VERIFICATION OF INFILTRATION AT SEWER PIPE JOINTS

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Abstract
Infiltration due to leaking pipes, manholes, laterals and other components of a wastewater system will add to the problem of overflow and substantially load the treatment facilities. Frequent overflows not only lead to regulatory problems but also increase the treatment cost. In order to quantify the infiltration at the joints of the pipes, a full scale test facility has been developed to perform hydrostatic tests for straight joints up to 7 psi. Also angular tests and shear tests at the joints can be performed using this test facility. Preliminary testing is underway on 30-in diameter sewer pipes. The testing protocol is being reviewed by number of pipe associations.

1. INTRODUCTION

Preliminary literature review indicates that each type of sewer pipes is tested differently to determine the infiltration rate at the pipe joint. Hence a testing protocol must be developed to better quantify the infiltration at pipe joints under various joint-loading conditions. Based on review of the literature and ASTM testing standards, a testing protocol for determining the infiltration at the pipe-joint must be developed.

Since several factors in the field can affect the performance of pipe joint, it is important to identify the important factors through controlled experiments where important variable is studied one at a time. In this project, a comprehensive testing program was developed to determine the leak rate at pipe joints.

2. OBJECTIVE

The overall objective is to determine, through laboratory controlled testing, the *infiltration* leak-rates for different types of large diameter sewer pipe-joint under various loading conditions. The specific objectives are as follows:

1. Develop a testing protocol to determine the infiltration at the pipe-joint under the following conditions:
    a. Straight joint (Method A)
    b. Angular deflection (Method B)
    c. Shear load (Method C)

Develop a testing facility to perform the tests under an external hydrostatic pressure.

3. TESTING PROGAM

Model A. Straight Pipe Joint Test

In order to stimulate the straight pipe-joint condition this model test (Fig. 1) is proposed using 30 in. diameter pipe. A composite watertight bladder was designed and used at the joint to apply the necessary water pressure for testing. The pipe manufacturer will submit a data sheet on the joint. Any preconditioning for the joint as recommend by the manufacture will be done before the test. Water pressure up to 7 psi will be applied. Infiltration will be collected from the pipe interior and quantified to an accuracy of 1 ml.

Model B. Angular Deflection Test

In order to stimulate the angularity at the pipe-joint condition this model test (Fig. 1) is proposed using 30 in. diameter pipe. A composite water tight bladder will used at the joint to apply the necessary water pressure during the rotation of the joint.

Model C. Shear Load/Deflection Test

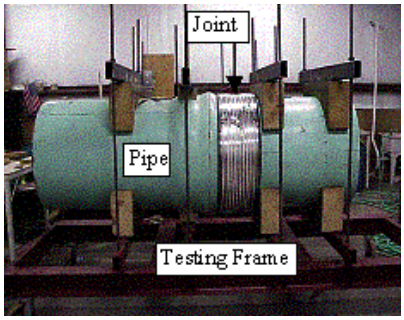
In order to stimulate the shear loading at the pipe-joint condition this model test is proposed using 30 in. diameter pipe. A composite water tight bladder will used at the joint to apply the necessary water pressure during the shearing of the joint.

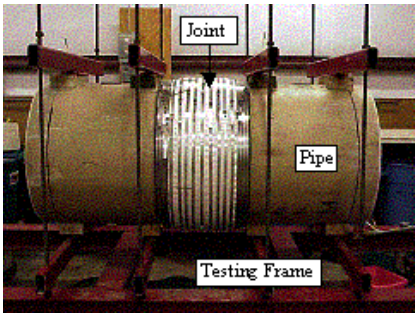
4. MEASUREMENTS

(i) Testing Parameters: Pressure and time used for the hydrostatic test will be noted. Applied shear load/deflection will be recorded.

(ii) Leak Rate: Joint will be subjected to hydrostatic pressure of 3, 4,5 6 and 7 psi and the leak rate will be determined. Pressures 3, 4,5 and 6 will be held 5 minutes and pressure 7 psi for 10 minutes.

(iii) Visual Inspection*:* After the test the joint will be carefully inspected for and defects.





(a) Rigid Pipe (b) Semi-rigid/Flexible Pipe

Figure 1 - Configuration of Pipe-Joint Infiltration Test

5. CONCLUSION

Testing facility can be used to qualify the infiltration rates at sewer pipe joints under various loading conditions.

6. ACKNOWLEDGEMENT:

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7. REFERENCE

Annual Book of ASTM Standards (1999), Section 4 (Construction) and Section 8 (Plastics), ASTM, Philadelphia, PA.