

Cincinnati Water Works
Materials Testing and Specifications
For
Flowable Fill Products

1.0 Flowable Fill Mix Submittal:

Prior to installation of flowable fill products on Cincinnati Water Works (CWW) water main installation projects, mix designs as identified by the HAMCIN Mixture Certification Number shall be submitted for CWW approval. No changes shall be made in the amounts or sources of the approved mix ingredients without written approval of the CWW. Production inspection and testing of the approved mix designs may be made by CWW.

2.0 Flowable Fill Products:

All material utilized in the production of flowable fill products shall meet the requirements of the current Ohio Department of Transportation specification 613.02.

- 1) **Cementitious Materials:**
Cement may be either ASTM C 150, Type IA or ASTM C 150, Type 1 Portland Cement.
- 2) **Fly Ash:**
Fly ash may be either Class "C" or Class "F" and conforming to ASTM C618. Current Material Safety Data Sheets (MSDS) for fly ash materials shall be provided as part of the testing submittal.

3.0 Procedure for Laboratory Resistivity Value of Flowable Fill After 24 hr. Saturation:

- 1) *Objective*
To laboratory determine the resistivity value of flowable fill samples, either obtained from in-situ field samples or from laboratory fabricated compression test samples. The CWW minimum acceptable electrical resistivity of a flowable fill product is 2,500 ohm-cm when tested after a 24-hour saturation and at a minimum moisture content of 13%.
- 2) *Applicable References*
ASTM G57-95a, "Standard Test Method for Field Measurement of Soil Resistivity using the Wenner Four Electrode Method"
- 3) *Equipment*
 - a. Resistivity Meter, Instructions for use should be followed and the connections made in accordance with the type soil box used.
 - b. Soil Box, designed for the measurement of electrical resistivity.
 - c. Miscellaneous equipment for moisture content, mixing, and temperature readings.
 - d. Wiring, 18 to 22-gage insulated stranded copper wire for connections from the meter to the soil box.
- 4) *Procedure*
 - a. For non in-situ samples batch raw materials, per HAMCIN Certified Mixture Number design criteria, and create compression test samples.
 - b. A sufficient amount of the selected sample should be broken down to a natural grain size and placed in a container.
 - c. Add distilled water sufficiently to produce a slight amount of surface water. Mix the material and allow to saturate for 24 hours.

- d. After 24 hours, remix the material then place the material in lifts in the soil box. Each lift should be well compacted. If surplus water accumulates on the surface of the compacted lift, introduce this back into the sample and remix prior to placing and compacting following lift.
- e. Connect the resistivity meter to the soil box as instructed by the manufacturer. Then take and record resistivity reading.
- f. Obtain and record the temperature of the tested sample, if the temperature exceeds 21° C (70° F) correct the resistivity reading to 15.5° C (60° F) by the following formula.

$$R_{15.5} = R_T [(24.5 + T) \div 40]$$

Where: T = soil temperature in °C
R_T = resistivity at T °C

- g. Remove the sample from the soil box and set up an oven dry moisture content test.

4.0 Ten Point Soil Evaluation:

1) *Objective*

To evaluate the properties of a flowable fill product as to its ability to promote a corrosive environment when utilized as a backfill material in water main trench line construction. The CWW maximum acceptable point rating is 10 points when the flowable fill is evaluated against the Ten Point Soil Evaluation Test. This testing is to be conducted in parallel with the resistivity testing (Section 3.0) with sample product at a minimum moisture content of 13%.

2) *Applicable References*

ANSI/AWWA C105/A21.5-93 Appendix A

5.0 Properties:

The final mix shall have the required strength, fill the voids of the intended usage, and set up within 12 hours. Setup is defined in the HAMCIN Specifications Section 2.2.1 of the Producers Guide as a minimum compressive strength of 21 psi.

6.0 Data Submittals:

The required data submittals for CWW approval are identified below:

- a. Identification of HAMCIN Mixture Certification Number for reference of flowable fill mix design components.
- b. Verification of material properties compliance with current Ohio Department of Transportation specification 613.02.
- c. Current Material Safety Data Sheets (MSDS) for fly ash materials.
- d. Electrical resistivity test results with resistivity value and associated moisture content, unit weight of test sample, and temperature.
- e. Ten Point Soil Evaluation results with overall point rating and associated measurements for resistivity, pH, redox potential, sulfides, and moisture.

7.0 Inspection:

CWW will conduct random sampling of flowable fill products used on construction projects to assure compliance. This testing will include, but will not be limited to, obtaining electrical resistivity measurements of in-situ flowable fill products. Additionally, CWW inspection representatives reserve the right to refuse the use of products that exhibit characteristics in the field that are not consistent with the intent of the use of the product, i.e. shrinkage, flowability.