

## V. DRAINAGE

### 5.01 GENERAL

The Industry shall construct, or cause to be constructed, at its own expense, all drainage structures for the proposed track including that portion of the track on the Railway Company's right-of-way. Any change or additions to existing drainage structures under the Railway Company's tracks, required because of the proposed track, shall be the responsibility of the Industry. The Industry shall be liable for all claims from upstream and downstream property owners for any damages due to changes in existing drainage. The Industry shall furnish to the Railway Company, for review, plans and specifications for proposed drainage structures and drainage changes involving the Company's right-of-way prior to start of construction.

All pipe shall conform to American Railway Engineering and Maintenance-of-Way Association (AREMA) or American Society for Testing and Materials (ASTM) specifications for culvert pipe under railroads and be designed to carry Cooper's E-80 loadings. All pipe shall be installed to the line, grade, and elevations and be of the size as shown on plans approved by the Company.

All pipe shall be installed for the full width of the section, properly bedded as per attached Installation Of Corrugated Metal Pipe Culverts Detail, and shall be backfilled with select material and carefully compacted.

### 5.02 CORRUGATED METAL PIPE

The following requirements will be met for all corrugated metal pipe placed under Company tracks or tracks that will be owned by the Company at some later time.

Corrugated metal pipes shall be of adequate cross section to provide proper drainage opening and have a minimum of 36 inches inside diameter and a wall thickness to carry Cooper's E-80 loadings with adequate cover but at no time shall be less than 12 gage. See the Gage Selection of Corrugated Metal Pipes Detail, attached.

All corrugated metal pipes to be installed under tracks on Norfolk Southern's right-of-way or easements to be conveyed to Norfolk Southern in the future, shall be galvanized, annular, riveted, and fully asphalt coated for normal soil and water conditions. Helically corrugated pipe with annular rerolled ends may not be used within Railway Company's right-of-way or easements to be conveyed to the Railway Company. The rerolled ends should be manufactured to accommodate 2 feet wide connecting bands. Corrugated metal pipe used under "acidic" conditions (pH. factor  $\leq 4.0$ ) such as in mine water should be either fiber bonded, epoxy bonded or polymer coated. Where the stream bed consists of sand and gravel, or other abrasive conditions exist, the invert shall be paved.

Corrugated metal pipes of 48 inch or larger diameter will be formed to a specified 5 percent vertical elongation with tension wires or turnbuckle rods at horizontal axis. These tension wires are to be removed when grading is complete.

### 5.03 CONNECTING BANDS

Connecting bands for annular bituminously coated corrugated metal pipe shall consist of a single piece 24 inches wide, one gage lighter, with the same

corrugations and same cover treatment as the drainage pipe. Connecting bands for drainage pipe 48 inches and larger diameter will be fully bolted with a minimum of four - 0.5 inch circumferential rods and silo-type lugs. See the Gage Selection of Corrugated Metal Pipes Detail, attached.

Dimpled bands are not acceptable.

#### **5.04 CONCRETE PIPES**

Concrete pipes shall not be allowed under Company owned tracks or tracks that will be owned by the Company at a later date. The following requirements shall be met for all concrete pipe placed under industry tracks over which Norfolk Southern equipment will operate:

Concrete pipes shall be of adequate cross section to provide proper drainage, reinforced Wall B, and shall conform to ASTM C-76 Class V concrete pipe. A minimum inside pipe diameter of 36 inches is suggested.

The use of pre-cast concrete box culverts is acceptable. Boxes must be designed and fabricated in accordance with the current AREMA Manual For Railway Engineering, Chapter 8, for Coopers E-80 Live Loading.

#### **5.05 PAVED INVERTS – END TREATMENT**

Paved inverts and/or end treatment will be provided where soil and water conditions or facility design requires, and when designated by the Company.

#### **5.06 DITCHES**

The Industry shall provide temporary or permanent ditches in order to maintain the Company's existing drainage of the tracks. No ponding of water against the Company's existing roadbed shall be allowed. Ditches draining Company tracks shall be designed to carry the expected flows of a storm with a 100-year recurrence interval.

No drainage is to be diverted to railroad ditches without the specific notification and approval of the Company. Also, additional runoff created due to paving or structures within existing drainage basins, which drain toward Company property, must be released through a control structure such as a detention pond.