

Shear Bonding Strength of Grouts Used in Pipe-in-Pipe Application

T.Shah and C.Vipulanandan

Department of Civil and Environmental Engineering
University of Houston, Houston, TX 77204-4003
Phone: 713-743-4291 E-mail: tarangyshah@yahoo.co.in

Abstract

In this study various polymer grouts have been tested to determine the shear bonding strength with coated steel sections. Grouts in both state, pure and with aggregates, is used as the addition of aggregates results in very high strengths. Tests were performed at room temperature and also at 140 F to determine the shear strength. Also, the shear strength is checked at different curing times from 15 min. to 24 hr. on different types of coatings on steel. The addition of aggregates reduces the shrinkage, which results in very high strengths, as compared to the pure grout. Generally, the failure is of bonding type only but in some cases, coating failure also occurred; however, the grouts with aggregates give the desired shear bonding strength.

1. Introduction

Pipe-in-Pipe configurations are used in offshore pipeline applications. Generally, the space between the two pipes is filled with grouts; hence, shear-bonding strength is an important property of the grout to hold the pipes in position.

2. Objective

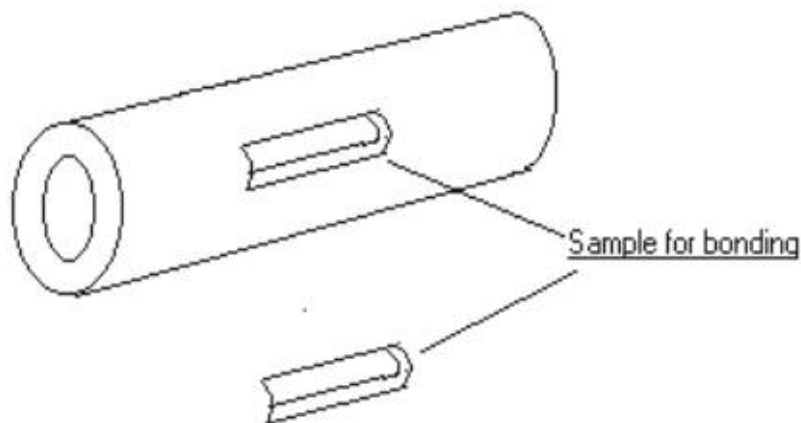
Specific objectives are to:

- (1) determine the Shear bonding Strength of the grouts with steel surface;
- (2) evaluate the effect of grouts with aggregates and
- (3) study the effect of temperature and curing time on shear strength.

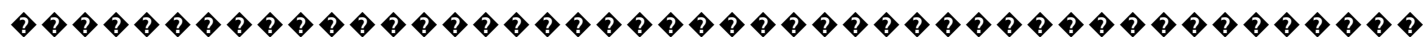
3. Materials and Testing Program

Several polymer grouts having elastic modulus about 30 times less than that of steel have been tested in a single shear test configuration with the lap joint area of 1x4. Steel specimens were obtained by cutting pipe specimens.

Coatings are used on the pipes to control corrosion and hence, bonding strength studies were performed with the coatings on the steel surface. Specimens were prepared using pure grouts, with and without aggregates. The specimens are tested at different curing times and a curing temperature of 140 F.



◆Figure 1. Cutting Strips from pipe for bonding Test



4. Results and Discussions

◆Single Shear Test:

Generally the shear strength was in the range of 40 to 450 psi. Also, the shear strength increases with the increase in curing time. In 90% of the cases it was bonding failure and in other cases it was the failure of the coating. The addition of aggregates generally increased the shear strength. Shrinkage causes very poor bonding between grout and surface resulting in a very low shear strength. The addition of aggregates in grouts reduced the shrinkage to a greater extent and improved the shear bonding strength of the grout. Curing the grout at higher temperature also affected the shear strength of the grouts.

5. Conclusions

Single Shear test was used to determine the shear bonding strength of grouts to steel surfaces. The shear bonding strength of the grouts tested was affected by curing time, curing temperature and addition of aggregates. The shear bonding strength of grouts varied from 40 to 450 psi.

6. Acknowledgement

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7. References

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If you have any questions, please contact [Dr. C.Vipulanandan](#)

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