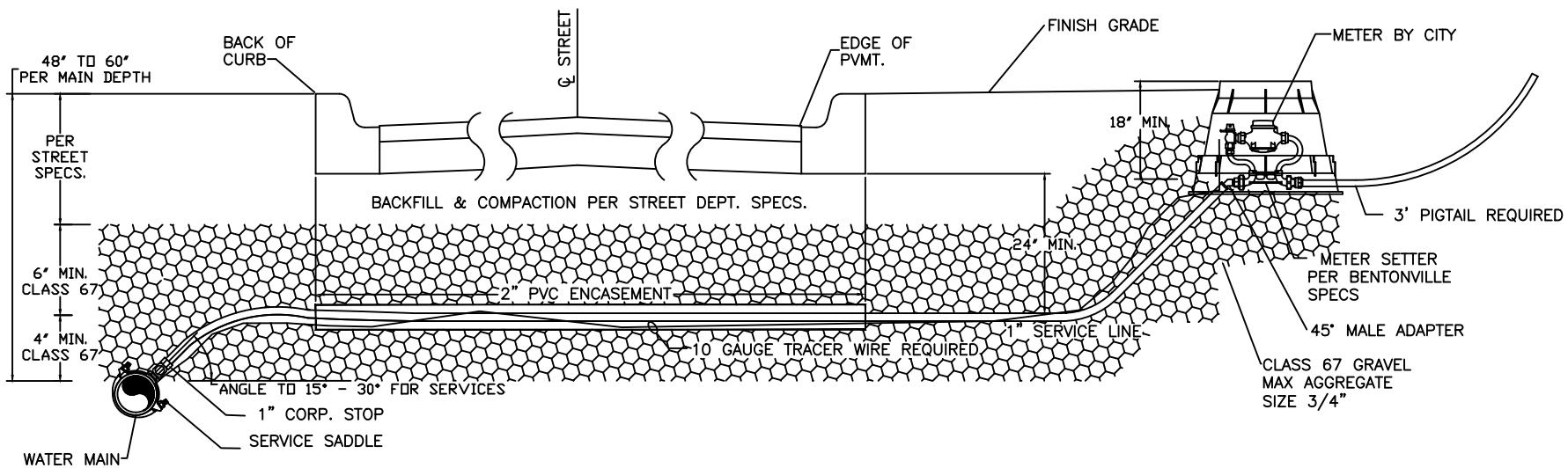
NOTE:
1" TUBING WILL
SUPPLY WATER TO A SINGLE
5/8" METER SERVICE OR A DOUBLE
5/8" METER SERVICE.



DOUBLE SET

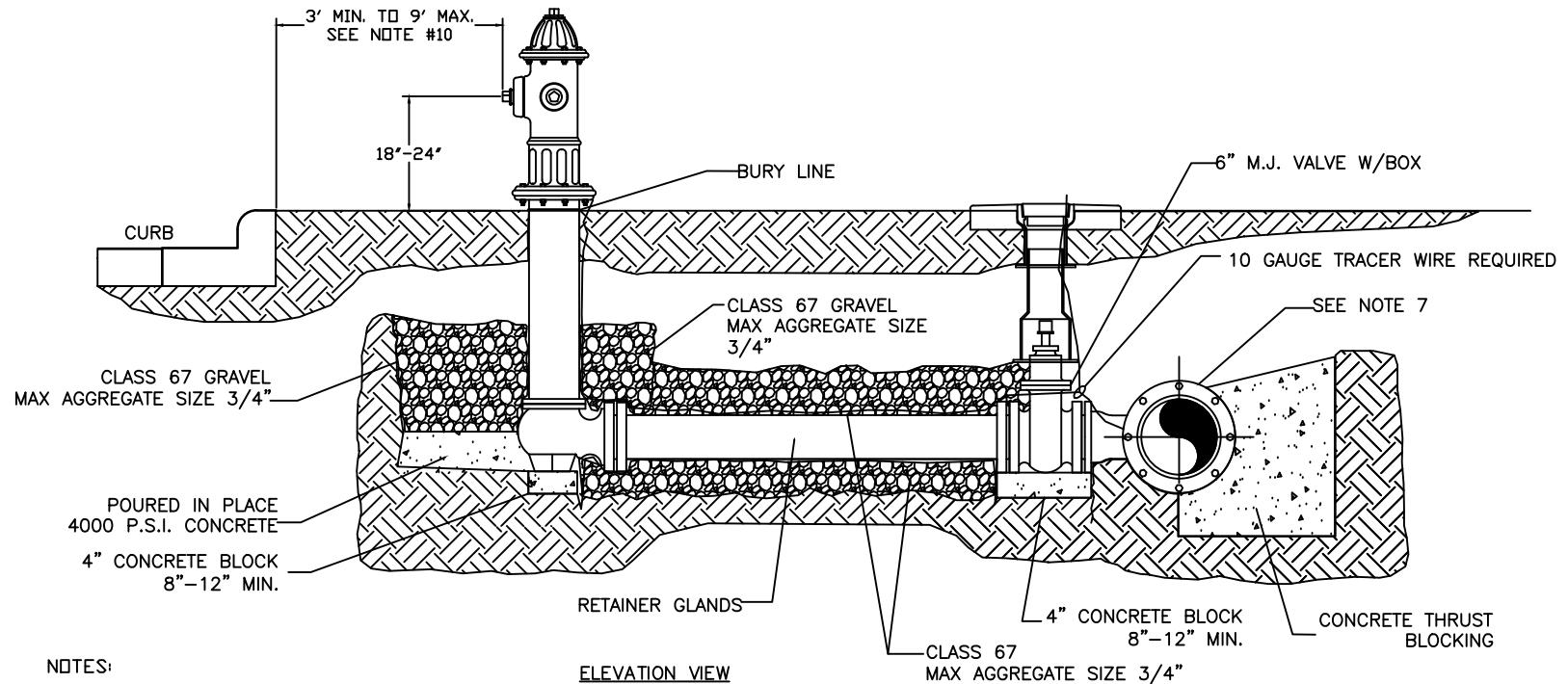


SINGLE SET



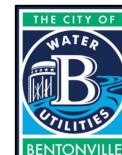
DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W03	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

FIRE HYDRANT DETAIL W/ RETAINER GLANDS



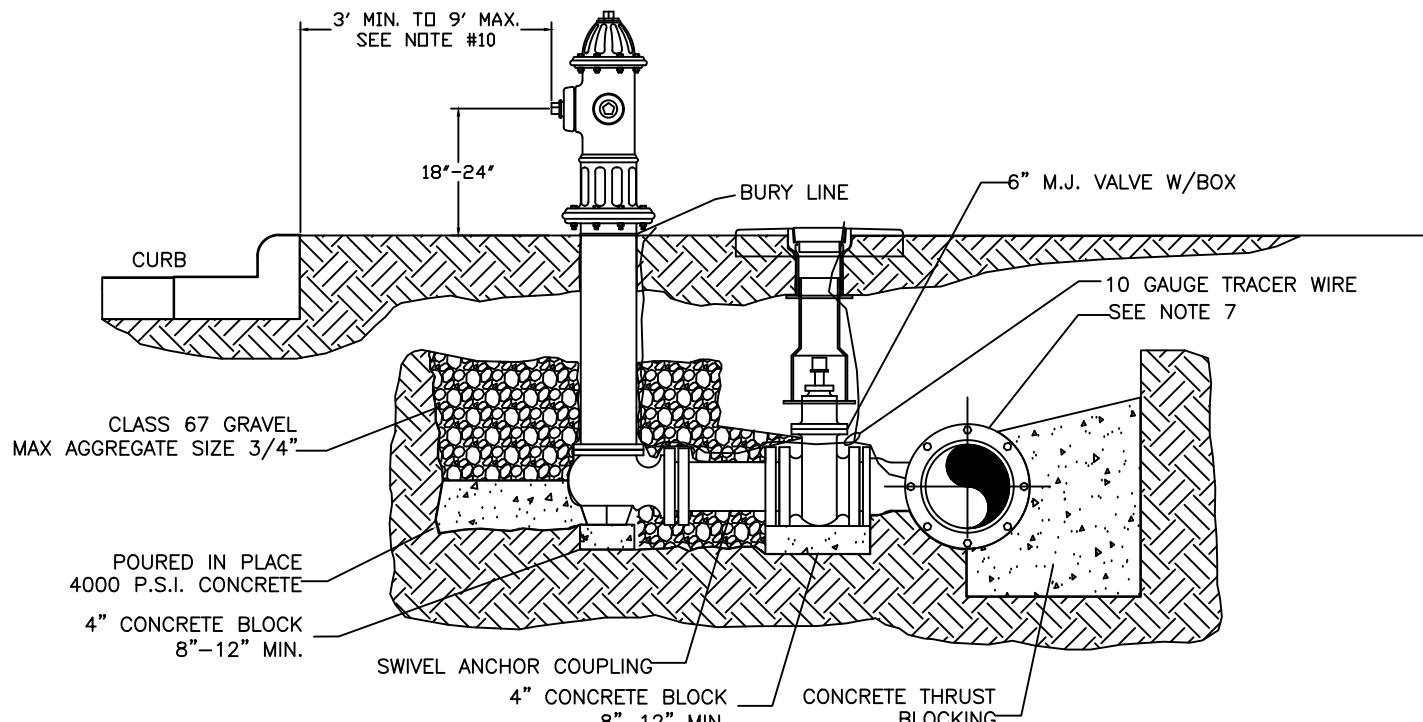
NOTES:

1. DRAINAGE BED SHALL CONSIST OF CLASS 67 GRAVEL WITH A MAX AGGREGATE SIZE OF 3/4".
2. USE 6" NIPPLE WITH M.J. RETAINER GLANDS IF DISTANCE BETWEEN VALVE AND HYDRANT MUST BE GREATER THAN 13" SWIVEL ADAPTER.
3. FIRE HYDRANT TO BE BLOCKED AGAINST FIRM SOIL AS SHOWN.
4. ALL HYDRANTS SHALL BE INSTALLED PLUMB.
5. LARGE NOZZLE SHALL FACE CURB UNLESS OTHERWISE NOTED. ROTATE BARREL AS REQUIRED.
6. HYDRANT SHOULD NOT BE SET CLOSER THAN 4.0' TO OBSTRUCTIONS THAT ARE IN LINE WITH NOZZLE.
7. M.J. ANCHOR TEE, TAPPING SLEEVE OR TAPPING SADDLE MAY BE USED (SEE MATERIAL SPECIFICATIONS)
8. HYDRANTS TO BE SET AT DEPTHS GREATER THAN 6.0' SHALL BE SET WITH A MODIFIED FIRE HYDRANT SETTING.
9. POLYWRAP ENTIRE HYDRANT ASSEMBLY. DO NOT COVER WEEP HOLE DRAIN.
10. HYDRANTS WILL BE SET AT A MINIMUM OF 3' TO A MAXIMUM OF 9' BACK OF CURB OR EDGE OF DRIVING SURFACE, NOT IN SIDEWALK, FIRE LANE, OR RADIUS OR AS DIRECTED BY BENTONVILLE WATER DEPARTMENT.



DRAWN BY: JI	CHECKED BY: PN
WATER DETAIL: W04	
LAST REVISION DATE: 03/16/2021	
APPROVED:	06/22/2021

FIRE HYDRANT DETAIL W/SWIVEL ANCHOR COUPLING



NOTES:

ELEVATION VIEW

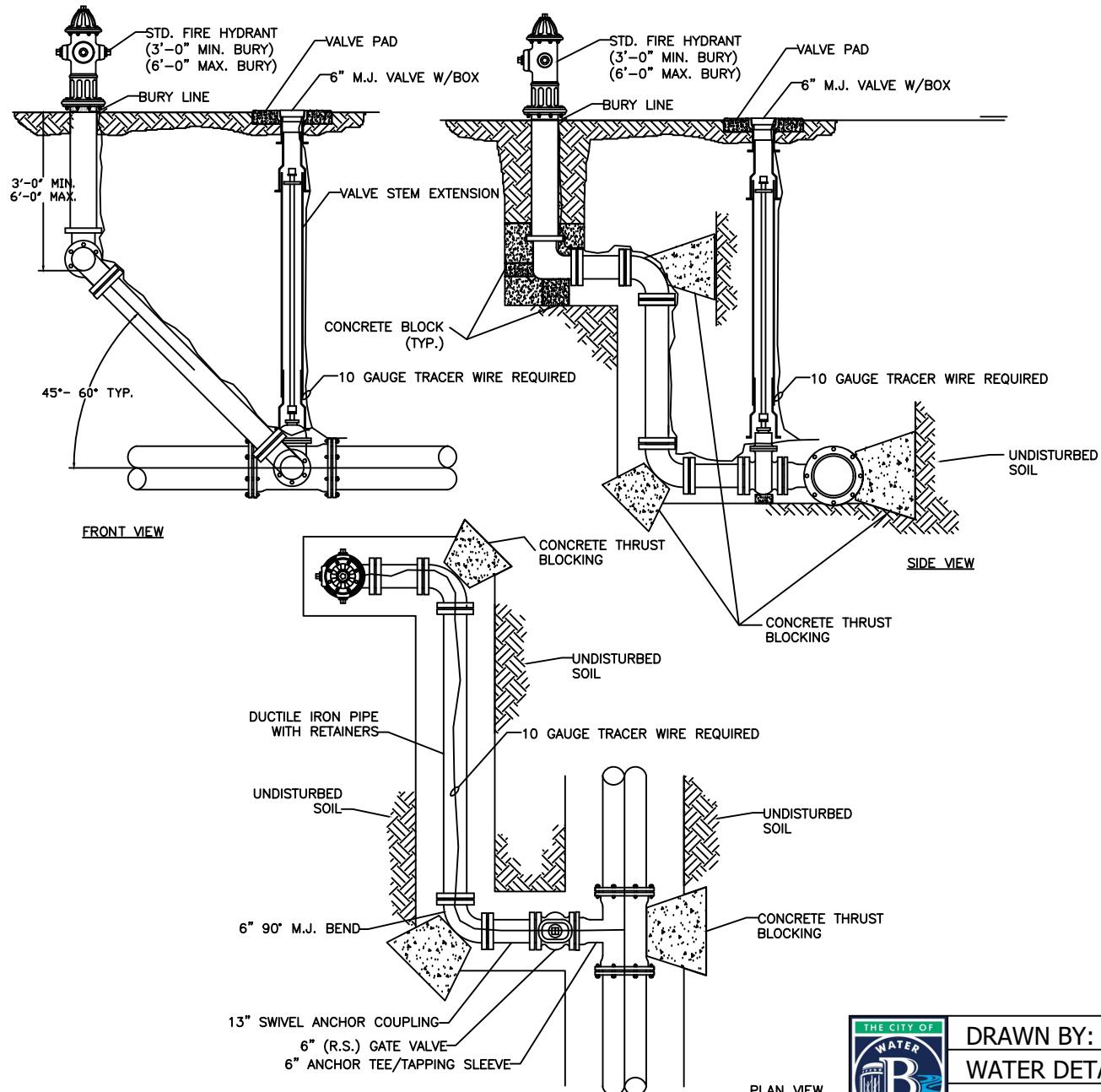
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DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W05	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

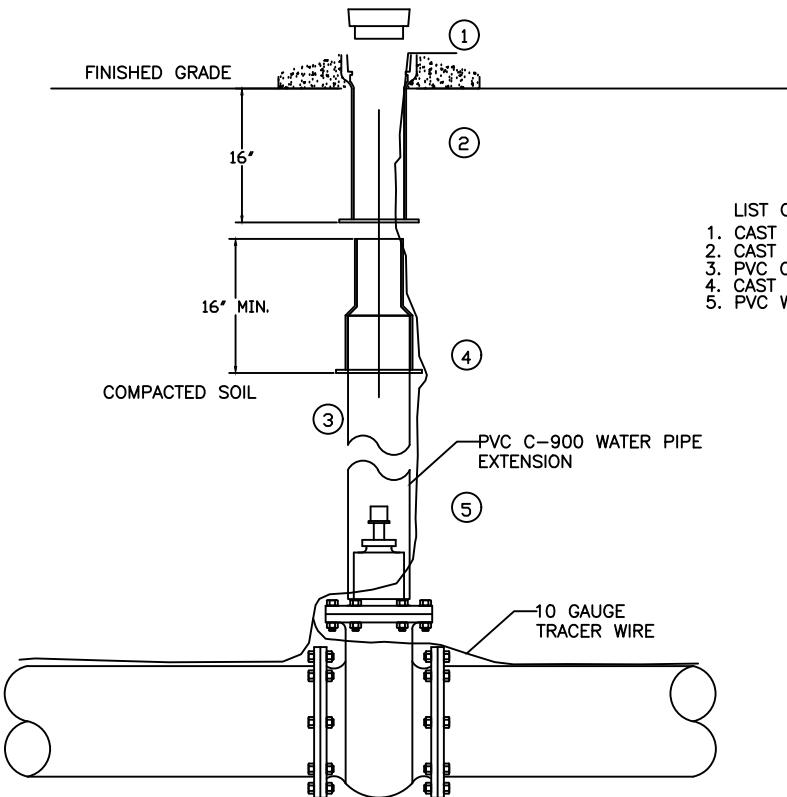
DEEP BURY FIRE HYDRANTS

(BURY DEEPER THAN 6'-0")



DRAWN BY: JI	CHECKED BY: PN
WATER DETAIL: W06	
LAST REVISION DATE: 03/16/2021	
APPROVED:	06/22/2021

VALVE BOX VALVE STEM & TRACER WIRE INSTALLATION



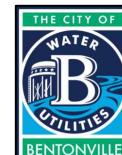
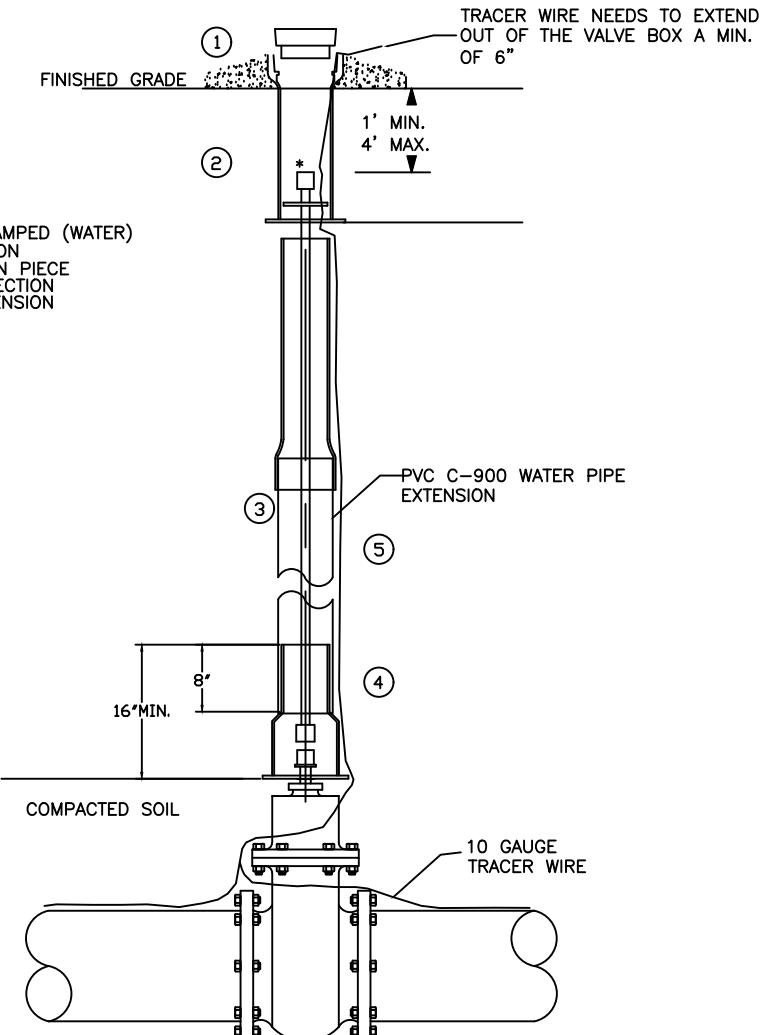
NOTES:

1. IF EXTENSION PIECE IS NEEDED, PVC C-900 WATER PIPE MAY BE USED.
2. EXTENSION PIECE CAN BE CUT TO LENGTH REQUIRED.
3. TRACER WIRE NEEDS TO EXTEND OUT OF THE VALVE BOX A MINIMUM OF 6"

*PROVIDE VALVE STEM EXTENSION WITH CENTERING DEVICE IF GREATER THAN 4.0' DEEP.

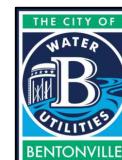
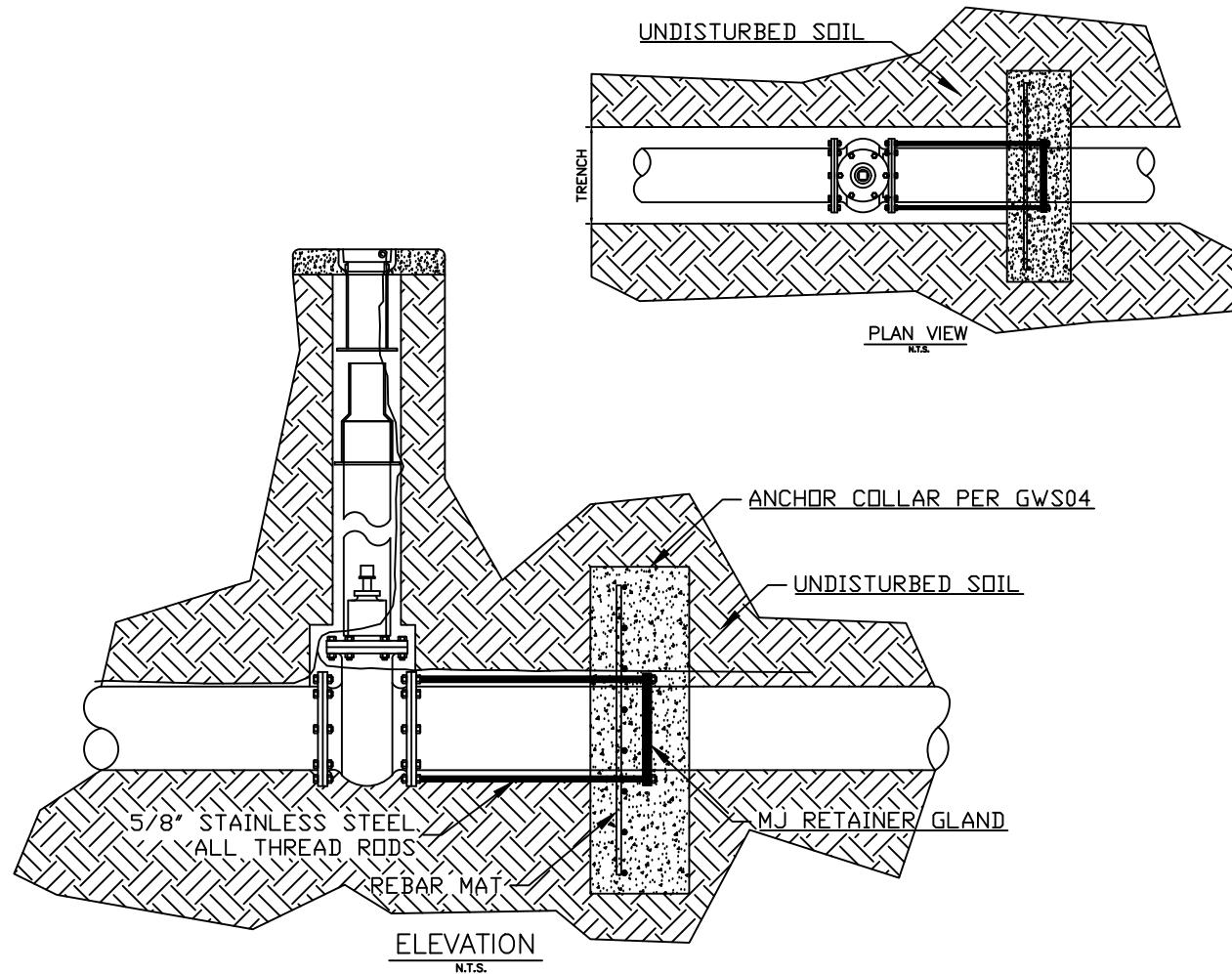
LIST OF MATERIAL

1. CAST IRON COVER STAMPED (WATER)
2. CAST IRON TOP SECTION
3. PVC C-900 EXTENSION PIECE
4. CAST IRON BOTTOM SECTION
5. PVC WATER PIPE EXTENSION



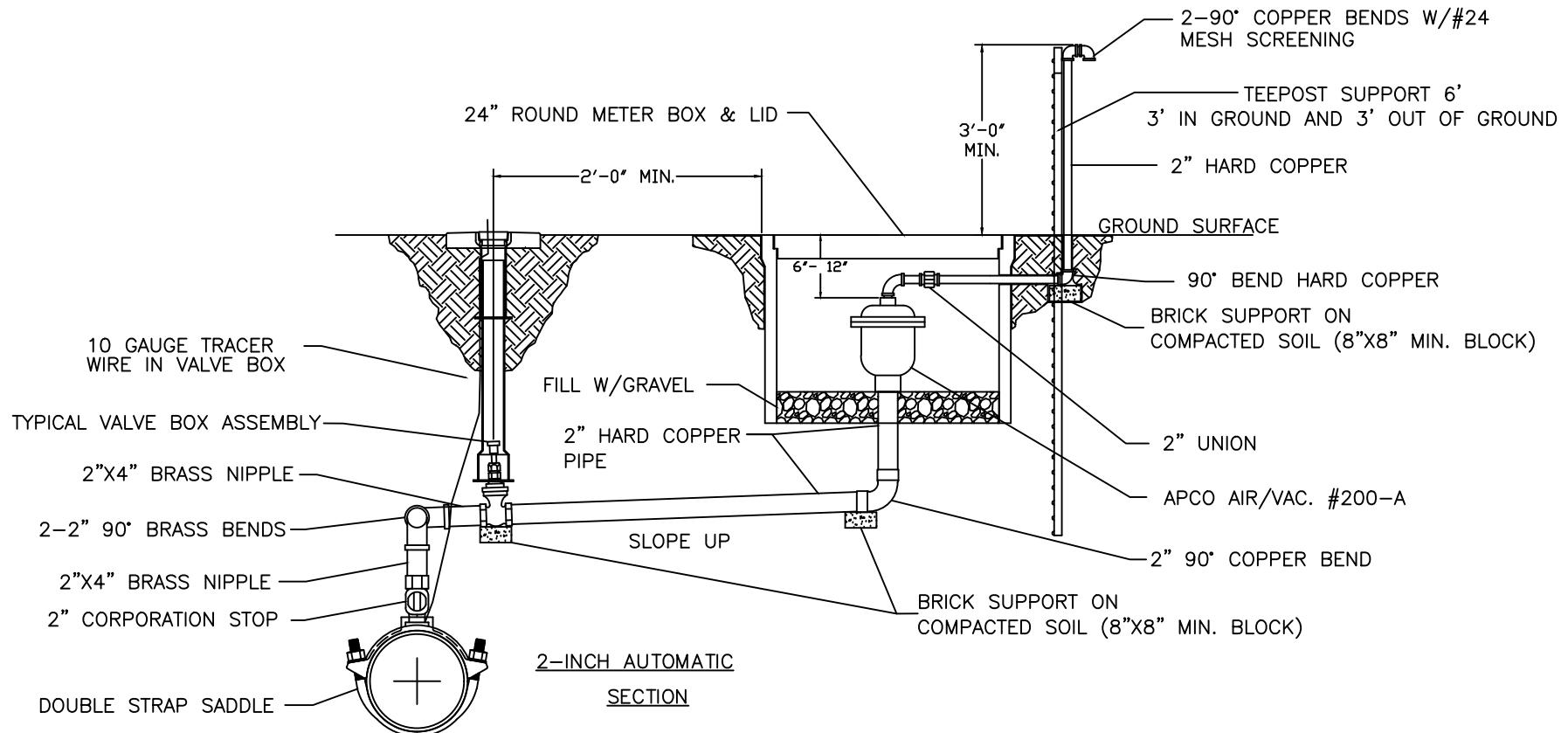
DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W07	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

RESTRAINED GATE VALVE



DRAWN BY: JI	CHECKED BY: PN
WATER DETAIL: W08	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

2" COMBINATION AIR/VACUUM VALVE DETAIL



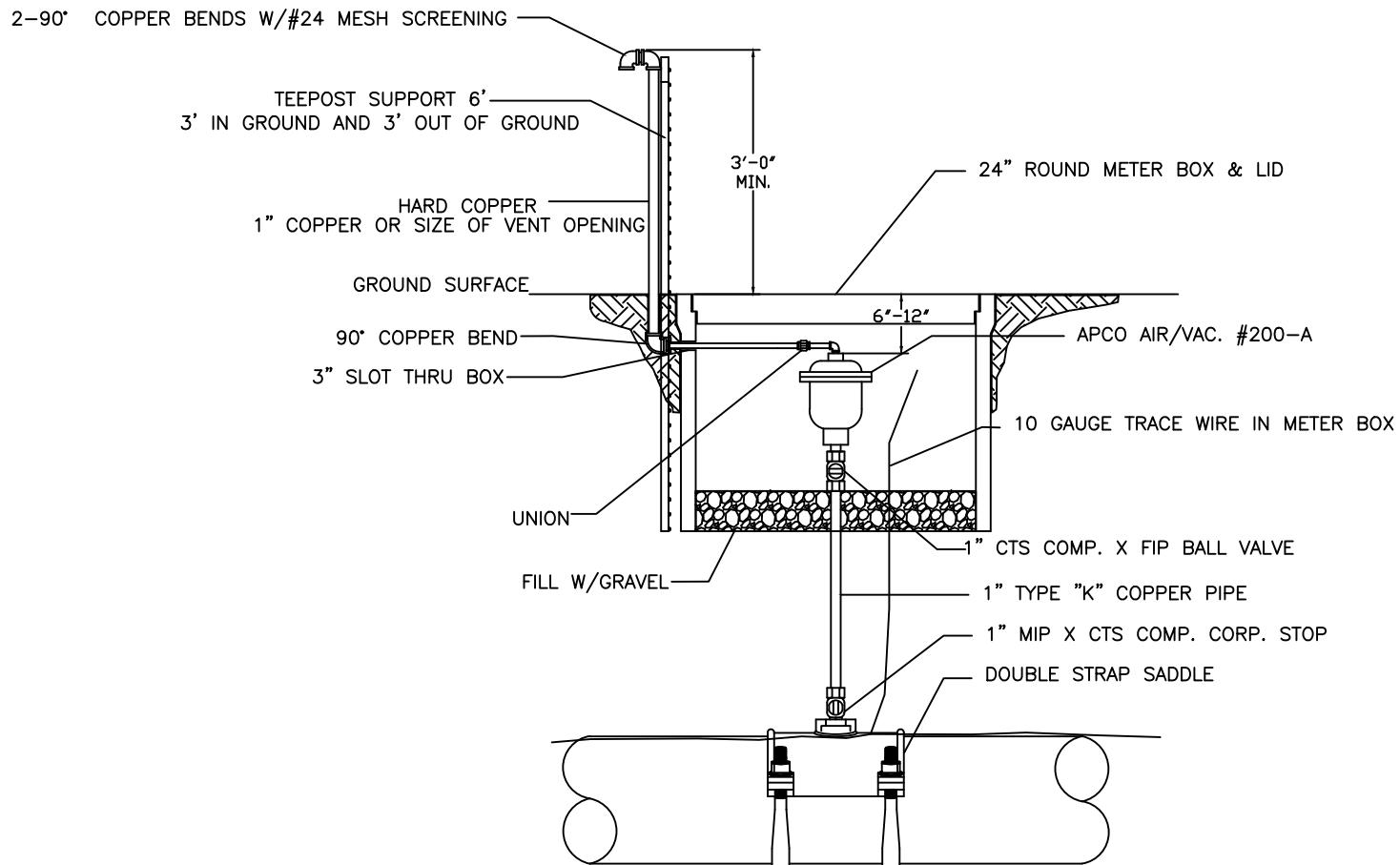
NOTES:

1. ALL THREADED CONNECTIONS SHALL HAVE A DOUBLE WRAP OF TEFLOON TAPE ON THREADS.
2. DRILL HOLE IN SIDE OF METER BOX FOR OUTLET PIPING.
3. VALVES WILL BE PIPED TO POINT BEYOND PAVEMENT AND SHOULDER.



DRAWN BY: JI	CHECKED BY: PN
WATER DETAIL: W09	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

1" COMBINATION AIR/VACUUM VALVE DETAIL



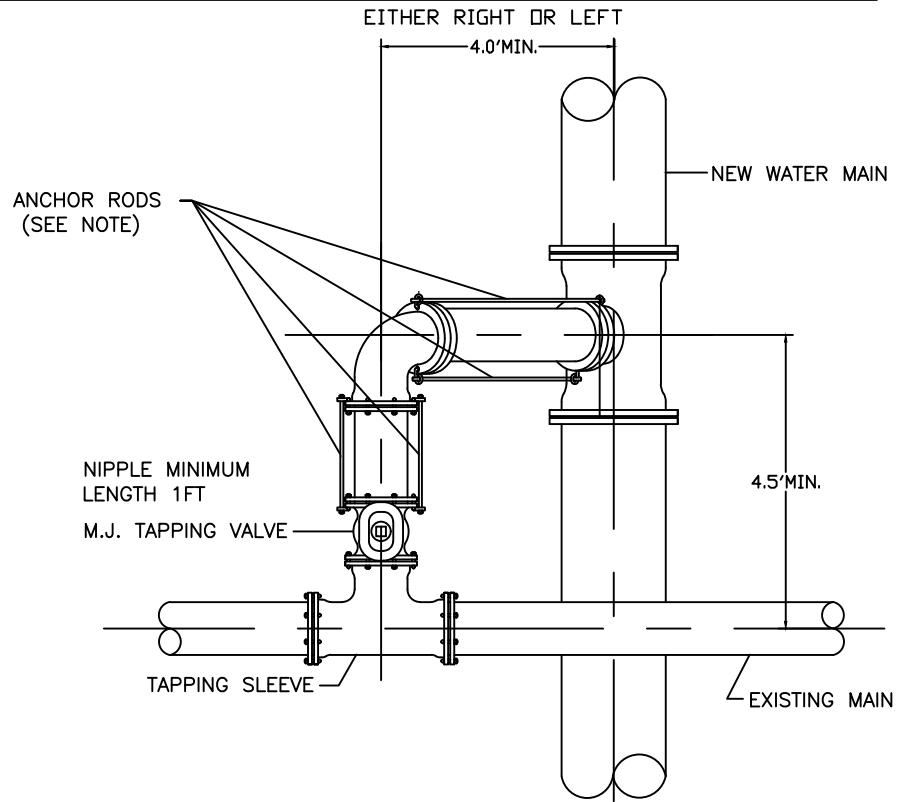
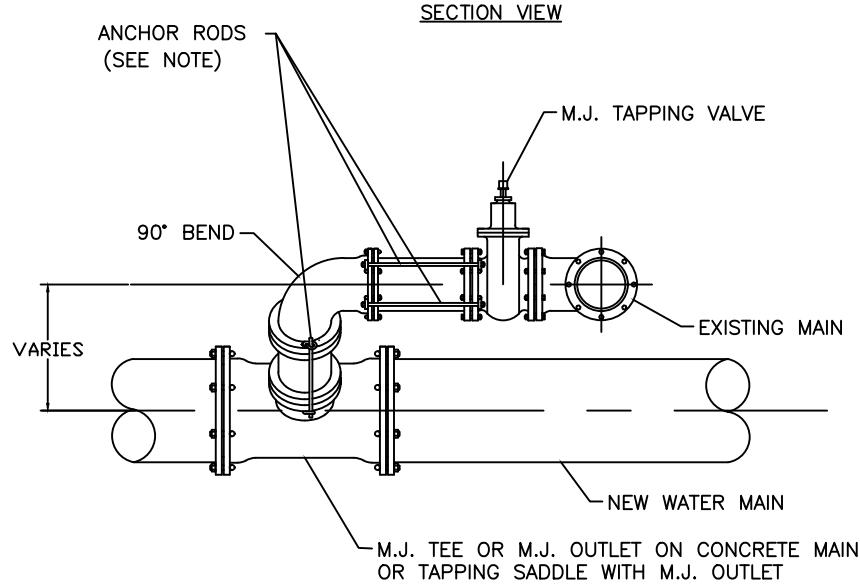
NOTES:

1. ALL THREADED CONNECTIONS SHALL HAVE A DOUBLE WRAP OF TEFLOON TAPE ON THREADS.
2. DRILL HOLE IN SIDE OF METER BOX FOR OUTLET PIPING.
3. VALVES WILL BE PIPED TO POINT BEYOND PAVEMENT AND SHOULDER.



DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W10	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

SWING CONNECTION – NEW MAIN TO EXISTING MAIN



THRUST BLOCKING REQUIRED AT TEES AND ELBOWS.

ROD REQUIREMENTS	
MAIN SIZE	NO. OF RODS
6"	2
8"	4
12"	4
16"	6
24"	6
30"	8
36"	8

NOTES:

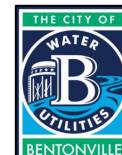
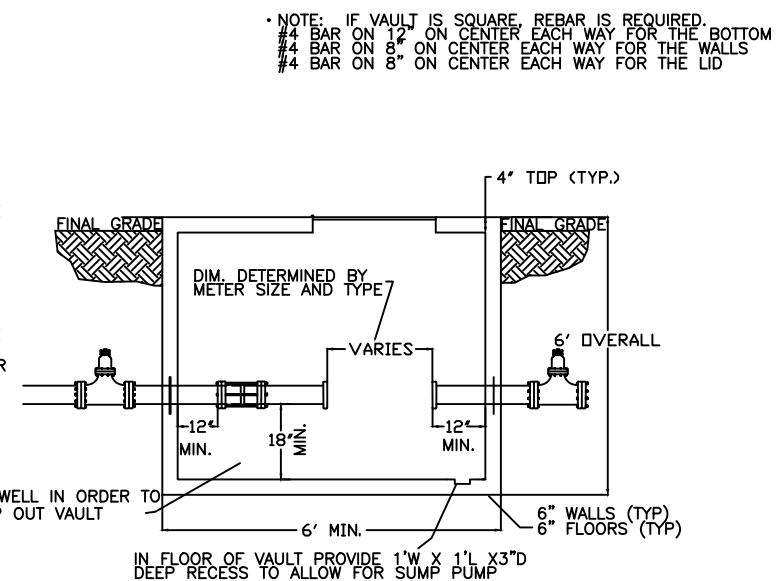
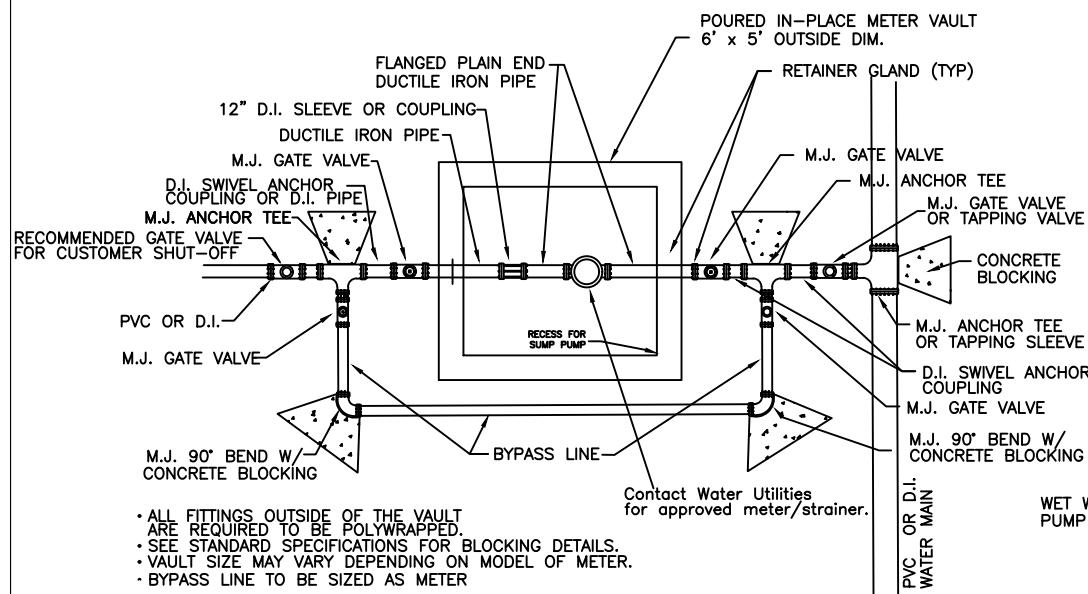
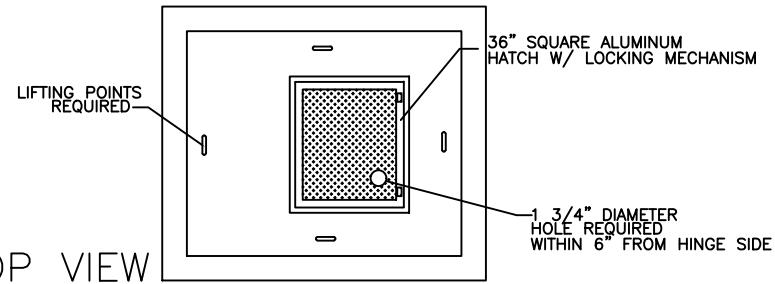
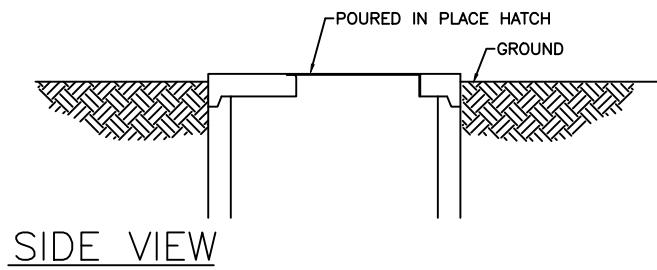
1. CONTRACTOR SHALL LOCATE EXISTING MAIN IN ADVANCE OF LAYING NEW LINE IN ORDER TO ASSURE ADEQUATE LENGTH TO ADJUST DEPTH OF NEW MAIN.
2. DIMENSIONS SHOWN ARE RECOMMENDED MINIMUMS TO PROVIDE ADEQUATE ROOM FOR TIGHTENING BOLTS ON JOINTS. (OTHER DIMENSIONS MAY BE USED)
3. PROVIDE STAINLESS STEEL "ALL THREAD(MIN 5/8")" TIE RODS WITH EYE BOLTS FOR ANCHORING ALL JOINTS.
4. RODS SHALL BE FIELD CUT TO FIT & SHALL BE PROTECTED WITH POLYWRAP.
5. ROTATE TEE UP & ELBOW DOWN AS REQUIRED TO MATCH.
6. USE TYPICAL CONCRETE BLOCKING REQUIRED.



DRAWN BY: JS CHECKED BY: AW
 WATER DETAIL: W11
 LAST REVISION DATE: 08/27/2024
 APPROVED: 10/01/2024

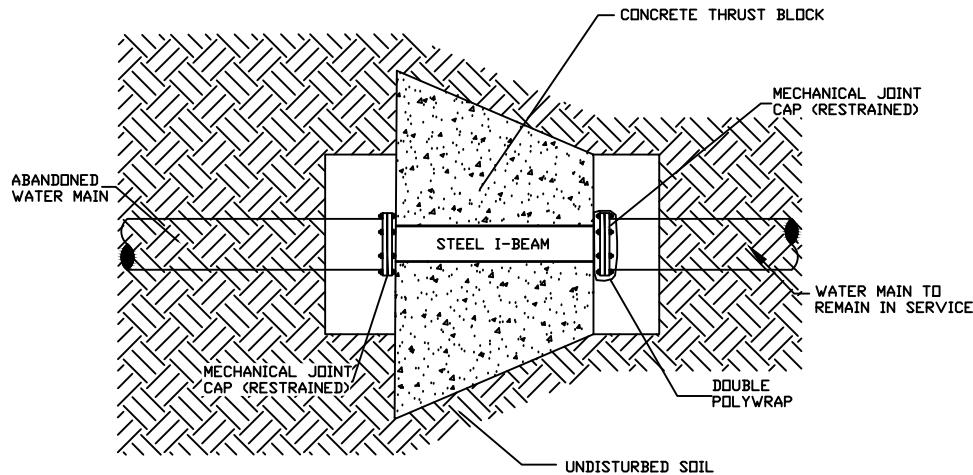
METER VAULT DETAIL FOR 4" - 8" METERS (TYPICAL)

(DIMENSIONS MAY VARY FOR METER SIZES)



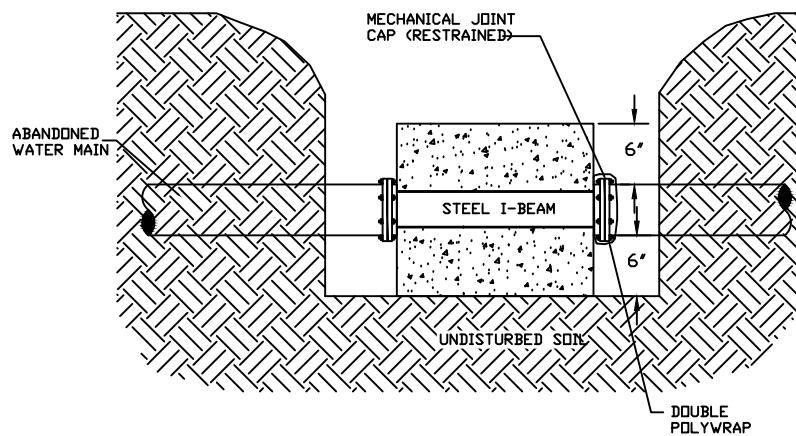
DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W12	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

TYPICAL CUT/CAP DETAIL

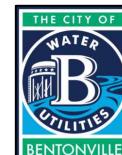


PLAN VIEW

* STEEL I-BEAM TO BE SIZED BY
PROJECT ENGINEER AND INCLUDED IN
THE PROJECT SUBMITTAL.

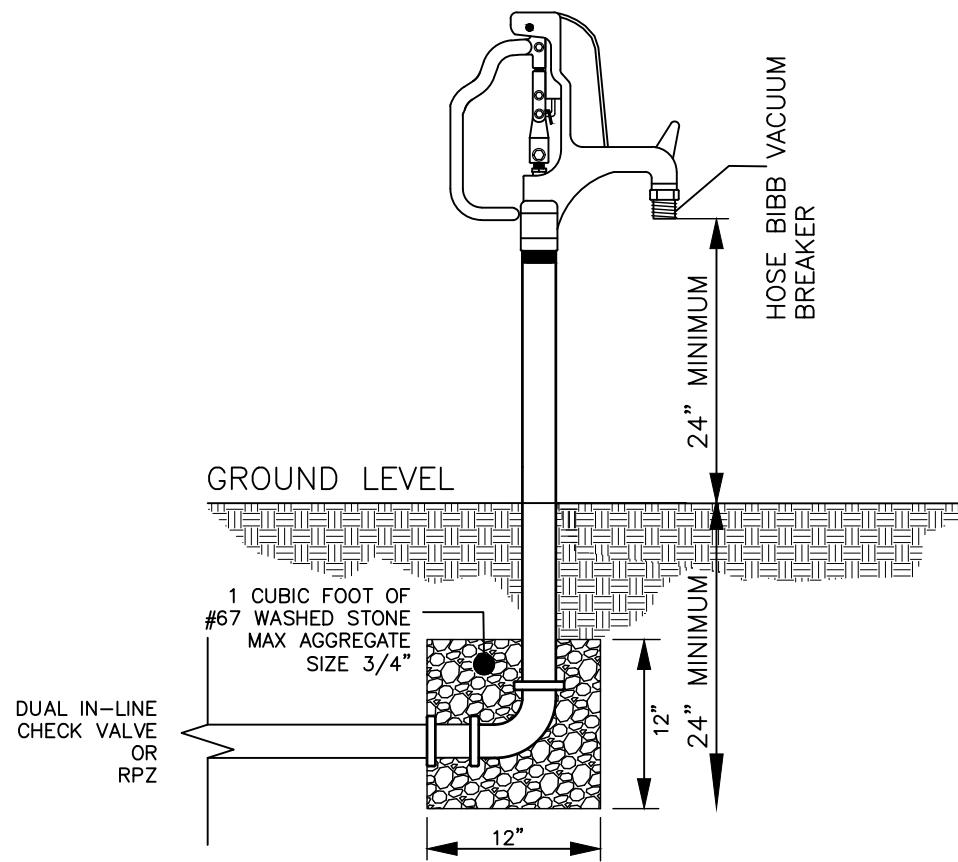


PROFILE VIEW



DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W13	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

FROST FREE HOSE BIBB WITH BACKFLOW PREVENTION



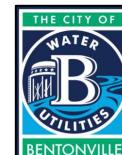
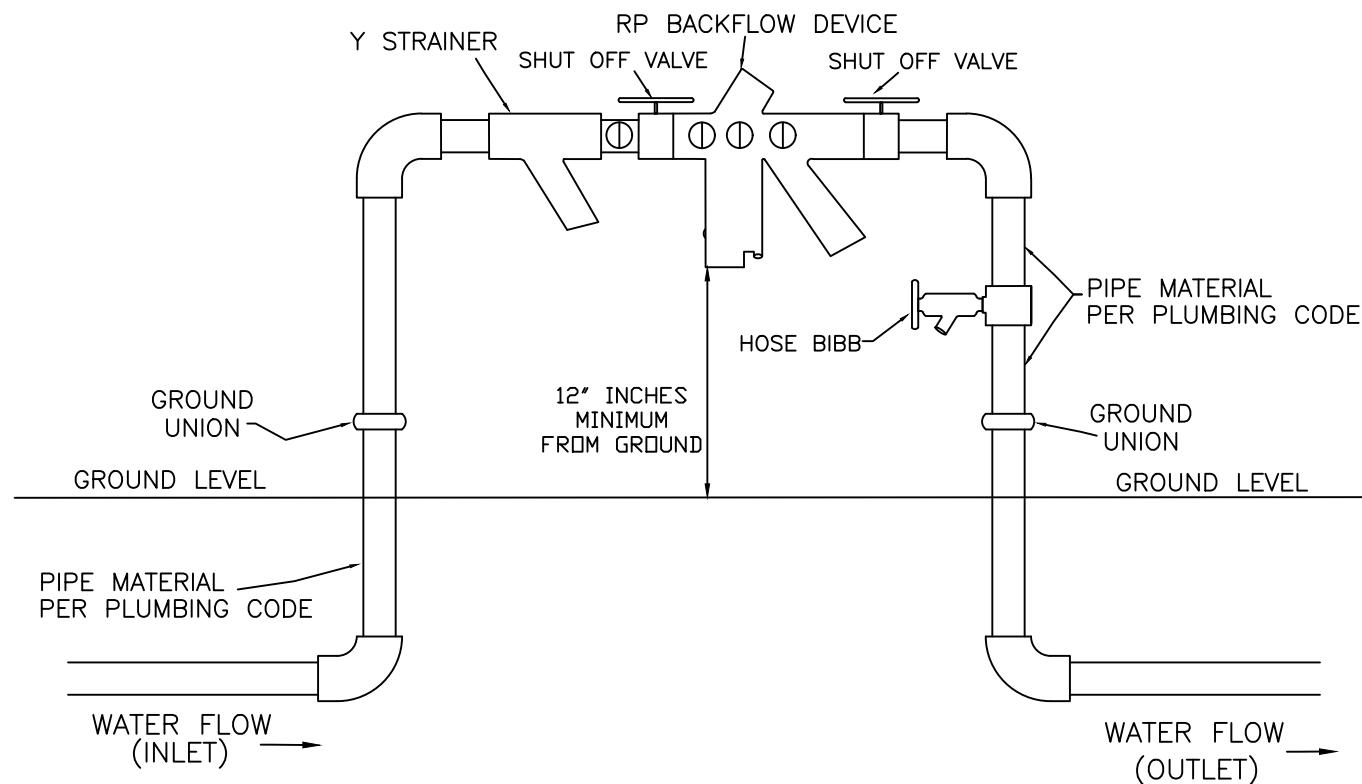
ELEVATION
N.T.S.



DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W14	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

REDUCED PRESSURE (RP) BACKFLOW

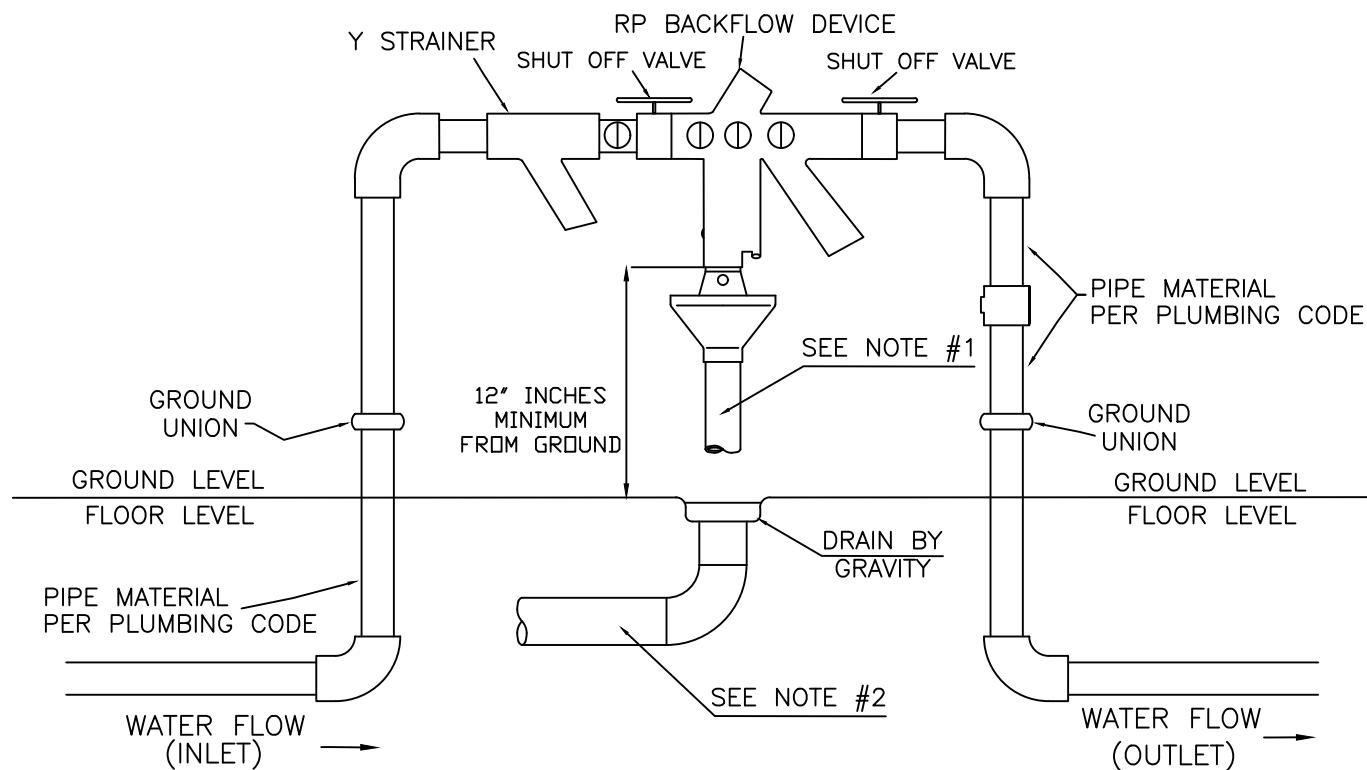
EXTERIOR IRRIGATION ONLY



DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W15	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

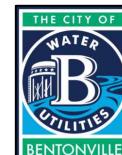
REDUCED PRESSURE (RP) BACKFLOW

INTERIOR DOMESTIC OR IRRIGATION

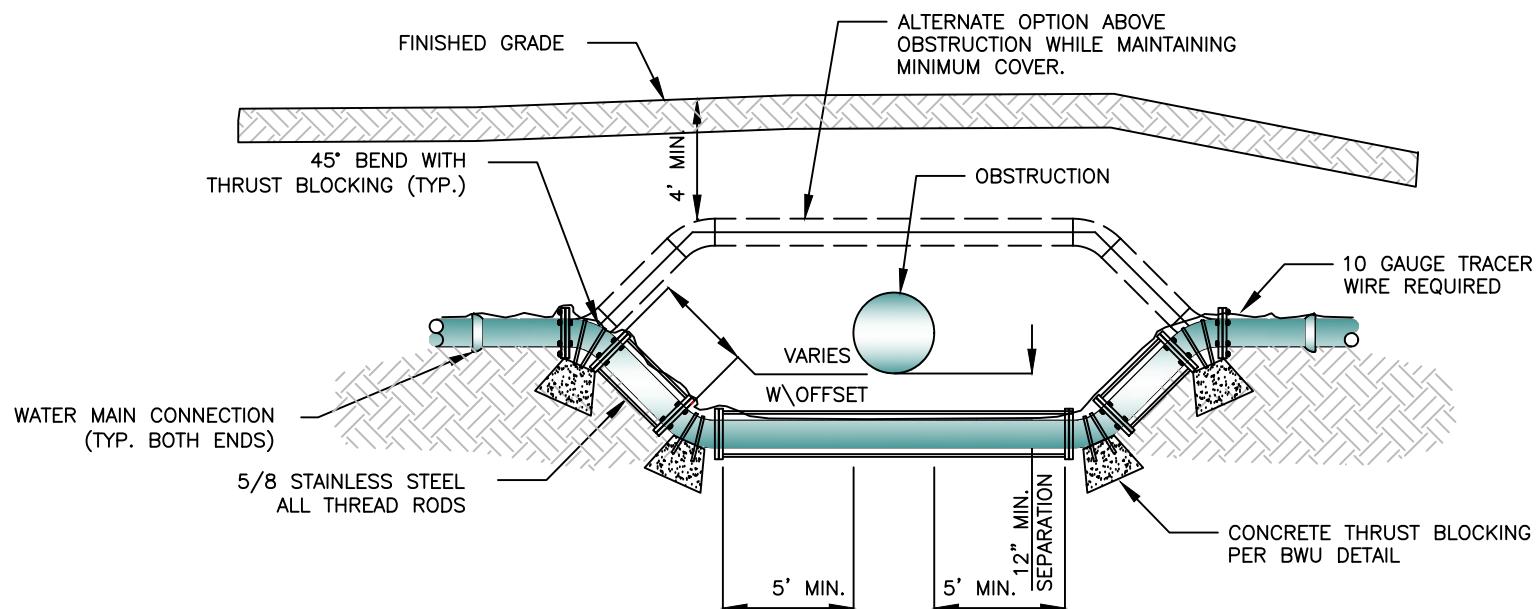


INDOOR APPLICATION ONLY NOTES:

1. AN AIR GAP DRAIN IS REQUIRED TO REDUCE SPLASHING OF MINOR DISCHARGES FROM THE RELIEF VALVE DRAIN PORT.
2. INDOOR INSTALLATION OF RP'S SHOULD PROVIDE FOR DRAINAGE CAPABLE OF HANDLING IN EXCESS OF THE MAXIMUM DISCHARGE RATE EXPECTED BY THE BACKFLOW ASSEMBLY MANUFACTURER.



DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W16	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024



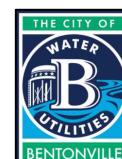
NOTE:

1. ALL VERTICAL ADJUSTMENTS TO THE EXISTING WATER MAINS SHALL BE DONE IN THIS MANNER, USING THE MATERIAL TYPE SHOWN ON THE APPROVED DRAWINGS. THE DEPARTMENT RESERVES THE RIGHT TO REQUIRE DUCTILE IRON WATER PIPING.
2. THE PROPOSED VERTICAL ADJUSTMENT MAY BE CONSTRUCTED EITHER OVER OR UNDER THE PROPOSED OBSTRUCTION HOWEVER TO GO OVER, THE NEW LOCATION OF THE WATER MAIN MUST PROVIDE A MINIMUM OF 4' OF COVER. IF THERE IS LESS COVER, GO UNDER THE PROPOSED OBSTRUCTION.
3. ALL EXISTING FITTINGS AND APPURTEINANCES THAT MUST BE REMOVED TO MAKE WATERLINE ADJUSTMENT, MUST BE RELOCATED BACK ONTO MAIN IN ACCORDANCE WITH BWU SPECIFICATIONS AND REQUIRE INSPECTION.
4. ALL MATERIALS AND COATING TO BE IN ACCORDANCE WITH THE CITY OF BENTONVILLE WATER UTILITIES DEPARTMENT SPECIFICATIONS.
5. ALL APPURTEINANCES MUST BE SHOWN ON RECORD DRAWINGS IN ACCORDANCE WITH SECTION 5 OF BENTONVILLE WATER UTILITY DEPARTMENT SPECIFICATIONS.

WATERLINE OBSTRUCTION CROSSING

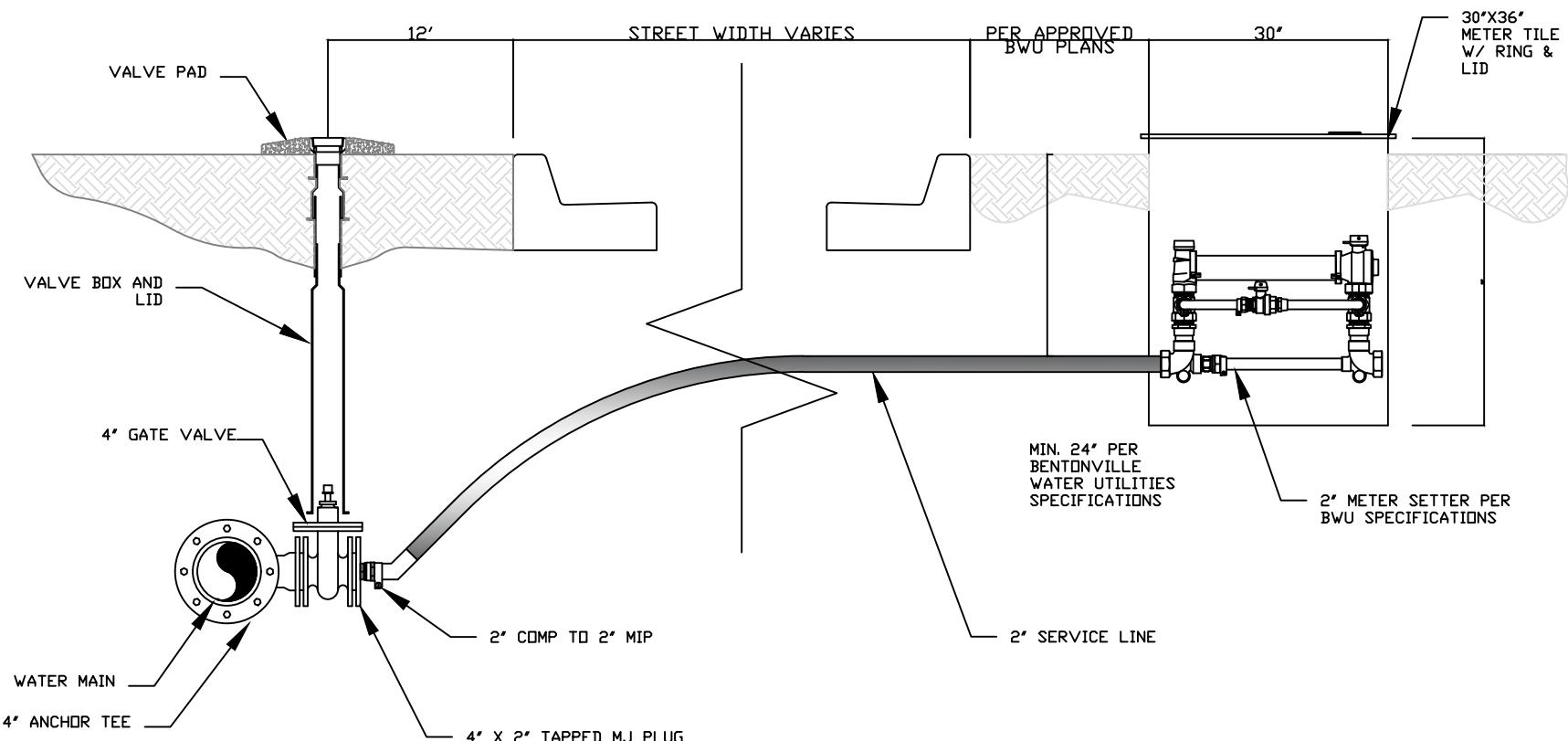
NOT TO SCALE

DO NOT USE WITHOUT PRIOR APPROVAL
FROM BENTONVILLE WATER UTILITIES



DRAWN BY: JS	CHECKED BY: JI
WATER DETAIL: W17	
LAST REVISION DATE: 10/21/2021	
APPROVED:	10/21/2021

2" WATER SERVICE DETAIL



ELEVATION
N.T.S.

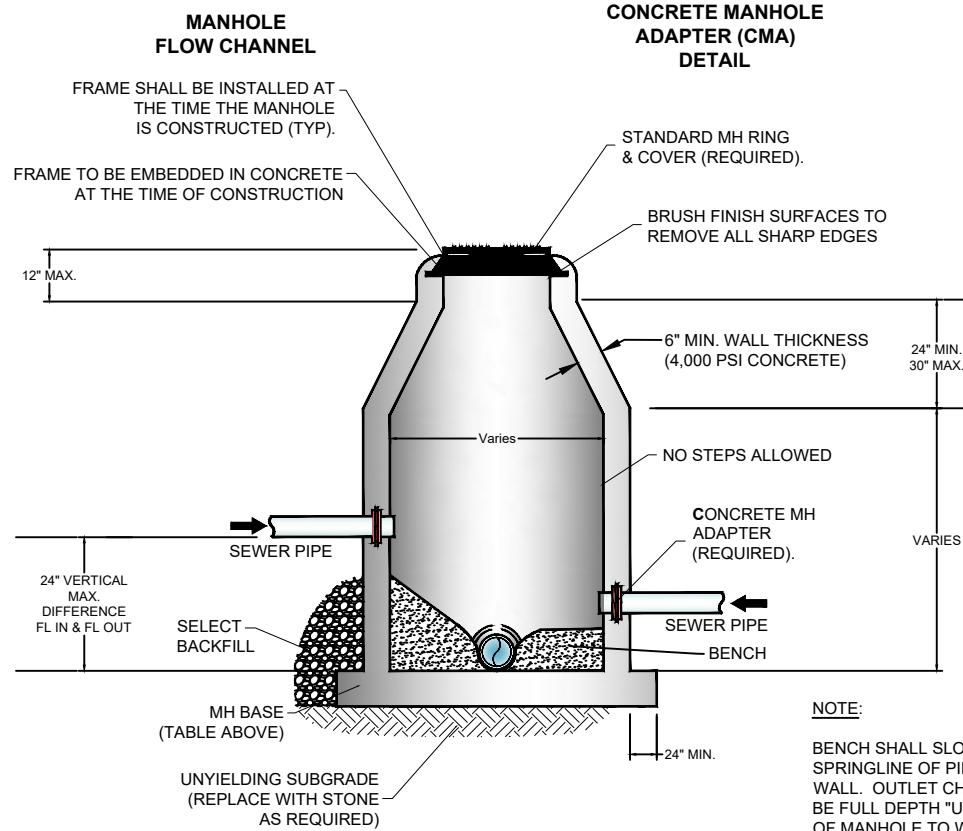
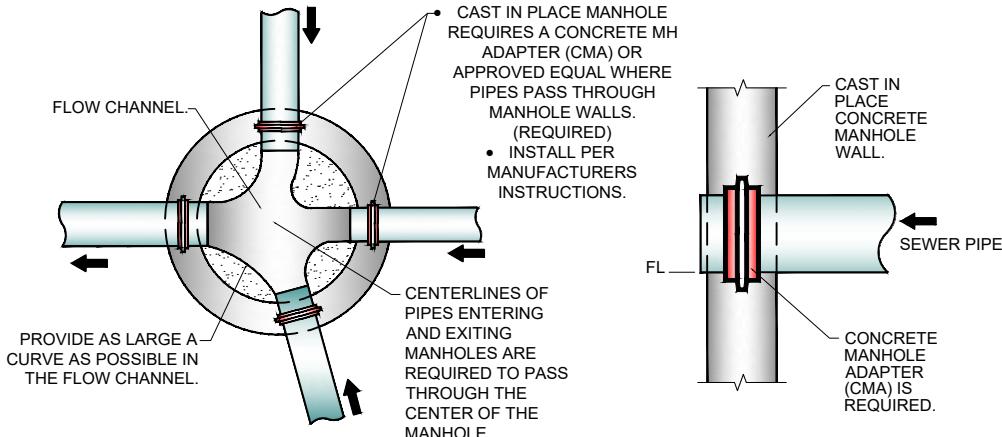
*ALL FITTINGS W/0 PART NUMBER SHALL BE PER SPECIFICATIONS
*ALL FITTINGS MUST BE ANCHORED TO VALVE OR METER SETTER. NO IN-LINE FITTINGS WILL BE PERMITTED.



DRAWN BY: JS	CHECKED BY: AW
WATER DETAIL: W18	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

SANITARY SEWER CAST IN PLACE MANHOLE

4,000 PSI CONCRETE



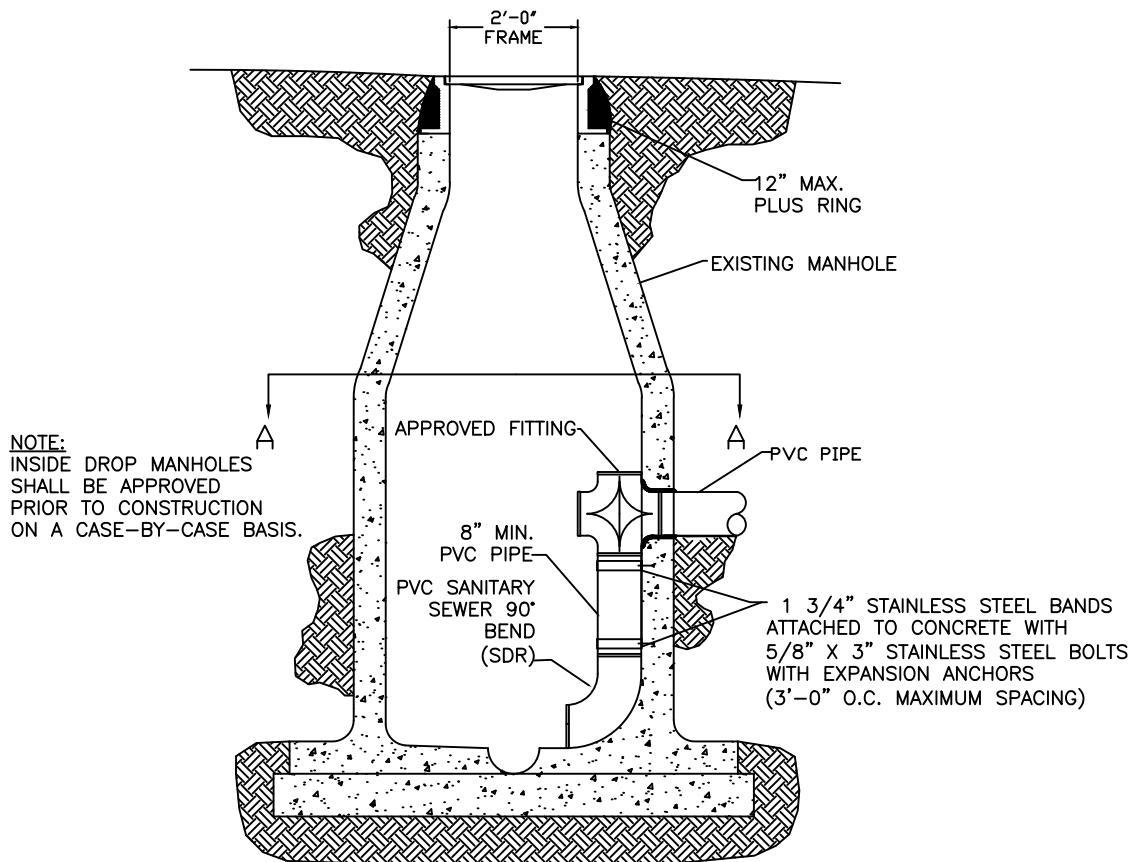
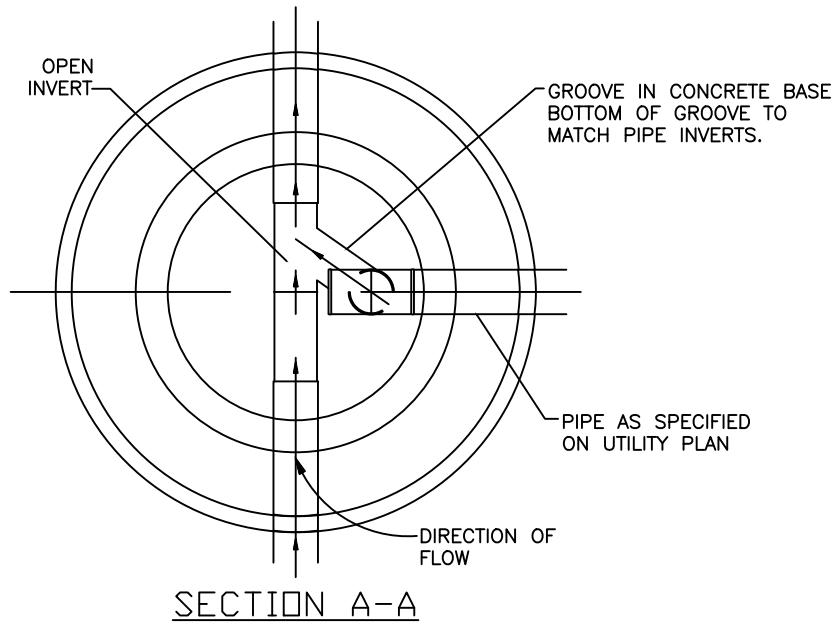
Pipe Size	Inside Diameter of Manhole	Minimum Wall Thickness	Base Thickness	Minimum Ring & Cover Size
12" OR LESS	4' DIA	6"	8"	24"
15" TO 24"	5' DIA	8"	10"	24"
>24"	6' DIA	8"	12"	30"

MANHOLE INFORMATION TABLE



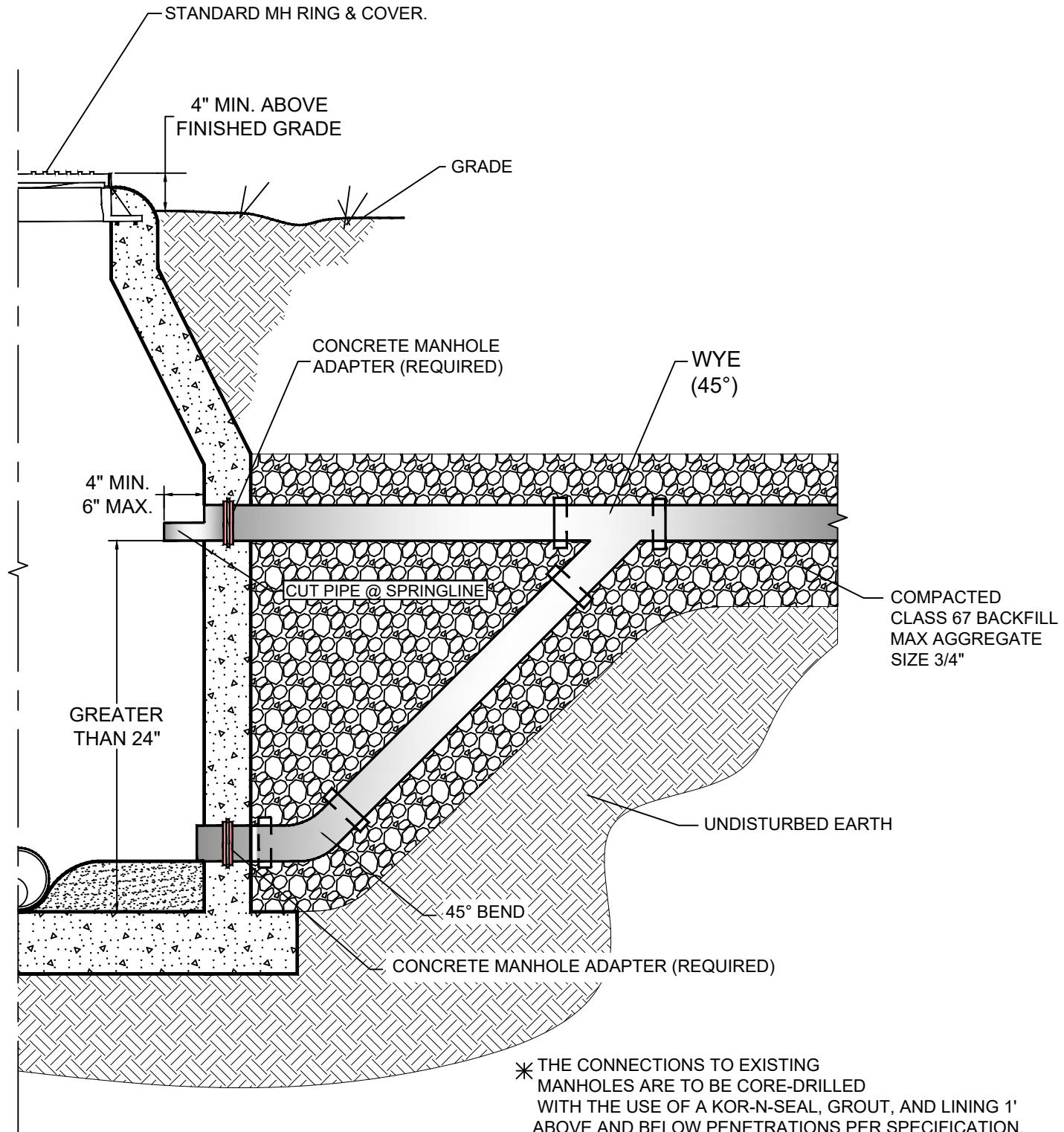
DRAWN BY: JS	CHECKED BY: AW
SANITARY SEWER DETAIL: SS01	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

SANITARY SEWER INTERIOR DROP MANHOLE



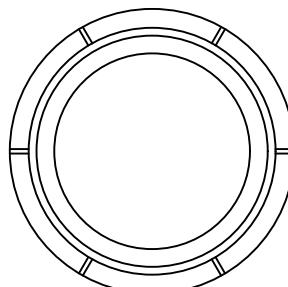
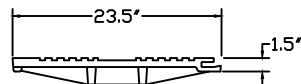
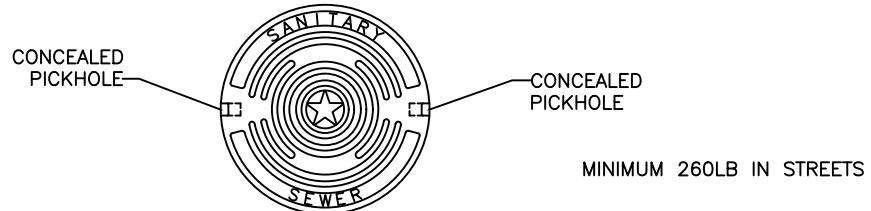
DRAWN BY: JI	CHECKED BY: PN
SANITARY SEWER DETAIL: SS02	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

SANITARY SEWER EXTERIOR DROP MANHOLE



DRAWN BY: JS	CHECKED BY: AW
SANITARY SEWER DETAIL: SS03	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

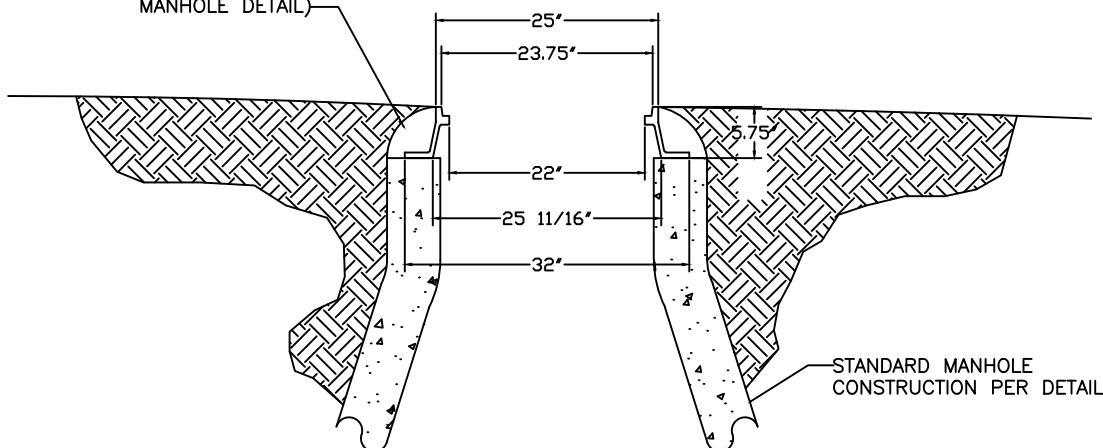
HEAVY DUTY MANHOLE LID & FRAME



USA MANUFACTURED
RING AND LID
ASSEMBLY REQUIRED

* SEE PLANS FOR
PROPER MANHOLE ELEVATION

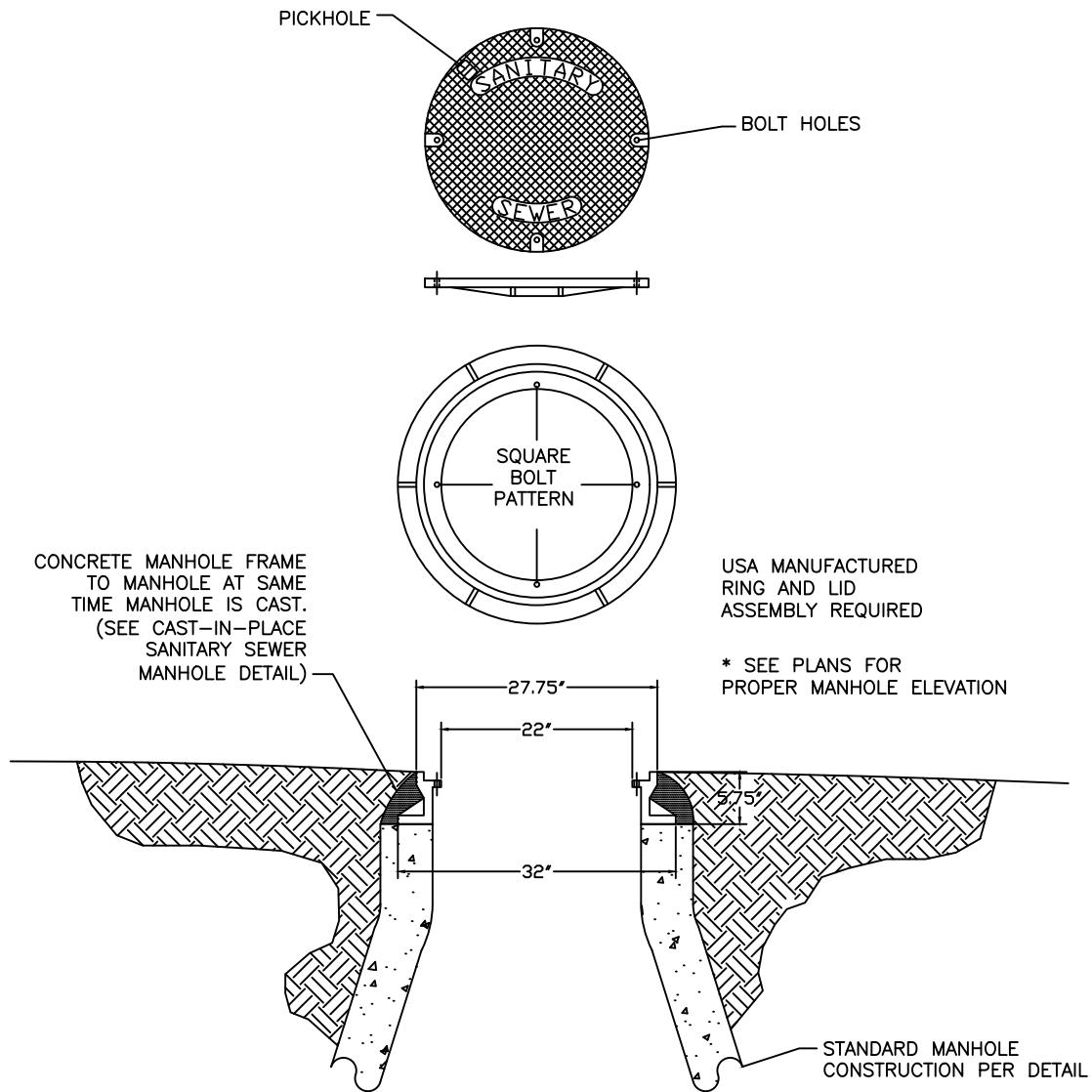
CONCRETE MANHOLE FRAME
TO MANHOLE AT SAME
TIME MANHOLE IS CAST.
(SEE CAST-IN-PLACE
SANITARY SEWER
MANHOLE DETAIL)



DRAWN BY: JI	CHECKED BY: PN
SANITARY SEWER DETAIL: SS04	
LAST REVISION DATE: 01/27/2020	

APPROVED: 06/22/2021

WATER TIGHT BOLTED MANHOLE LID & FRAME

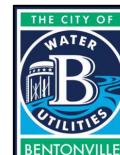
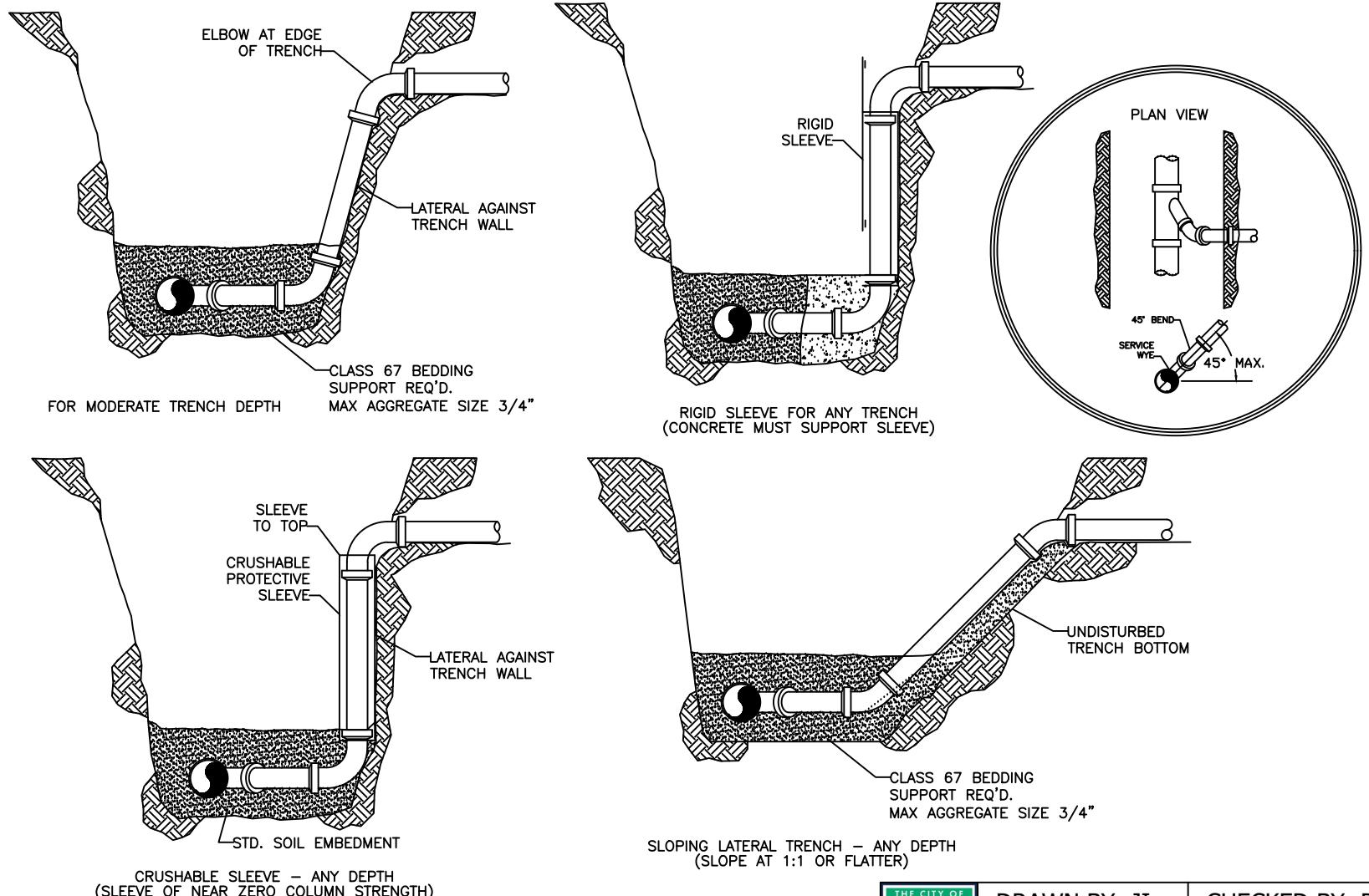


DRAWN BY: JI	CHECKED BY: PN
SANITARY SEWER DETAIL: SS05	
LAST REVISION DATE: 01/27/2020	

APPROVED: 06/22/2021

SANITARY SEWER

SERVICE WYE



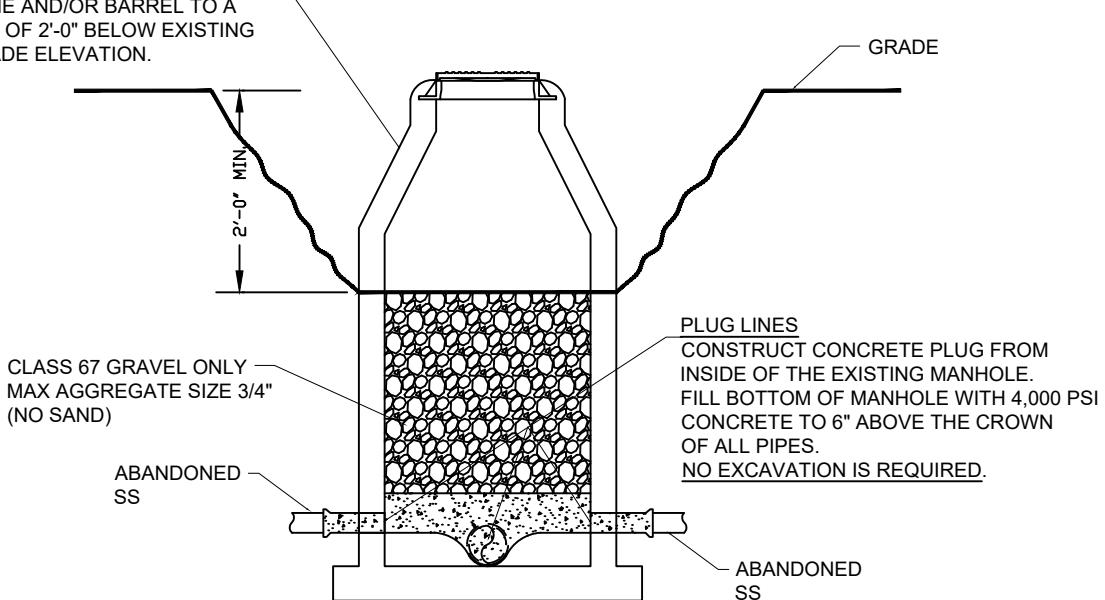
DRAWN BY: JI	CHECKED BY: PN
SANITARY SEWER DETAIL: SS06	
LAST REVISION DATE: 01/27/2020	APPROVED: 06/22/2021

EXISTING MANHOLE

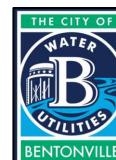
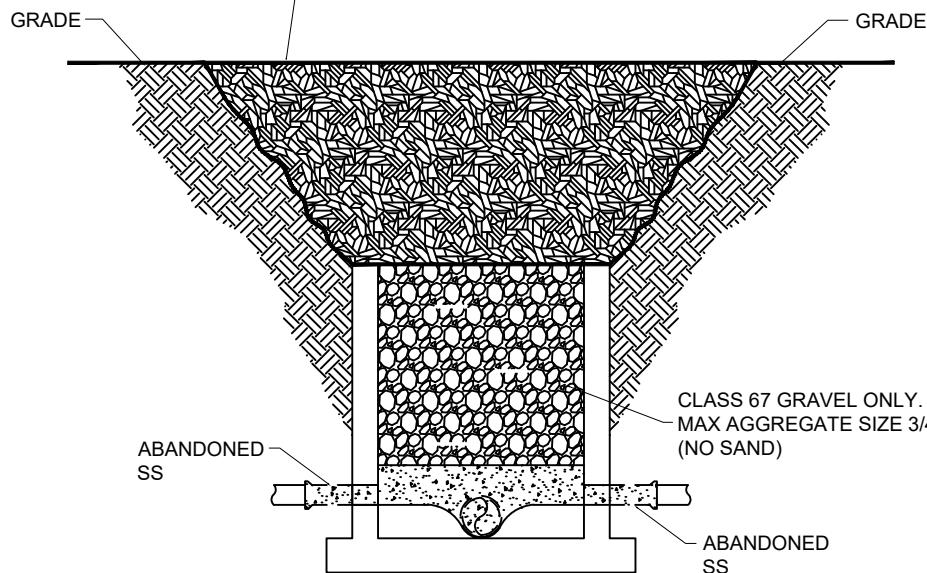
ABANDONMENT DETAIL

5 FT OR DEEPER

REMOVE MH RING & COVER, CONE AND/OR BARREL TO A MIN. OF 2'-0" BELOW EXISTING GRADE ELEVATION.

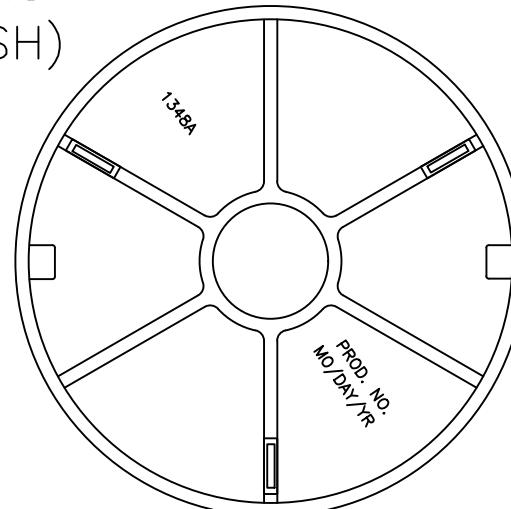
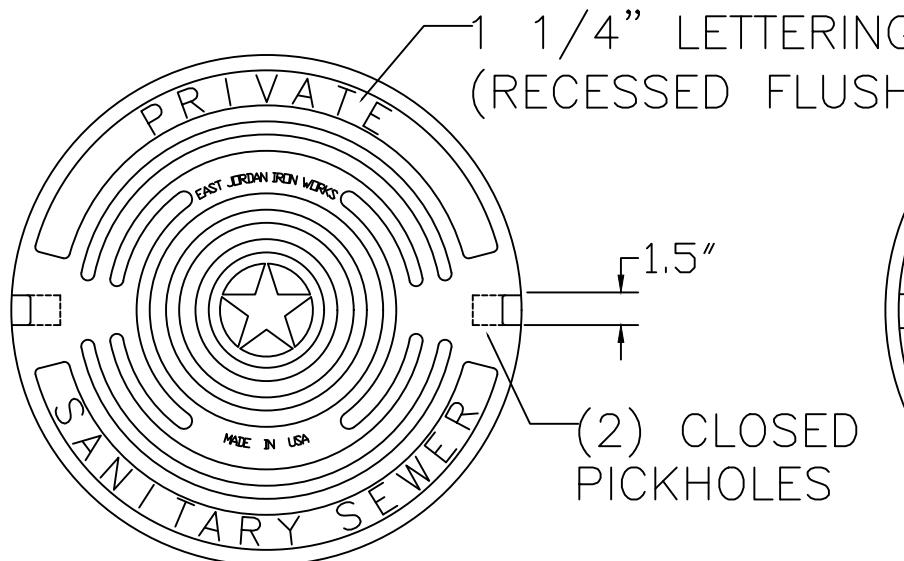


BACKFILL, REPAVE or RESURFACE
BACKFILL ABANDONMENT IN PAVED AREAS, AND PERFORM PAVEMENT REPAIR AS PER STANDARD STREET DEPARTMENT SPECIFICATIONS.
BACKFILL ABANDONMENT IN NONPAVED AREAS WITH SELECT NATIVE MATERIAL, AND RESURFACE WITH APPROPRIATE MATERIALS.

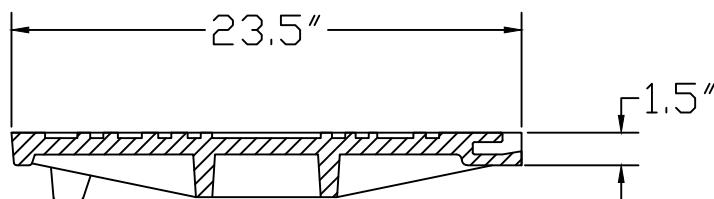


DRAWN BY: JI	CHECKED BY: PN
SANITARY SEWER DETAIL: SS07	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

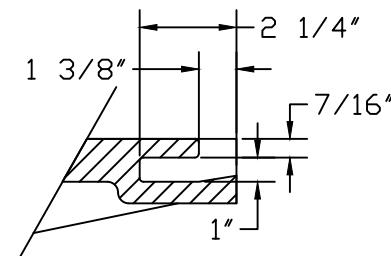
PRIVATE MANHOLE RING AND LID



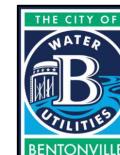
BOTTOM VIEW



COVER SECTION

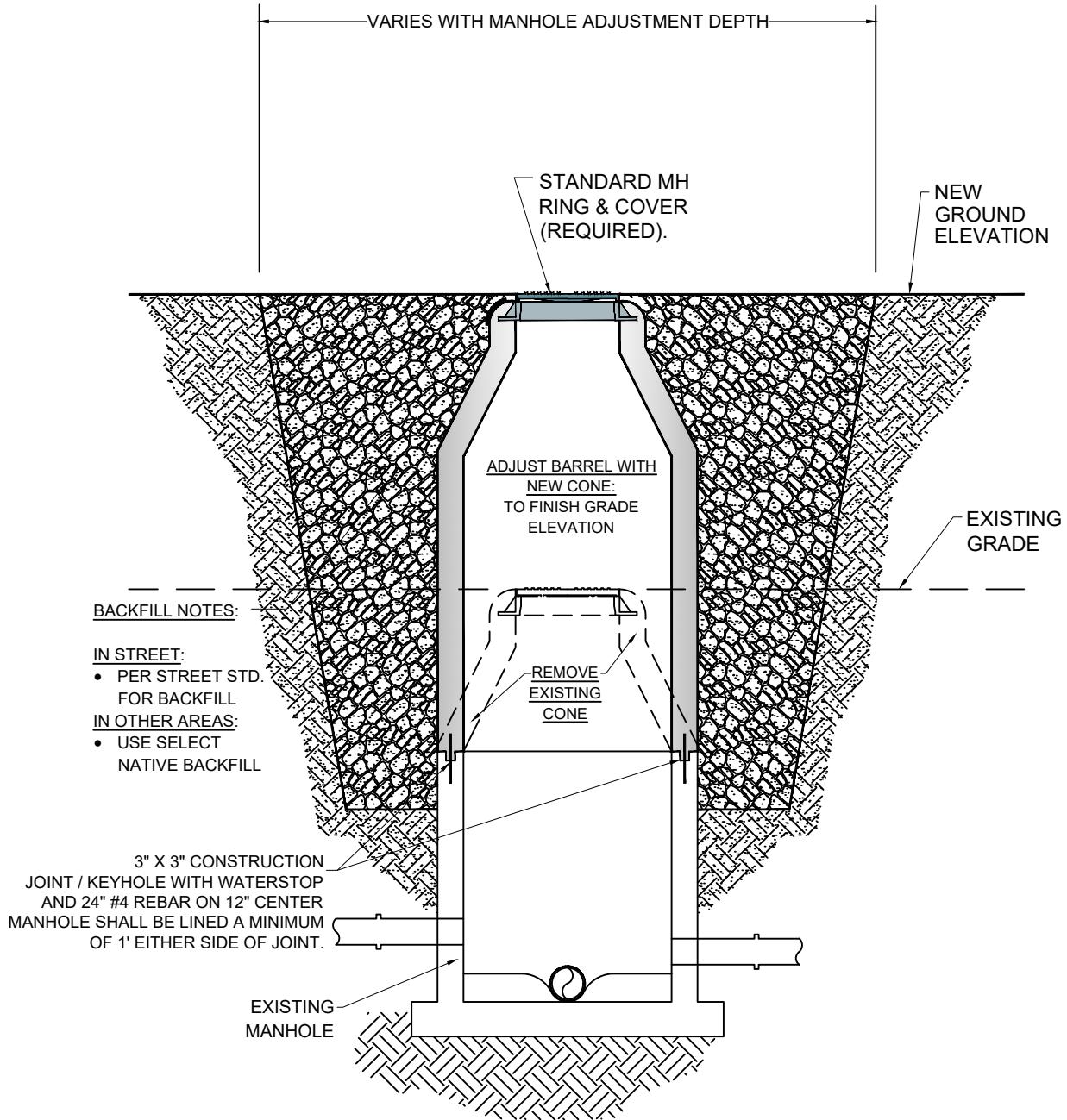


PICKHOLE DETAIL



DRAWN BY: JI	CHECKED BY: PN
SANITARY SEWER DETAIL: SS08	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

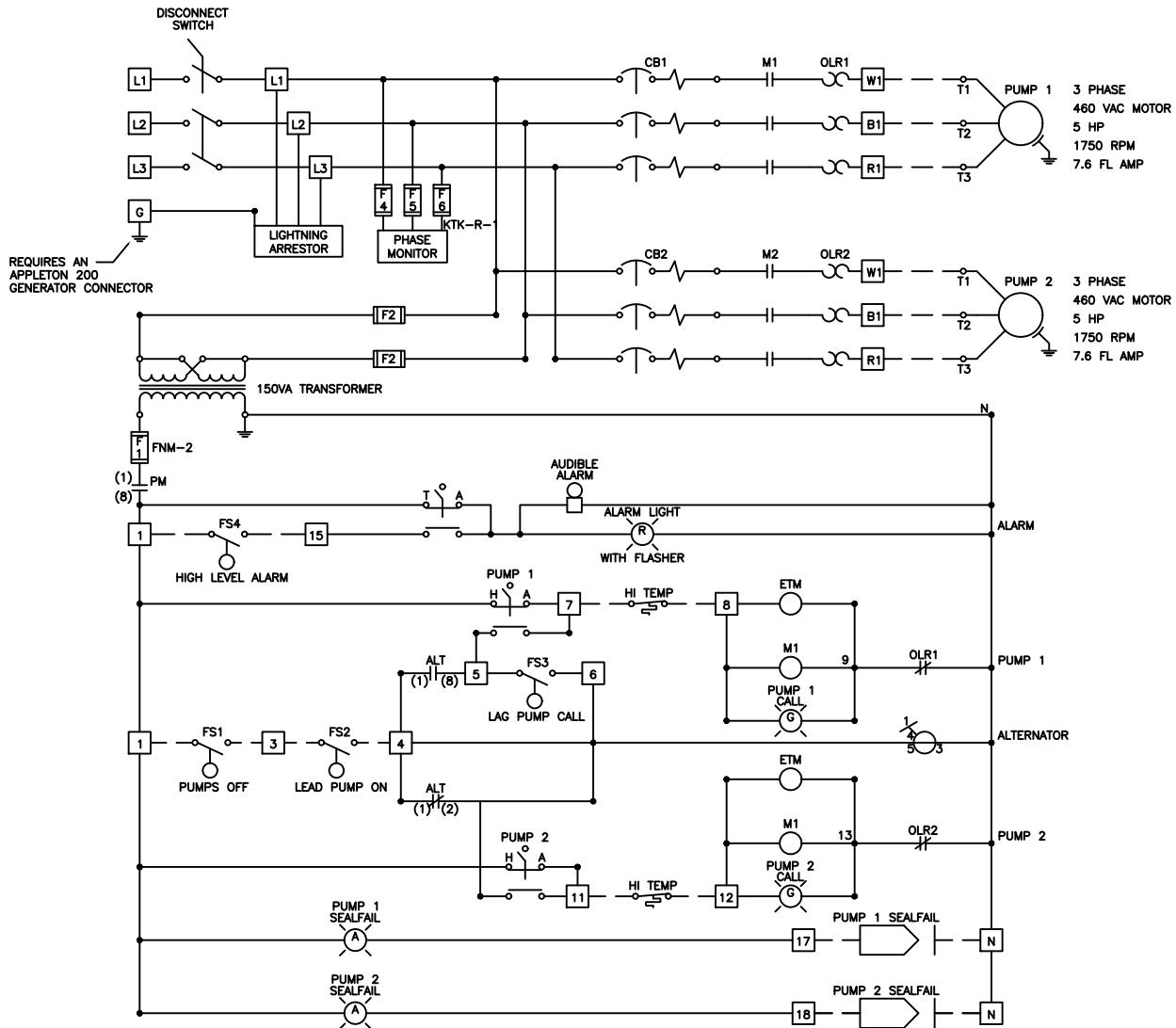
TYPICAL MANHOLE ADJUST TO GRADE DETAIL



DRAWN BY: JS	CHECKED BY: AW
SANITARY SEWER DETAIL: SS09	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

DUPLEX PUMP CONTROL PANEL

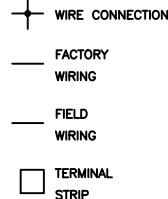
480 V / 3 PHASE



SUPPLY

480 Volts
3 Phase
60 Hz
3 W

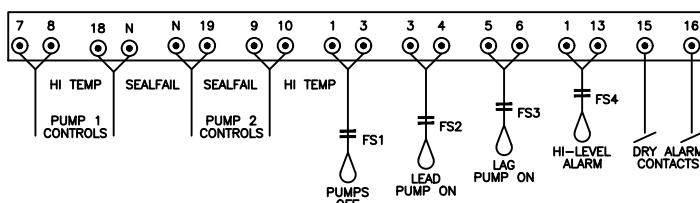
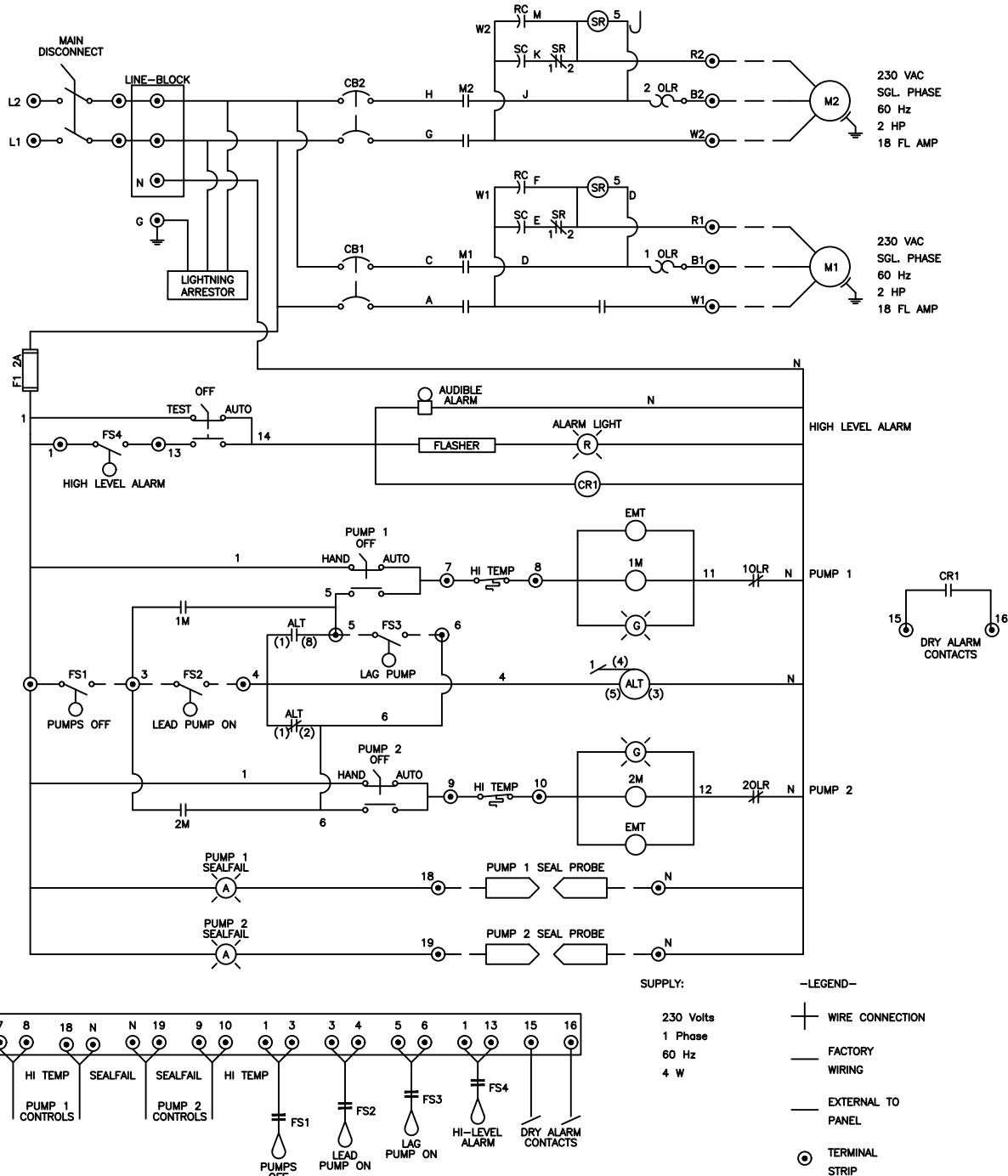
-LEGEND-



DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS01	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

DUPLEX PUMP CONTROL PANEL

230 V / SINGLE PHASE



230 Volts

-LEGEND-

230 Volts
1 Phase
60 Hz

WIRE CONNECTION

FACTORY

WIRING

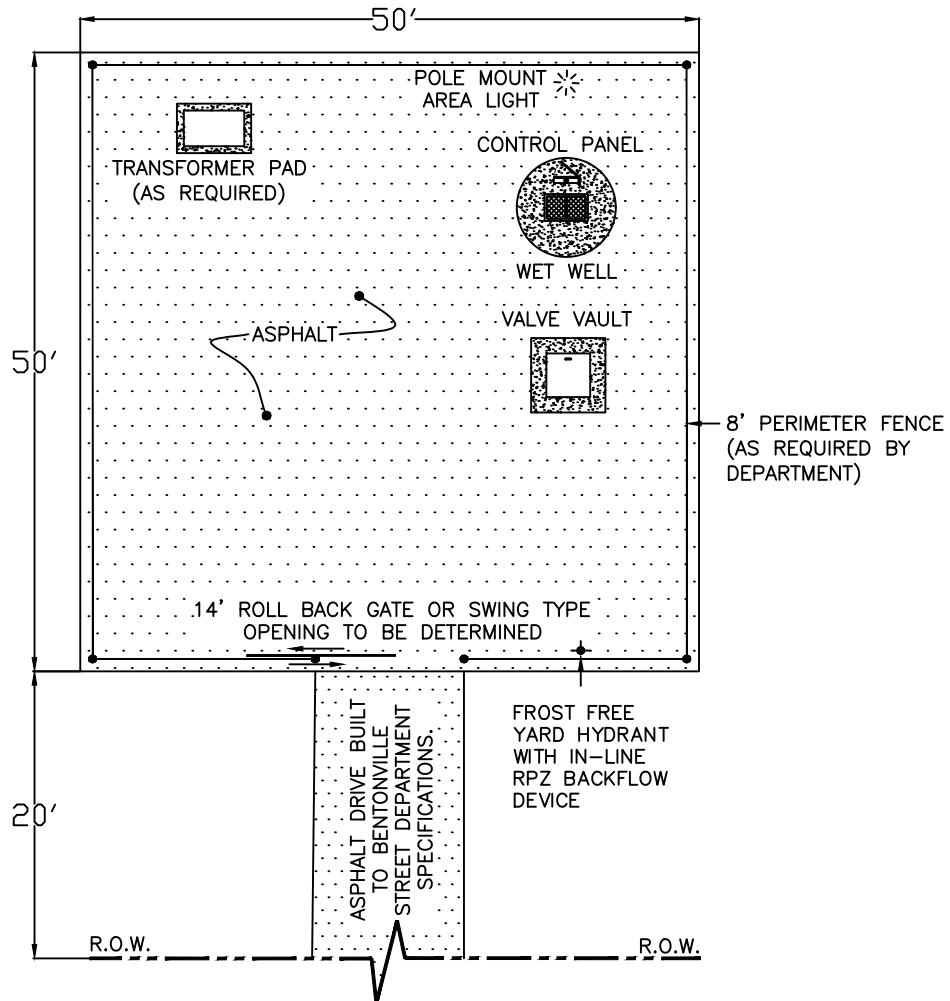
EXTERNAL PANEL

THE JOURNAL OF CLIMATE



DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS02	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

LIFT STATION SITE DETAIL



*ACTUAL SITE LAYOUT MAY VARY

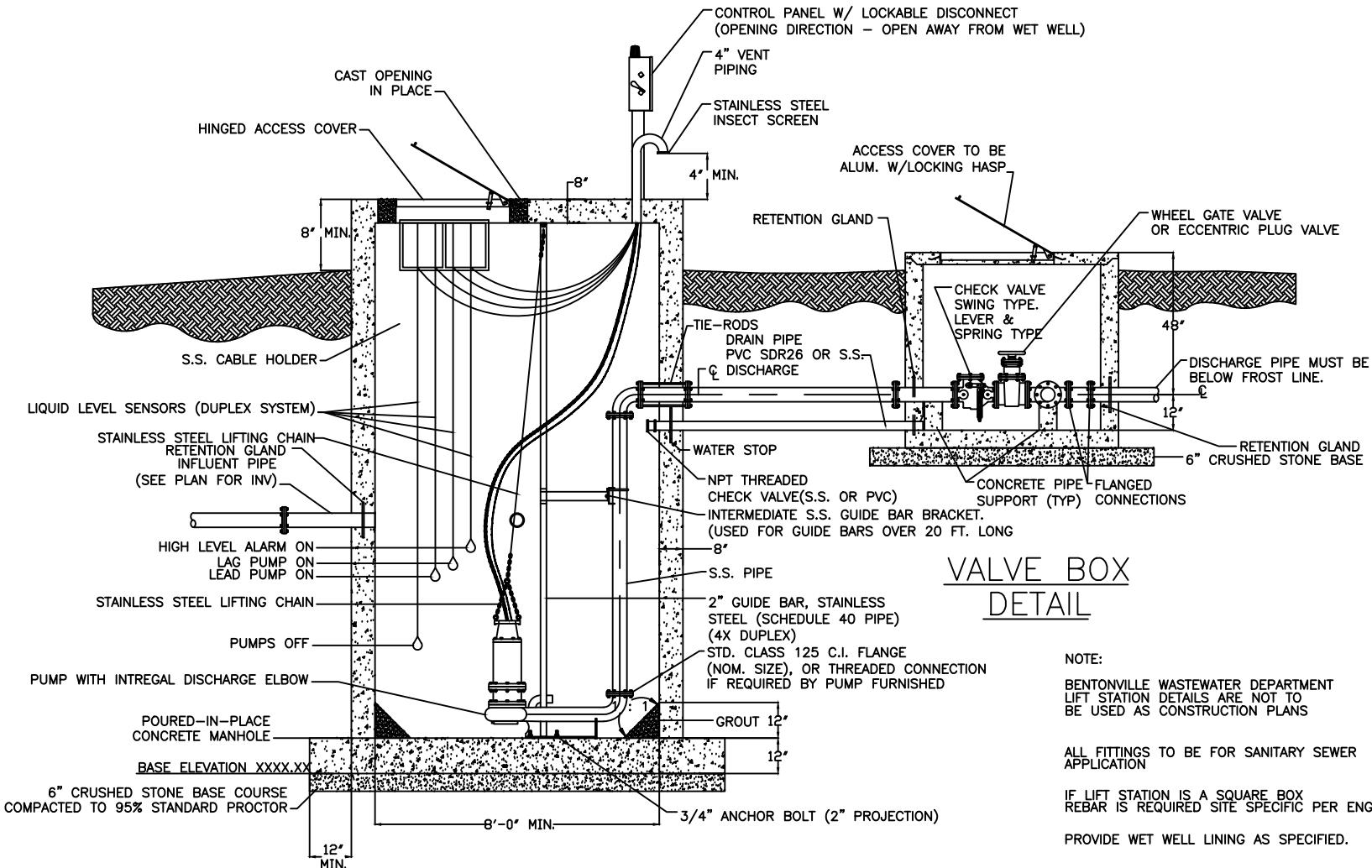
BENTONVILLE WASTEWATER DEPARTMENT
LIFT STATION DETAILS ARE NOT TO
BE USED AS CONSTRUCTION PLANS



DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS03	
LAST REVISION DATE: 01/27/2020	
APPROVED: _____	06/22/2021

LIFT STATION DETAIL

NON-CLOG PUMPS ABOVE 5 HP



VALVE BOX DETAIL

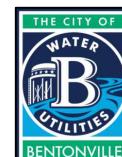
NOTE:

BENTONVILLE WASTEWATER DEPARTMENT
LIFT STATION DETAILS ARE NOT TO
BE USED AS CONSTRUCTION PLANS

ALL FITTINGS TO BE FOR SANITARY SEWER
APPLICATION

IF LIFT STATION IS A SQUARE BOX
REBAR IS REQUIRED SITE SPECIFIC PER ENGINEERING.

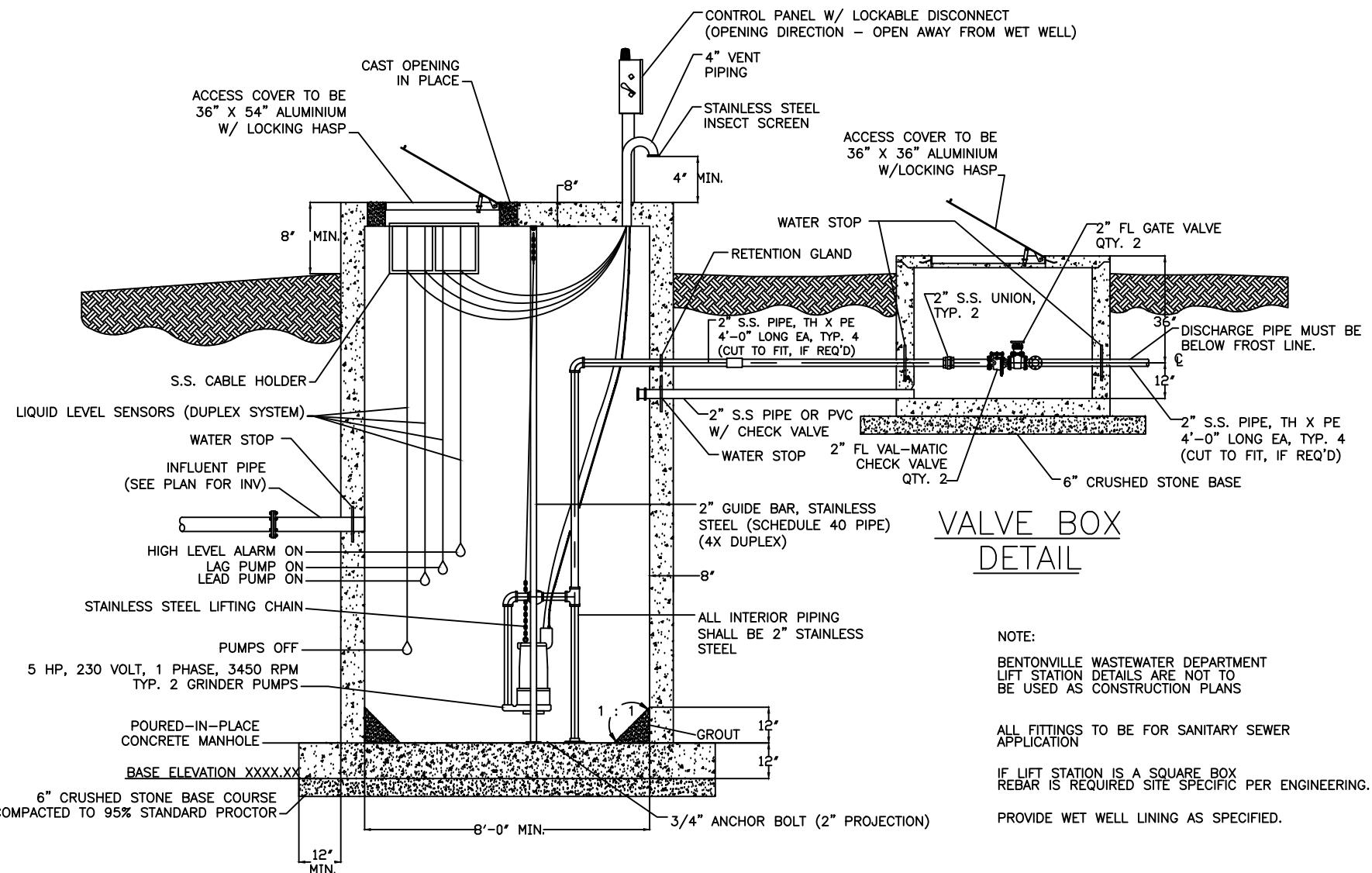
PROVIDE WET WELL LINING AS SPECIFIED.



DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS04	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

LIFT STATION DETAIL

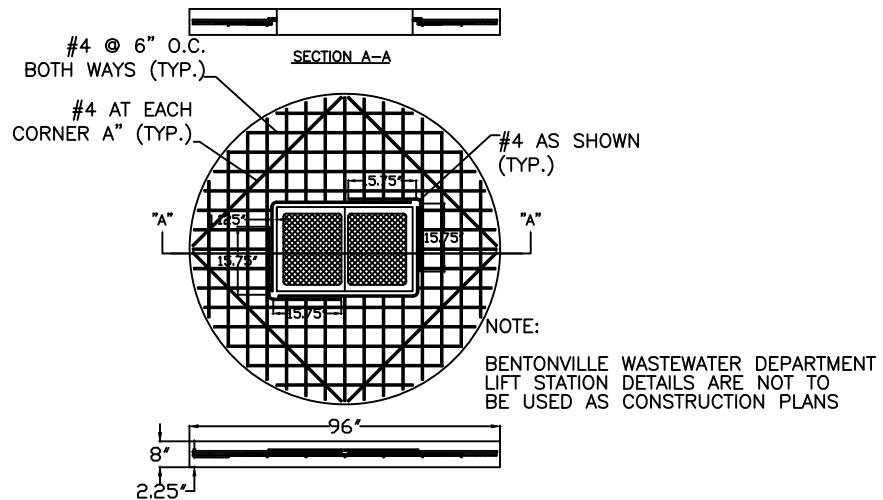
GRINDER PUMPS 5 HP AND LESS



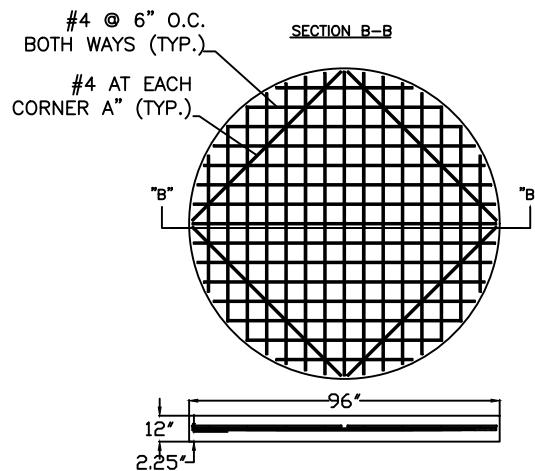
DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS05	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

WET WELL

TOP SLAB REINFORCEMENT DETAIL

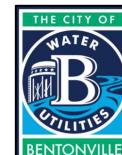
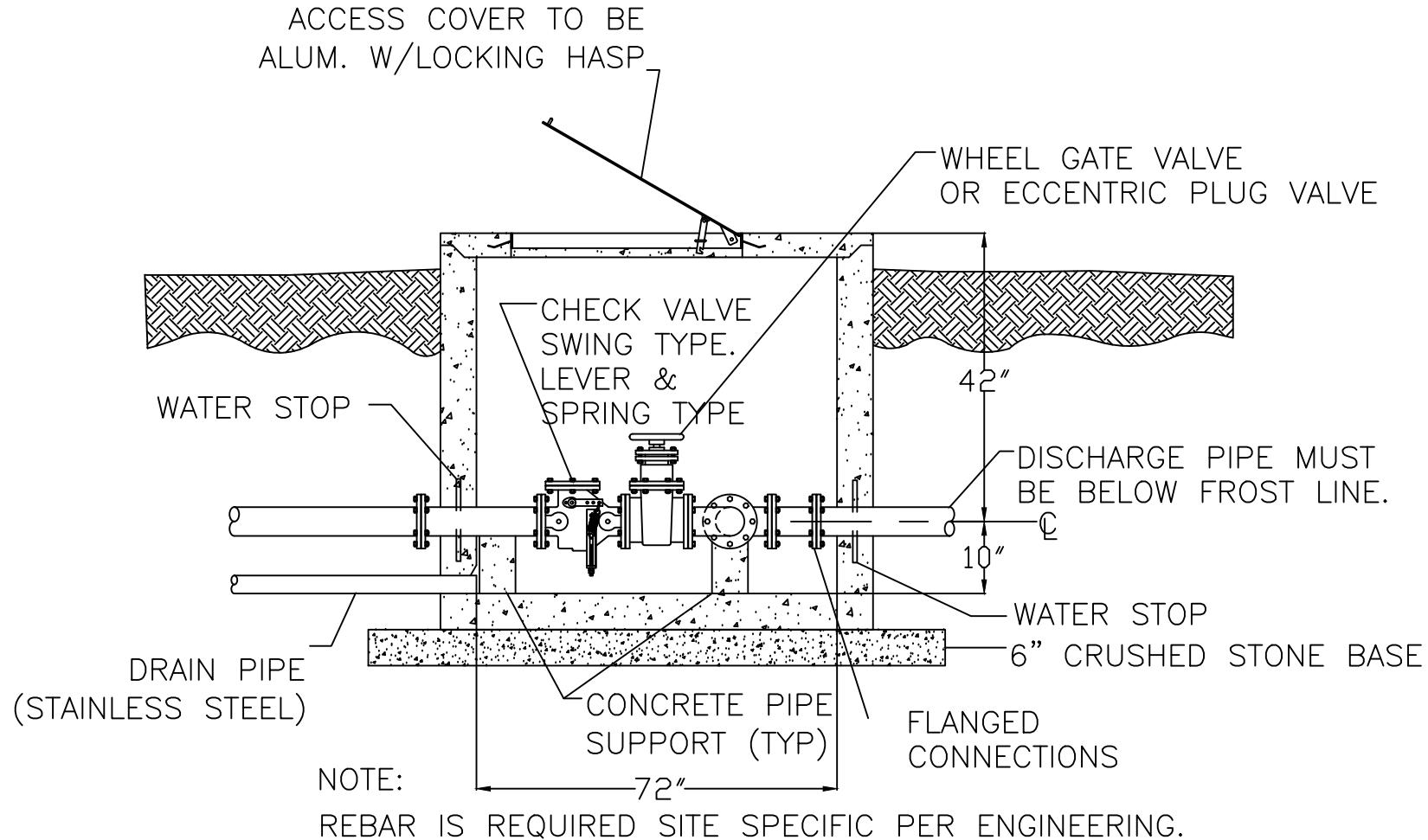


BOTTOM SLAB REINFORCEMENT DETAIL



DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS06	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

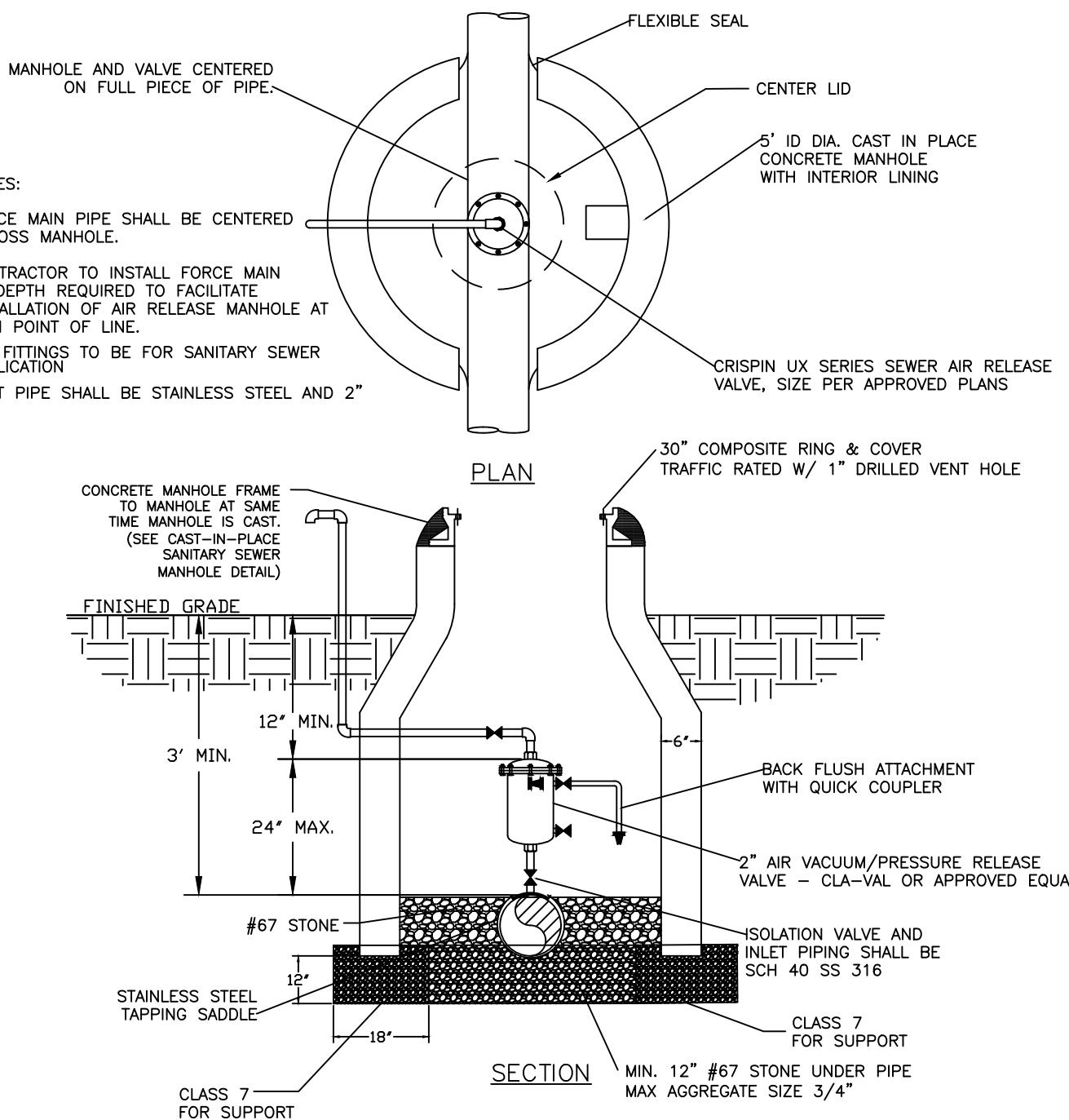
LIFT STATION VALVE VAULT DETAIL



DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS07	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

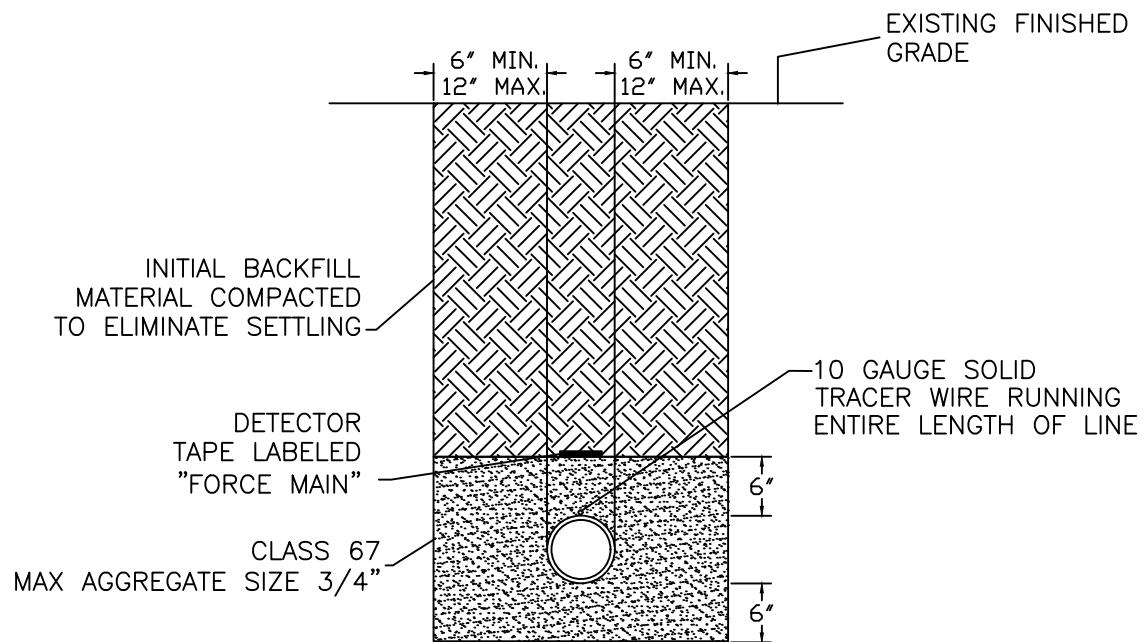
AIR VACUUM/RELEASE MANHOLE FOR FORCE MAIN

NOT TO SCALE



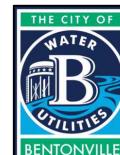
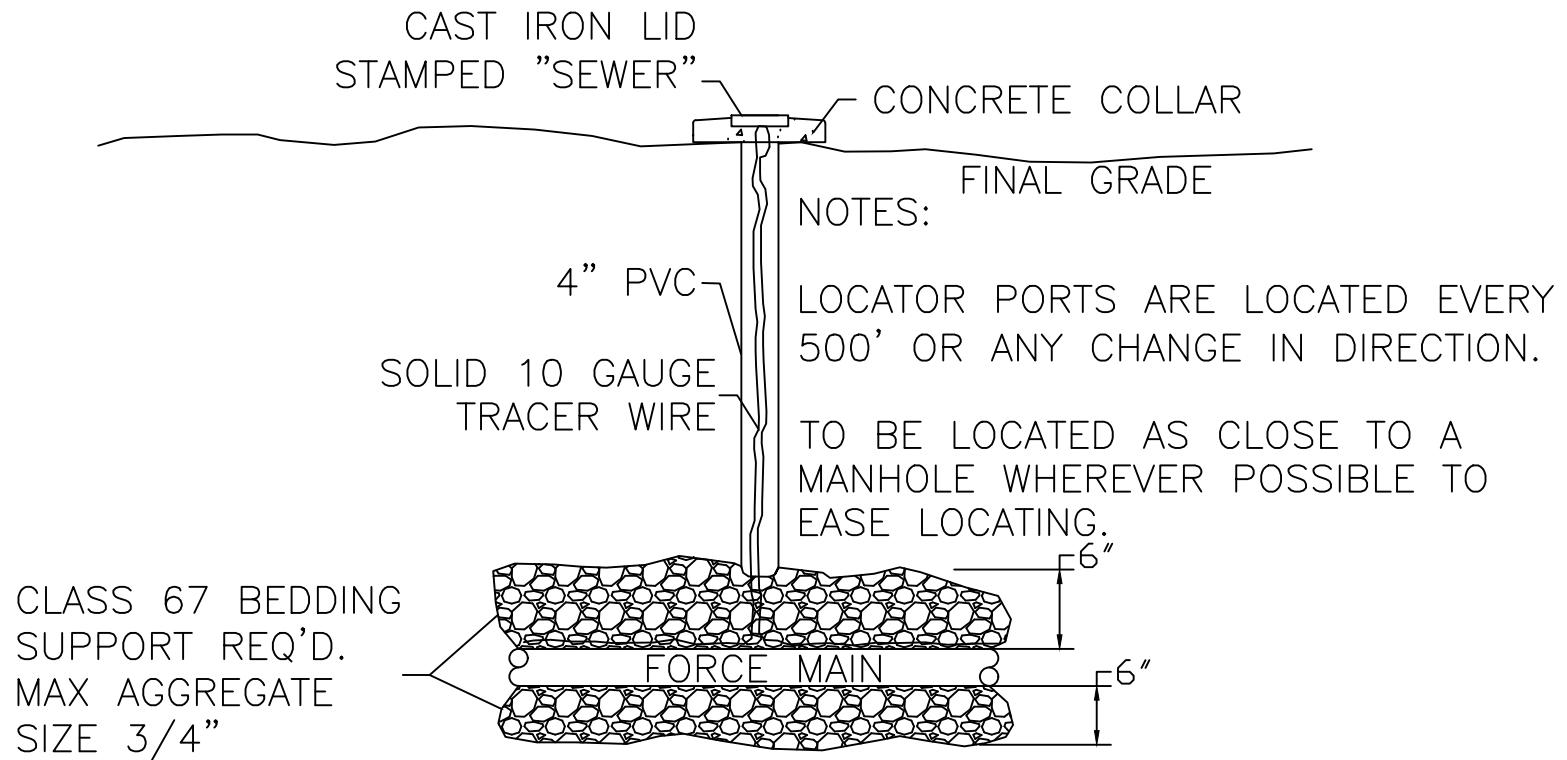
DRAWN BY: JS	CHECKED BY: AW
LIFT STATION DETAIL: LS08	
LAST REVISION DATE: 08/27/2024	
APPROVED:	10/01/2024

TYPICAL BEDDING DETAIL FOR FORCE MAIN



DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS09	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021

TRACER WIRE PORT



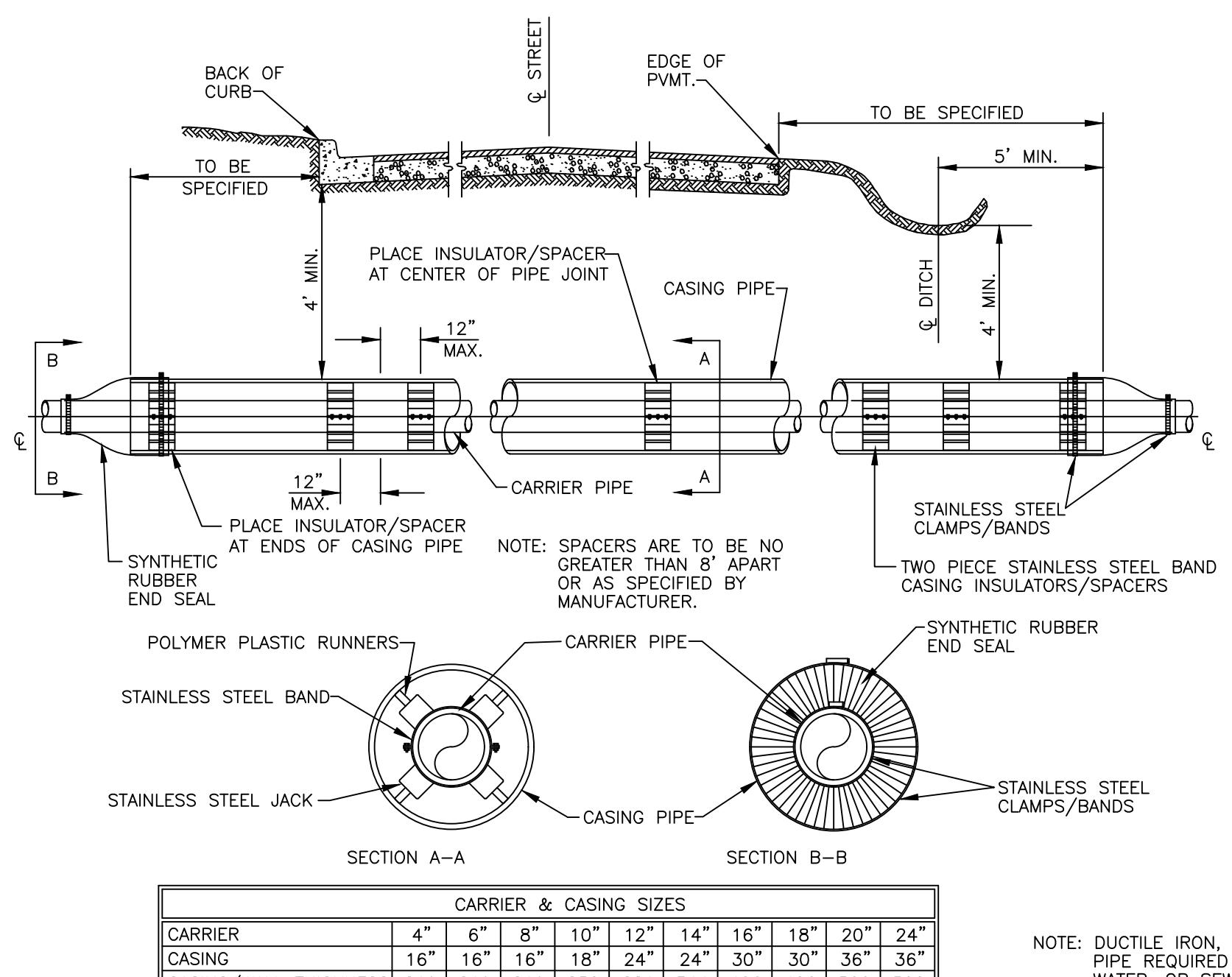
DRAWN BY: JI	CHECKED BY: PN
LIFT STATION DETAIL: LS10	
LAST REVISION DATE: 01/27/2020	
APPROVED:	06/22/2021



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WATER/SEWER DETAILS

ENCASEMENT DETAIL

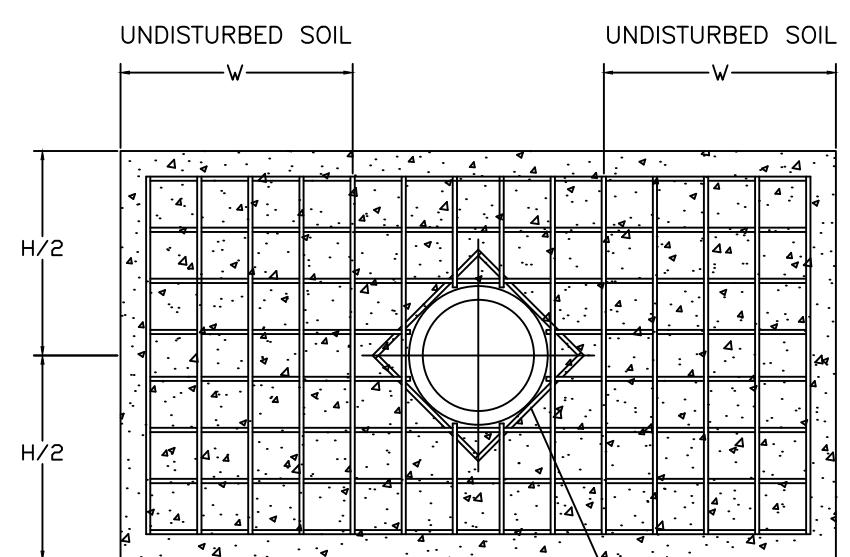


*ALL BELLS SHALL BE RESTRAINED INSIDE ENCASEMENT BY APPROVED METHOD.

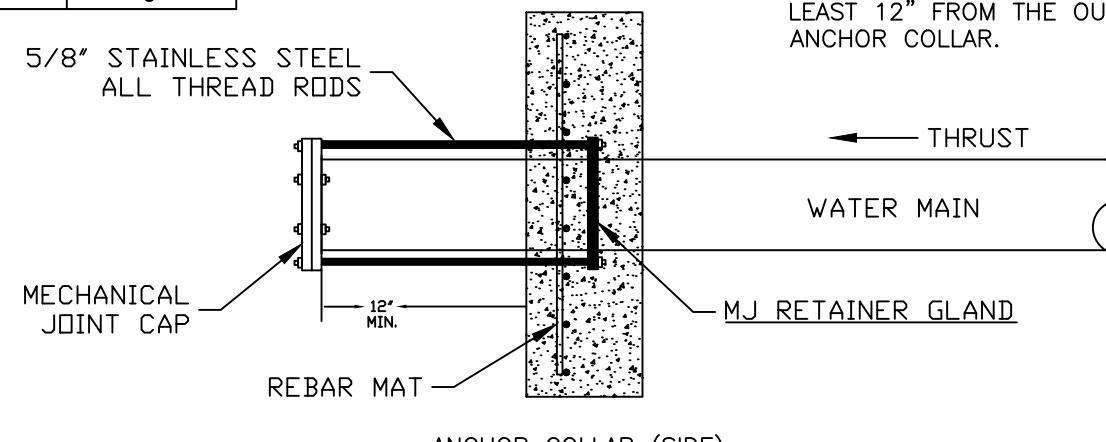
GENERAL WATER/SEWER DETAIL: GWS01

ANCHOR COLLAR SPECIFICATIONS

PIPE SIZE	DIMENSIONS			REINFORCING BARS		
	W	H	T	M	"A" BARS	"B" BARS
6"	1.5"	2.0"	1.0"	M.J. RETAINER GLAND	#6@6"	#6@6"
8"	1.5"	2.5"	1.0"	M.J. RETAINER GLAND	#6@6"	#6@6"
12"	2.0"	4.0"	1.5"	M.J. RETAINER GLAND	#6@6"	#6@6"
16"	3.0"	4.5"	1.5"	M.J. RETAINER GLAND	#6@6"	#6@6"
20"	3.0"	5.0"	2.0"	M.J. RETAINER GLAND	#6@6"	#6@6"
24"	3.5"	5.5"	2.0"	M.J. RETAINER GLAND	#7@6"	#6@10"
30"	6.5"	6.0"	2.5"		#8@6"	#7@10"
36"	7.0"	7.0"	2.5"		#8@6"	#7@10"



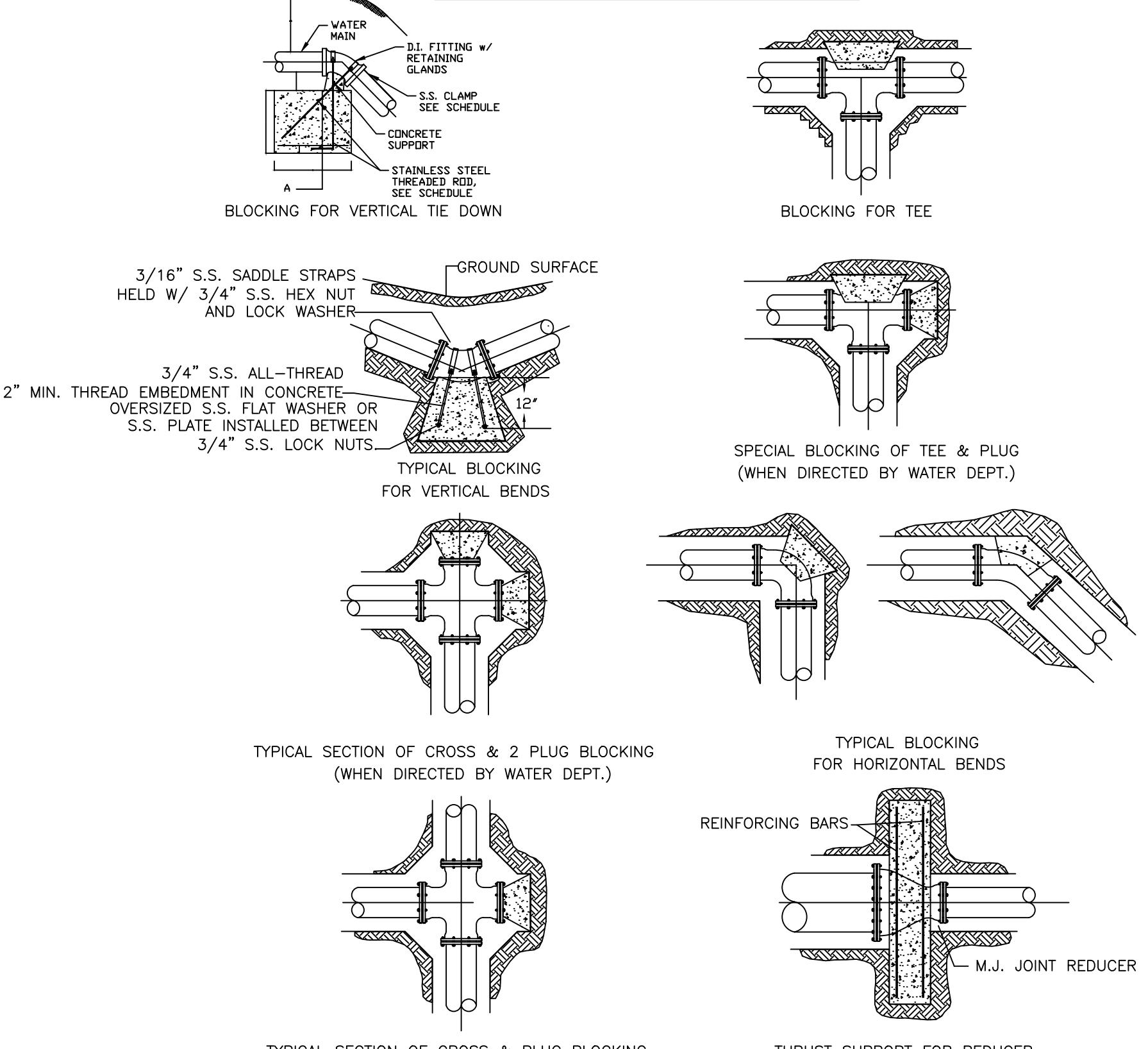
ROD REQUIREMENTS	
MAIN SIZE	NO. OF RODS
6"	2
8"	4
12"	4
16"	6
24"	6
30"	8
36"	8



NOTE:
ALL-THREAD STEEL RODS SHALL BE
5/8" STAINLESS STEEL WITH STAINLESS
STEEL HARDWARE.

GENERAL WATER/SEWER DETAIL: GWS04

THRUST BLOCKING



REACTION BACKING TABLE

PIPE SIZE	BENDS			
	45°	22 1/2°	11 1/4°	ROD DIA.
VOLUME REQ'D (CU. FT.)	98.5	50.2	25.2	
A (FT.)	5.00'	4.00'	3.00'	
B (FT.)	4.00'	3.20'	2.80'	
C (FT.)	5.00'	4.00'	3.00'	
MIN. CLAMP (2 EA)	3/8 IN. x 2 IN.			
VOLUME REQ'D (CU. FT.)	209.5	106.8	53.7	
A (FT.)	6.00'	5.00'	4.00'	
B (FT.)	6.00'	4.25'	3.50'	
C (FT.)	6.00'	5.00'	4.00'	
MIN. CLAMP (2 EA)	1/2 IN. x 2 IN.			
VOLUME REQ'D (CU. FT.)	457.2	233.1	117.1	
A (FT.)	8.00'	6.50'	5.00'	
B (FT.)	7.25'	5.50'	4.75'	
C (FT.)	8.00'	6.50'	5.00'	
MIN. CLAMP (2 EA)	5/8 IN. x 3 IN.			
VOLUME REQ'D (CU. FT.)	800.3	408.0	205.0	
A (FT.)	9.50'	7.50'	6.00'	
B (FT.)	9.00'	7.25'	5.75'	
C (FT.)	9.50'	7.50'	6.00'	
MIN. CLAMP (2 EA)	5/8 IN. x 3 IN.			

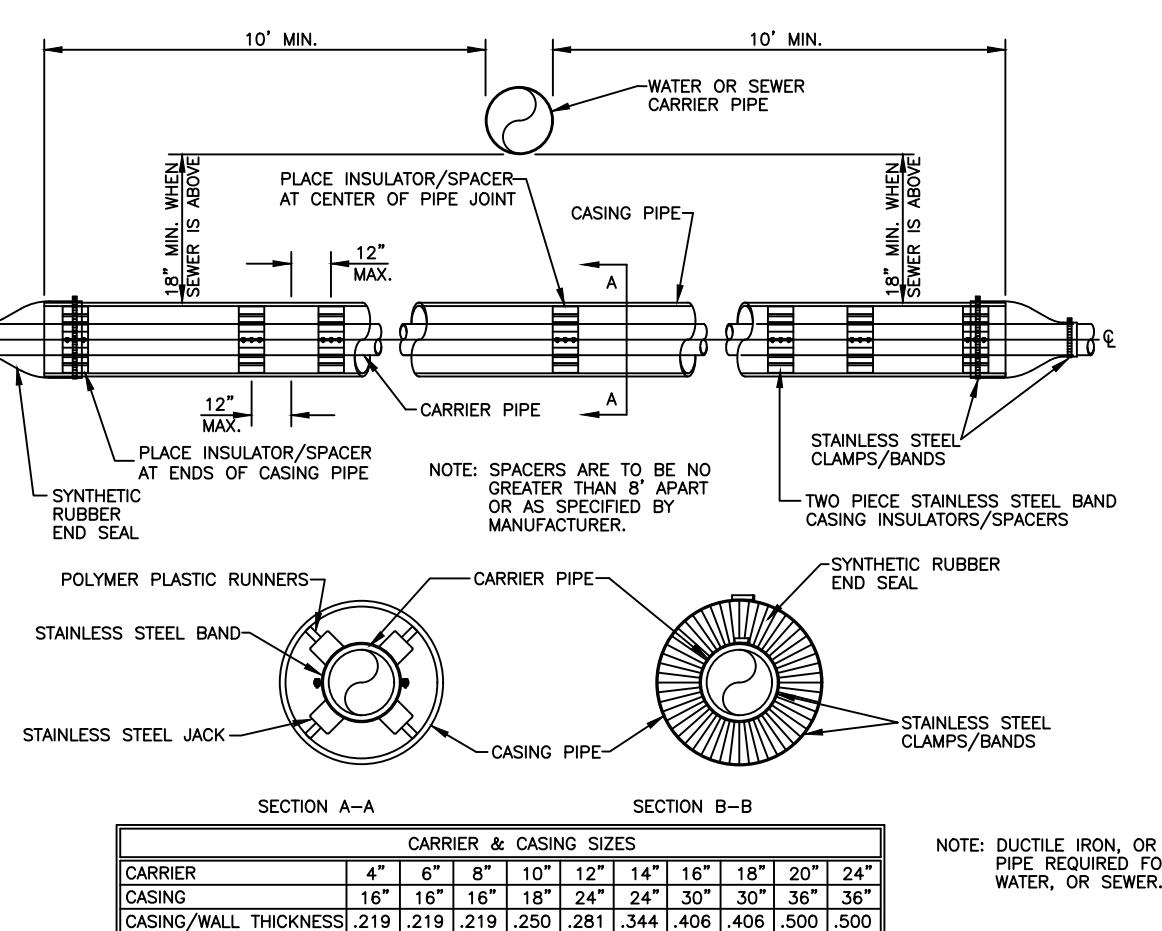
NOTES:
1. ALL FITTINGS SHALL BE MECHANICAL JOINTS.
2. DO NOT COVER BELLS OR FLANGES WITH CONCRETE.
3. WRAP ALL FITTINGS WITH POLY WRAP.
4. BACK ALL TEES ACCORDING TO SIZE OF BRANCH.
5. BACKING FUTURE LINE EXTENSIONS SHALL BE SUCH THAT LATER REMOVAL IS POSSIBLE.
6. ALL BENDS WHERE FITTINGS ARE USED, BOTH HORIZONTAL OR VERTICAL, SHALL BE BACKED WITH CONCRETE.
7. REACTION BACKING TABLE IS BASED ON 150 PSI AND SOIL BEARING PRESSURE OF 2,000 LB/SQ. FT. ADDITIONAL BACKING MAY BE REQUIRED IN SOME AREAS AS REQUIRED BY CITY WATER DEPARTMENT.

NOTES:
1. ALL BLOCKING SHALL BE AGAINST UNDISTURBED SOIL USING 4,000 PSI CONCRETE.
2. WHERE SOIL CONDITIONS MAKE IT NECESSARY TO POUR CONCRETE OVER JOINTS, THE ENDS OF THE ADJACENT PIPES MUST HAVE A THRUST BLOCK TO RESIST MOVEMENT OF THESE JOINTS.
3. WEIGHT CALCULATIONS TO BE BASED ON REACTION BACKING TABLE (SEE GWS03).
4. WHEN BLOCKING AGAINST FITTINGS, FITTINGS SHALL BE COVERED WITH POLYETHYLENE WRAP TO PREVENT BONDING OF CONCRETE.
5. WHERE SHEAR BECOMES A PROBLEM, PROPER REINFORCING MUST BE INSTALLED INTO THE BLOCKING.
6. CLEARANCE ON PIPES BELONGING TO OIL/GAS COMPANIES SHALL BE 18" UNLESS SPECIAL PERMISSION IS GIVEN BY THESE COMPANIES AND THE DEPARTMENT.
7. 12" OF ALL THREAD EMBEDDED IN CONCRETE.
8. 12" OF ALL THREAD FOR SECTIONS 10' OR UNDER

GENERAL WATER/SEWER DETAIL: GWS02

GENERAL WATER/SEWER DETAIL: GWS03

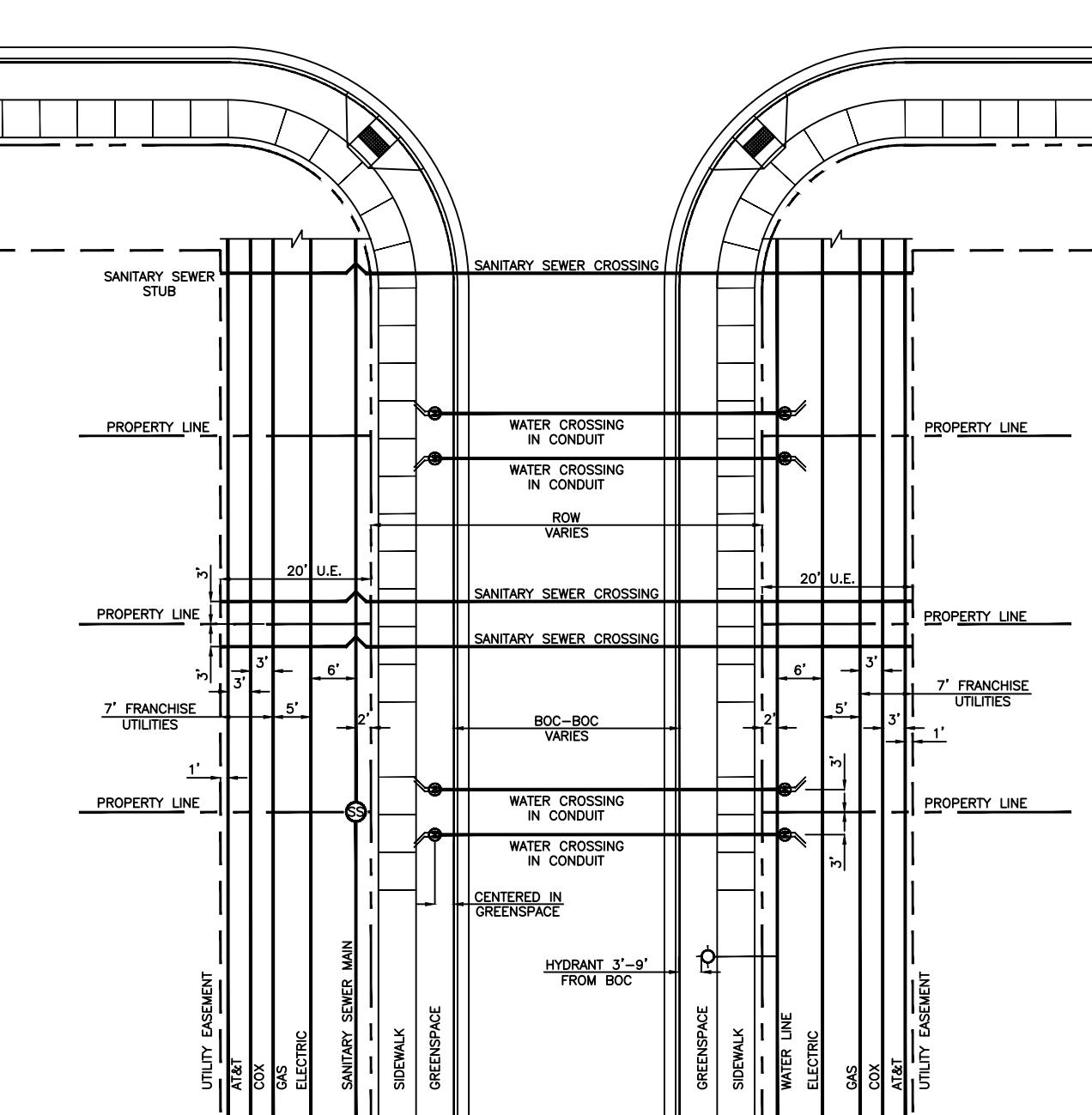
ENCASEMENT CROSSING DETAIL



*ALL BELLS SHALL BE RESTRAINED BY APPROVED METHOD.

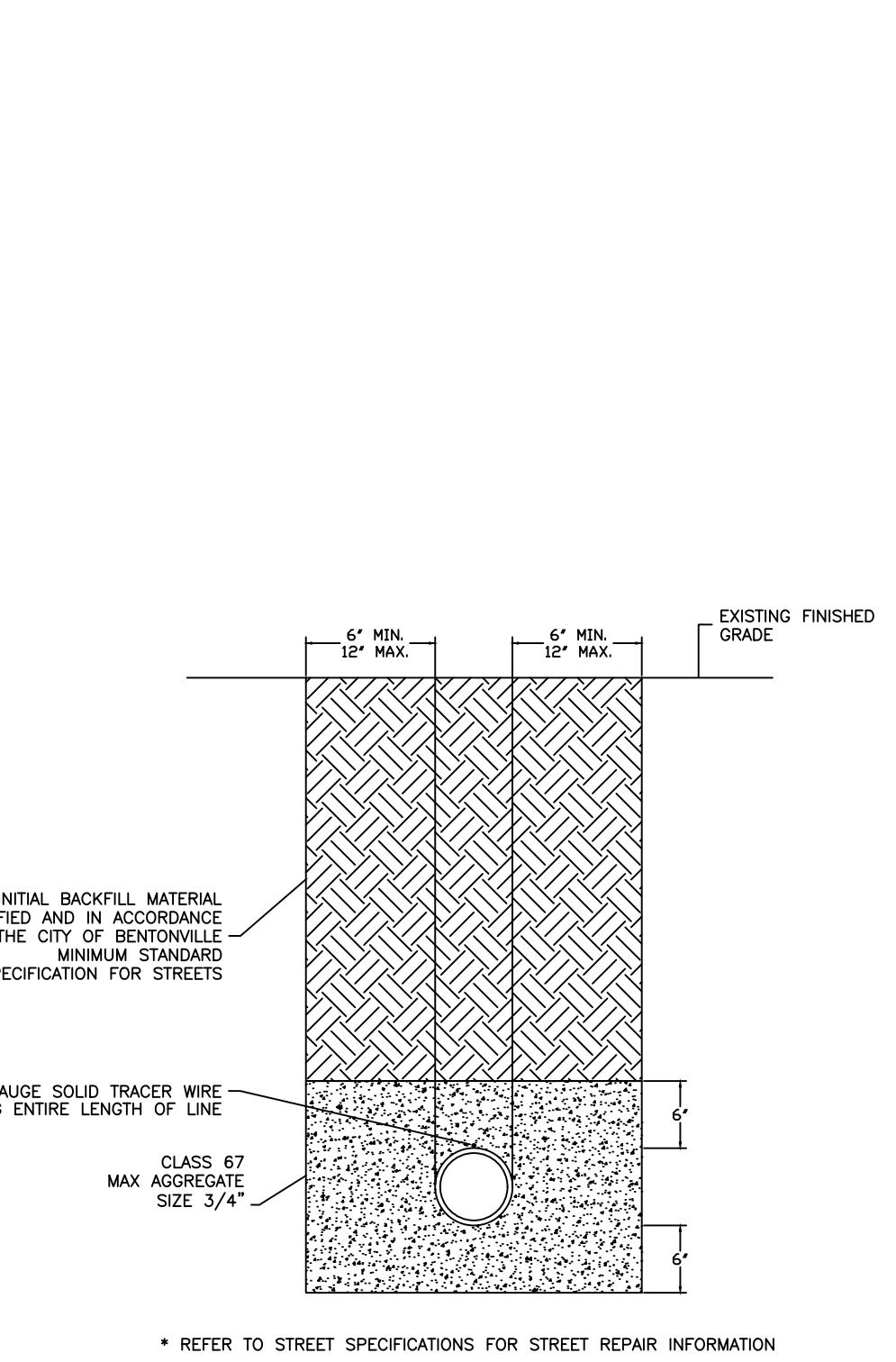
GENERAL WATER/SEWER DETAIL: GWS05

SUBDIVISION UTILITY PLACEMENT

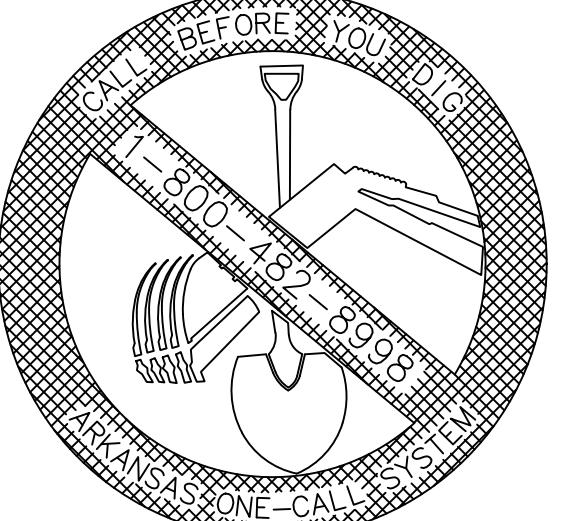


GENERAL WATER/SEWER DETAIL: GWS06

TYPICAL BEDDING DETAIL



GENERAL WATER/SEWER DETAIL: GWS07



REVISION:
2024

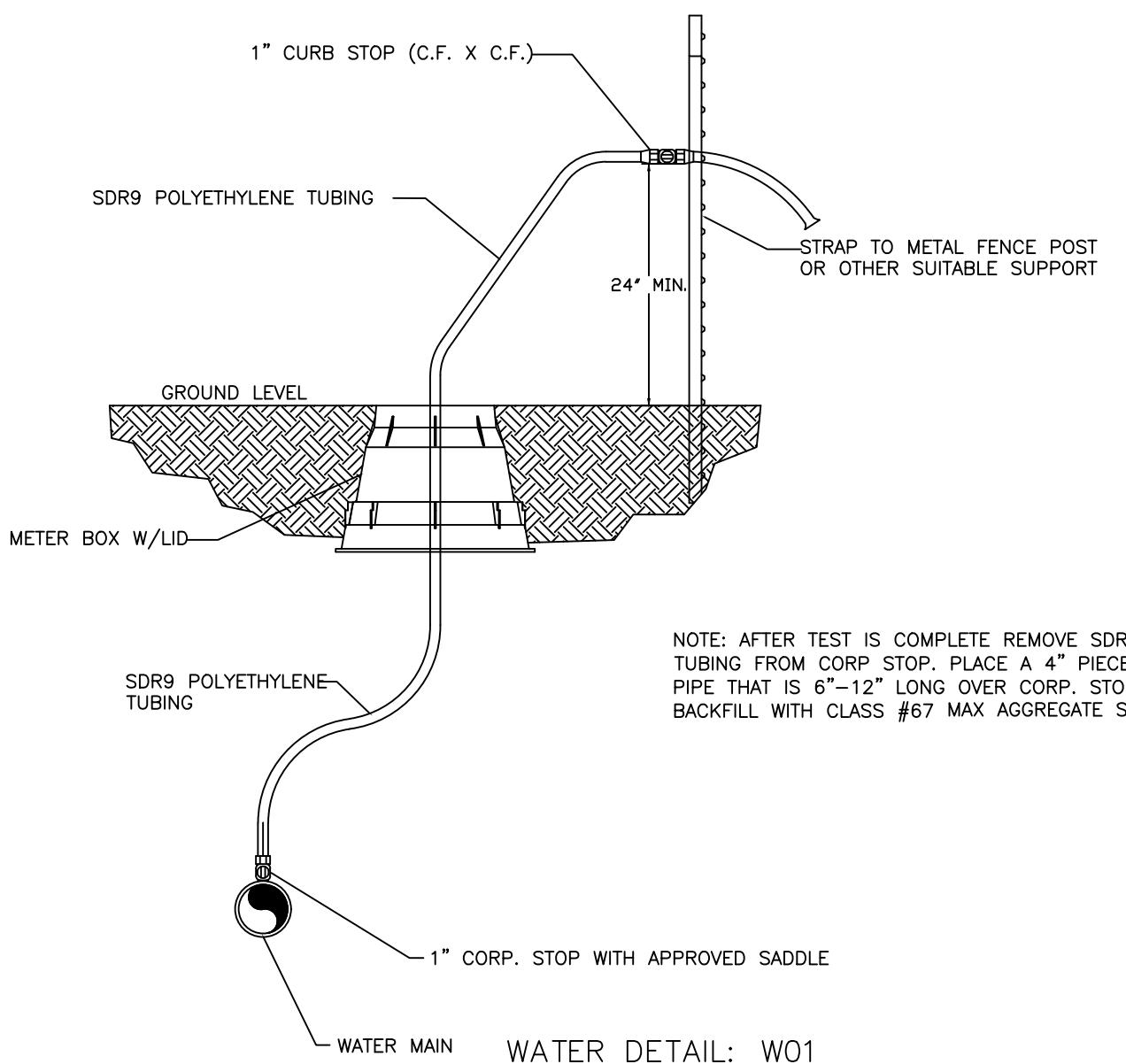
DRAWN BY: JS DATE: 08/27/2024

APPROVED BY: AW DATE: 08/27/2024

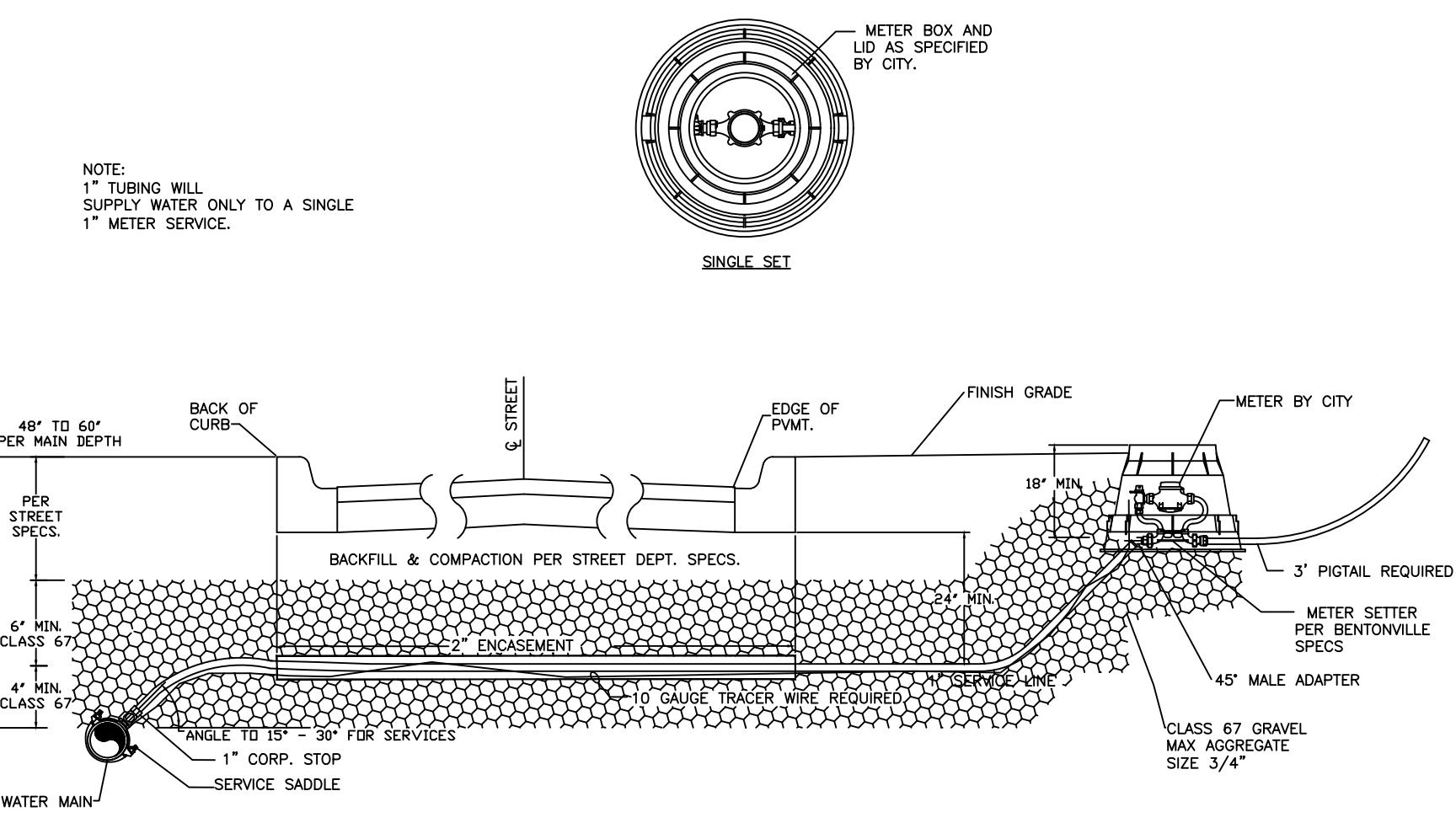
SHEET NUMBER: 1 OF 1

TEMPORARY 1" BLOW OFF ASSEMBLY

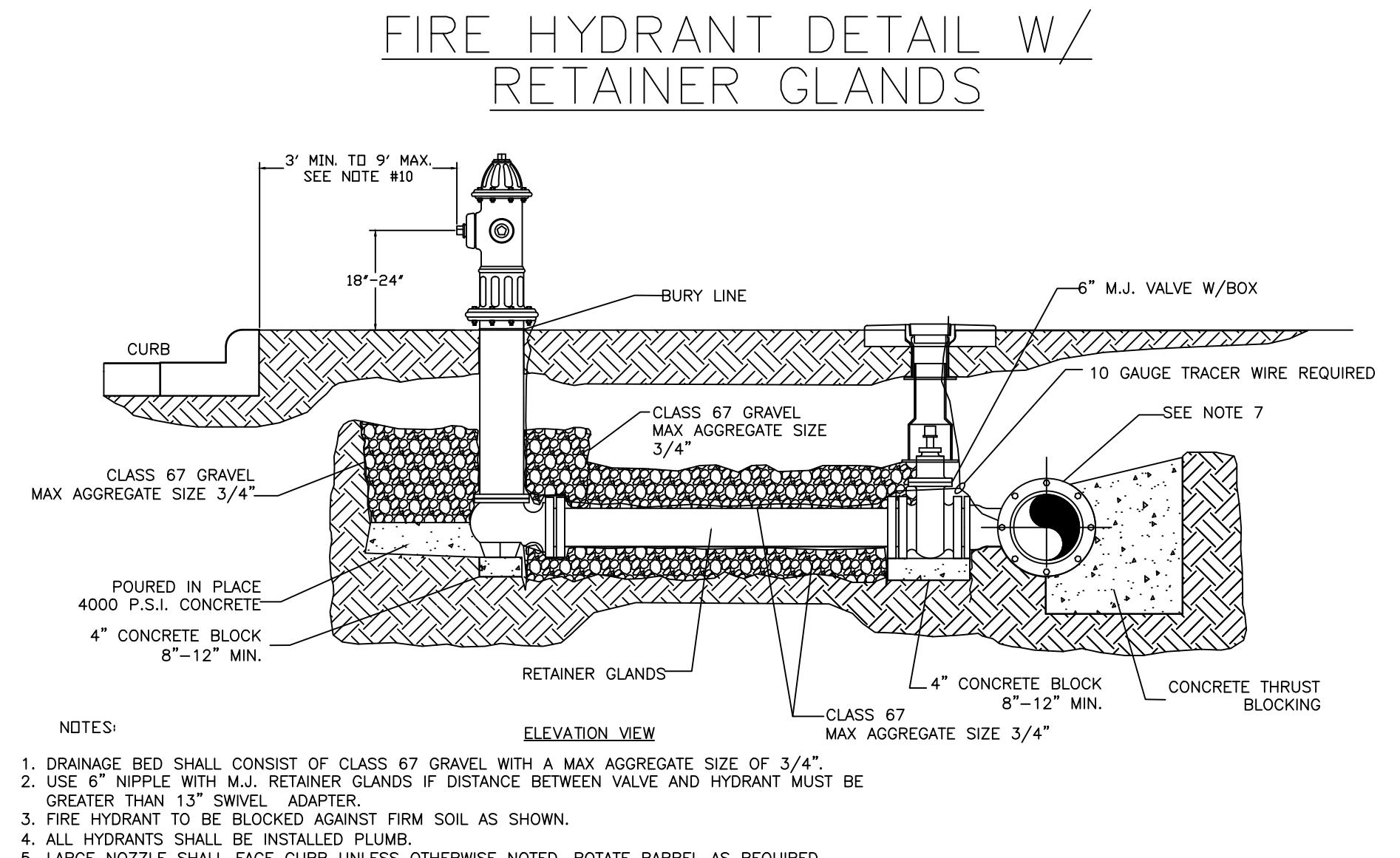
SAMPLE POINTS



WATER SERVICE DETAIL 1"

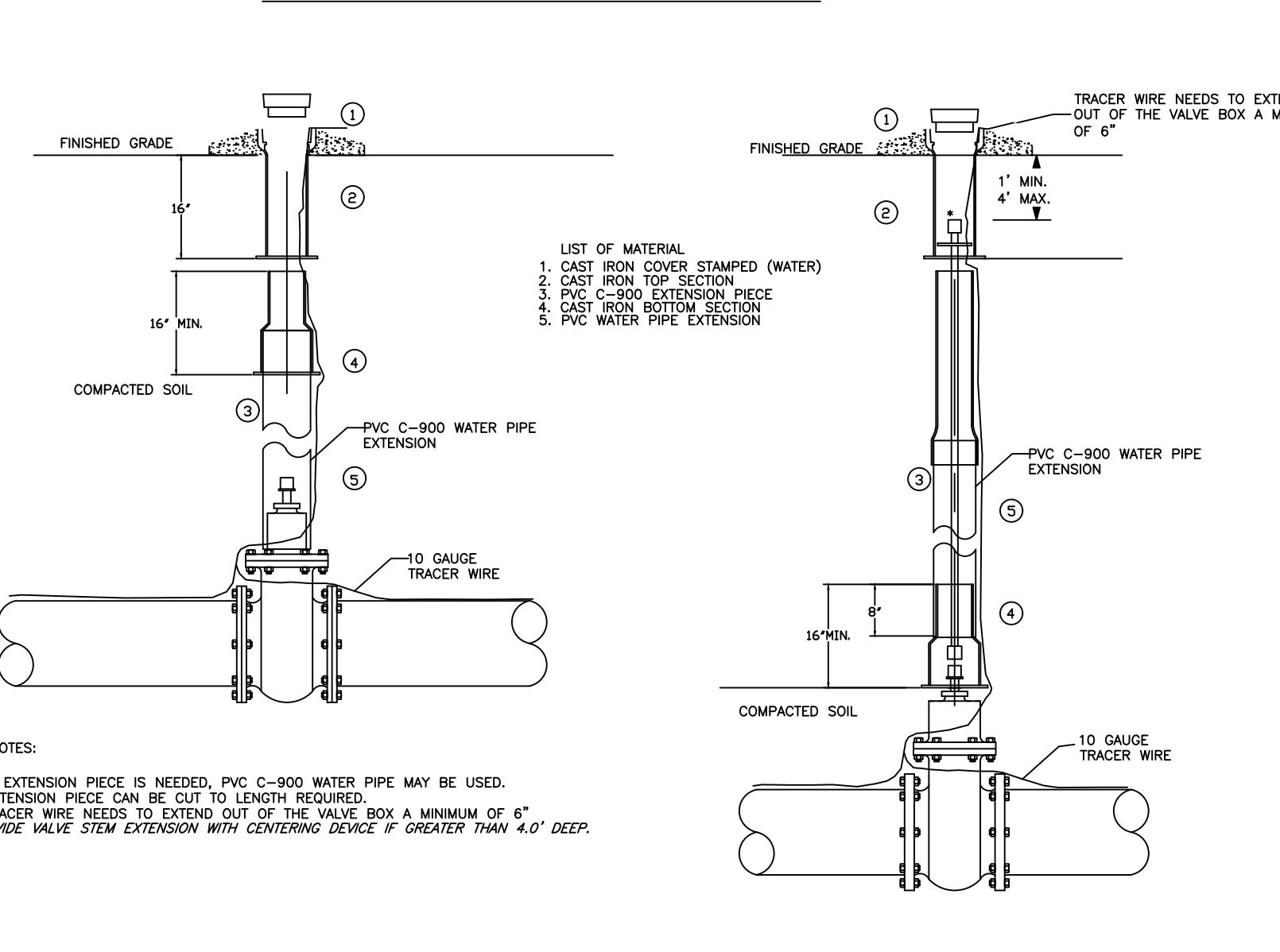


WATER DETAIL: W02



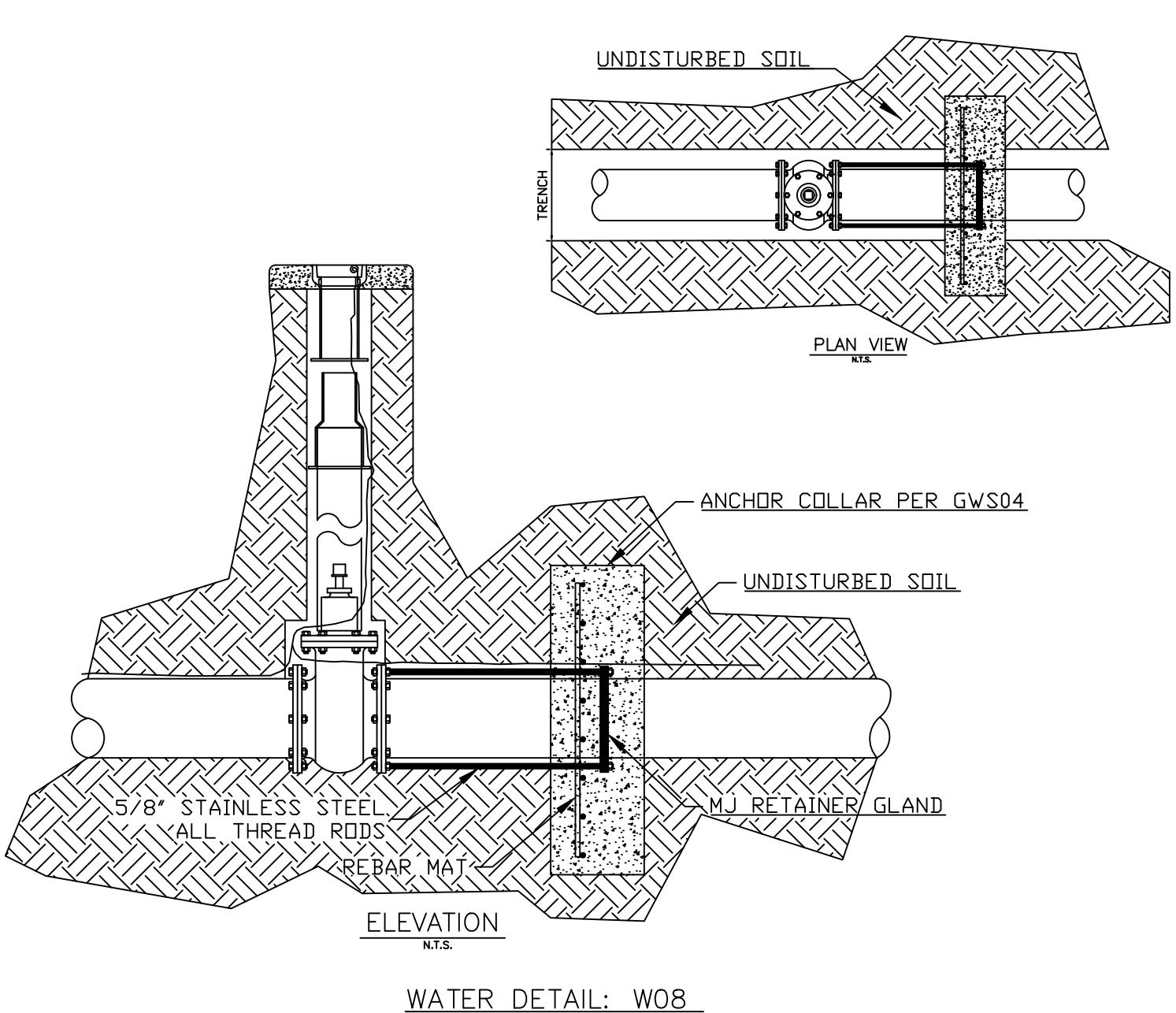
WATER DETAIL: W04

VALVE BOX VALVE STEM & TRACER WIRE INSTALLATION



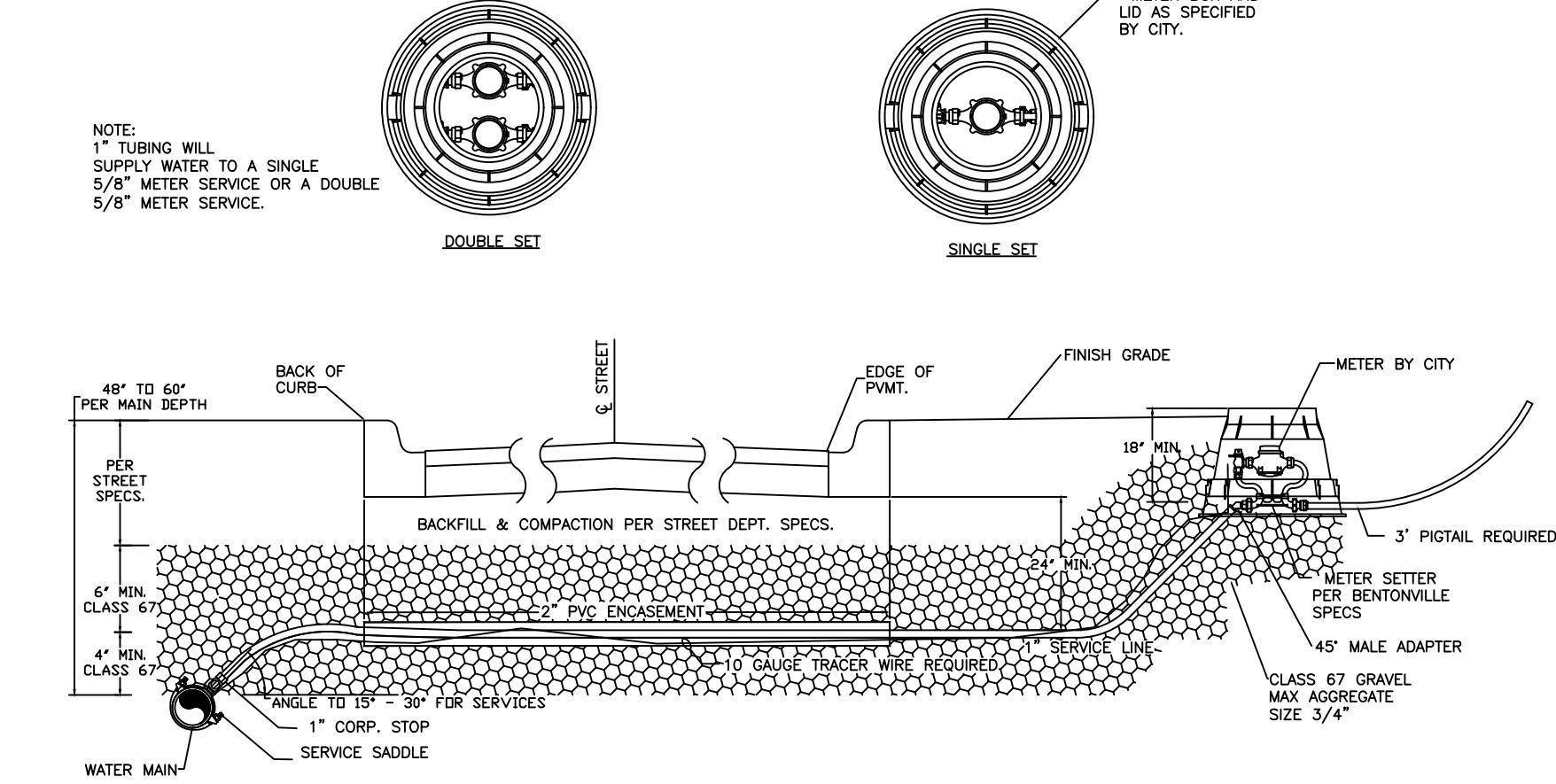
WATER DETAIL: W07

RESTRAINED GATE VALVE

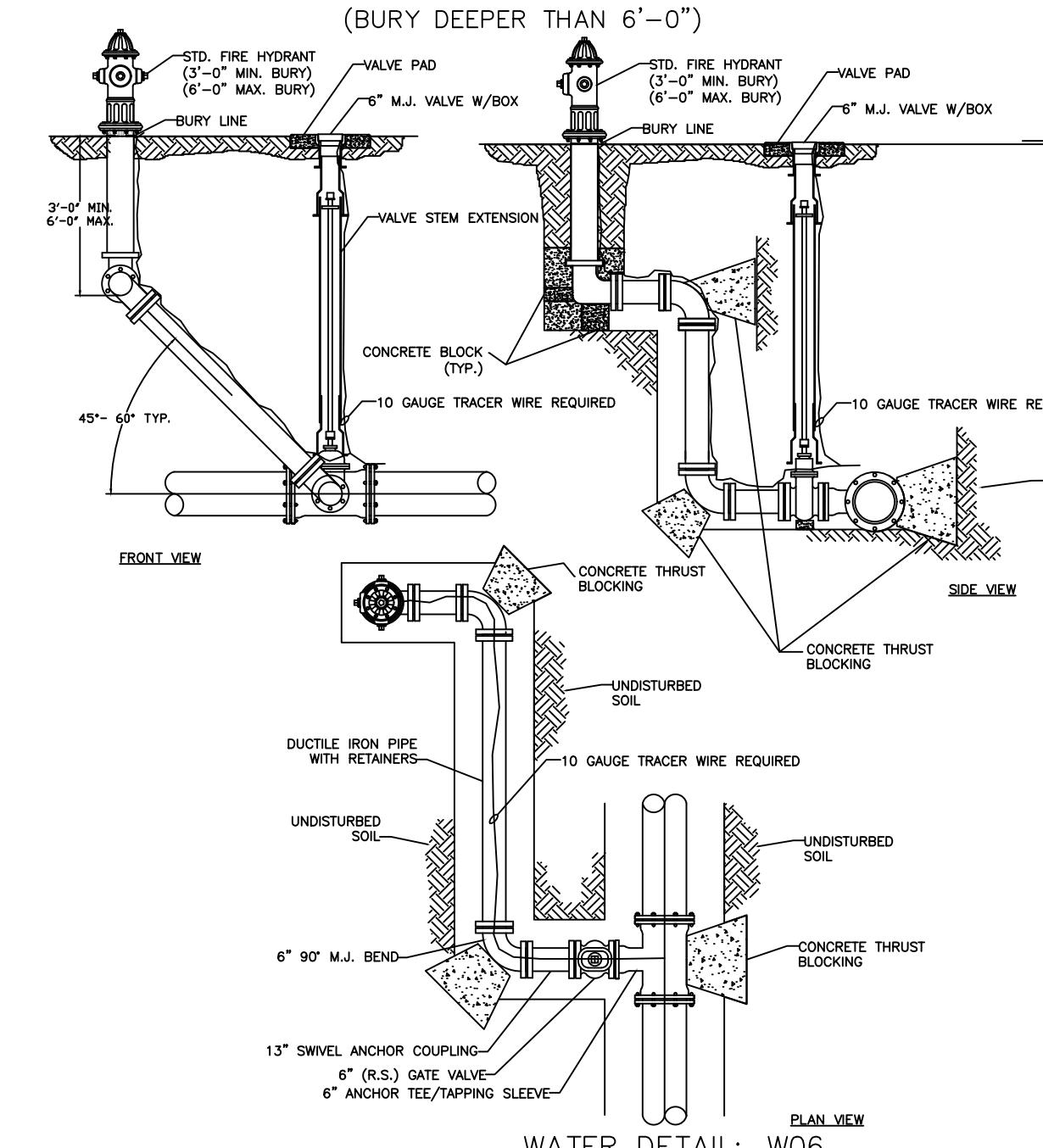


WATER DETAIL: W08

WATER SERVICE DETAIL 5/8"

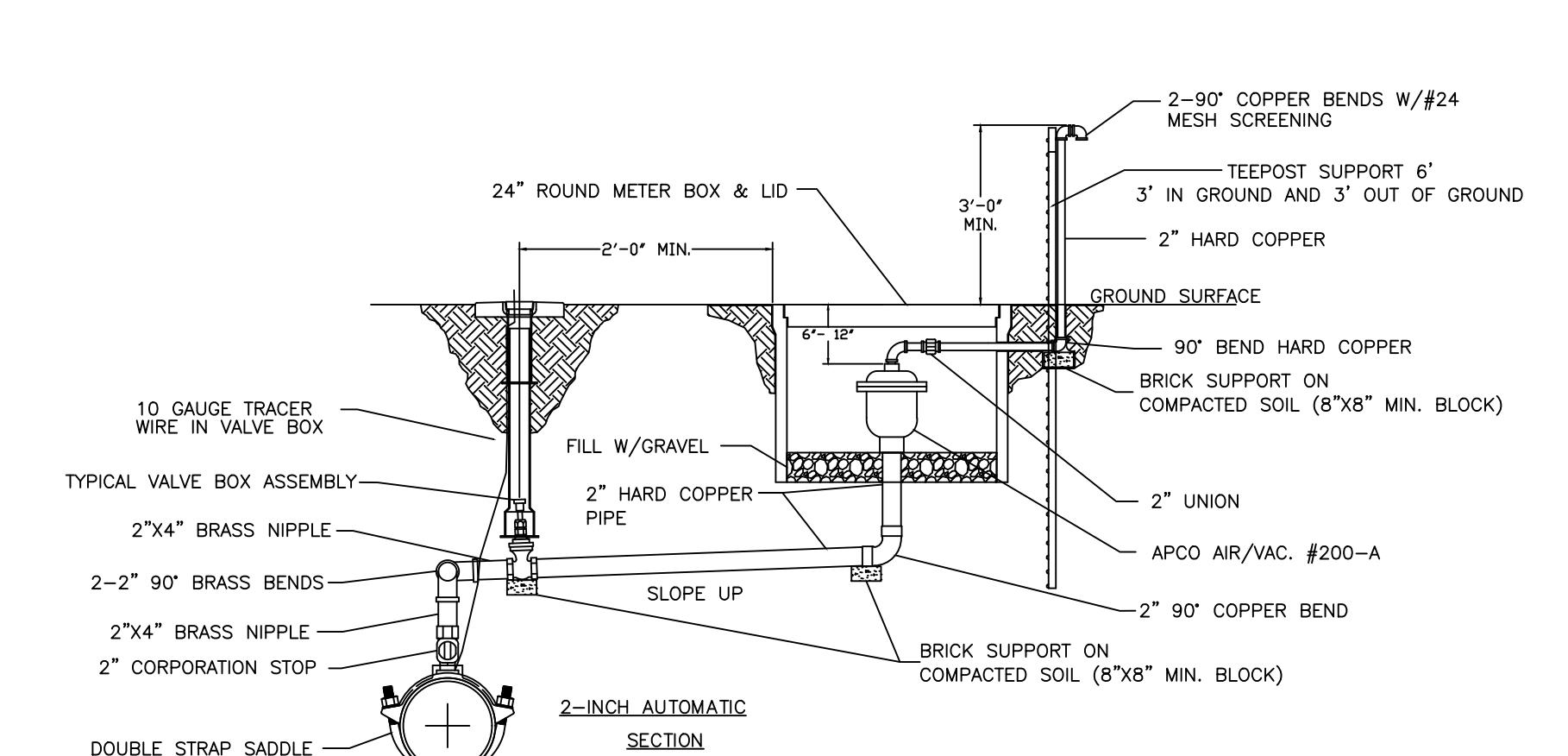


WATER DETAIL: W03



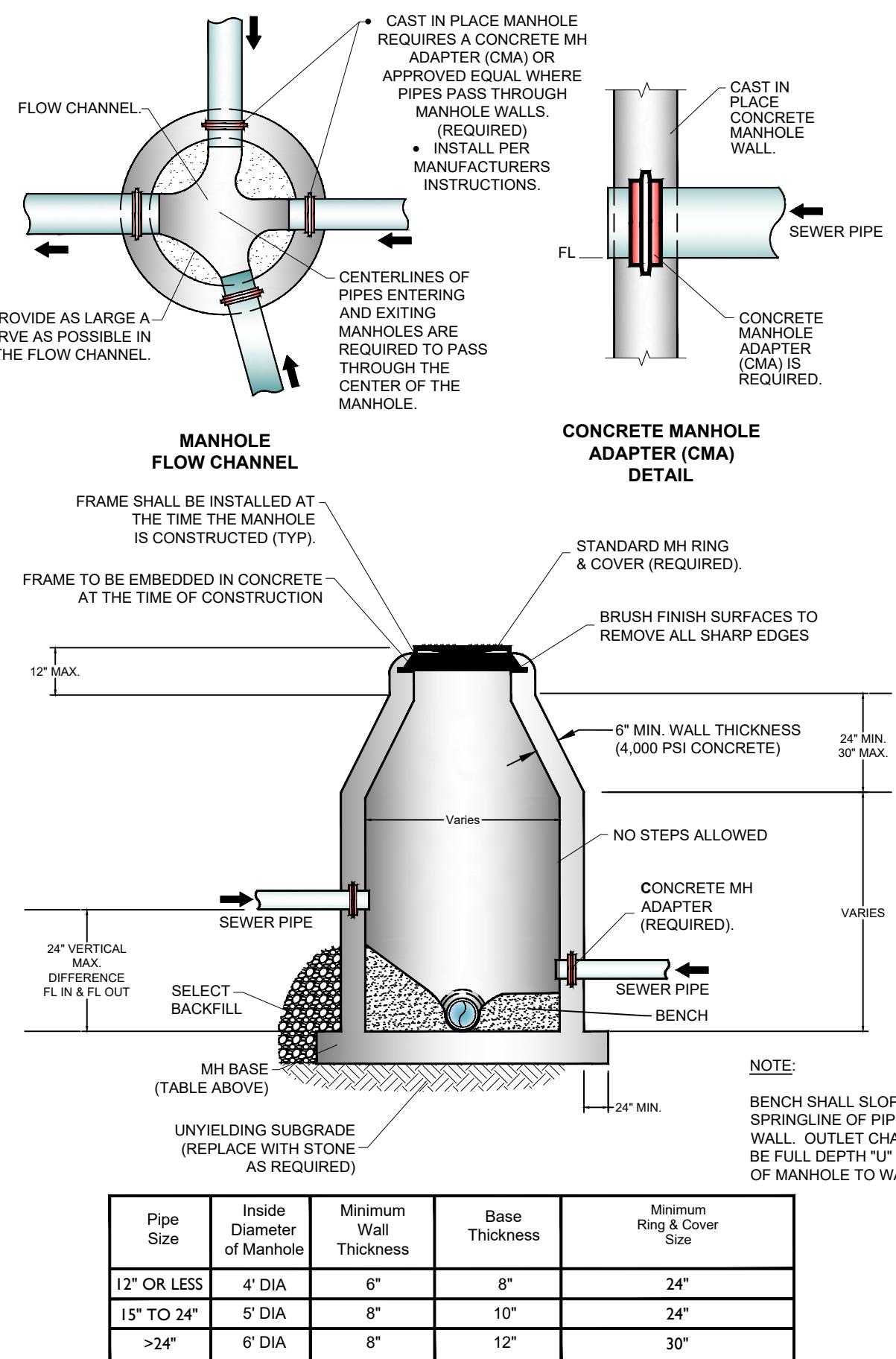
WATER DETAIL : W06

2" COMBINATION AIR/VACUUM VALVE DETAIL



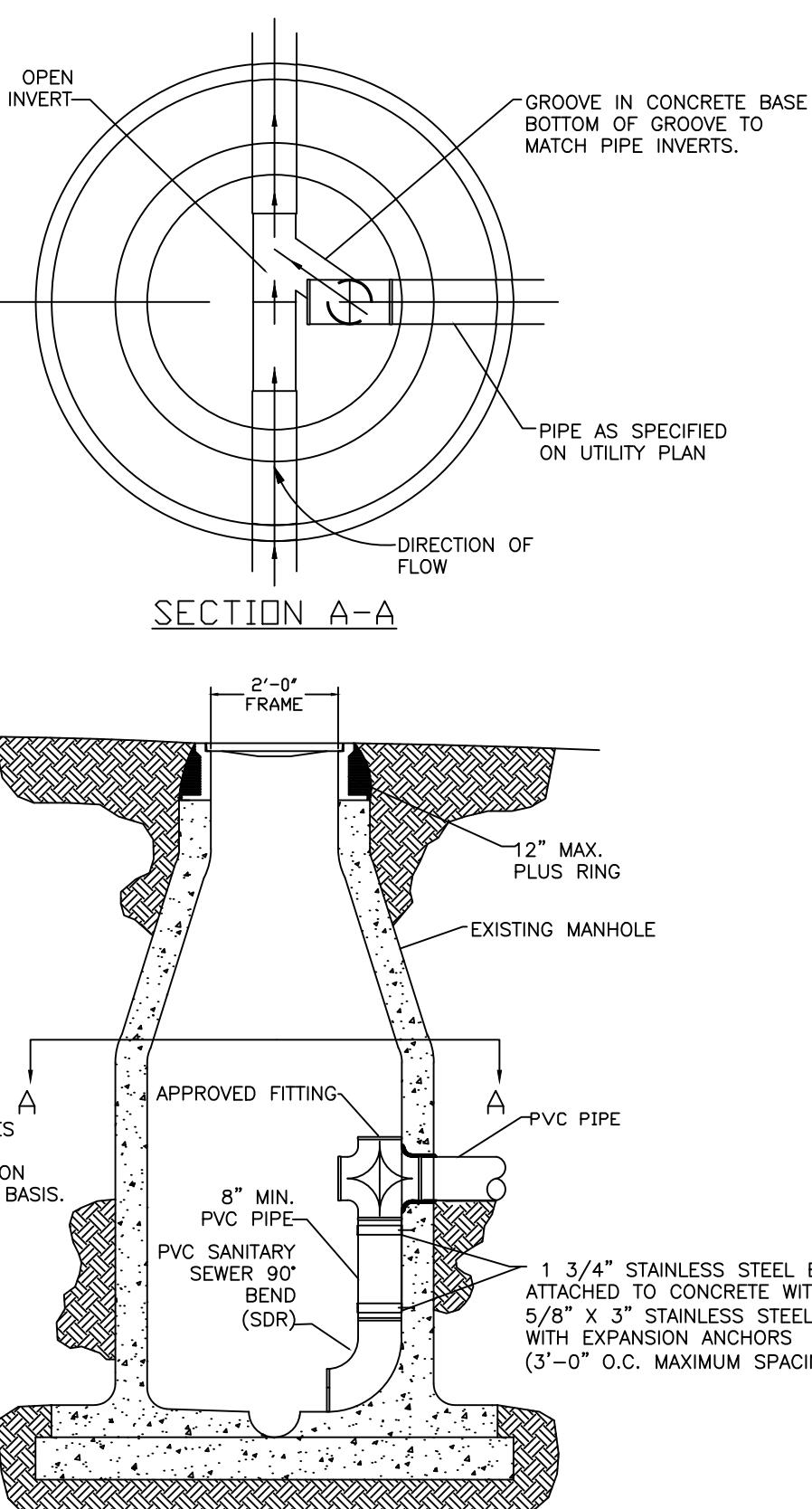
WATER DETAIL: W09

SANITARY SEWER CAST IN PLACE MANHOLE



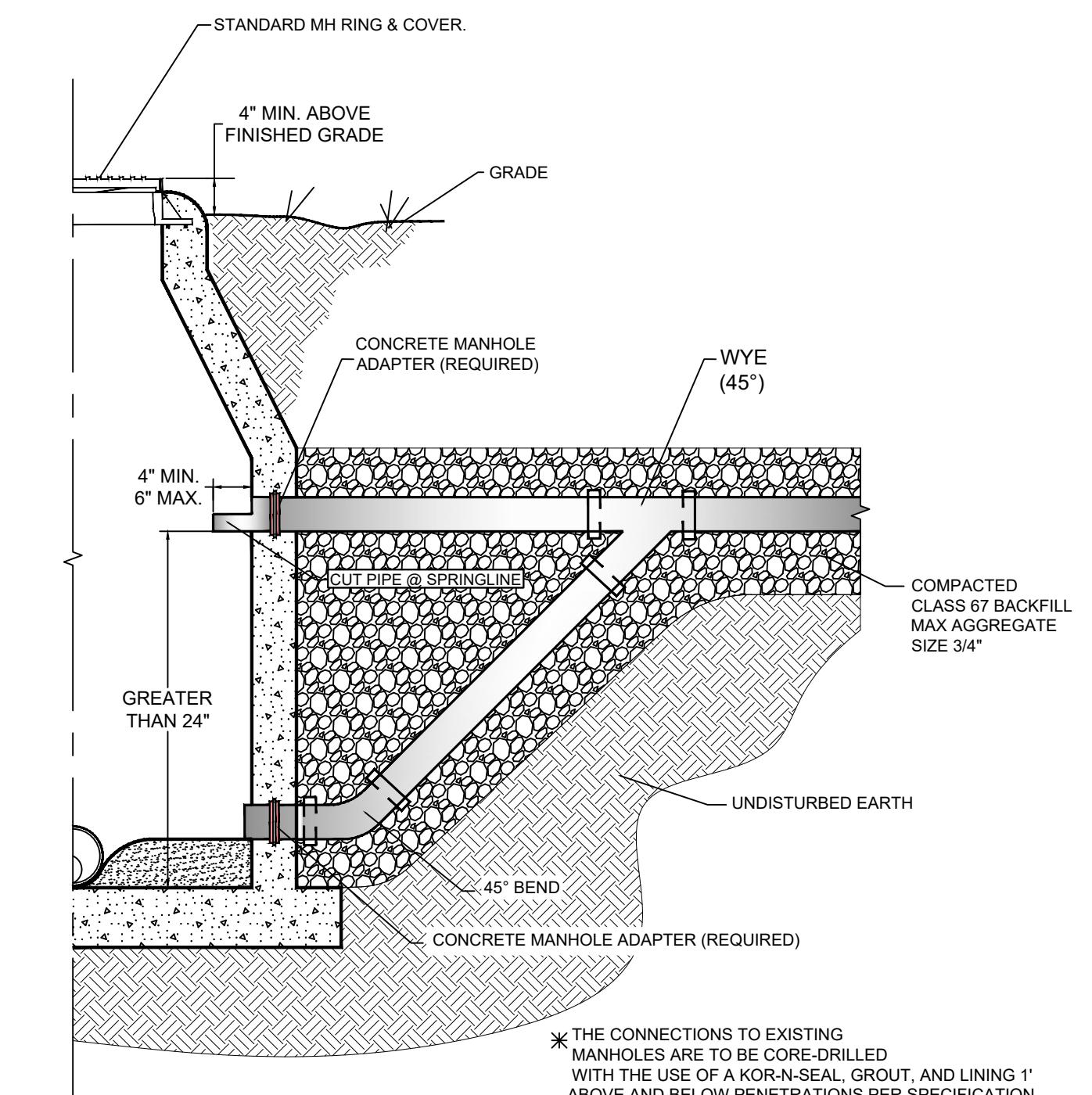
MANHOLE INFORMATION TABLE
SANITARY SEWER DETAIL: SS01

SANITARY SEWER INTERIOR DROP MANHOLE



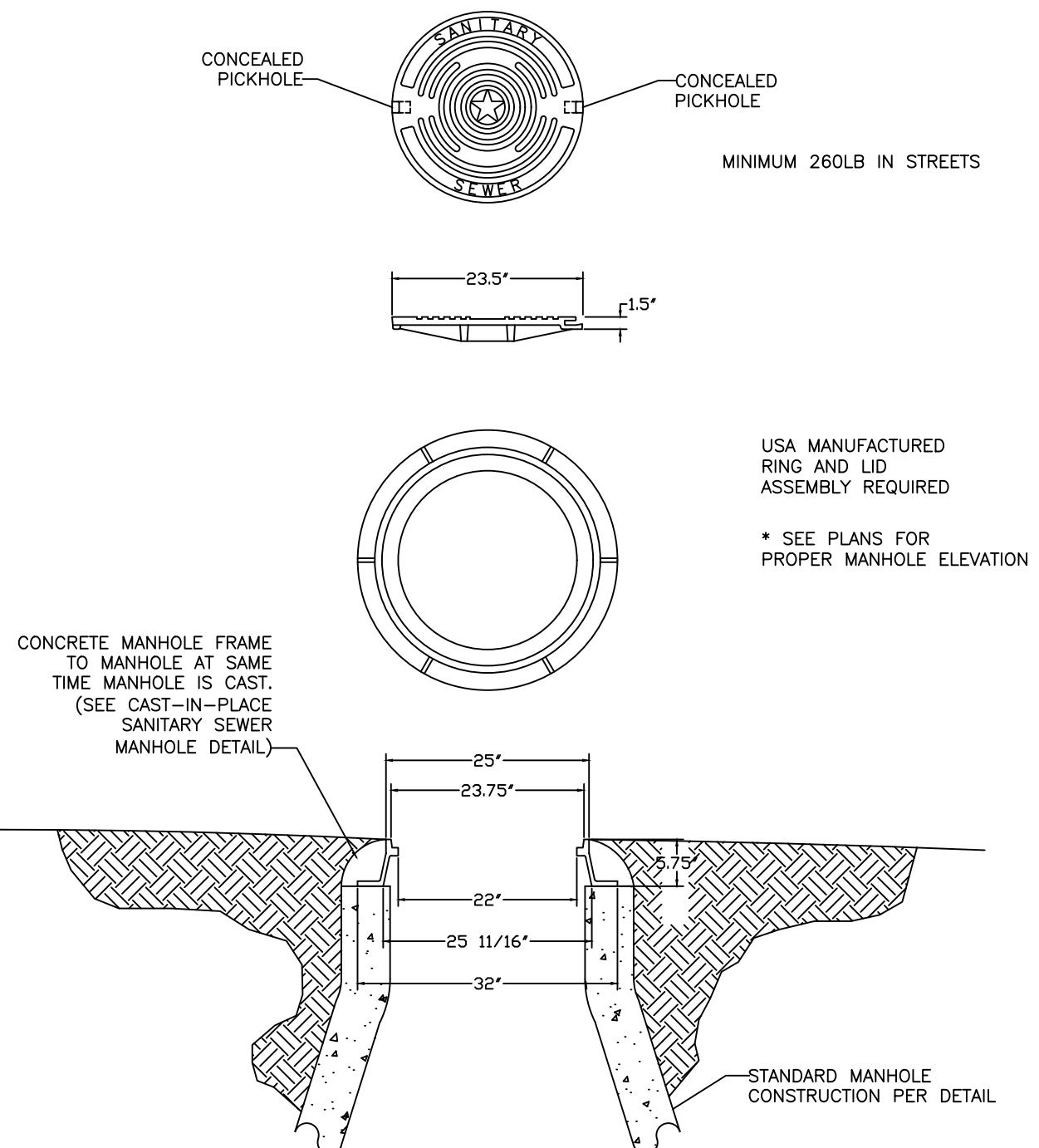
SANITARY SEWER DETAIL: SS02

SANITARY SEWER EXTERIOR DROP MANHOLE



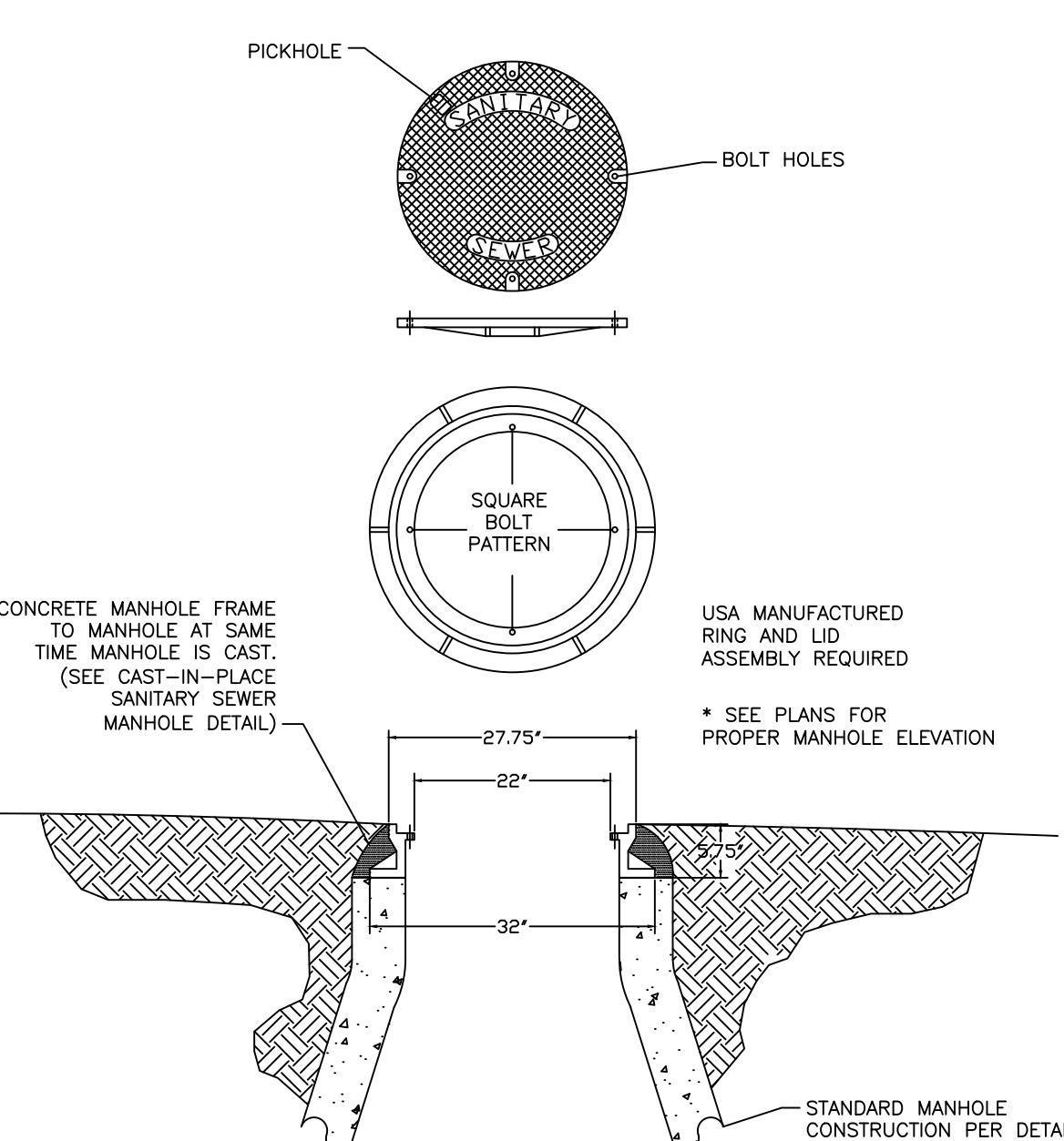
SANITARY SEWER DETAIL: SS03

HEAVY DUTY MANHOLE LID & FRAME



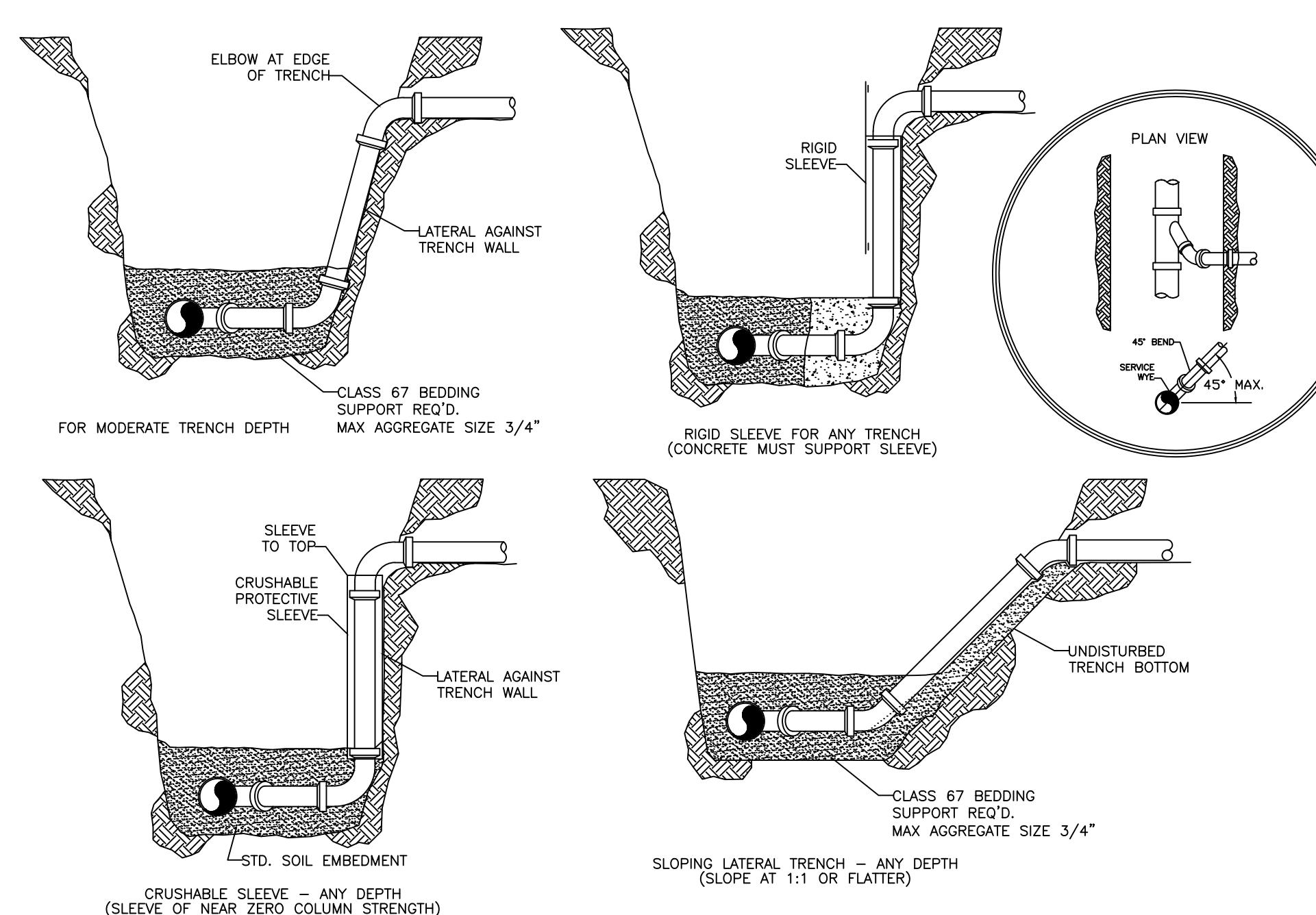
SANITARY SEWER DETAIL: SS04

WATER TIGHT BOLTED MANHOLE LID & FRAME

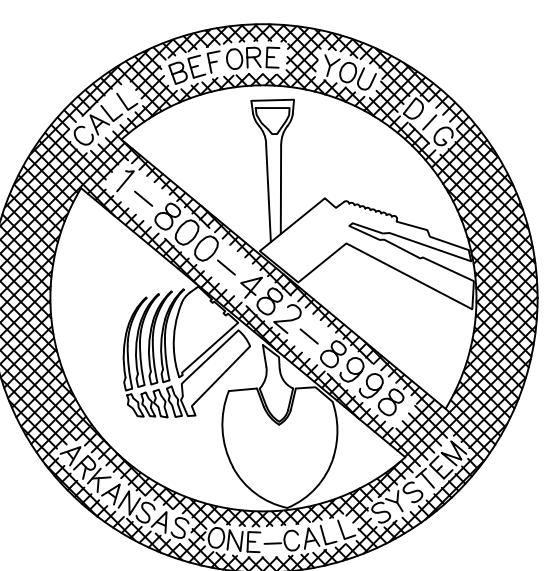


SANITARY SEWER DETAIL: SS05

SANITARY SEWER SERVICE WYF

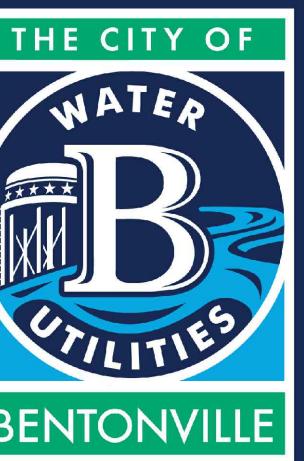


SANITARY SEWER DETAIL: SS06



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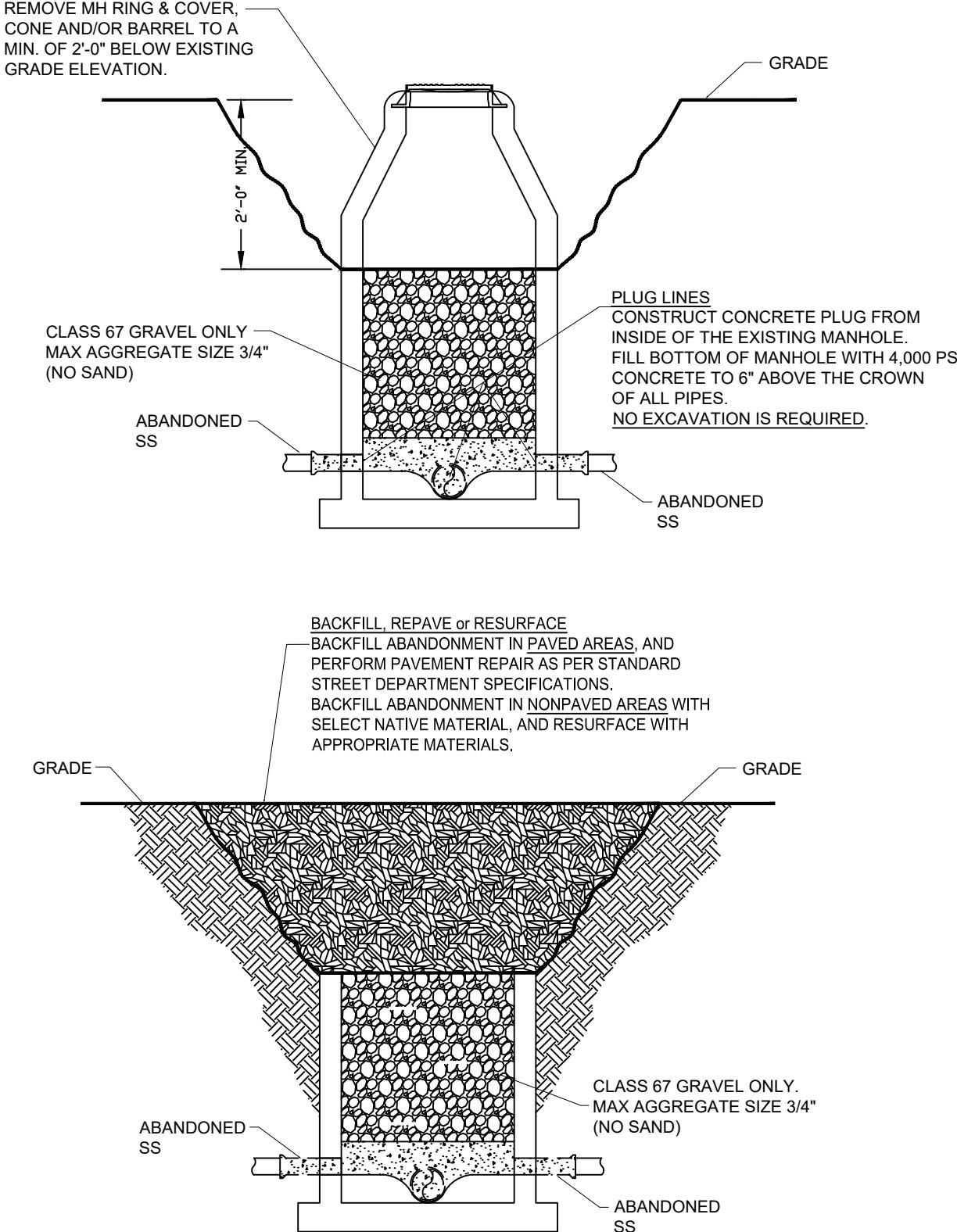
DRAWN BY:	JS	DATE:	08/27/2024
APPROVED BY:	AW	DATE:	08/27/2024
SHEET NUMBER:		1	OF 2



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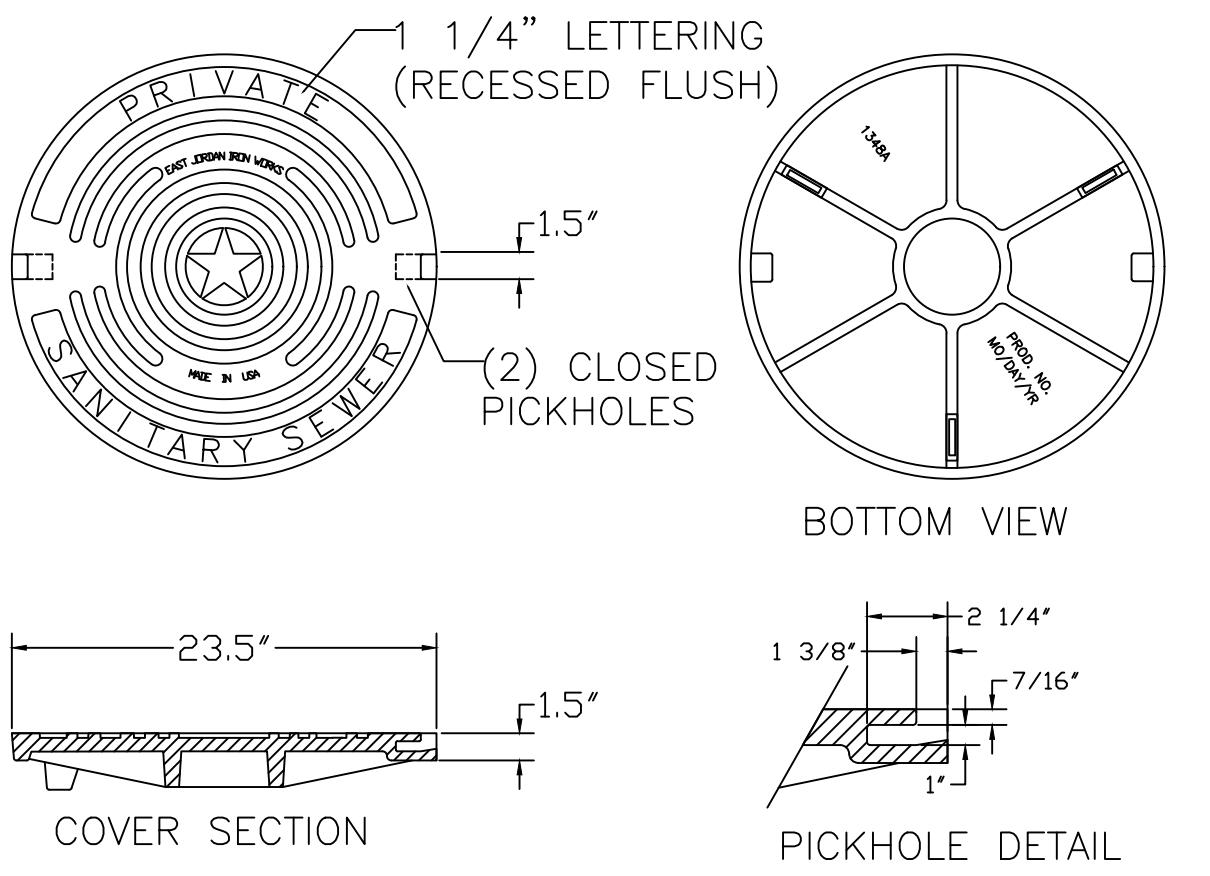
SAN.SEWER DETAILS

SANITARY SEWER MANHOLE ABANDONMENT



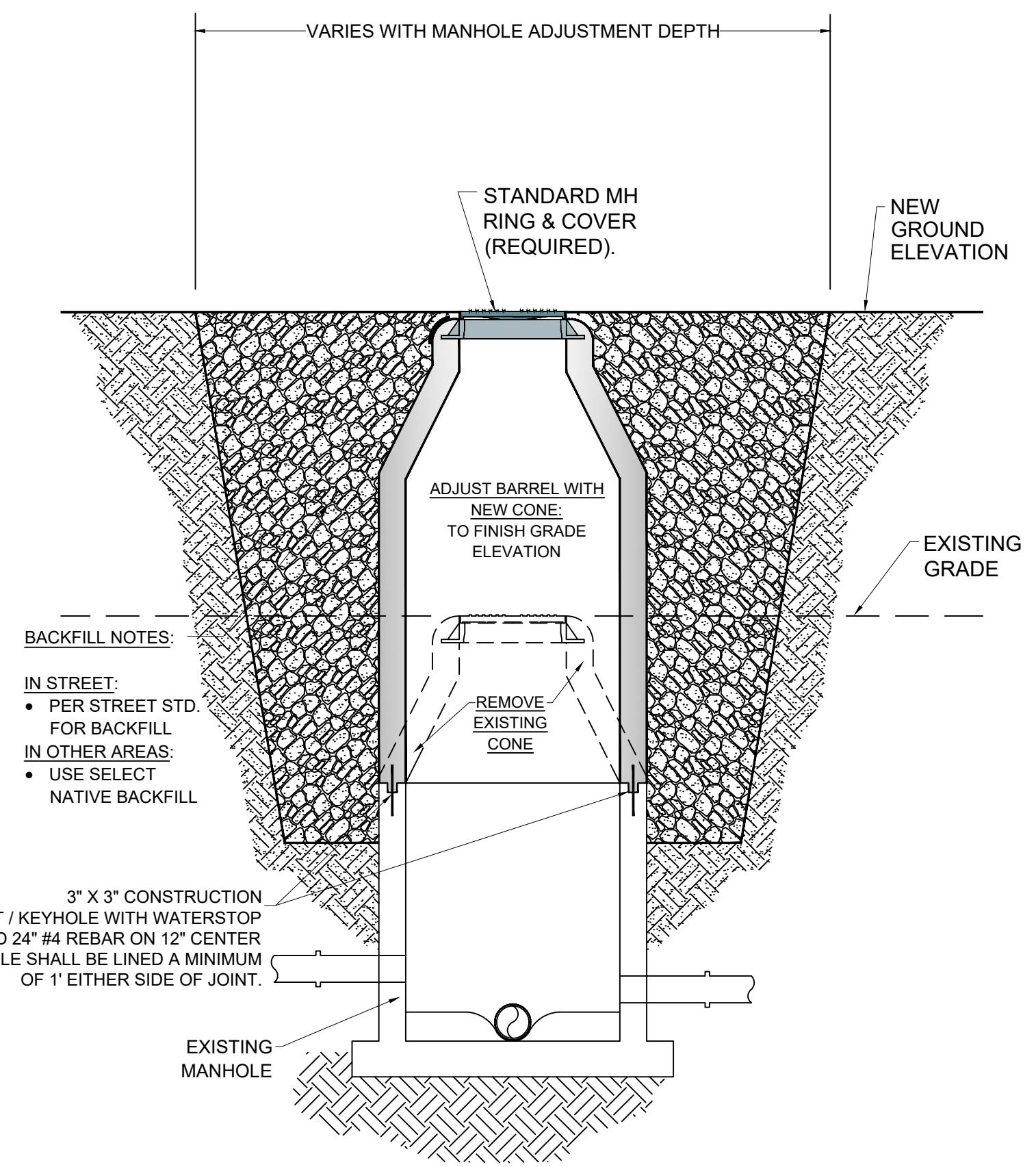
SANITARY SEWER DETAILS: SS07

PRIVATE MANHOLE RING AND LID

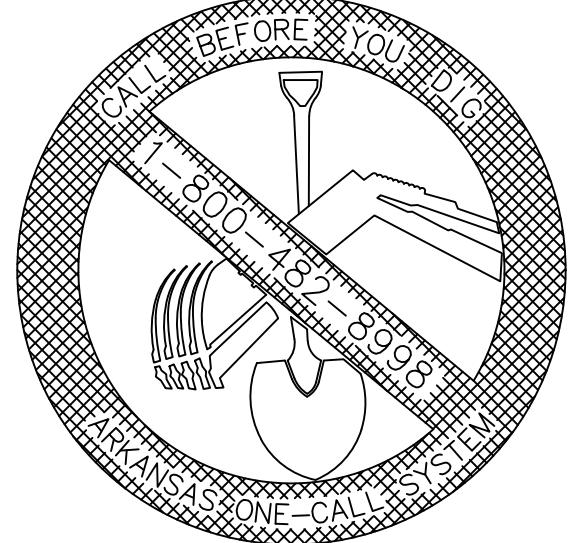


SANITARY SEWER DETAILS: SS08

TYPICAL MANHOLE ADJUST TO GRADE



SANITARY SEWER DETAILS: SS09



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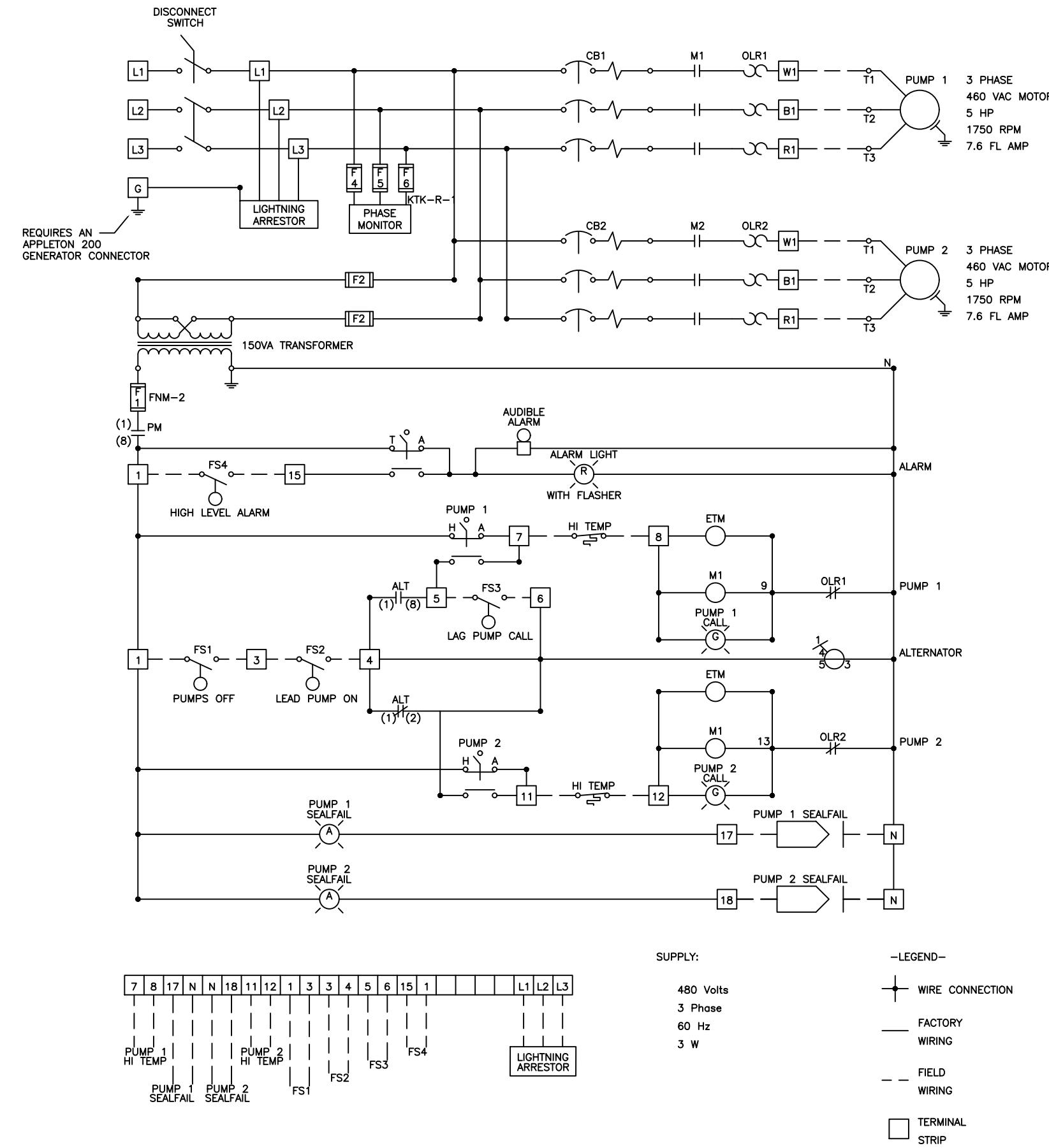
NOTES:

DRAWN BY: JS DATE: 08/27/2024
APPROVED BY: AW DATE: 08/27/2024

SHEET NUMBER: 2 OF 2

DUPLEX PUMP CONTROL PANEL

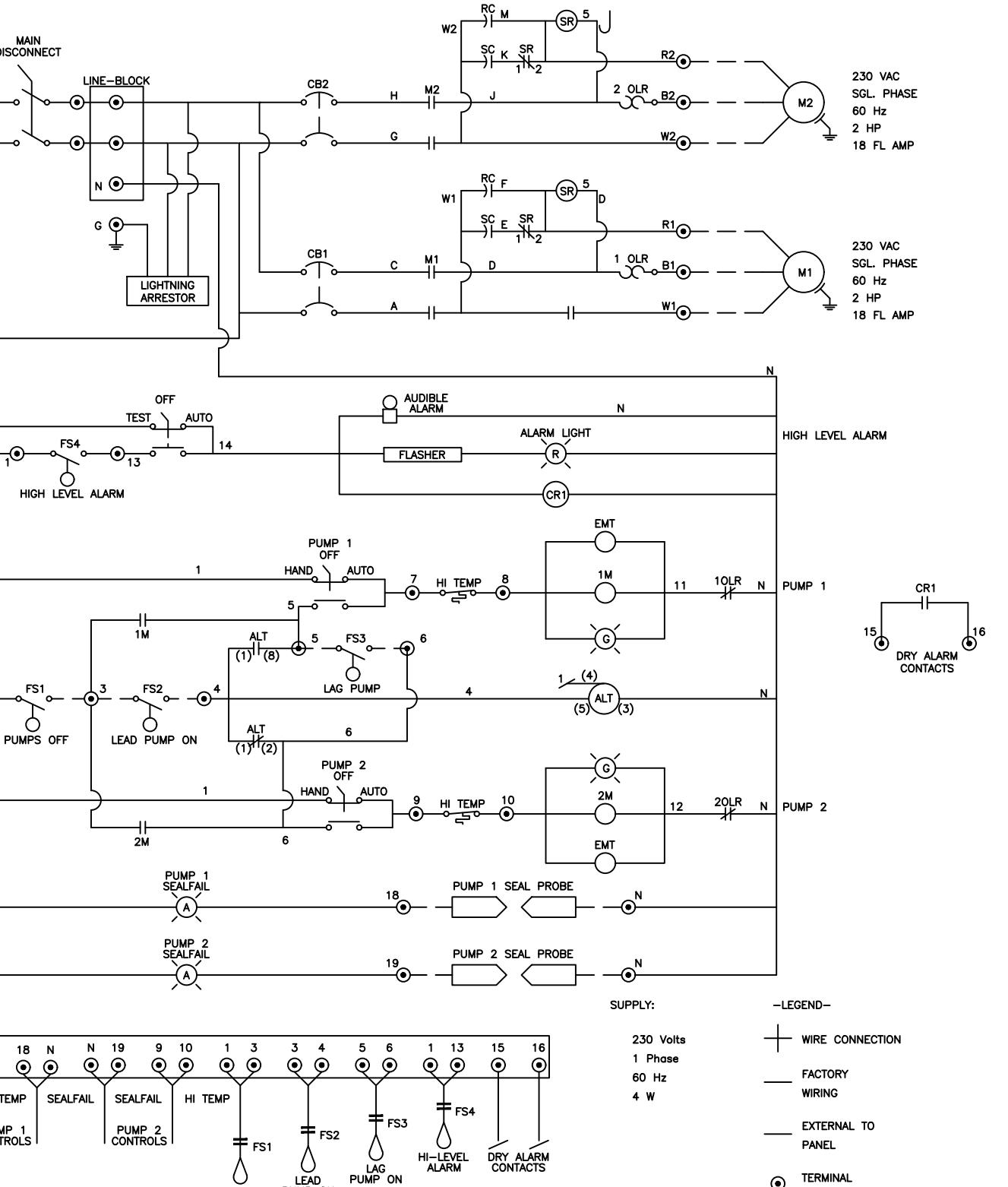
480 V / 3 PHASE



LIFT STATION DETAILS: LS01

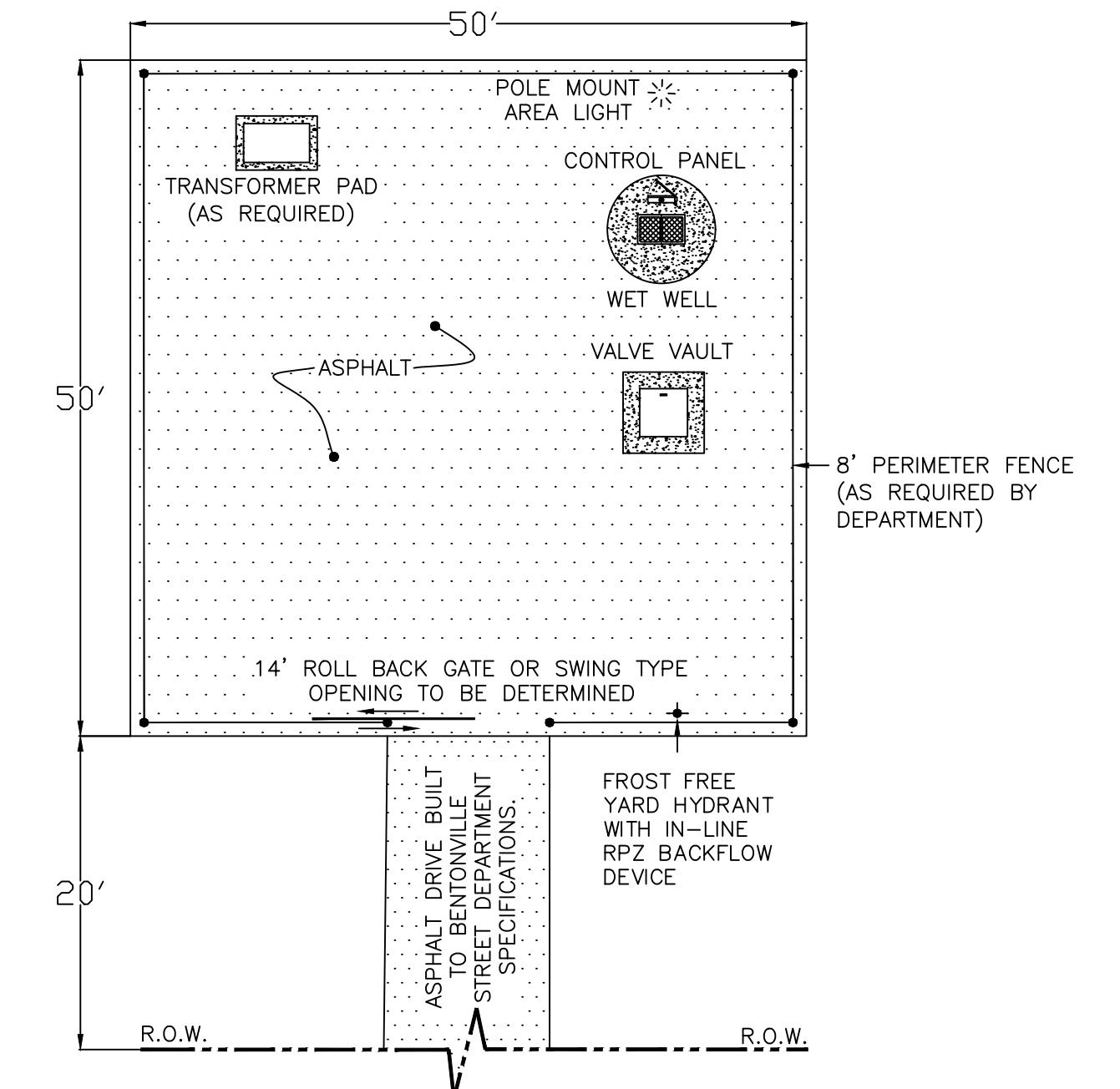
DUPLEX PUMP CONTROL PANEL

230 V / SINGLE PHASE



LIFT STATION DETAILS: LS02

LIFT STATION SITE DETAIL

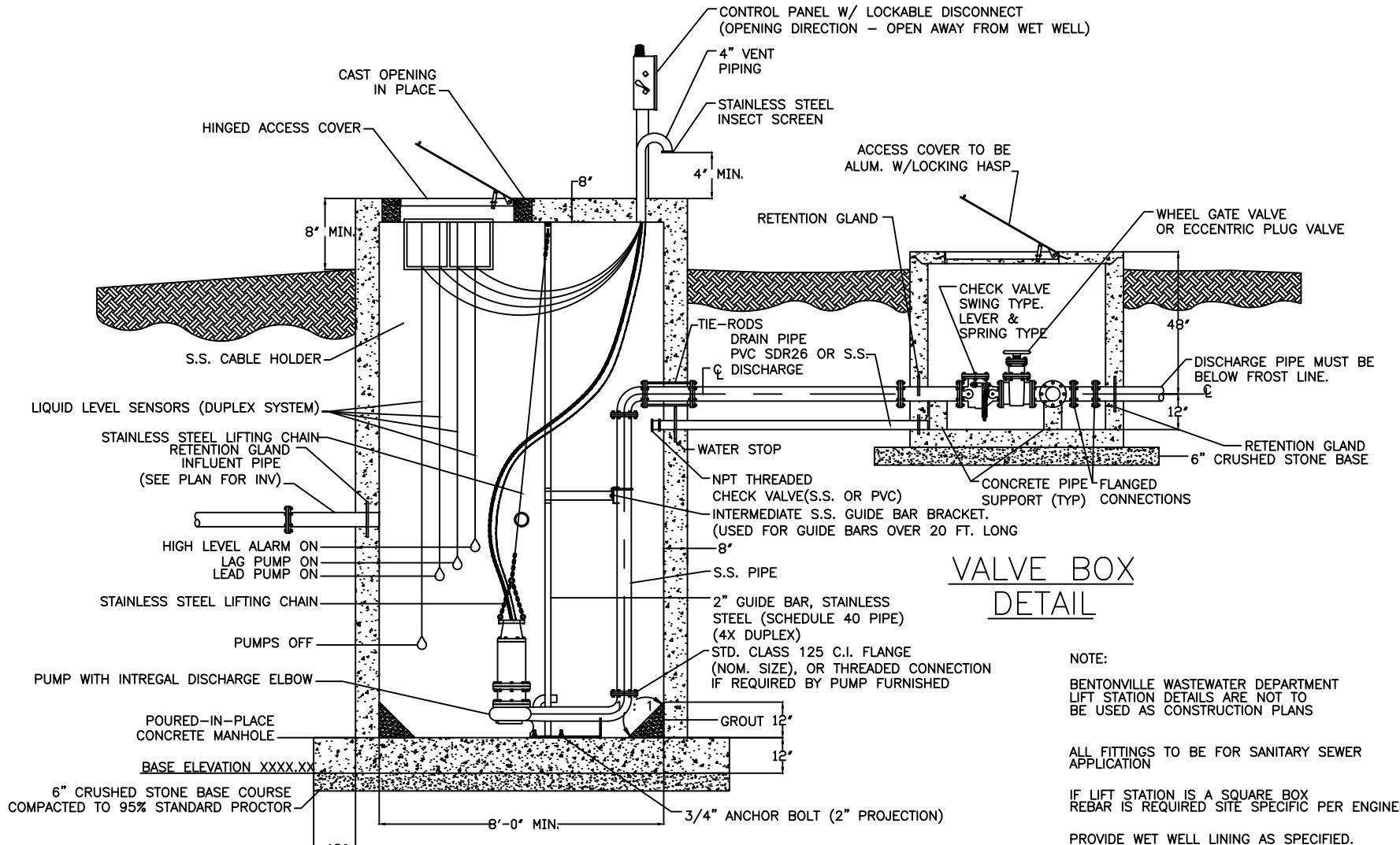


*ACTUAL SITE LAYOUT MAY VARY

BENTONVILLE WASTEWATER DEPARTMENT
LIFT STATION DETAILS ARE NOT TO
BE USED AS CONSTRUCTION PLANS

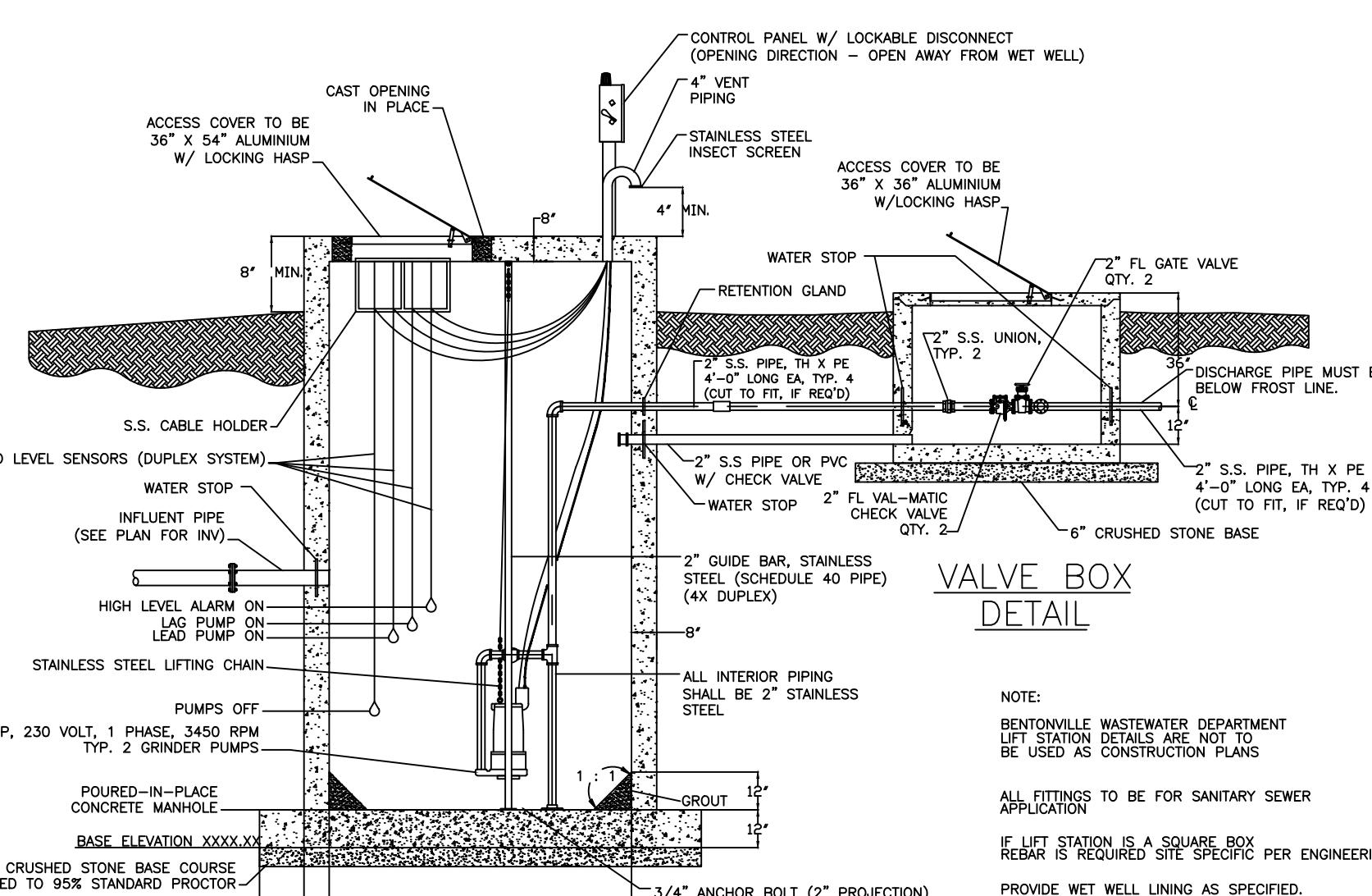
LIFT STATION DETAILS: LS03

LIFT STATION DETAIL NON-CLOG PUMPS 5 HP AND UP



LIFT STATION DETAILS: LS04

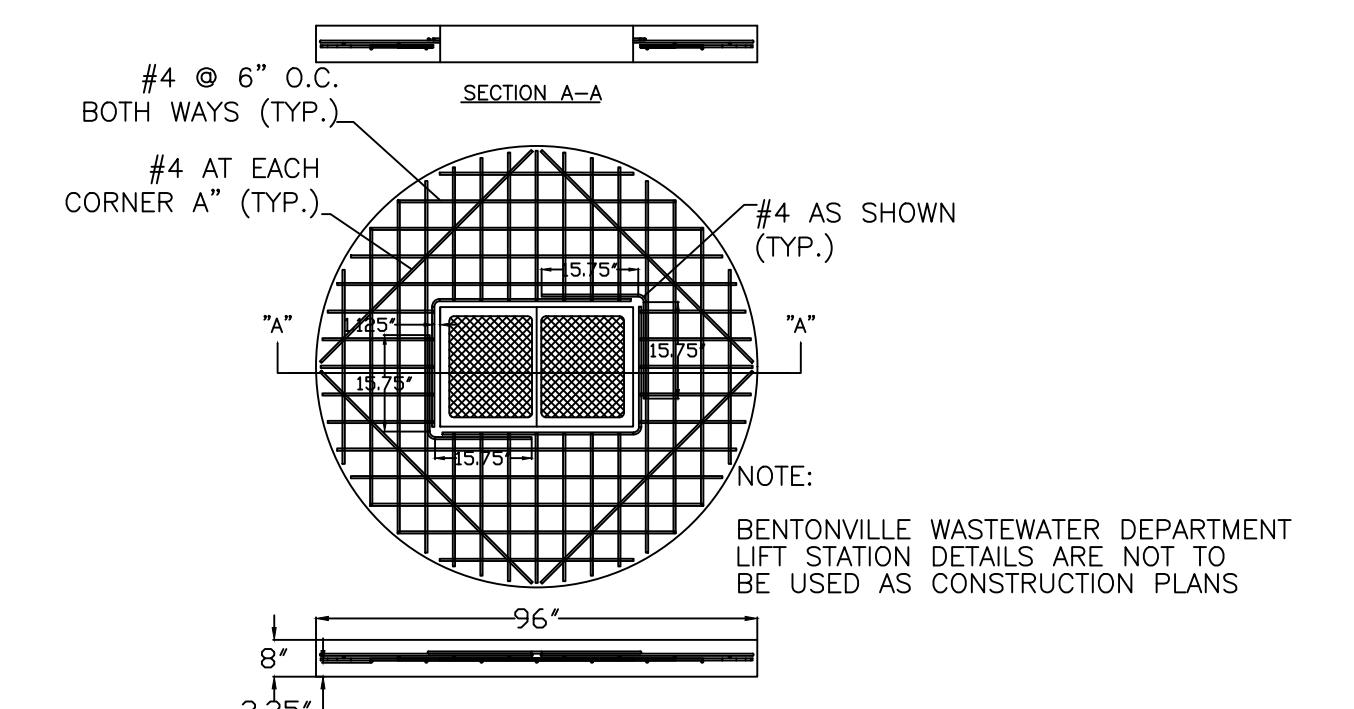
LIFT STATION DETAIL GRINDER PUMPS 5 HP AND LESS



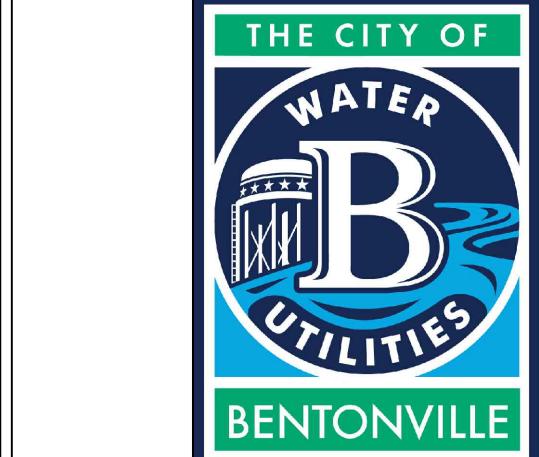
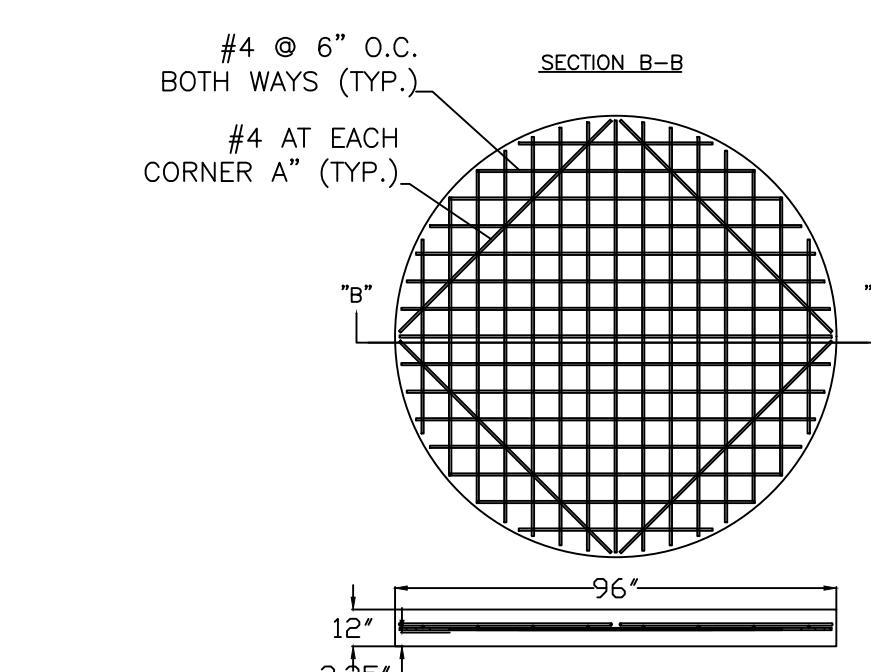
LIFT STATION DETAILS: LS05

WET WELL AND VALVE VAULT

TOP SLAB REINFORCEMENT DETAIL

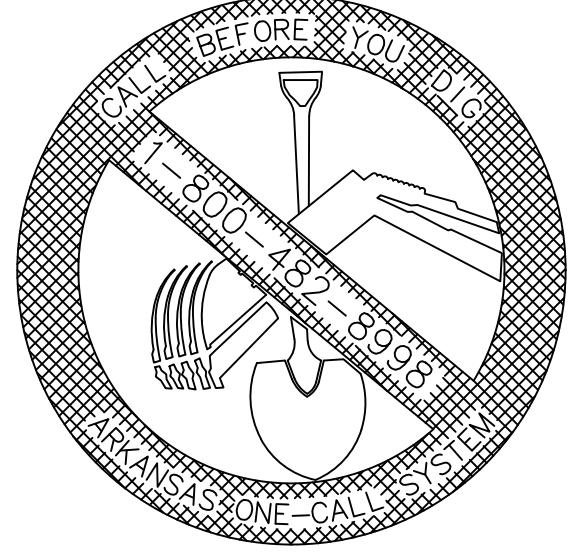


BOTTOM SLAB REINFORCEMENT DETAIL



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LIFT STATION DETAILS



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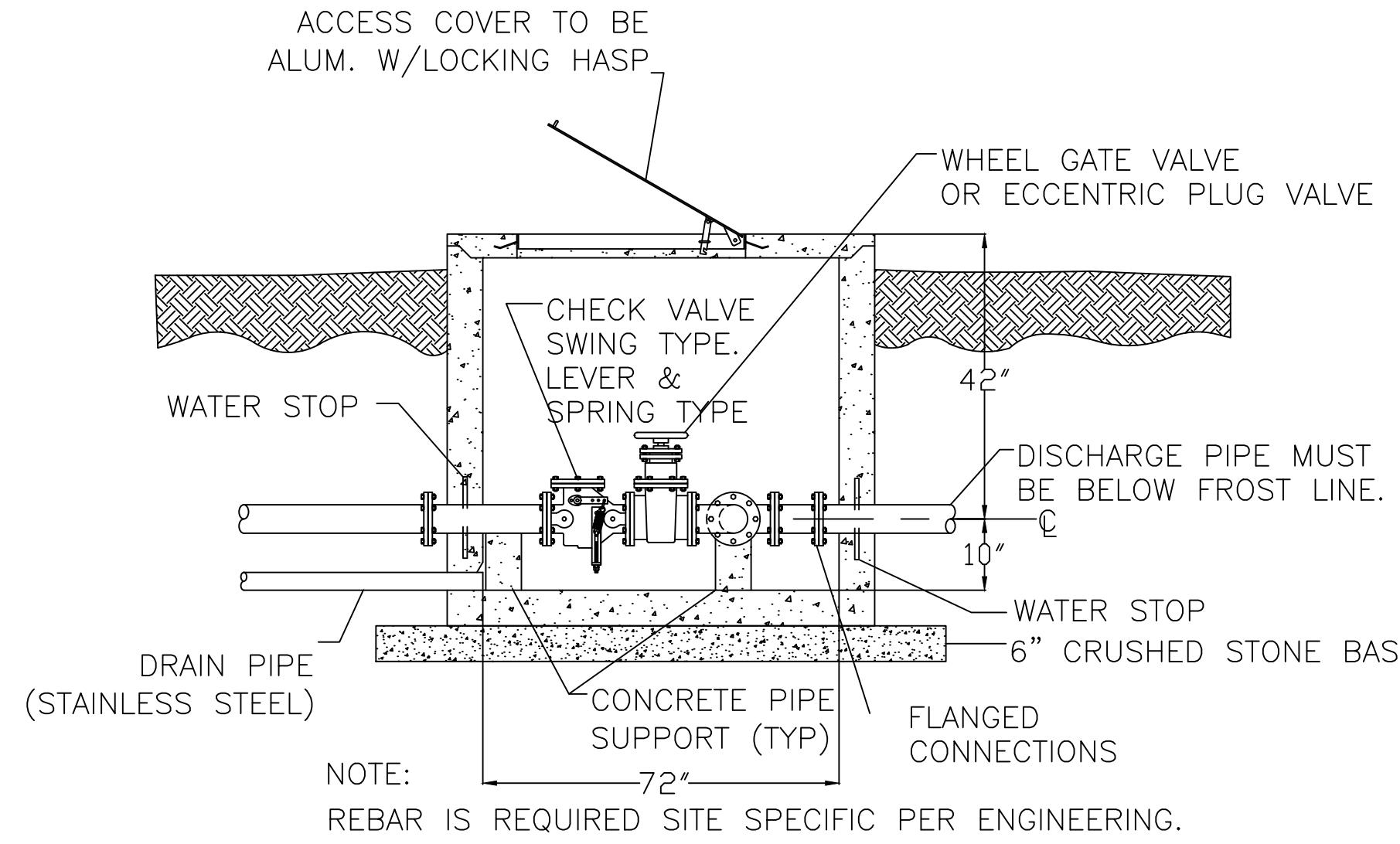
NOTES:

DRAWN BY: JS DATE: 08/27/2024
APPROVED BY: AW DATE: 08/27/2024

SHEET NUMBER: 1 OF 2

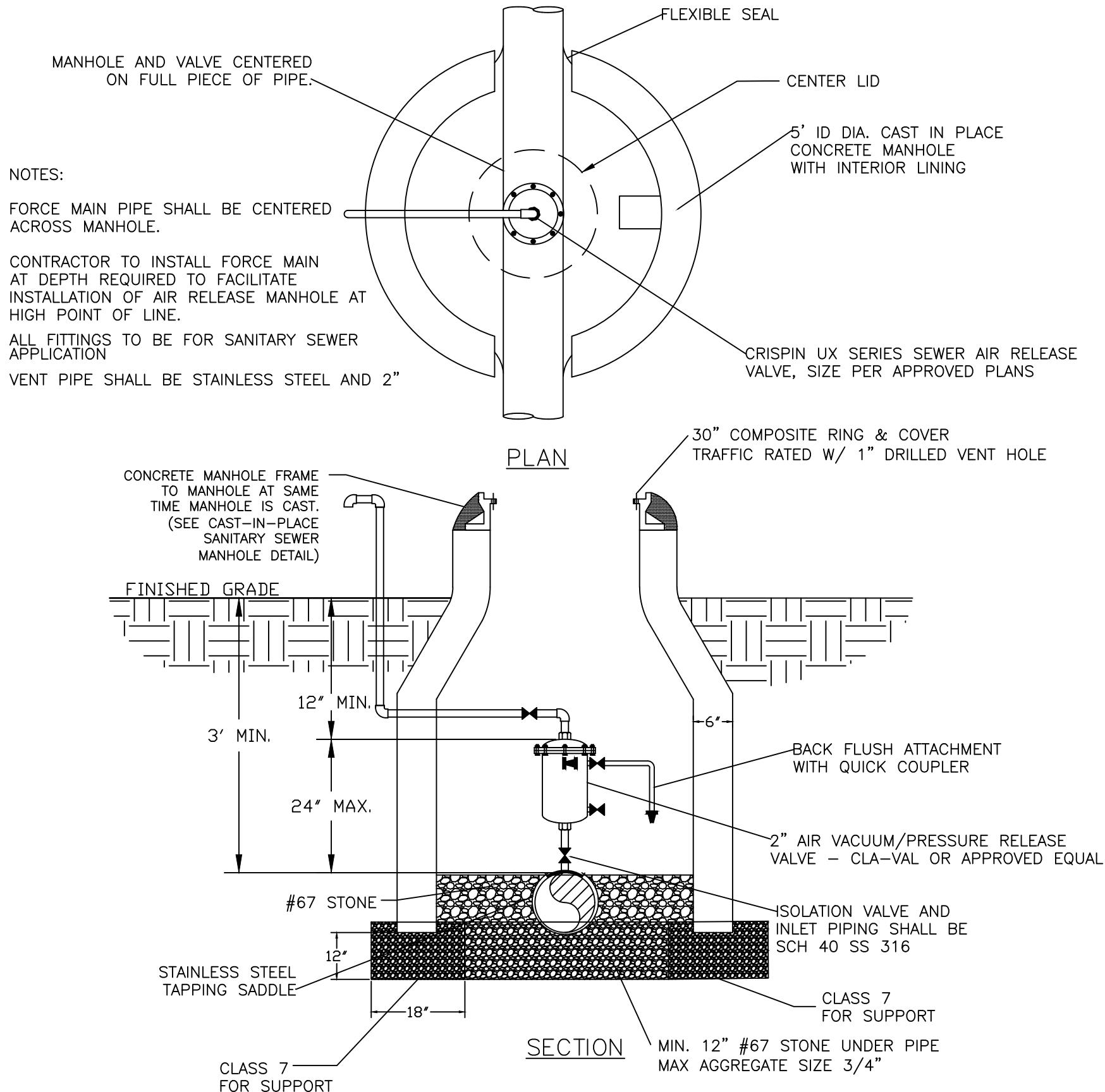
LIFT STATION DETAILS: LS06

LIFT STATION VALVE VAULT DETAIL



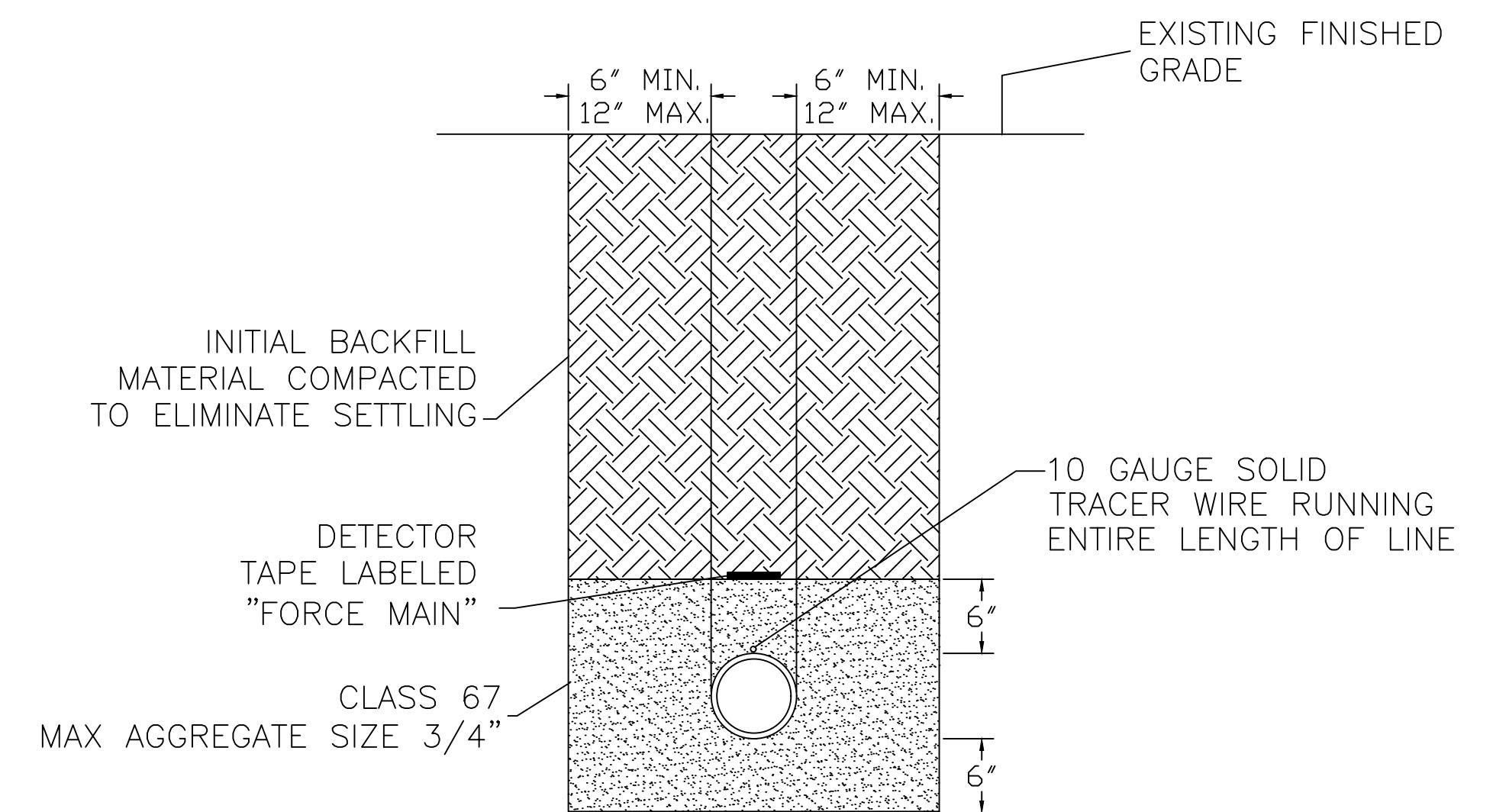
LIFT STATION DETAILS: LS07

AIR VACUUM/RELEASE MANHOLE FOR FORCE MAIN



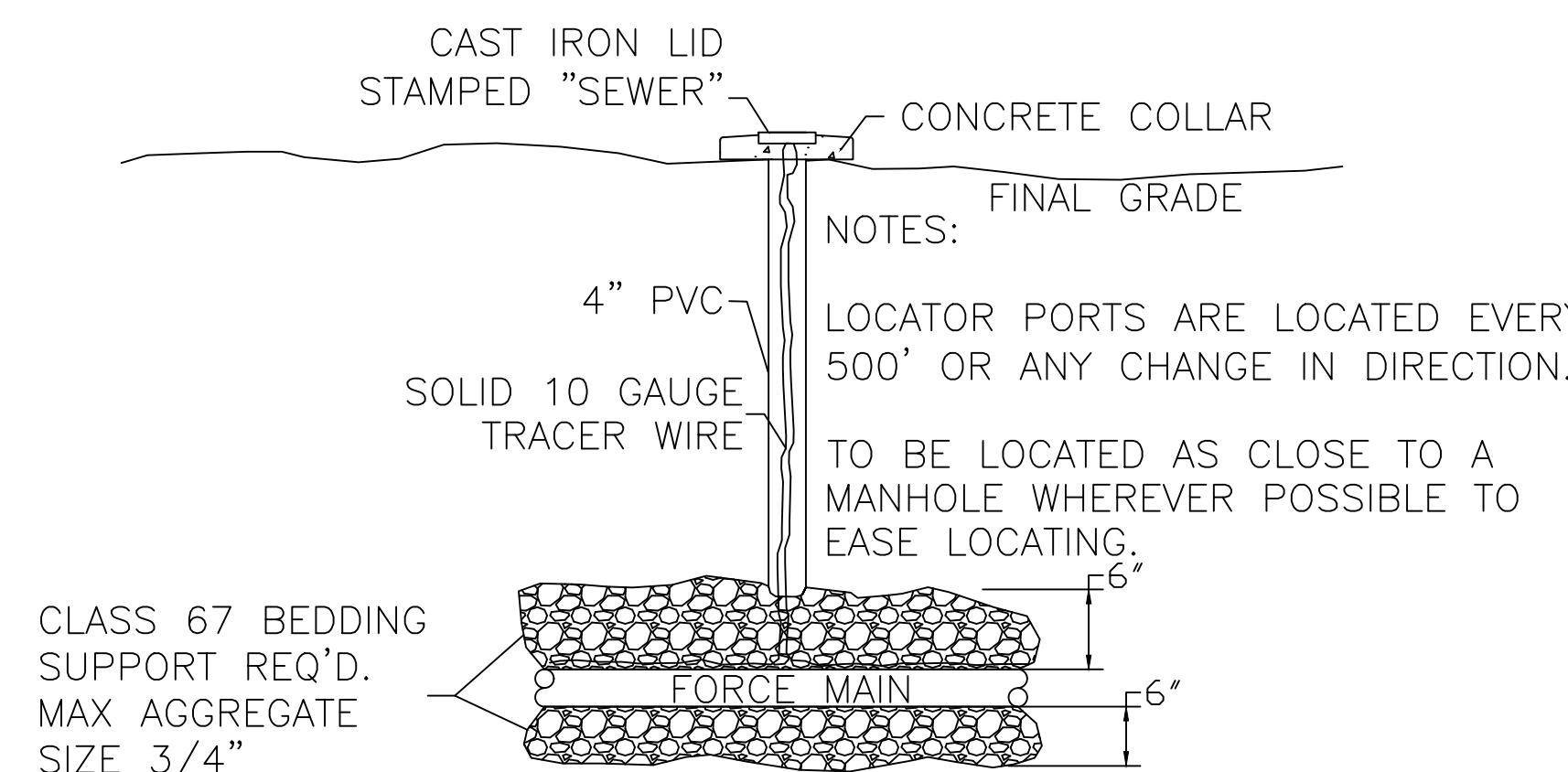
LIFT STATION DETAILS: LS08

TYPICAL BEDDING DETAIL FOR FORCE MAIN



LIFT STATION DETAILS: LS09

TRACER WIRE PORT

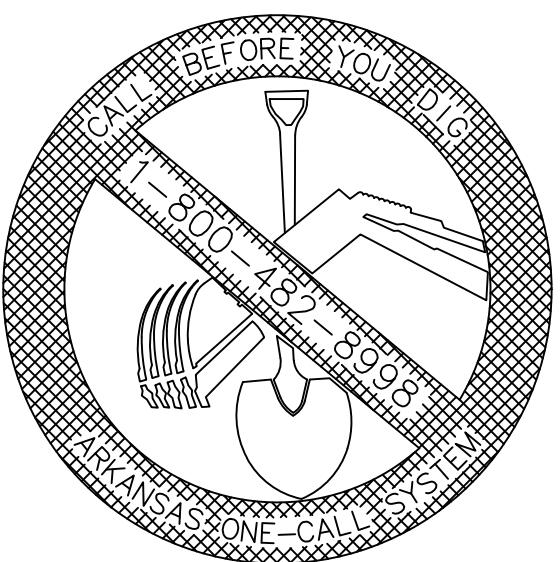


LIFT STATION DETAILS: LS10



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LIFT STATION DETAILS



REVISION:
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NOTES:

DRAWN BY: JS DATE: 08/27/2024
APPROVED BY: AW DATE: 08/27/2024

SHEET NUMBER: 2 OF 2