



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

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August 27, 2009

Memorandum To: Mr. Jay Bennett, PE
State Roadway Design Engineer
and
Mr. Dave Henderson, PE
State Hydraulics Engineer

From: Drainage Subcommittee

JJA FOR RON HANCOCK

Subject: Updates to drainage pipe standard details and material selection process.

PIPE INSTALLATION STANDARDS AND SPECIFICATIONS

As you are aware, the Drainage Subcommittee began an initiative over a year ago to improve our overall drainage pipe installation practices. A major part of this effort was to update our Standard Installation Details and associated Standard Specifications. Drainage Pipe Installation Standard Drawings have been modified and condensed to three sheets in lieu of four. The new drawings are attached and a summary of the major changes is as follows:

- No longer using reference to Method A and Method B installation types.
- Method B is replaced by a special RCP design when fill heights are greater than 40 feet. See the attached Special Provision to be used for this case.
- There are separate details for flexible and rigid pipes. Standard 300D01 sheet 1 of 3 is for flexible pipe and 300D01 sheet 2 of 3 is for rigid pipe
- Fill height tables have been updated and are included on 300D01 sheet 3 of 3. This is a condensed version of the fill height tables that should also be updated in the Roadway Design Manual.
- Arch pipe and structural plate pipe are no longer shown in the pipe Standard Drawings. Drawings for these applications will be provided on project specific basis.

The updated Standard Drawing details (3 sheets) should be included in all projects beginning with the October 20, 2009 letting. These new details will require one new pay item. This pay item will be the Foundation Conditioning Fabric. It is labeled Type IV Engineering Fabric in the revised Standard Drawings. These details sheets can be picked up from the Standards Section or by email request to Joel Howerton, PE, Standards Engineer.

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PIPE ALTERNATES/ DRAINAGE SUMMARY

In addition to improving drainage pipe installation details, the Drainage Subcommittee has developed a new Project Special Provision to expand the use of alternate drainage pipe materials. This provision titled "Drainage Pipe" is attached. In addition, Article 310-4 of the Specifications has been revised to expand the definition of "Side Drain Pipe" to include more than driveway pipe. The revised specification states "Side drain pipe is defined as storm drain pipe running parallel to the roadway to include pipes in medians, outside ditches, driveways, and under shoulder berm gutter along outside shoulders greater than four feet wide.

These changes require a modification to the Drainage Summary and Estimate Plan Sheets. The revised Drainage Summary will have columns for ___" Drainage Pipe as well as ___" Side Drain Pipe. Having these pay items will allow the Contractor to select the specific type of material used and eliminates the need for multiple alternate bid items. However, if there are specific restrictions of certain materials a note will be needed in the remarks column. The associated pay items will also be designated ___" Drainage Pipe and ___" Side Drain Pipe. The use of the "Drainage Pipe" item will be limited to pipes located on Sub Regional and Regional Tier facilities. Statewide Tier facilities will not use the "Drainage Pipe" item but will continue to use the "Side Drain Pipe" pay item with the above referenced expanded definition.

The revised Drainage Summary sheets and pay items should be implemented with all projects beginning with the January 19, 2010 letting. If there are extenuating circumstances that make this impractical, please contact Randy Garris to discuss.

Joel Howerton, of the Contract Standards and Development Unit will provide training on using the revised Drainage Summary and the new pay items. He will coordinate with you to make sure each of your units is well represented. In addition division design staff will be invited to attend and regional sessions held as needed. Your assistance with this effort is appreciated.

The Drainage Subcommittee encourages your unit to update the "Roadway Design Manual" and "Guidelines for Drainage Studies and Hydraulic Design" to reflect these changes. To aid with this, two documents have been developed and are attached for your use. The first is a table titled "NCDOT Material Selection Guidelines for Drainage Pipe" and the second is a narrative titled "Drainage Pipe Restrictions".

RH RAG/JSH

Attachments

Cc: Division Engineers

Jon Nance, PE

Cecil Jones, PE

Greg Perfetti, PE

Njoroge Wainaina, PE

Dan Holderman, PE

Jennifer Brandenburg, PE

John Sullivan, PE - FHWA

Drainage Subcommittee Members

Ron Hancock, PE

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NCDOT MATERIAL SELECTION GUIDELINE FOR DRAINAGE PIPE

TYPE OF PIPE INSTALLATION	REINFORCED CONCRETE (RCP) AASHTO M170	CORRUGATED STEEL (CSP) AASHTO M36	CORRUGATED ALUMINUM (CAAP) AASHTO M196	HDPE AASHTO M294	PVC - ASTM F949 AASHTO M304
STATEWIDE TIER					
Side drains	YES	YES	YES	YES	YES
Open ended cross drains	YES	NO*	NO*	NO	NO
Storm drain systems	YES	NO*	NO*	NO	NO
Transverse median drains	YES	NO*	NO*	NO	NO
Slope drains	NO	YES	YES	YES	YES
REGIONAL & SUBREGIONAL TIER					
Side drains	YES	YES	YES	YES	YES
Open ended cross drains	YES	YES	YES	YES	YES
Storm drain systems	YES	NO	NO	YES	YES
Transverse median drains	YES	YES	YES	YES	YES
Slope drains	NO	YES	YES	YES	YES

*CSP and CAAP are YES for these conditions when the slope of pipe is greater than 10%. These materials should also be considered when the fill heights dictate a special design.

Notes:

1. All pipe types are subject to the maximum and minimum fill height requirements as found in Chapter 5 of the Roadway Design Manual. The appropriate class of pipe for RCP and gage thickness for CSP / CAAP should be selected based on the fill height.
2. RCP is not allowed for grades over 10%
3. For counties listed in Article 310-2 of the Standard Specifications CSP is not allowed. In other counties CSP requires an acceptable coating in accordance with 1032-4.
4. Site specific conditions may limit a particular material beyond what is identified in the table. These conditions include, but are not limited to, abrasion, environmental, soil resistivity and pH, high ground water, and special loading conditions. The Hydraulic Design Engineer will determine if additional restrictions are necessary.
5. Only pipe with smooth wall inside walls will be allowed for storm drain systems.

Definitions:

Statewide Tier – The Strategic Highway Corridor Network as approved by the Board of Transportation

Regional Tier – US and NC routes not on the Statewide Tier

Subregional Tier – SR Routes

Side drains – Storm drain pipes running parallel to the roadway to include pipes in medians, outside ditches, driveways, and under shoulder berm gutter along outside shoulders greater than 4 feet wide. May or may not be open ended.

Storm drain systems – Lateral drain pipe under curb and gutter, expressway gutter, and shoulder berm gutter (with shoulders 4 feet wide or less) that connect drainage structures and is not open ended. Also includes cross drains connecting two or more systems or system outlets.

Transverse median drains – shallow cross drain pipe that collects drainage in a median ditch or curb section and deposits it outside ditches or natural drainage channels. May or may not be open ended.

Side Drain Pipe

This guide is intended to be used by the designer when preparing the three series (Drainage Summary) plan sheets that contain the pay item *Side Drain Pipe*. As defined in Article 310-4 of the Standard Specifications, *Side Drain Pipe* is storm drain pipe running parallel to the roadway to include pipe in medians, outside ditches, driveways, and under shoulder berm gutter along outside shoulders greater than 4 feet wide. Several pipe material options are allowed for *Side Drain Pipe*. The following exceptions should be considered when preparing the plans.

1. Do not use the pay item of *Side Drain Pipe* for fill heights greater than 10'. Call out a particular pipe type or use the *Drainage Pipe* pay item in this case.
2. Do not use the pay item of *Side Drain Pipe* for Commercial Driveways. Call out a particular pipe type for this application.
3. If there is known future widening that will lead to the *Side Drain Pipe* being under future pavement, call out a particular pipe type or use the *Drainage Pipe* pay item in this case.

Drainage Pipe Restrictions

These restrictions are intended to be used by the designer when preparing the three series (Drainage Summary) plan sheets that contain the pay item *Drainage Pipe*. There are three restrictions for use of the *Drainage Pipe* pay item. If these conditions exist, particular type of pipe should be specified on the plans and in the drainage summary:

1. Do not use *Drainage Pipe* pay item when fill height is greater than 20'
2. Do not use *Drainage Pipe* pay item when fill height is less than 2'
3. Do not use *Drainage Pipe* pay item on Statewide Tier Routes. *Drainage Pipe* pay item is restricted to Regional and Sub-Regional Tier Routes.

Below is a list of restrictions per pipe type that must be applied when the *Drainage Pipe* pay item is allowed. If a restriction applies, it should be noted in the "Remarks" section of the Drainage Summary plan sheet.

Reinforced Concrete Pipe (RCP)

- Not allowed when pipe slope is greater than 10%
- Class II not allowed when fill height greater than 10 feet. Require Class III in this case.

Corrugated Polyethylene Pipe (HDPE)

- Pipe diameter of 30" or greater not allowed when fill is greater than 17 feet

Polyvinyl-Chloride (PVC)

- No restrictions

Corrugated Steel Pipe (CSP)

- Not allowed in the following counties due to corrosion concerns: Beaufort, Bertie, Bladen, Brunswick, Camden, Carteret, Chowan, Columbus, Craven, Currituck, Dare, Gates, Hertford, Hyde, Jones, Martin, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrell, and Washington
- Not allowed in Storm Drain Systems – defined as lateral drain pipes under curb and gutter, expressway gutter, and shoulder berm gutter (with shoulder 4 feet wide or less) that connects drainage structures and is not open ended. Also includes cross drain pipe connecting two or more systems or outlets for a system.

Corrugated Aluminum Alloy Pipe (CAAP)

- Not allowed in Storm Drain Systems – see definition above