5-Step Testing Procedure to Determine if Soil Conditions are Corrosive to Cast Iron Soil Pipe

CHARLOTTE PIPE AND FOUNDRY COMPANY

Soil-Test Evaluation

Date of Evaluation	
Time	
Project Name	
Project Location	
General Contractor	
Plumbing Contractor	
Testing Company	
Evaluator Name	
Evaluator Signature	

Note:

1) A qualified engineer or soil scientist should be utilized if there is any concern about corrosion and the use of cast iron DWV products in a given underground project.

2) Soil sampling should only occur at the trench bottom as soil conditions can vary from top to bottom.

[A] If sulfides are present and low or negative redox potential results are obtained, three points shall be given for this range.

Soil Characteristics	Points	Your Point Value
1. Soil Resistivity, ohm-cm (based on single probe at pipe depth or water-saturated soil-box):		
<1500	10	
≥ 1500 to 1800	8	
≥ 1800 to 2100	5	
≥ 2100 to 2500	2	
≥ 2500 to 3000	1	
>3000	0	
2. Soil pH		
0-2	5	
2-4	3	
4-6.5	0	
6.5-7.5	0[A]	
>7.5-8.5	0	
>8.5	3	
3. Redox Potential: Footnote A		
> +100 mV	0	
+50 to +100 mV	3.5	
0 to +50 mV	4	
Negative	5	
4. Sulfides		
Positive	3.5	
Trace	2	
Negative	0	
5. Moisture:		
Poor drainage, continuously wet	2	
Fair drainage, generally moist	1	
Good drainage, generally dry	0	
TOTAL POINTS*		

*** Each category is scored with a numerical value and then all five are totaled. If the total equals 10 or more points, then the soil is considered corrosive to cast iron soil pipe and a protective polyethylene wrap would be required.**

1. Soil Resistivity: The soil scientist must analyze the soil for resistivity at the given trench depth in order for the results to be considered accurate. There are several factors which may skew the results:

- **Ground Water Table** - The percentage of time the soil would be saturated.
- **Dry Conditions** - The percentage of time the soil would be dry. This affects the corrosion rate because dry soils contract and can peel off layers of rust, thereby accelerating corrosion.
- **Temperature** – Cooler conditions affect resistivity readings. Freezing conditions should be avoided when taking a reading. The soil sample must be sent to a lab for a proper determination.

Resistivity is normally measured in ranges instead of an exact number due to a wide variation in results. Soils measuring less than 1,500 ohmcm (10 points) are considered highly corrosive while soils measuring higher than 3,000 ohm-cm (0 points) are considered neutral.

2. Soil pH: pH values between 4 and 8.5 are considered to be neutral unless sulfides are present in soils with low or negative redox potentials. Soils that fall in pH ranges between 0 and 4 are acidic and have point values ranging from 3 to 5.

3. Oxidation Reduction Potential: Heavy clays, muck, and organic laden soils are prime for sulfate reducing bacteria due to anaerobic or oxygen deprived conditions and should be tested for redox potential. Redox readings greater than +100 mV yields sufficiently aerated soils and will not support sulfate reducers. Negative readings are considered corrosive and have a maximum point value of 5.

4. Sulfides: This is a quick field test that reveals the presence of a sulfide reaction which reveals a potential problem due to sulfate reducing bacteria. Soils are considered corrosive when the test is positive and neutral when the test is negative. Point values range up to 3.5.

5. Moisture: Drainage conditions are also very important. This category does not actually measure a value from the soil, but is based on a general understanding of the annual climate conditions. Poor drainage or constantly wet soil yields 2 points while properly drained, generally dry soils are considered neutral.

Polyethylene Encasement for Cast Iron Pipe for Waste Water

- Polyethylene encasement shall prevent contact between the pipe and fittings and the surrounding backfill and bedding material when installed correctly. Low density polyethylene encasement must be a minimum of 0.008 inches thick and high density 0.004 inches.
- Pipe and fittings should be clean of excess dirt or mud prior to installation of the polyethylene material for encasement.
- There are two types of polyethylene material that can be used, either the tube type which is slipped over the pipe and fittings or flat sheet type which is wrapped and overlapped over the pipe and fittings.

1) Tube Type Polyethylene Encasement:

- Refer to TABLE I - Polyethylene Tube Sizes below for given pipe diameters to determine flat tube widths. Tubing should be cut 2 feet longer than the pipe section to allow it to overlap with the next section of pipe.
- Slip the tube around the pipe, centering it to provide a 1-foot overlap on each adjacent pipe section.
- Take up slack in the tube along the pipe barrel, making a snug, but not tight, fit. Fold over on top of pipe and secure in place about every 3 feet.

2) Flat Sheet Type Polyethylene Encasement:

- Flat sheet polyethylene should have a minimum width that is twice the flat tube width shown in the table below. Cut the polyethylene sheet 2 feet longer than the pipe section.
- Center the cut length to provide a 1 feet overlap on each adjacent pipe section.
- Wrap the polyethylene around the pipe so that it overlaps circumferentially over the top of the pipe-securing the cut edge, with adhesive tape, at 3 feet intervals.
- Where the fittings are installed and polyethylene material is required, make sure to overlap the sheets and secure in place as before.

- Wrap tees, crosses, and any other odd shaped fittings that cannot be wrapped in a tube with a flat sheet or split length of polyethylene.
- Lower the wrapped pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow hub hole must be made at the joints to facilitate installation of the polyethylene.
- Make sure any tears in the polyethylene are repaired with adhesive tape or another piece of polyethylene secured over the damaged area.
- Backfill material shall be the same as specified for pipe and fittings without the polyethylene encasement but shall not have boulders, rocks, stones or any other refuse that may damage the encasement.
- Any damage to the encasement must be repaired with 20 mil tape before burial of the pipe and fittings.

TABLE I – Polyethylene Tube Sizes

Normal Pipe Diameter, in.	Recommended Polyethylene Flat Tube Width, in. (cm)
1 ½, 2, 3	14 (35)
4	16 (41)
6	20 (51)
8	24 (61)
10	27 (69)
12	30 (76)
15	37 (94)

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