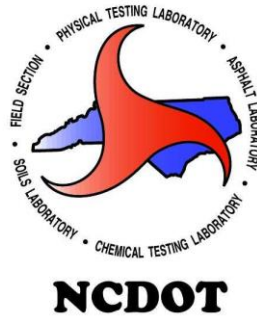


Materials & Tests Unit



Standard Operating Procedure Inspection of Corrugated Metal Pipe & Pipe Arch

Objectives:

The purpose of this SOP is to provide a quick reference guide and a means for the inspection, the acceptance and the reporting of Corrugated Metal Pipe and Pipe Arch. This SOP doesn't cover any specialty items. To inspect the specialty items, the technician/inspector will refer to the project plans or contract special provisions.

Materials Inspection and Acceptance:

The NCDOT Materials and Tests Unit are responsible for the inspection of all Corrugated Metal Pipe, located on NCDOT Right of Way or future NCDOT Right of Way. To insure all AASHTO, ASTM and NCDOT specifications are followed, all materials must come from the NCDOT approved list and/or participate in the Department's Brand Registration program.

Safety Equipment List:

- Safety Shoes with ANSI Z 41 rating
- Hard Hat with ANSI Z89.1 rating
- Safety Vest
- First Aid Kit
- Safety Glasses (optional)
- Ear Plugs (optional)
- Sun Block (optional)
- Lifting Belt (optional)
- Dust Mask (optional)

Safety Concerns:

- Vehicular Traffic
- Sharp Edges
- Heavy Equipment/Backing Incidents
- Possible dusty conditions.

Equipment Required for Inspection of Corrugated Metal Pipe:

Corrugated Metal Pipe Worksheet
Tape Measure
Magna gage (Calibrated Annually by Materials and Tests Unit Chemical Lab)
Micrometer
Calculator
Pen or Pencil

M&T Inspector's Duties for Inspection of Corrugated Metal Pipe:

1. Periodically review SOP for the Inspection of Corrugated Metal Pipe.
2. Periodically review specifications listed below:
 - a. [NCDOT Standard Specification Section 1032-1 thru 4.](#)
 - b. AASHTO M 36 Corrugated Steel Pipe, Metallic Coated, for Sewer and Drains
(See Section 2 in AASHTO M 36 for other referenced documents)
3. Technician will review contract or purchase order before inspection to verify specified material.
4. No inspection should be made without a copy of the Bill of Lading.
 - The following statement shall be on each shipping document, and signed by a responsible company representative who has the authority to bind the company:

We certify that these materials have been inspected and tested and conform to the NCDOT Brand Certification Program for Corrugated Metal Pipe Materials.

5. Is the manufacturer/producer approved and currently on the NCDOT Brand Certification Program.
6. Identification markings required on each Pipe
 - a. CM Pipe (galvanized/aluminized) shall have the following identification marked on each pipe:
 - Sheet Manufacturer
 - Specified Thickness
 - Specified weight of coating
 - AASHTO Designation
 - Heat Number
 - b. Aluminum Pipe shall have following identification marked on each pipe:
 - Sheet Manufacturer
 - Identification of the pipe fabricator, if different than the sheet manufacturer
 - Alloy and temper (AASHTO M 197 alclad alloy 3004-H34 for annular pipe and alclad alloy 3004-H32 for helical pipe or lock seam)
 - Specified Thickness
 - AASHTO Designation
 - c. Technician will verify required identification of each pipe with corresponding BOL and AASHTO M 36 to insure compliance with specifications.
 - d. If heat numbers do not match BOL. A certified mill test report is requested from the producer/manufacturer.
 - e. Technician will record heat # or temper on Corrugated Metal Pipe Field Worksheet.

7. Dimensions

- a. Diameter of pipe is measured from crest to crest on the inside of pipe. The average diameter will not vary more than 1 percent or 1/2", whichever is greater, for circular pipe. Arched Pipe has a tolerance of 1" or 2 percent whichever is greater, will be permissible in span and rise.
- b. All types of pipe ends, shall be matched in a joint such the maximum difference in diameter of abutting pipe ends is 1/2".
- c. Pipe sections and special attachments for pipe 60" or larger diameter pipe shall be alphanumerically match-marked at the plant site before shipping.
- d. Length of pipe shall not be deficient greater than 1% of total shipment.
- e. Corrugations will be specified on Contract/PO and BOL. Where 3" x 1" corrugations are required, the Contractor will be permitted to use 5" x 1" corrugations.
- f. Pipe with helical corrugations (lock seam) shall have rerolled end with at least 2 annual corrugations at each end.

8. Gage or Thickness:

- a. Technician will use a micrometer to measure gage of pipe.
- b. Measurements will be recorded on CMP Worksheet

<u>Specified Gage or Thickness</u>	<u>Minimum Gage Allowed</u>
18 (0.052")	0.046"
16 (0.064")	0.057"
14 (0.079")	0.072"
12 (0.109")	0.101"
10 (0.138")	0.129"
8 (0.168")	0.159"

Measurement will be taken at any point not less than 3/8" from edge.

9. Metallic Coatings

- a. Minimum requirements for metallic coatings are:
 - AASHTO M 289 Aluminum Coated (T2) = 1.0 ozs. sq. ft. (Both Sides)
 - AASHTO M 218 Zinc Coated (Galvanized) = 2.0 ozs. sq. ft. (Both Sides)
- b. NCDOT technician will use a calibrated magna gauge to measure coatings in the field. These gauges will measure the thickness in mils. If a discrepancy arises with coating then slugs are to be taken randomly from the heat number in question. A minimum of three slugs per heat number will be taken. Slugs will be sent to NCDOT Materials and Tests Chemical Lab.
- c. Calculating mils to ounces square foot are as follows:
 - Aluminum Coating 1.9 mils = 0.5 ozs. sq. ft (one side)
 - Galvanized/Zinc Coating 1.7 mils = 1.0 ozs. sq. ft (one side)
 - Aluminum coating you will take the average mils for each side and add together. Divide this number by 3.8. This will give you ozs. sf. ft. for both sides.
 - Zinc coating you will take the average mils for each side and add together. Divide this number by 1.7. This will give you ozs. sf. ft. for both sides.

- d. Aluminum Pipe will not have a coating specification. Slugs will be taken for chemical and mechanical check.
 - Three slugs will be taken per temper number for shipment.
 - Contact Kelly Croft if you have a speciality item manufactured from aluminum (Endwall and etc.). Mr. Croft will determine amount of slugs needed.

10. Workmanship

- a. Damage to pipe from shipping or handling.
- b. Poor workmanship.
- c. Coating repairs shall be in accordance with the [NCDOT Standard Specification Section 1076-7](#).

11. Coupling Bands

- a. Sheet steel used in fabricating bands must be same coating and shall conform to same specification as pipe.
- b. Bands shall not be more than 3 nominal gage thicknesses lighter than the gauge of the pipe being connected to. In no case shall the bands be lighter than 18 gage. (Example: When connecting bands to 10 gauge pipe, 16 gauge bands are the minimum allowable band that can be used.)
- c. Annular corrugated bands shall have a minimum width of 10-1/2" where 2-2/3" x 1/2" corrugations are used.
- d. Huger type corrugated bands having one annular corrugation at each outside edge of the band will be acceptable.
- e. Coupling bands with projections (Dimple Bands) may be used where it is necessary to join new pipe to existing pipe having helical corrugations (no rerolled ends) at the joint locations. Use an approved sealer with this type of coupling band.
- f. Fasten coupling bands on the ends with at least two 1/2" bolts. Bolts, nuts, threaded items and lugs shall be zinc coated by the following process hot dip, electroplating or mechanical.

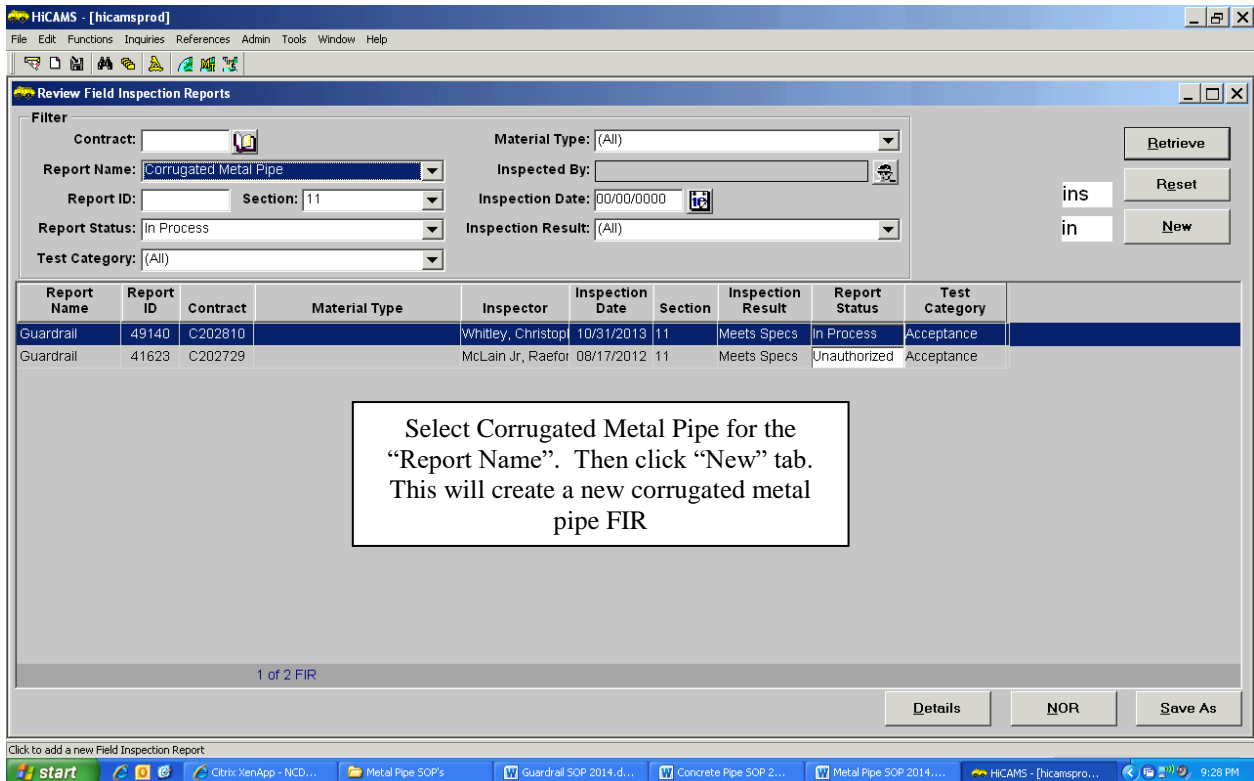
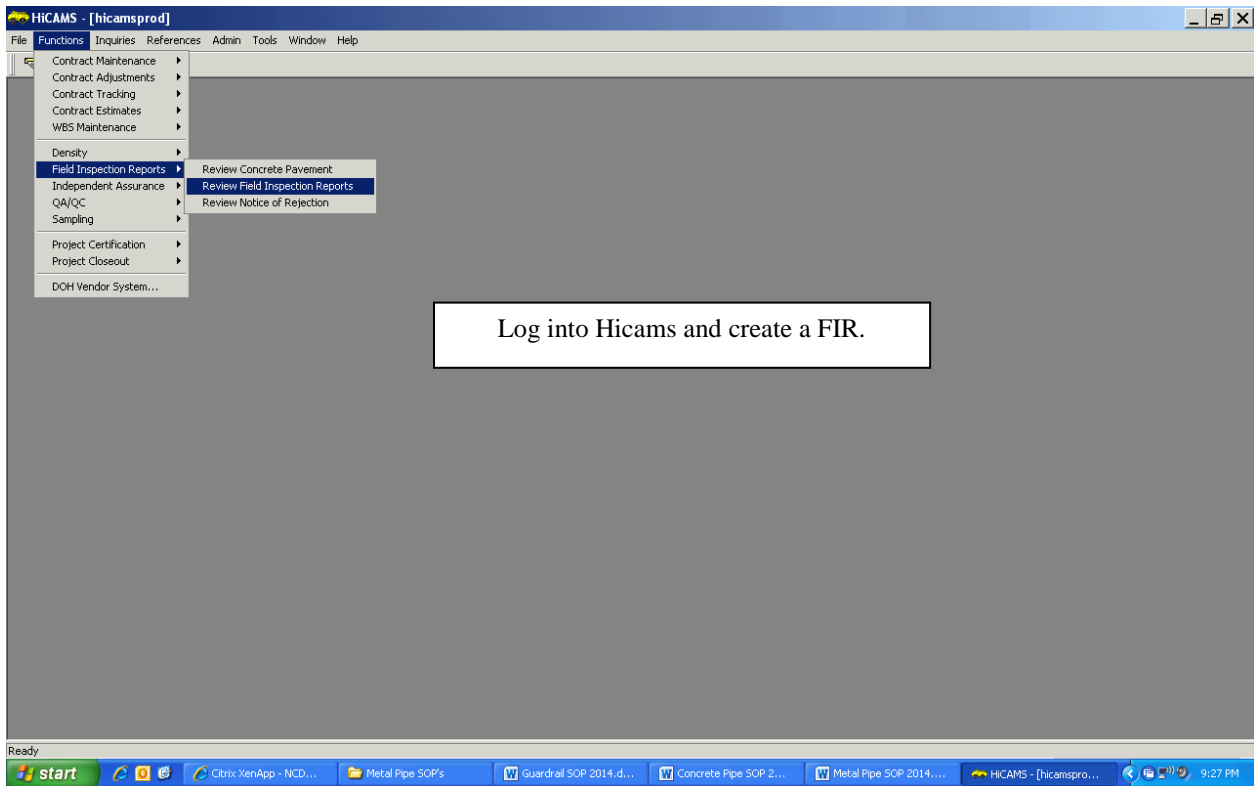
Standards:

NCDOT Standard Specification Section 1032-1 thru 4

AASHTO M 36

Sample Prep and Submittal:

Listed below are screen shots on Hicams concerning entry of a Guardrail Field Inspection Report.



HICAMS - [train] Training Environment

File Edit Functions Inquiries References Admin Tools Window Help

Review Corrugated Metal Pipe (New)

Report Name: Corrugated Metal Pipe Report ID: Report Status: In Process

General Results Alt IDs Report History

Sample From: Project Test Category: Acceptance

Contract: WBS: County:

Contractor:

Station: + Location:

PO: BOL:

Maint Supervisor:

Maint Yard:

Fabricator:

Search by Plant ID: Section: 14

Producer:

Inspection Results

Inspector: Inspection Date: 00/00/0000 Comment:

Click the "General" tab and enter the following:

- Contract #
- Station
- Location
- PO (NCDOT Maint)
- Maint Supervisor (NCDOT Maint)
- Maint Yard (NCDOT Maint)
- Fabricator
- Section
- Producer
- Inspector
- Inspection Date and Inspection Results.

HICAMS - [train]

File Edit Functions Inquiries References Admin Tools Window Help

Review Corrugated Metal Pipe (New)

Report Name: Corrugated Metal Pipe Report ID: Report Status: In Process

General Results Alt IDs Report History

Sample From: Project Test Category: Acceptance

Contract: C202240 WBS: 34427.3.2 County: Macon

Contractor:

Station: 0 + 00 Location: PROJECT

PO: N/A BOL: 3233-1

Maint Supervisor: N/A

Maint Yard: N/A

Fabricator: LANE-DUBLIN

Search by Plant ID: Section: 14

Producer: Lane Enterprises, Inc., Lane Enterprises, Inc. - Dublin - MP17

Inspection Results

Inspector: Ledford, Brandon S Inspection Result: In Process

Inspection Date: 09/26/2013 Notice of Rejection:

Comment:

Material Type	Material	Gage	Metal Thickness	Corrugation	Perforated	Weld	Band	Accepted	Rejected
			.000 *					.000	.000

- Click the "Results" tab to enter in all of your test results
- Click the "insert" icon in the top left corner, 4th icon in
- Entry "Material Type" Pipe Culvert or Accessories
- Entry "Material" material that was inspected.
- Entry "Gage" gage of specified pipe.
- Entry "Metal Thickness" gage of material specified and gaged with micrometer.
- Entry "Corrugation" corrugation specified by contact or special provision.
- Entry "Perforated" if pipe is perforated. Does it meet AASHTO M 36-8.
- Entry "Weld" if pipe is welded. Do welds look good with no holes? Has weld been repaired according to NCDOT Standard Specification 1076-7
- Entry "Band" if bands were supplied do they meet the specifications required.
- Entry "Accepted" quantity of material that meets NCDOT specifications.
- Entry "Line Item" pipe inspected must be associated with correct line items.
- Entry "Coating Type" choice of coatings: Aluminized, Asphalt, Polymer or Zinc.
- Entry "Avg Reading" coatings entered in average mils.

1 of 1 Material

Line Item: (None)

First Reading

Coating Type: [None]

Avg Reading: [0.00]

Coating:

Asphalt Coating Type:

Available Accepted:

Material Type	Material	Gage	Metal Thickness	Corrugation	Perforated	Weld	Band	Accepted	Rejected
Pipe Culvert, Metal - English	Aluminized Corrugated Steel	16 - English	.061	2 2/3 x 1/2	N/A	N/A	Pass	60.0	.000

Line Item: [20 - 18" DRAINAGE PIPE]

First Reading

Coating Type: [Aluminized]

Avg Reading: [1.90]

Coating: [1.00]

Asphalt Coating Type:

Available Accepted:

Second Reading

Coating Type: [(None)]

Avg Reading: [0.00]

Coating: [0.00]

Disposition

Accepted: .000 Pay Adjusted: .000 PAR

Removed: .000 Test ID:

Comment:

HICAMS - [train] Training Environment

Review Corrugated Metal Pipe (New)

Report Name: Corrugated Metal Pipe Report ID: Report Status: In Process

General Results **Alt IDs** Report History

Alternate IDs for Material:
Aluminized Corrugated Steel Pipe Culvert, 16 Gage, 0.064 in Thick, 18 in- Linear Feet

Alternate Type	Alternate ID	Status	Quantity	Available
Heat	89889	Available	60.000	60.000

Define Range
Count: 2
Create Range
Clear Range

Click the "Alt IDs" tab. The alternate type will be "Heat". Record the number from item inspected and enter as alternate id. These numbers will be used for tracking if any issues arise with the metal pipe. Quantity accepted also must be entered.

Ready

HICAMS - [train] Training Environment

Review Corrugated Metal Pipe (Report ID: 49184)

Report Name: Corrugated Metal Pipe Report ID: 49184 Report Status: Complete

General Results Alt IDs Report History

Sample From: Project Test Category: Acceptance

Contract: C202240 WBS: 34427.3.2 County: Macon

Contractor:

Station: 0 + 00 Location: PROJ BOL: 3233-

PO: N/A

Maint Supervisor: N/A

Maint Yard: N/A

Fabricator: LANE-DUBLIN

Search by Plant ID: MP17 Section: 14

Producer: Lane Enterprises, Inc., Lane Enterprises, Inc. - Dublin - MP17

Inspection Results

Inspector: Ledford, Brandon S Inspection Result: Meets Specs

Inspection Date: 08/26/2013 Notice of Rejection:

Comment:

Once all information is entered, than the report status can be change to complete & report saved. A report id # will be assigned to the FIR.

Ready

Documentation Submittal:

- After the inspection, the technician will notify the appropriate NCDOT personnel of the inspection results. If contract is not in HiCams or pipe was inspected at a maintenance yard then a hard copy of the report will be sent to the appropriate personnel.
- Corugated Metal Pipe Fir should be entered into HiCams within two working days after the inspection. FIR will be reviewed and authorized by the Section Materials Specialist within two working days after being completed.
- A hard copy of the Corrugated Metal Pipe Field Worksheets, BOL and copy of the FIR will be filed by the technician