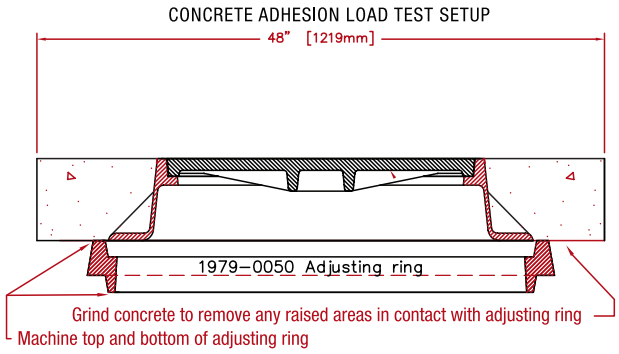
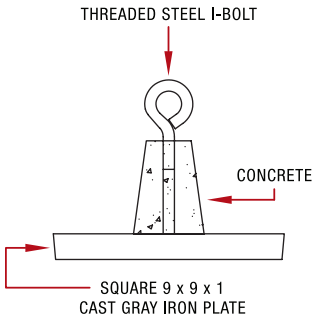
CONCRETE/CAST IRON ADHESION TESTING

Neenah Foundry conducted testing regarding the adhesion of concrete to gray iron. A commercial mix of bagged concrete (listed at 4,000 pound strength) was mixed with water and placed in 8-ounce plastic cups with a 2.25" diameter at the brim. The cups were inverted and placed on 9" square, 1" thick samples of cast gray iron meeting ASTM A48 class 35 B. An eye bolt was placed in the concrete through a hole in the bottom of the cup, the concrete was hand vibrated as the eye bolt was plunged into the concrete. This eye bolt was used as an anchoring point for the tensile test.



A total of 18 test samples were made. Six sample pieces of iron were shot blast clean. Six sample pieces of cast iron were wet two times with ordinary tap water creating a rusty appearance, and six samples were painted with a black primer base paint.*



The concrete was allowed to cure for 28 days.
Test results are as follows:

Sample #	Adhesive strength	Sample #	Adhesive strength	Sample #	Adhesive strength
Unpainted-1	16.2 psi	Rust-1	9.6 psi	Paint-1	2.9 psi
Unpainted-2	13.9 psi	Rust-2	12.7 psi	Paint-2	3.3 psi
Unpainted-3	16.2 psi	Rust-3	12.0 psi	Paint-3	4.6 psi
Unpainted-4	40.1 psi	Rust-4	7.6 psi	Paint-4	7.8 psi
Unpainted-5	28.8 psi	Rust-5	26.7 psi	Paint-5	failed prior to test
Unpainted-6	22.0 psi	Rust-6	failed prior to test	Paint-6	failed prior to test
AVERAGE 6 TESTS	**22.9 psi**	AVERAGE 5 TESTS	**13.7 psi**	AVERAGE 4 TESTS	**4.7 psi**
	100%		**59.8%**		**20.5%**

*The paint description is as follows:
Intended Uses: A high-performance primer that exhibits fast cure in dip or spray applications, offering excellent salt spray performance.

NEENAH FOUNDRY

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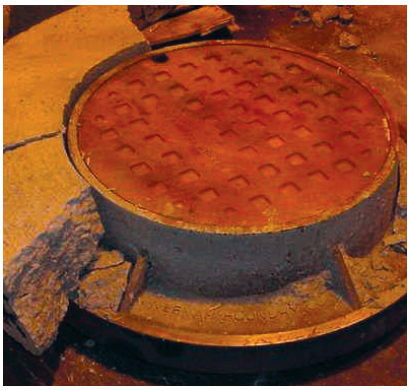
PRODUCT INFORMATION

Color: Black
Theoretical Coverage: 600 ft.^{2} @ 1 mil DFT
Gloss: 1-5 on 60 degree meter
Salt Spray Test: 96 hrs. untreated steel; 240 hrs. @ 2 mil DFT
Volume Solids: 37.0%
Humidity Test: 96 hrs. untreated
Weight Solids: 56.0%
Weatherometer Test: Topcoat Performance
Weight per Gallon: 11.25–11.75 lb/gal
Pencil Hardness: B @ 96 hrs.
VOC: 1.69 lb/gal
Viscosity: 40-50 #4 Ford
Film Thickness: 1.0-1.5 dip 1.5-2.0 spray



Additional follow-up was conducted with the Neenah R-1642 frame. Formwork was made and six cast-iron frames with different surface conditions were cast into concrete. Two frames were shot blast clean and unpainted, two were rusty subject to rainwater and two were painted black with the paint mentioned above.

Results of the full-scale frame testing are as follows:

Unpainted-1	28,700 pounds
Unpainted-2	30,000 pounds
Rust-1	39,500 pounds
Rust-2	29,800 pounds
Paint-1	21,500 pounds
Paint-2	Operator error no results available

In conclusion, bare unpainted cast iron—rusty or not—has a greater adhesion to the concrete than painted cast iron. If long term, the adhesion of concrete to cast iron is a favorable consideration. It is better to not coat the castings. If the goal is to have a barrier between the concrete and cast iron to minimize concrete adhesion, then painting of cast iron is desirable.

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