

Engineering Department
Manual Of
Practice



Life. Well Crafted.

200 Drainage

DIVISION 200 DRAINAGE

A. GENERAL NOTES

1. All work and materials shall conform to the latest edition of the NCDOT Standard Specifications unless otherwise specified in this manual.
2. Only the following drainage pipe materials are allowed within the street right of way without prior approval by the City Engineer excluding driveway pipes:
 - (a) Class III reinforced concrete pipe.
 - (b) Fully bituminous coated corrugated steel or aluminum pipe with paved invert, minimum 14 gage.
 - (c) High density polyethylene (HDPE) pipe with corrugated exterior/smooth interior conforming to the requirements of AASHTO specification M294 for corrugated polyethylene pipe and shall require coupling bands and fittings and installed per manufacturer's recommendations.
3. All driveway pipes within right of way must be approved by City Engineer.
4. All pipe shall be laid with the bell or groove up grade and the joint entirely interlocking.
5. Pipe used within the street right-of-way shall be a minimum diameter of fifteen (15) inches (eighteen (18) inches minimum on cross drain culverts).
6. The minimum cover for all pipe is per the manufacturer's recommendations but should not be less than two (2) feet. Special applications for less than two (2) feet of cover will be reviewed individually.
7. Concrete mortar joints shall be used for joining all concrete pipes. The pipe shall be clean and moist when mortar is applied. The lower portions of the bell or groove shall be filled with mortar sufficient to bring the inner surface flush and even when the next joint is fitted into place. The remainder of the joint shall then be filled with mortar and a bead or ring of mortar formed around the outside of the joint. The application of mortar may be delayed until fill is completed when the pipe is larger than thirty (30) inch.
8. Preformed joint sealer, which conforms to AASHTO specification M-198 for Type B flexible plastic gaskets, may be used in lieu of the mortar jointing method, item #7 above.
9. Coupling bands and fittings shall be used for joining all HDPE pipe. Coupling bands shall cover at least one full corrugation on each section of pipe. Gasket coupling bands are required between all pipe joints. The gasket shall be made of closed-cell synthetic expanded rubber meeting the requirements of ASTM D1056, Type 2. Gaskets shall be installed on the coupling band by the pipe manufacturer. All coupling bands shall meet or exceed the soil-tightness requirement of AASHTO Standard Specification for Highway Bridges, section 23, paragraph 23.1.5.4(e). Pipe fittings shall conform to AASHTO M252 or AASHTO M294.

10. The interior surfaces of all storm drainage structures shall be pointed up and smoothed to an acceptable standard using mortar mixed to manufacturer's specifications.

11. All pipes in storm drain structures shall be flush with the inside wall. All storm drain structures shall have hand-formed fillets to prevent standing water.

12. All storm drain structures, including pre-cast boxes, frames, grates, hoods, etc., shall meet current NCDOT standards. Refer to std. # 606 for requirements for steps.

13. Any storm drain structures over 3'-6" (three feet six inches) in height must have steps in accordance with standard details set forth in this manual.

14. All frames, grates, rings, covers etc., must conform to the standards set forth in this manual.

15. All graded creek banks and slopes shall be at a maximum of two (2) feet horizontal to one (1) foot vertical (2:1).

16. All backfill shall be non-plastic in nature, free from roots, vegetative matter, waste, construction material or other objectionable material. Said material shall be capable of being compacted by mechanical means and shall have no tendency to flow or behave in a plastic manner under the tamping blows or proof rolling.

17. Materials deemed by the Engineering Division as unsuitable for backfill purposes shall be removed and replaced with select backfill material.

18. Backfilling of trenches shall be accomplished immediately after the pipe is laid. The fill around the pipe shall be placed in layers not to exceed six (6) inches, each layer shall be thoroughly compacted to 95% of the maximum density obtainable with the Standard Proctor Test (a density of 100% Standard Proctor is required for the top eight (8) inches). All tests shall be provided by Contractor at no cost to the City.

19. Compaction requirements shall be attained by the use of mechanical compaction methods. Each layer of backfill shall be placed loose and thoroughly compacted in place.

20. Under no circumstances shall water be permitted to rise in unbackfilled trenches after the pipe has been placed.

B. STANDARDS FOR DESIGN

1. All storm drainage design shall conform with the standards and specifications as provided in the Land Development Code, or the more restrictive of any standards that conflict.

2. Adequate storm drainage shall be provided throughout the proposed development by means of storm drainage pipes or properly graded channels. All pipe shall be of adequate size and capacity, as approved by the City Engineer, to carry all storm water in its drainage area.



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3. The City Engineer shall review the proposed drainage plan for compliance with the standards contained in the current edition of the Land Development Code and Manual of Practice and all other relevant and appropriate standards established by the City Engineering Department.

4. Sub-surface drainage shall be provided where the ground water level is likely to be near the surface. In capillary soils, the water level should be four (4) to six (6) feet below the surface to prevent the rise of moisture into the subgrade. Four (4) inch PVC or corrugated metal pipe with perforations shall be used to lower ground water in low areas in the street.

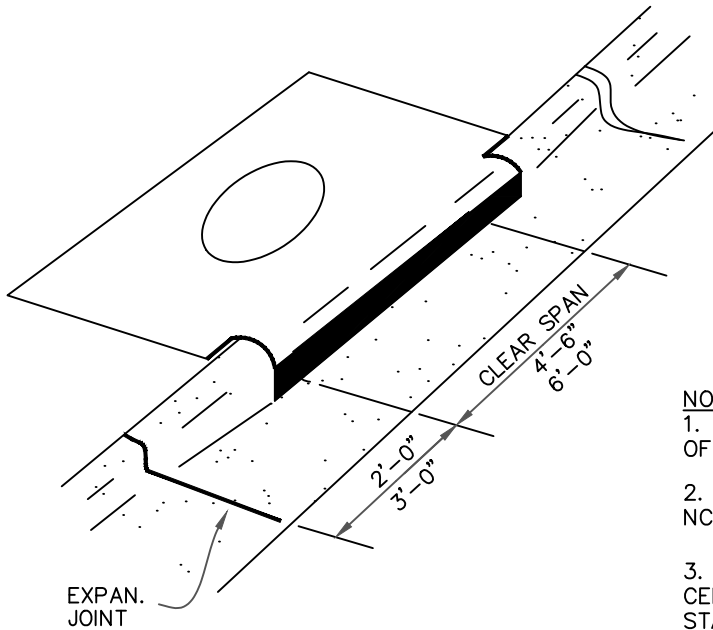
REFERENCES

1. North Carolina Department of Transportation, Standard Specifications for Roads and Structures, Latest Edition

2. American Association of State Highway and Transportation Officials, Latest Edition, A Policy on Geometric Design of Highways and Streets

3. North Carolina Department of Transportation, Roadway Design Manual, Latest Edition

4. North Carolina Department of Environment, Health, and Natural Resources, Erosion and Sediment Control Planning and Design Manual, Latest Edition



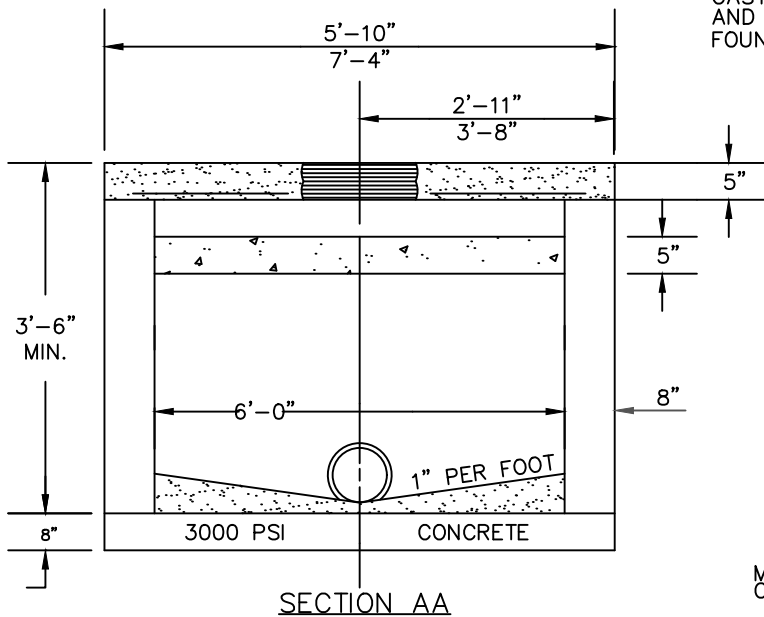
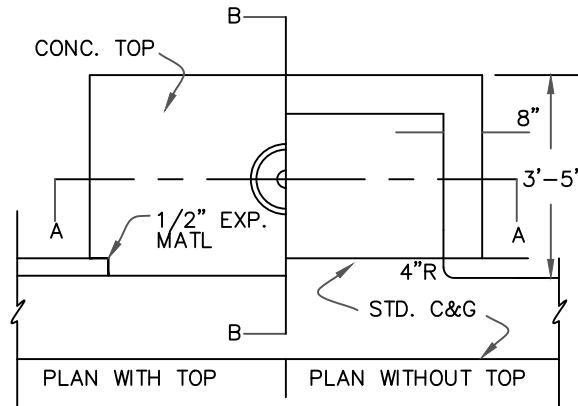
NOTES

1. BRICK MASONRY STRUCTURES MAY BE USED IN LIEU OF PRE-CAST CONCRETE

2. ALL DRAINAGE STRUCTURES SHALL MEET CURRENT NCDOT SPECIFICATIONS

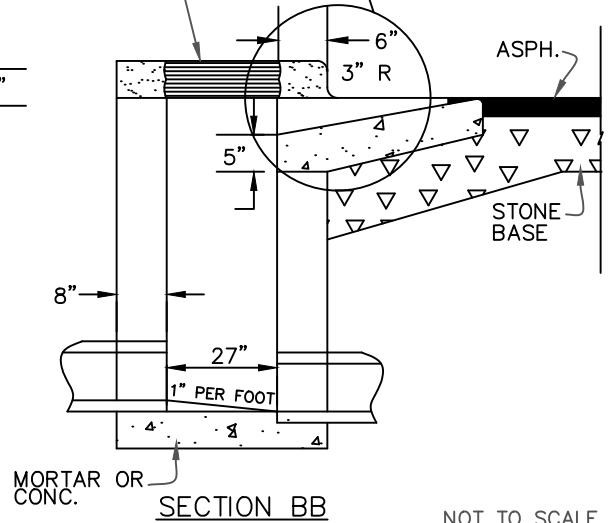
3. FOR DEPTHS OVER 4'-0" USE STEPS ON 1'-3" CENTERS. STEPS SHALL BE IN ACCORDANCE WITH STANDARD #606

4. REFERENCE STANDARD 840.03 FRAME, GRATES, AND HOOD IN NCDOT STANDARDS



CAST-IN-PLACE RING AND COVER. REFER TO U.S. FOUNDRY 1161, OR EQUIVALENT

SEE SHEET 2 OF 2



NOT TO SCALE



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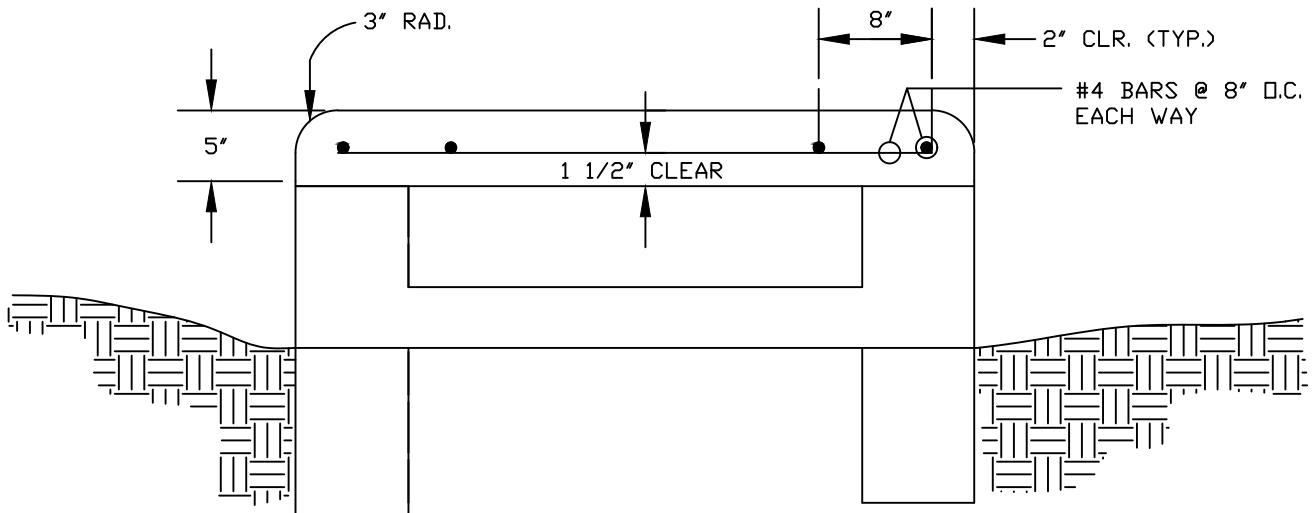
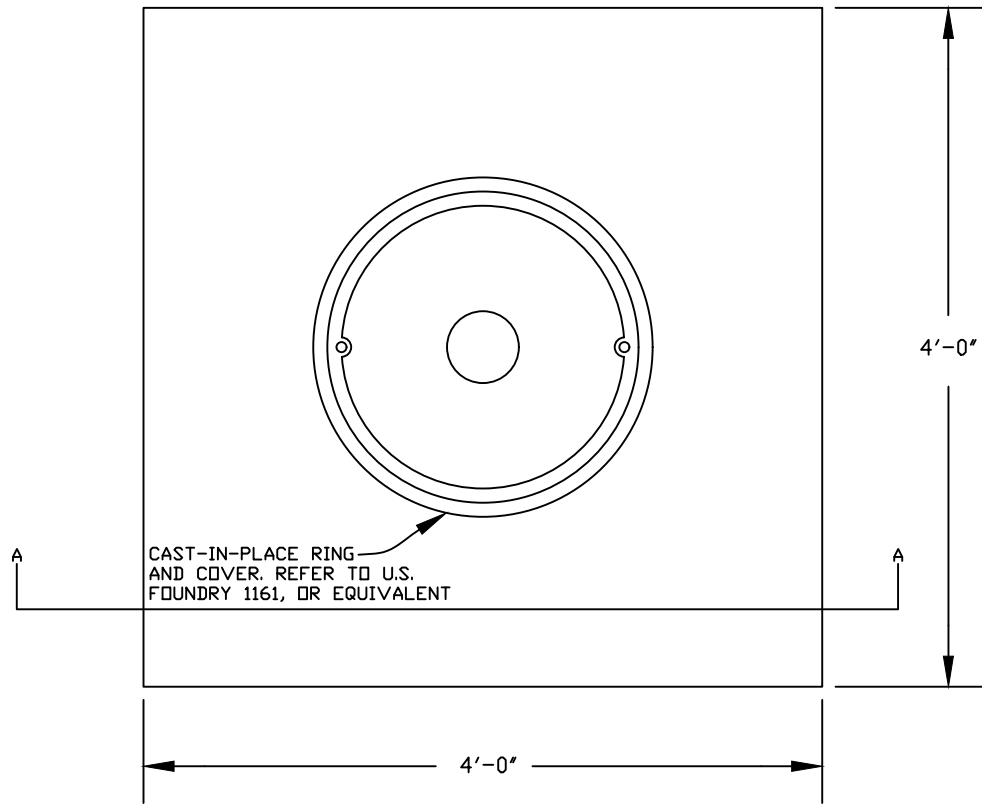
CURB INLET

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NOTES:
 CONCRETE SHALL BE 3000 PSI.
 TOP SHALL HAVE A SMOOTH FINISH.



SECTION A-A

NOT TO SCALE



CITY OF HICKORY

4'x4' BRICK MASONRY YARD INLET

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