

925.2.43

4. Ensure that the Tri-Stud Span Wire Entrance has a minimum of 0.5 inch (13 mm) diameter throughout for wire access and that wire access is free of burrs and casting webs.
5. Ensure that the Wire Entrance opening is recessed and has a neoprene grommet with sealed membrane sections.
6. Ensure that the signal head attachment end is serrated and has a minimum of 3-signal head centering bosses extending 0.19 inches (5 mm) from the serrations.
7. Ensure that the serrations have a 72-tooth design to match the signal head.
8. Ensure that three (3) stainless steel studs are cast into the wire entrance fitting. Ensure that the studs are 0.31 inches (7 mm) and extend 1.5 inches (38 mm) [+/- 0.13 inches (4 mm)] beyond the serrations. Provide each Tri-Stud span wire entrance fitting with a Tri-Stud hardware kit.
9. Ensure that the Tri-Stud Span Wire Entrance Fitting has an alodine conversion coating to provide a proper base for paint adhesion. Ensure that the assembly is painted federal yellow and baked in a drying oven after painting.
10. Ensure that the all Hardware is galvanized or stainless steel.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

Refer to Subsection 925.2.D for Materials Warranties.

925.2.43 Bull Rings

A. Requirements

Provide bull rings that are weldless steel 0.63 inch (16 mm) diameter. Submit catalog cuts for approval.

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

General Provisions 101 through 150.

D. Materials Warranty

Refer to Subsection 925.2.D for Materials Warranties.

Section 934—Rapid Setting Patching Materials for Portland Cement Concrete

934.1 General Description

This section includes the requirements for rapid setting patching materials used in Portland cement concrete.

934.1.01 Related References

A. Standard Specifications

Section 886—Epoxy Resin Adhesives

B. Referenced Documents

AASHTO	ASTM
T 97	C 31/C31M
T 260	C 109/C 109M
	C 140
	C 666

Federal Hazardous Products Labeling Act

QPL 27

934.2 Materials

934.2.01 Rapid Setting Patching Materials

A. Requirements

1. Use rapid setting patching materials that have the following characteristics:
 - Are nonmetallic
 - Have a color similar to Portland cement concrete
 - Can be mixed and placed like concrete
 - Have accelerated hardening characteristics
 - Can yield a permanent patch in concrete that can be subjected to traffic within 2 hours.

For a list of sources, see QPL 27.

2. Type I
Use Type I to patch reinforced or nonreinforced Portland cement concrete. Ensure that Type I contains less than 0.6 lbs (0.4 kg) total chloride per cubic yard (meter).
3. Type II
Use Type II to patch only nonreinforced Portland cement concrete. Type II may contain more than 0.6 lbs (0.4 kg) total chloride per cubic yard (meter).
4. Classify Type I and Type II as follows:
 - a. Class A, Premixed: Use these materials as received by adding water or an activator solution, according to the manufacturer's instructions.

NOTE: Although some manufacturers allow you to add more aggregate at the jobsite to Class A materials to increase yield, DO NOT do this unless you receive approval from the Office of Materials and Research.

- b. Class B, Non-Premixed: These materials contain no aggregate. Add aggregate (fine and/or coarse) according to the manufacturer's recommendations.
5. Physical Requirements
Ensure that rapid setting patching materials meet these requirements when tested with the required test methods.

Requirement	Measurement
Flow of Mortar, Minimum	100%
Flexural Strength, Minimum	500 psi (3.5 MPa) in 24 hours
Compression Strength, Minimum	
2 hours	1,200 psi (8.5 MPa)
24 hours	3,000 psi (20 MPa)
7 days (moisture cure)	4,000 psi (27.5 MPa)
Absorption, Maximum	10%
Shear Bond, Minimum	200 psi (1.5 MPa) in 24 hours
Freeze Thaw Durability Factor	75% of the reference concrete after 300 freeze-thaw cycles
Total Chlorides	
Type 1	0.6 lb/yd ³ (0.4 kg/m ³) maximum
Type 2	No limits

6. Submittals
For the Freeze-Thaw test, submit to the Department a certification from the manufacturer showing results of durability tests conducted by an independent professional testing laboratory.
Ensure that the tests are conducted according to ASTM C 666. Express the durability as a durability factor.

B. Fabrication

1. Packaging
 - a. Package this material in strong, moisture-proof paper bags or other suitable containers that can withstand shipping, normal handling, and storage without breaking.
 - b. Clearly label each container of the components of a patching system with the following information:
 - Component designation, if two components
 - Manufacturer's batch number
 - Mixing ratio and directions
 - Potential hazards and precautions displayed according to the Federal Hazardous Products Labeling Act

C. Acceptance

1. Follow the mixing instructions of the manufacturer to create test specimens.
2. Air-cure all test specimens except for the 7-day moisture cure cubes.
3. The Department will reject a patching system that meets all the requirements of this Specification, but does not work as required in actual use.
4. Test using the following methods:

Test	Method
Flow of mortar	ASTM C 109/C 109M
Flexural strength	AASHTO T 97
Compressive strength	ASTM C 109/C 109M or C 31/C 31M, whichever is applicable
Absorption	ASTM C 140
Shear bond strength	See Subsection 934.2.01.C, "Acceptance", Step 5
Rapid freeze thaw	ASTM C 666
Total chlorides	AASHTO T 260

5. Shear Bond Strength
 - a. Place a Type II epoxy resin adhesive meeting the requirements of Section 886 on the surface of a cured mortar bar 16 x 3 x 3 in (400 x 75 x 75 mm).
 - b. Cast a 16 x 2 x 0.5 in (400 x 50 x 13 mm) rapid-setting material patch in the center of the mortar base.
 - c. Air-cure the test sample for 24 hours.
 - d. Saw the mortar bar base and the cured rapid setting material patch into 2 in (50 mm) segments for testing.
 - e. Use a holding device and plunger to apply a load at a rate of 0.05 in (1.3 mm) per minute to the patch until the patch fails.
 - f. Read the load in pounds (newtons) on the plunger.
 - g. Calculate the shear bond strength in pounds per square inch by dividing the load in pounds by the interfacial area of the patch in square inches. The metric equivalent for shear bond strength in MPa is obtained by dividing the load in newtons by gravitational acceleration (9.81 m/s²).

D. Materials Warranty

Storage: Ensure that the material has a minimum storage life of at least 1 year under conditions of 40 ° to 90 °F (4 ° to 32 °C) and a maximum relative humidity of 90 percent.