

103.3 DRAINAGE STRUCTURES

DRAINAGE STRUCTURES INCLUDE CATCHBASINS, MANHOLES, JUNCTION BOXES, AND CULVERTS.

1. ALL INVERTS ARE REQUIRED TO BE U-SHAPED.

2. THE ACCESS ENTRANCE SHALL BE AT LEAST 24" IN DIAMETER.

3. APPROVED CATCHBASIN GRATES IN THE CITY OF MARYVILLE ARE:

STANDARD CURB AND GUTTER	NEENAH R-3248-AL EJW 00751004
MARYVILLE MODIFIED CURB & GUTTER	NEENAH R-3248-AM WITH R-3000-A ENVIRONMENTAL MESSAGE)
ROLL TYPE CURB & GUTTER	NEENAH R-3580
NO CURB OPENING	NEENAH R-3210-L
AREA DRAIN	NEENAH R-3807

APPROVED EQUIVALENTS WILL ALSO BE ALLOWED. ALL CATCHBASINS MUST BE STAMPED "DUMP NO WASTE, DRAINS TO STREAM" OR APPROVED EQUIVALENT.

106 PRODUCTS

Pipe and all accessory fitting and appurtenances, etc., shall be made in America where possible unless approval is obtained from the EPW Department for the use of a product that is not made in America. This requirement shall be construed in a manner that does not violate the North American Free Trade Agreement, any amendments thereto, or any other free trade or other laws.

106.1 Pipe Materials Approved storm pipe is as follows:

- Reinforced Concrete Pipe (RCP):
  - ASTM C76/AASHTO M86M
  - ASTM C506/AASHTO M206M
  - ASTM C507/AASHTO M207M
- Spiral Rib Metal Pipe (SRMP):
  - ASTM A760/AASHTO M36
- Corrugated Steel Pipe (CMP):
  - ASTM A760/AASHTO M36
- Thermoplastic Pipe (HDPE, PVC):
  - High Density Polyethylene (HDPE): ASTM F2306/AASHTO M252 Type S and M294 Type S
  - Polyvinyl Chloride (PVC): ASTM F949

Acceptable pipe material selection shall adhere to the following table:

TABLE "A"

FILL HEIGHT					
UP TO 10'	OVER 10' UP TO 18'	OVER 18' UP TO 27'	OVER 27' UP TO 41'	>41'	
EXPRESSWAYS, MAJOR AND MINOR ARTERIAL, MAJOR AND MINOR COLLECTOR					
CROSS DRAINS	RCP CL III	RCP CL III	RCP CL IV	RCP CL V	NOTE 3
TRANSVERSE MEDIAN DRAINS	RCP CL III	RCP CL III	RCP CL IV	RCP CL V	NOTE 3
LONGITUDINAL STORM DRAINS	RCP CL III	RCP CL III	RCP CL IV	RCP CL V	NOTE 3
RESIDENTIAL SUB-COLLECTORS, LOCAL STREET, MINOR STREET					
CROSS DRAINS	RCP CL III HPDE NOTE 1 PVC NOTE 1	RCP CL III HPDE NOTE 1 PVC NOTE 1	RCP CL IV	RCP CL V	NOTE 3
TRANSVERSE MEDIAN DRAINS	RCP CL III HPDE NOTE 1 PVC NOTE 1	RCP CL III HPDE NOTE 1 PVC NOTE 1	RCP CL IV	RCP CL V	NOTE 3
LONGITUDINAL STORM DRAINS	RCP CL III HPDE NOTE 1 PVC NOTE 1	RCP CL III HPDE NOTE 1 PVC NOTE 1	RCP CL IV	RCP CL V	NOTE 3
RESIDENTIAL AREAS IN DRAINAGE EASEMENTS					
	RCP CL III HPDE NOTE 1 PVC NOTE 1 ALUMINIZED SRMP NOTE 2	RCP CL III HPDE NOTE 1 PVC NOTE 1 ALUMINIZED SRMP NOTE 2	RCP CL IV	RCP CL V	NOTE 3
OFFSITE DRAINAGE CONVEYANCE					
	RCP CL III HPDE NOTE 1 PVC NOTE 1	RCP CL III HPDE NOTE 1 PVC NOTE 1	RCP CL IV	RCP CL V	NOTE 3

Note 1: Where site conditions permit and at the discretion of the design engineer.

Note 2: Spiral rib metal pipe. Minimum gauge as follows: 16 to 30 inch 16 gauge, 36 to 42 inch 14 gauge, 48 to 72 inch 12 gauge. CMP shall not be substituted for SRMP. Bands for pipe ends shall use rubber o-ring seals.

Note 3: Structural, hydraulic, and cost analysis required for pipes with a fill height of over 41 feet.

106.2 Pipe Fittings

- Pipe shall be fitted together per pipe manufacturer's recommendation.
- A structure shall be installed when connecting dissimilar pipe materials or sizes.

106.3 Concrete Materials

Concrete used in conjunction with the installation or repair of storm drain lines and appurtenances shall be as follows:

- Minimum compressive strength: 28 days, 4,000 psi average any 3 cylinders.
- Coarse aggregates: Size No. 57 crushed limestone.
- Fine aggregates: Natural sand or manufactured limestone sand proportioned by dry weight of fine to total aggregates between 30-45 percent.
- Slump: 2-4 inches.
- Mixing Water: Maximum 6.0 gallons per sack of cement. Deduct the moisture content of the aggregate from the amount of mixing water required.
- Cement: Use Portland cement meeting the requirements of ASTM Standard C150. Use minimum 6.6 sacks of cement per cubic yard of concrete.
- Dry aggregate per cement sack: Coarse aggregate-280, fine aggregate using manufactured limestone sand-194, fine aggregate using natural sand-187.

106.4 Drainage Structures

Drainage structures include catchbasins, manholes, junction boxes, and culverts.

- General Requirements All structures shall be precast reinforced concrete meeting the requirements of ASTM Standard C478 except as may be provided otherwise in the following:
  - Inside diameter shall be based on required pipe diameter. Structures used within the public right of way and in residential applications within drainage easements should be sized on the following criteria:

MINIMUM DIMENSIONS FOR STRUCTURES					
PIPE SIZE	RECTANGULAR: PIPE SIDE DIMENSION	ROUND: INSIDE DIAMETER	PIPE SIZE	RECTANGULAR: PIPE SIDE DIMENSION	ROUND: INSIDE DIAMETER
15 TO 30 INCHES	AT LEAST 6 IN LARGER THAN OD OF PIPE BUT NOT LESS THAN 24 IN	4 FT	60 INCHES	7 FT	8 FT
36 INCHES	4 FT	5 FT	66 INCHES	7 FT	8 FT
42 INCHES	5 FT	6 FT	72 INCHES	8 FT	8 FT
48 INCHES	6 FT	6 FT	78 INCHES	9 FT	10 FT
54 INCHES	6 FT	8 FT			

- Wall thickness shall be a minimum of 5 inches.
- The minimum compressive strength of precast risers, bases, cone or top sections, and grade rings shall be 4,000 psi.
- The access opening in cone or top sections shall be a minimum of 24 inches.
- Joints: The reinforced concrete base and riser sections, excepting grade rings, shall be formed with male and female ends, so that when the base, riser, and top are assembled they will make a continuous and uniform structure.
- Lift eyes or holes may be provided in each section for the purpose of handling but must not protrude through the concrete walls.
- Poured-in-place reinforced concrete structures or polyethylene structures may be used with prior permission of the City.

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  - Lift eyes or holes may be provided in each section for the purpose of handling but must not protrude through the concrete walls.
  - Poured-in-place reinforced concrete structures or polyethylene structures may be used with prior permission of the City.
- Precast Reinforced Concrete Bases:
    - The base riser sections shall be precast with integral floors.
    - Heights of bases for pipes shall be according to the manufacturer's specifications, subject to prior approval of the City.
  - Precast Reinforced Concrete Tops shall be of the following two types:
    - Eccentric Cone
    - Flat Slab Top
  - Precast Reinforced Concrete Grade Rings:
    - Grade ring wall thickness shall be a minimum of 5 inches.
    - Grade rings shall match the structure being used and be either 2 inches, 4 inches or 6 inches in height.
    - The combined height of grade rings shall be a maximum of 12 inches.

- Steps:
  - Steps shall be fabricated from aluminum alloy 6061, T6.
  - Steps shall be corrosion resistant, free from sharp edges, burrs, or other projections which may be a safety hazard and shall be of sufficient strength to have a live load of 300 pounds imposed at any point.
  - The minimum width of cleat shall be 10 inches.
  - The legs and struts shall be of sufficient length for the cleat to project a minimum clear distance of 4 inches from the wall when the step is securely imbedded in the structure wall.
  - The top surface of the cleats shall be designed to prevent foot slippage.
  - Steps should be positioned vertically and at a maximum spacing of 16 inches.
  - Steps shall be the same size, projection, spacing, and alignment in each structure.
- Openings in the base section wall shall be factory installed for the required number and size of pipes.
- Pipe Entrance Requirements:
  - Pipe openings made in the field in existing structure walls for pipe installation shall be one of the following:
    - Concrete structures shall be cored in the field. All pipe shall be grouted both inside and outside to the structure.
    - Existing brick structures shall be evaluated in the field for replacement with a precast concrete structure. Whenever new lines are to connect to an existing brick structure, it shall be replaced unless approval is obtained from EPW to leave the existing structure in place. If a connection is made it shall be cored and new pipe grouted both inside and outside to the structure.
  - Other specially designed products may be approved by the Maryville EPW Department.
- Covers:
  - Frames and covers shall be of gray cast iron meeting the latest requirements of ASTM Standard A48, Class 30, (30,000 psi). The total weight of the frame and cover shall not be less than 375 pounds.
  - Covers shall be round and machine ground horizontally.
  - Frames shall have clear openings of 24 inches, heights between 7 & 8 inches, and overall base diameters between 35 & 37 1/2 inches. The base shall have four uniformly spaced holes for attachment to the structure using 5/8-inch diameter bolts. The maximum bolt circle diameter shall be 33 inches.
  - Covers shall have a thickness as specified by manufacturer and diameters of 26 inches.
  - Covers shall have two non-penetrating pick holes for lifting purposes.
  - The top face of the covers shall be embossed with the words "STORM SEWER" with letters approximately two (2") inches in size.

107.2 Installing Storm Drainage Pipe

All storm drain pipe systems installed in the City of Maryville shall conform to the standards listed below.

- Trench excavation details and dimensions shall be as specified by the design engineer on the approved site plan. Minimum trench width should provide clearance on each side of the pipe between the outside diameter of the pipe and the trench wall equal to 1/2 the nominal pipe diameter, but not to exceed 18 inches.

Minimum Trench Width - Inches

Diameter	Good Soil	Poor Soil
15	32	48
18	37	56
24	48	64
30	56	72
36	64	82
42	72	96
48	80	106
54	89	116
60	96	116
- If the trench walls or bottom are found to be unstable the contractor shall consult with the design engineer for an alternative trench design.
- Lay pipe true to the lines and grades from the grade and alignment stakes, or equally usable references.
- Laser equipment should be used and offset hubs should be provided at intervals of 100 feet and at every drainage structure location for the purpose of checking grade between sections.
- Accurately establish the centerline of each pipe using a transit.
- Carefully inspect all pipe and each fitting prior to its placement in the trench, and reject any defective pipe or fitting from the job site.
- Lay pipe progressively upgrade on a minimum 6 inch bedding of Class Ia or Ib material (ASTM D2321), with bell upstream in such a manner as to form close, concentric joints with smooth bottomed inverts. Joining of all pipe shall be in accordance with manufacturer's specifications. Metal pipe bands shall have rubber o-ring gaskets.
- Backfill pipe using clean Class Ia or Ib material (ASTM D2321) using the following criteria:

OPEN AREAS	
PIPE MATERIAL	BACKFILL DEPTH
THERMOPLASTIC METAL	6 IN ABOVE TOP OF PIPE
CONCRETE	TO SPRING LINE OF PIPE
UNDER ROADWAYS	
ALL	TO THE ROAD SUB-GRADE

- Keep the pipe free of all unneeded material, and upon completion of a section between any two drainage structures, it shall be possible to view a complete circle of light when looking through the pipe.
- When laying pipe ceases, close the open ends of the pipe with a suitable plug to prevent the infiltration of foreign materials.
- A structure shall be used when joining dissimilar pipe.
- Headwalls and endwalls shall be used at open pipe inlets and outfalls.
- Outlet protection shall be provided in the form of either riprap aprons, level spreaders, outlet basins, or baffled outlets based on the potential for erosion or scour caused by concentrated flow from the outlet pipe. Riprap aprons shall have a geotextile underlayment.

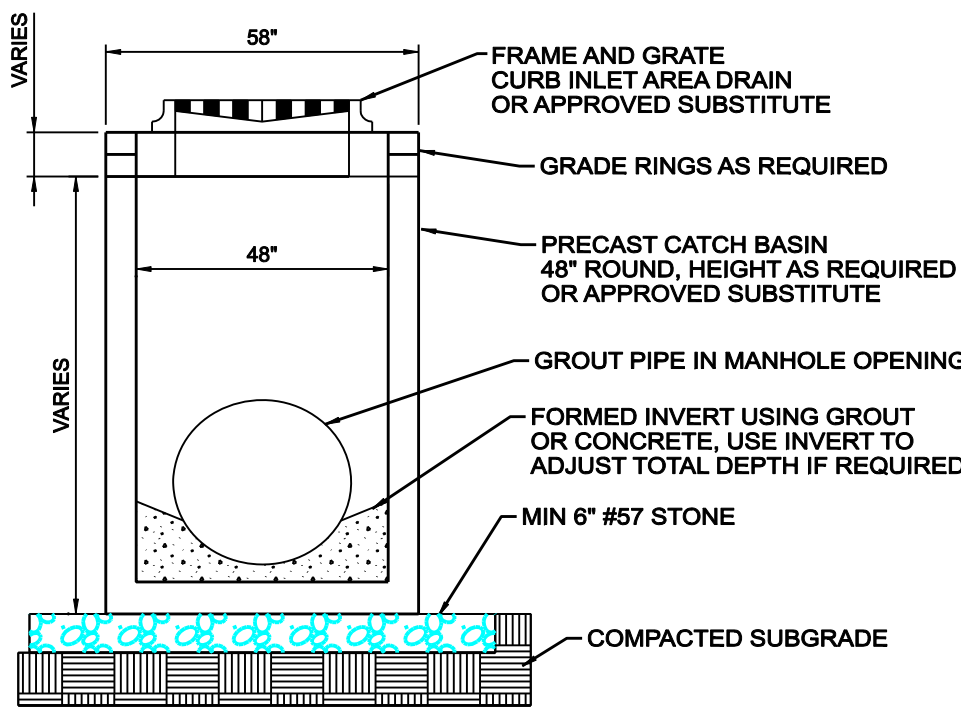
107.3 INSTALLING DRAINAGE STRUCTURES

All storm drain structures installed in the City of Maryville shall conform to the standards listed below.

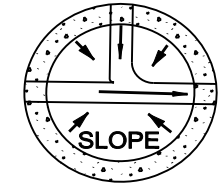
- Structures shall be furnished as provided under Section 106.4 of these Standards
- Depth of structures shall be the vertical distance from the lowest invert in the structure to the base of the cover frame.
- Backfill with the same material used for pipelines
- Prepare subgrade on undisturbed earth. Remove all loose earth prior to placing crushed stone base or concrete slab. Fill all disturbed areas below subgrade level with compacted bedding stone.
- Structures having a depth of less than 12 feet shall be set on compacted Class Ia or Ib (ASTM D2321) bedding material at a minimum 6 inches of thickness. Structures having a depth of 12 feet or more shall be set on a 6 inch thick concrete slab having minimum diameter 1 foot greater than the outside diameter of the base section. The concrete slab shall be poured on a minimum 6-inch thick compacted crushed stone bedding. Concrete shall meet the condition of Section 106.3 of these Standards.
- The base shall be placed on dry consolidated and, when possible, undisturbed soil.
- Structures shall be set plumb.
- Inverts shall be accurately shaped using concrete to a smooth surface texture. Invert flow channels shall be shaped having the same radii as those of the pipes for which the channels are being provided. The depth of the channels shall be a minimum of 1/3 the diameter of the pipes being accommodated.
- Inlets and outlets shall be finished smooth and flush with the sides of the structure wall so as not to obstruct the flow of stormwater through the structure.
- When completed, the structure shall be free from channel obstruction and leakage.
- Lift holes shall not completely penetrate the structure walls.
- Precast concrete grade rings shall be set using Portland Cement Mortar and/or flexible butyl resin sealant. Care should be exercised so as not to allow too much water in the Portland Cement Mortar, which may cause shrinkage. All cover frames that are attached to 2 or 4 inch grade rings shall be attached to the grade rings using Portland Cement Concrete mortar and/or butyl resin sealant. A minimum of 2-inch thickness of mortar shall also be placed over the top of the cover frame as shown on Standard drawings. Joints of precast concrete guard rings and frames shall be made so as to prevent leakage. Alternate attachment for 6-in height grade rings and direct attachment to the cone. The following alternate may be used in lieu of Portland cement mortar for attaching frames to grade rings 6 inches in height or directly to the cone. Frames shall be bolted by means of 4, 5/8-inch diameter bolts and shall be set in a bed of flexible butyl resin sealant. No Portland Cement Mortar will be required around the frame when this alternative is used.

107.5 Initial Inspection of Storm Systems

The City of Maryville is required by its NPDES Phase II Permit to accept responsibility of all stormwater runoff discharging into waters of the state. In an effort to prevent premature system failures, which can lead to illicit discharges, the City reserves the right to inspect any storm drainage installations. In order to establish confidence in the installation and avoid the unnecessary delay of final acceptance all storm drainage installations shall be inspected by the Director of Public Works or his/her designee. Any defects shall be corrected. The installation contractor should be aware that any defective pipe or pipe joint will require the line to be dug up and repaired. Great care should be exercised to ensure a proper installation. Other utility installations should be closely supervised to ensure that the stormwater drainage system is not damaged during construction.

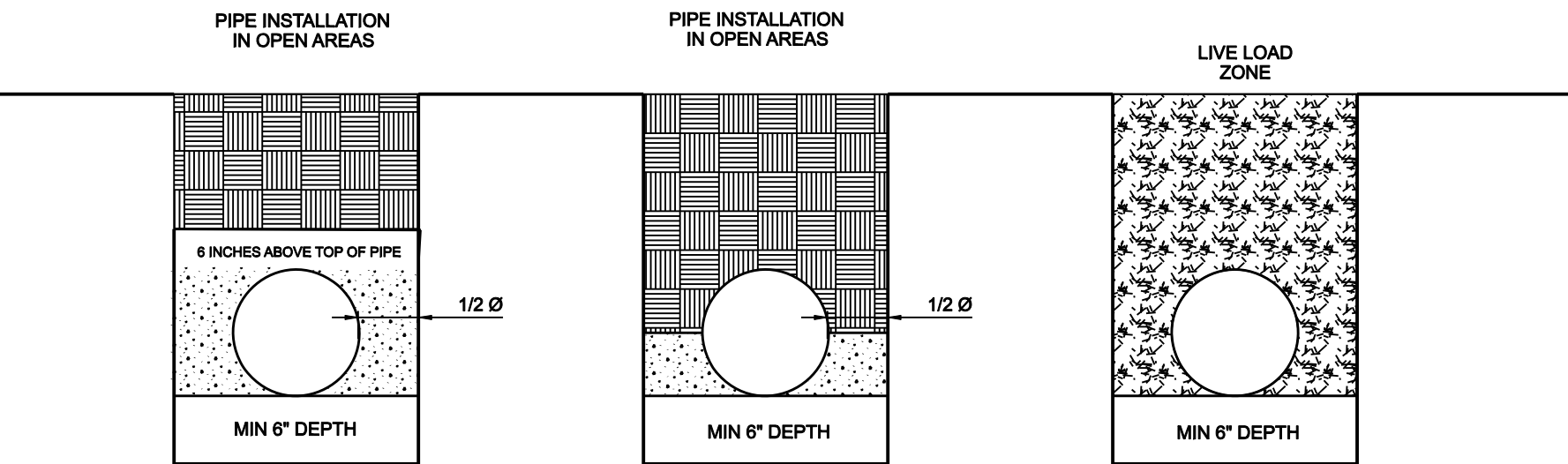


48" ROUND CATCH BASIN DETAIL

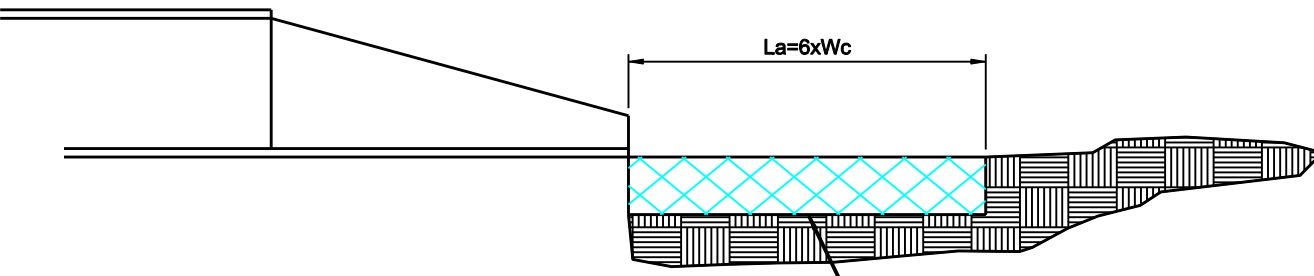
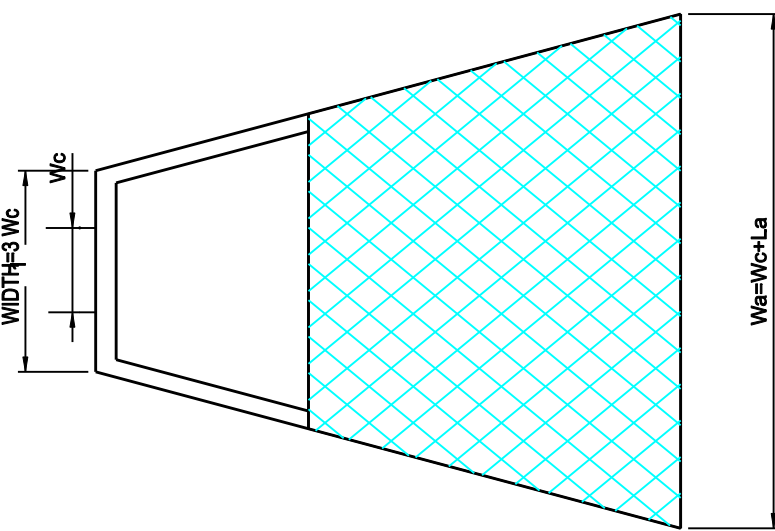


PLAN OF BOTTOM

TYPICAL PIPE INSTALLATION



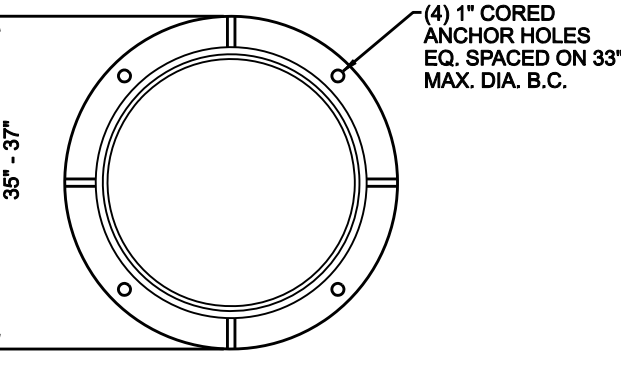
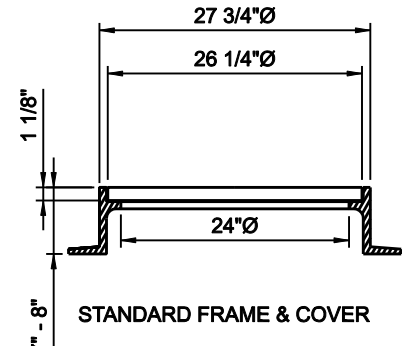
GRAVEL BEDDING AND BACKFILL TO BE WITH EITHER # 57 OR # 7 CLEAN STONE.



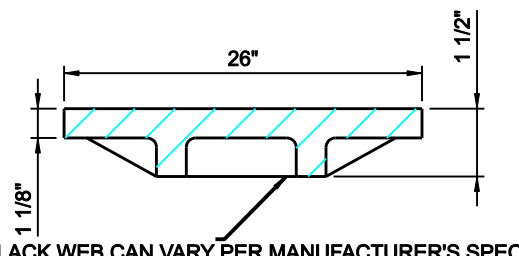
REFER TO TENNESSEE EROSION AND SEDIMENT CONTROL HANDBOOK

RIP-RAP OUTLET PROTECTION

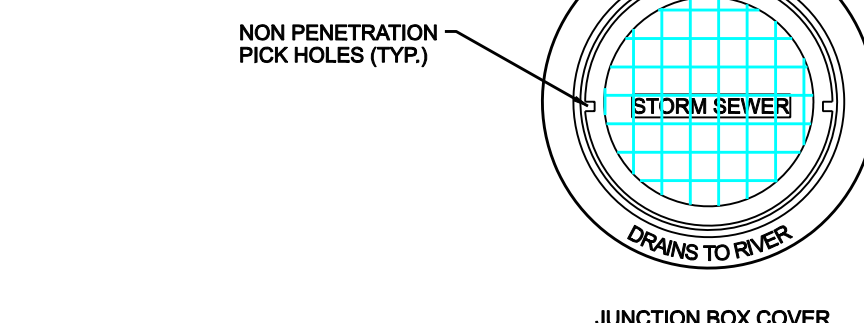
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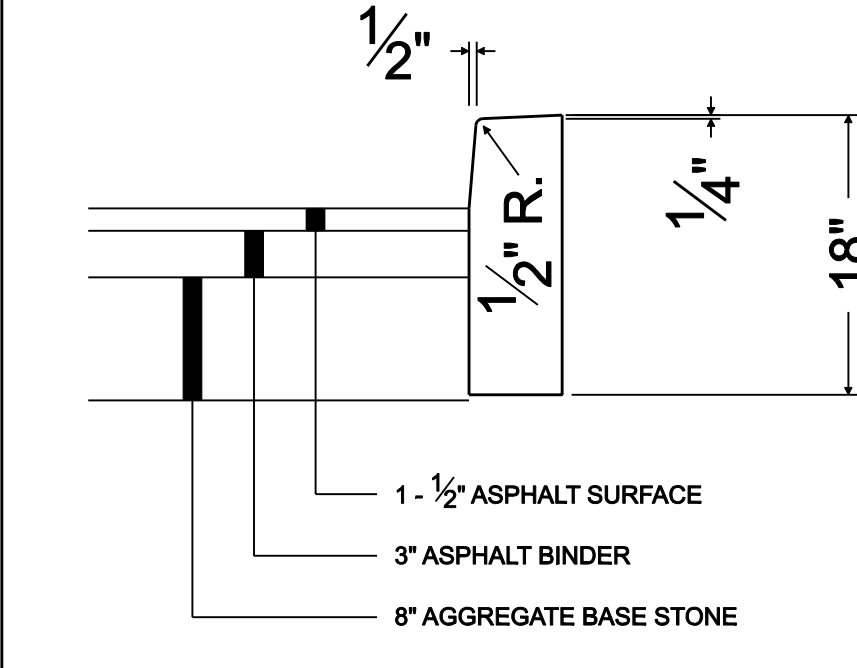
MANHOLE FRAME PLAN STANDARD & WARETIGHT



COVER SECTION



6" TYPE "A" DETACHED CURB



STORMWATER CONSTRUCTION DETAILS



CITY OF MARYVILLE  
ENGINEERING & PUBLIC WORKS  
STORMWATER DEPARTMENT  
416 W. BROADWAY AVE.  
PHONE: 865-273-3500  
FAX: 865-273-3525  
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