

# Bonding Strength of an Epoxy Coating to Concrete and Clay Brick

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## Abstract

Microbially induced corrosion in sewer facilities requires rapid in situ rehabilitation of the concrete/clay brick elements. Coating wastewater facilities is one method of extending the service life of current structures used in wastewater facilities and hence it must protect structures from sulfuric acid attack. Controlled laboratory tests (bonding) were performed on coated concrete/clay brick. ♦ Bonding strength of the epoxy coating with concrete and clay brick was in the range of 30 psi (0.2 MPa) to 398 psi (2.7 MPa).

## 1. INTRODUCTION

Concrete and clay brick are widely used construction materials in large wastewater systems. Concrete is commonly used for below grade wet wells or holding tanks; manholes; sewer pipelines and open top channels. Manholes made of clay bricks are also very common. Many municipalities are discovering that particular concrete structures and brick manholes in the wastewater collection treatment facilities are subjected to corrosive environments and are degrading rapidly. Bonding between the concrete/clay brick surface and the coating material is an important property that must be evaluated to determine the performance of the coating.

## 2. OBJECTIVE

The objectives of this study are (1) to identify the types of failures and (2) to evaluate bonding strength of the protective coating to the concrete /clay brick substrates under dry and wet conditions for a long period.

## 3. TESTING PROGRAM

The bond strength tests have been designed to investigate bonding of the coating material to the concrete or clay brick substrate. Two laboratory bond strength tests, Modified ASTM D 4541 (CIGMAT CT-2) and Modified ASTM C 321(CIGMAT CT-3), were used in this research to determine the bonding of the coating material to the substrate. ♦

## 4. RESULTS AND DISCUSSION

Over twenty types of coating materials are being investigated in the CIGMAT test facility. A coating was randomly selected for discussion. It should be noted that the results cannot be generalized to other epoxy or any other coating. Figures 1 and 2 summarize the results of ASTM D 4541 and ASTM C 321 tests on coated concrete and clay brick specimens. Depending on the failure, five types of failures were identified, which are also indicated. Failure in the substrate indicated good bonding of the coating to the substrate (Type 1) and failure at the interface (Type 3) was weak bonding. All the failures in coated concrete were Type 3. The average bonding strengths from ASTM D4541 and ASTM C321 tests were 73 psi and 176 psi respectively. Epoxy-coated concrete showed poor bonding strength to the concrete substrate. ♦ Most of failures in coated clay brick were Type 1 (83%). The average bonding strengths from ASTM D4541 and ASTM C321 tests were 292 psi and 255 psi respectively. Bonding strength of epoxy coating on clay brick was stronger than bonding strength of coatings on concrete.

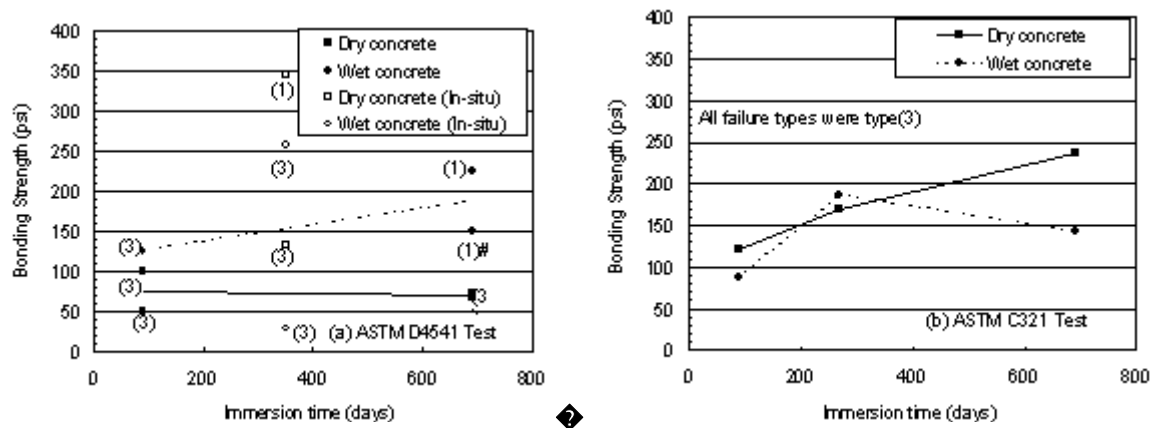


Figure 1 Bonding strength of Epoxy-Coated Concrete (a)ASTM D4541 Test and (b) ASTM C321 Test

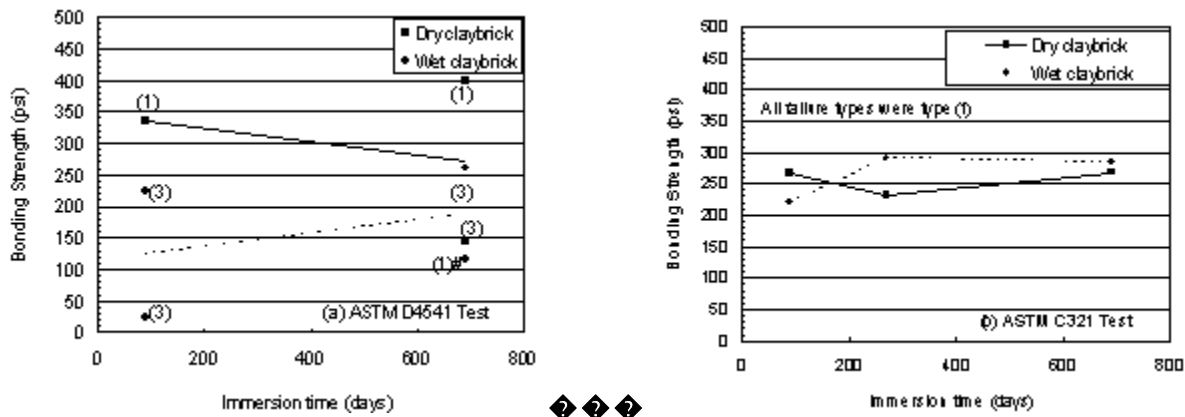


Figure 2 Bonding strength of Epoxy-Coated Clay Brick (a)ASTM D4541 Test and (b) ASTM C321 Test

## 5. CONCLUSION

The following conclusions can be advanced based on the test results of this study:

1. Five types of failures were observed in the bonding tests.
2. Bonding strength of the coating was depended on the testing method but the failure was not.
3. Coating had better bonding with clay brick substrate than concrete substrate.

## 6. ACKNOWLEDGMENT

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## 7. REFERENCES

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