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DESIGN-A-SPEC™ GUIDELINES

FIVE STAR ELASTOMERIC GROUT

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PART A - GENERAL CONDITIONS - ELASTOMERIC GROUTING

1.01 SCOPE

This document will address all necessary requirements for the proper storage, handling, mixing and installation of Five Star Elastomeric Grout.

1.02 QUALITY ASSURANCE

A. Five Star Products is an ISO 9001 certified manufacturer and maintains a strict quality control program. Five Star Elastomeric Grout is quality control tested on a batch by batch basis. Five Star Products may provide a Technical Representative at the job site when required, upon suitable advance notice, for pre-job instruction on product handling and use and/or during actual product installation.

1.03 DELIVERY, STORAGE AND HANDLING

A. For optimum performance and ease of placement, all components should be store and conditioned between 70ºF and 80ºF (21°C and 27°C) for 24 hours prior to use. While Five Star Elastomeric Grout may be placed when **material** temperatures are in excess of 80ºF (27°C), this recommended storage temperature range will provide the best performance in terms of product flow and working time, particularly when average daytime placement temperatures exceed 90°F (32°C). When stored at temperatures outside this range it is important to recognize this will impact product flow or working time. Grout components MUST be stored in a dry, weather proof area.

B. Where accidental spillage of grout component liquids occurs, use a suitable absorbent material to soak up liquids and place absorbed material into closed container. Wear gloves and protective eyewear when handling product at all times. Refer to Material Safety Data Sheet prior to use.

PART B - MATERIAL SPECIFICATIONS - ELASTOMERIC GROUTING

2.01 MATERIALS

A. Five Star Elastomeric Grout is a 100% solids, premeasured, packaged system containing thermosetting elastomer resins, expansive additives and inert fillers. Five Star Elastomeric Grout may be used neat (without aggregate filler) for lower project durometer requirements/ thin applications or filled with aggregate filler (1 bag aggregate per unit - supplied with grout) for higher project durometer requirements.

B. **Five Star Elastomeric Grout** meets all the following typical performance criteria when cured at 73°F (23°C):

Adhesion:
a. Test Method – ASTM C 882 Slant Shear Bond Strength:

No shear failure, deflection to steel or concrete.

C. Volume Resistively:
a. Test Method – Per ASTM D 257, at 50% relative humidity and 73ºF (23ºC) shall be measured for a dry specimen and the same specimen after 7 days immersion in a 3% NaCl solution. .

>1 x 10^{12} ohm-cm.

D. Dielectric Strength:
a. Test Method Per ASTM D 149

>400 volts/mil

E. Tensile Properties
a. Test Method Per ASTM D 638

450 psi Ultimate Tensile Strength and 200% Elongation

:

F. Hardness Test – Resin + Hardener + Aggregate (Components A + B + C) Type II
   a. Test Method – Per ASTM D 2240, report for cured specimens and specimens aged 24 hours at 75ºF.
      Shore Hardness 85 ±10 (filled at one full bag aggregate)

G. Hardness Test – Resin + Hardener (Components A + B) Type I
   a. Test Method - Per ASTM D 2240, report for cured specimens and specimens aged 24 hours at 75ºF.
      Shore Hardness: 70 ±10 (neat resin + hardener)

H. Compression Modulus
   a. Test Method – Per ASTM D 575B, report deflection at 250 psi loading.
      Deflection at 250 psi = 7%

I. Compression Set
   a. Test Method – Per ASTM D 395, for 22 hours at 158ºF (70ºC) performed three times on the same specimen. Report initial and incremental sets.
      < 1% incremental set, third test

J. Fatigue Resistance
   a. Test Method – 1,600,000 cycles at 20 Hz 5-250 psi
      < 10% deflection

K. Working Time
   a. At 73ºF (23ºC)
      30 minutes

L. Tack Free Time
   a. At 73ºF (23ºC)
      3 hours

M. Cure Time
   a. At 73ºF (23ºC)
      12 - 24 hours

2.02 CLEARANCES / DEPTH OF POUR

A. The grout thicknesses shall be as detailed on project drawings or specified within contract documents. Five Star Elastomeric Grout may be placed typically from a minimum 1 inch to a maximum 6 inches in depth. Thinner pours or tighter clearances may be accomplished with mixed resin and hardener, depending upon specific durometer requirements for the specific application. Single or multiple lifts may be accomplished with Five Star Elastomeric Grout; multiple lifts should be placed within 24 hours of previous placement. Aggregate filler should be utilized, where appropriate, for deeper pours over 1 inch (25mm) in depth that require a single lift or pour.

PART C – PREPARATION - ELASTOMERIC GROUTING

3.01 CONCRETE SURFACES

A. Concrete surfaces shall be roughened, dry, dimensionally stable and free of oil, grease, laitance and other contaminants. New concrete age shall be a minimum 28 days, but at the discretion of the Project Engineer, vapor transmission testing may be performed to ensure moisture content level of substrate concrete. Concrete surfaces that are sandblasted or mechanically prepped will provide the best substrate for grout bond development.

B. Prior to placement, concrete surfaces must be completely dry.

3.02 METAL SURFACES

A. Where bond to metal surfaces is not required, coat with a bond breaker such as paste wax or polyethylene sheeting.

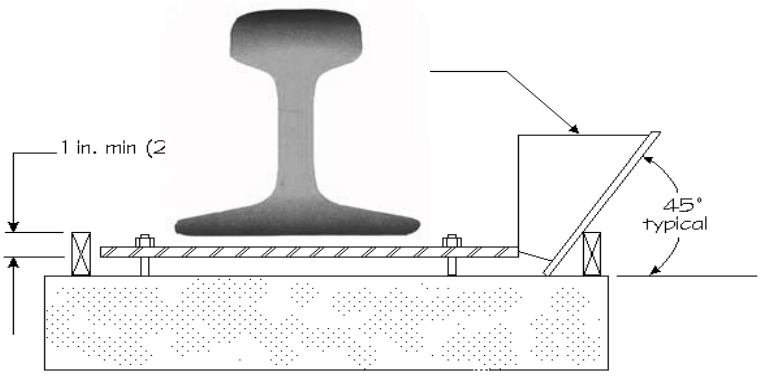
B. Where bond to metal surfaces is required, the surface shall be clean, free of oil, grease, rust and other contaminants. Sandblasting to a SSPC-SP6* commercial finish will further enhance bond development to steel surfaces.

*SSPC-SP6
Commercial blast cleaned surface is defined as one in which all oil, grease, dirt, mill scale, rust and old paint have been completely removed from the blast cleaned surface, except that slight streaks, or discolorations caused by rust stain, mill scale oxides, or slight tightly adherent residues of paint or coating may remain. If the surface is pitted, slight residues of rust or paint may remain in the bottom of the pits. The slight discolorations mentioned above are limited to one-third of every square inch.

3.03 FORMWORK – TIE PLATE TO TIE

A. Formwork, if required, shall be constructed of rigid nonabsorbent materials, securely anchored, caulked liquid tight and strong enough to resist forces developed during grout placement.

B. Formwork shall be constructed so that grout is placed across the shortest distance whenever possible. The clearance between formwork and tie plate shall be sufficient to allow for access of headbox. The clearance for remaining sides shall be one to three inches.



C. Height of any formwork shall extend a minimum of one inch (25mm) above bottom edge of the tie plate.

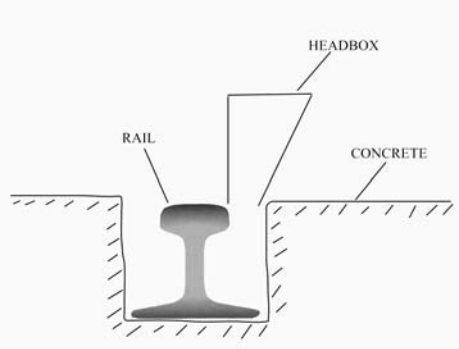
D. Any formwork installed and in-place shall be coated with a bond breaker such as two coats of paste wax or polyethylene sheeting. Form release oil is not acceptable. Care should be taken not to contaminate grouting surfaces where bond is required.

3.04 FORMWORK – RAIL IN CONCRETE TROUGH

A. Rail in concrete does not need any additional formwork. This application relies on a formed in-place trough in the concrete pad. It allows the rail to be mounted so that the top of the rail is near or flush with the top of the concrete. Concrete surfaces that have a broom finish and are sound and free of laitance are suitable for placement.

B. The rail shall be placed and suspended in the trough using devices that will hold the rail at the required height, cant and gage.

C. Five Star Elastomeric Grout should be poured from one side of the rail only to minimize air entrapment, allowing the grout to flow in place. A headbox or similar device will ensure elastomeric grout maintains contact with rail and will assist in housekeeping and clean up in keeping grout off concrete and steel surfaces.



D. All areas adjacent to grouting should be covered with poly sheeting to facilitate clean up.

3.05 CLEARANCES

A. All tie plates or rails shall be set to final alignment before grouting.

3.06 EQUIPMENT AND MATERIALS

A. All necessary tools, equipment and materials, such as mixers, trowels and grout, shall be as close as possible to the area being grouted. Provide an adequate number of mixers, in good operating condition, for uninterrupted placement. Equipment shall be clean and dry. Grout components may be mixed in a large pail or bucket

using a heavy duty drill and mixing paddle attachment. A paint type paddle is recommended for best mixing of grout components.

B. Appropriate clothing (gloves, eyewear) and safety equipment shall be available and worn to reduce direct skin contact with grout components.

C. Extra buckets shall be clean and available for transporting mixed grout.

D. Provide headbox and plunger when pouring grout.

E. A suitable solvent such as MEK (methyl ethyl ketone) may be used to clean tools and equipment.

3.07 MIXING

A. Five Star Elastomeric Grout is pre-measured and packaged as Component A (Resin), Component B (Hardener) and Component C (Aggregate). Component C is a single bag of aggregate and should be mixed with liquid components for deeper pours or where project durometer requirements require.

B. When mixing the two liquid components (A + B), pour Component B into container containing Component A. Use a heavy duty drill and mixing paddle attachment and mix at a slow speed for approximately 3-4 minutes. Avoid mixing at high speed so as not to introduce excessive amounts of air during this process. Mix liquids until a uniform color and consistency is obtained. Where grout mixes require aggregate addition, add bag of aggregate after liquids are completely mixed. Add aggregate slowly while mixing and mix until aggregate is completely wetted with liquids (approximately 1 – 2 minutes). At ambient temperatures of 70ºF - 80ºF (21° C to 27°C), do not mix more material than can be placed in 25-30 minutes. Where ambient temperatures are 90°F or greater, do not mix more material than can be placed in 15 minutes.

PART D – APPLICATION - ELASTOMERIC GROUTING

4.01 PLACEMENT PROCEDURES

POURING

A. Elastomeric grout must be placed without interruption. Should a delay occur beyond the working time of the material, all equipment used in mixing and placing the epoxy grout, shall be cleaned.

B. Five Star Elastomeric Grout will provide a pourable consistency and is self-leveling; no finishing is typically required. If finishing is required, solvent wiped steel trowels may be used as required. Maintaining a sufficient solvent coat on any tools is important as elastomeric grout will adhere to dry tools.

C. When installing grout under long baseplates or rails, start pouring from one end across the short dimension and work down the longer side as the material fills under the baseplate or rail.

D. If a section of rail is too long to be filled with elastomeric grout in the time allotted, a dam or joint can be used to act as an end point for that pour. The dam can be Styrofoam, plywood or similar material that is wedged into the trough to prevent grout flow beyond that point. When resuming the pour remove the dam and proceed as before. Elastomeric grout cannot be trimmed after set except by mechanical means. Final level and elevation should be accomplished immediately after placement.

PART E – FINISHING AND CURING - ELASTOMERIC GROUTING

5.01 FINISHING

A. No finishing is typically required with Five Star Elastomeric Grout. If finishing is required, prior to hardening, elastomeric grout can be finished with a solvent wiped steel trowel. Maintaining a sufficient solvent coat is important as elastomeric grout will adhere to dry trowel.

B. Elastomeric grouts cannot be trimmed after set except by mechanical means. Final level and finishing should be completed before hardening.

5.02 CURING

A. Five Star Elastomeric Grout is self-curing. **Protect grout from temperature extremes, rain and water after placement. Do not add solvents or wet cure elastomeric grout**.

B. The grout shall be protected from temperatures below 45^{o}F (7^{o}C) for 24 hours after the pour to allow for sufficient cure and initial strength development.

C. In-service operation may begin typically 24-48 hours after placement at curing temperatures of 70°F.

PART F – EXTREME WEATHER CONDITIONS - ELASTOMERIC GROUTING

6.02 HOT WEATHER GROUTING

High temperatures accelerate set, decrease working time, and accelerate strength gain. The procedures below may compensate for extreme hot weather conditions.

A. Materials shall be stored and pre-conditioned so that mixed grout is between 70°F and 80°F (21°C and 27°C). Proper storage and pre-conditioning of grout components is critical where ambient placement temperatures exceed 90ºF (32°C); see Section 1.03 of this document for further details on recommended storage and conditioning.

B. Tenting and shading of concrete surfaces from direct sunlight for 24 hours prior to grout placement will help to reduce substrate temperatures. Place grout during early morning or night time when ambient temperatures are decreasing.

C. Shade application areas from direct sunlight during placement of grout when ambient temperatures are excessive. When other cooling methods are used, extreme caution shall be taken to insure all surfaces in contact with grout are completely dry before grouting.

D. Grout shall remain shaded and protected from direct sunlight for at least 12 hours after placement where ambient temperatures exceed 90ºF (32°C).