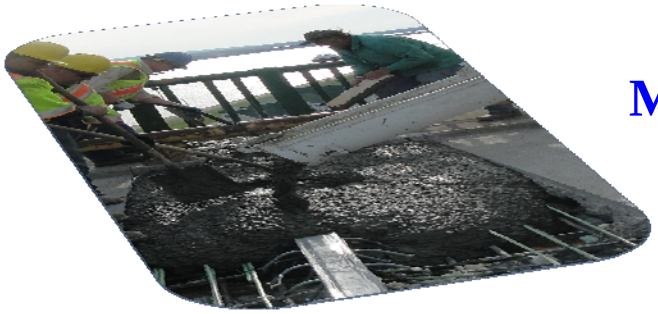

Structure Maintenance Bulletin

January 2012

Replacing Strip Seal Glands

Improper installation, environmental deterioration, or neglected debris removal are factors that contribute to strip seal gland failures. Replacing a gland requires effort, and doing it correctly the first time is imperative. Correctly matching the style of gland to be purchased to the existing steel armor will reduce repeated trips, sore backs, and money. The majority of strip seal expansion joint systems in use today are manufactured by DS Brown and Watson Bowman. The profiles of each manufacturer appear similar, but close examination is required to determine the gland to be inserted.

STEP 1. Before deciding to perform a gland replacement one must ensure the device is secure. If the rail is surrounded by deteriorated concrete, or if damage has occurred during winter maintenance, a full or partial replacement of the rail and surrounding concrete should be performed. A close visual inspection and sounding of the adjacent concrete are helpful to determine the proper repair.

STEP 2. If only a gland replacement is required determine who manufactured the rail. Four profiles are manufactured by DS Brown with SSA2 being the most common in Michigan, while Watson Bowman has nine profiles with Type A being widely used.

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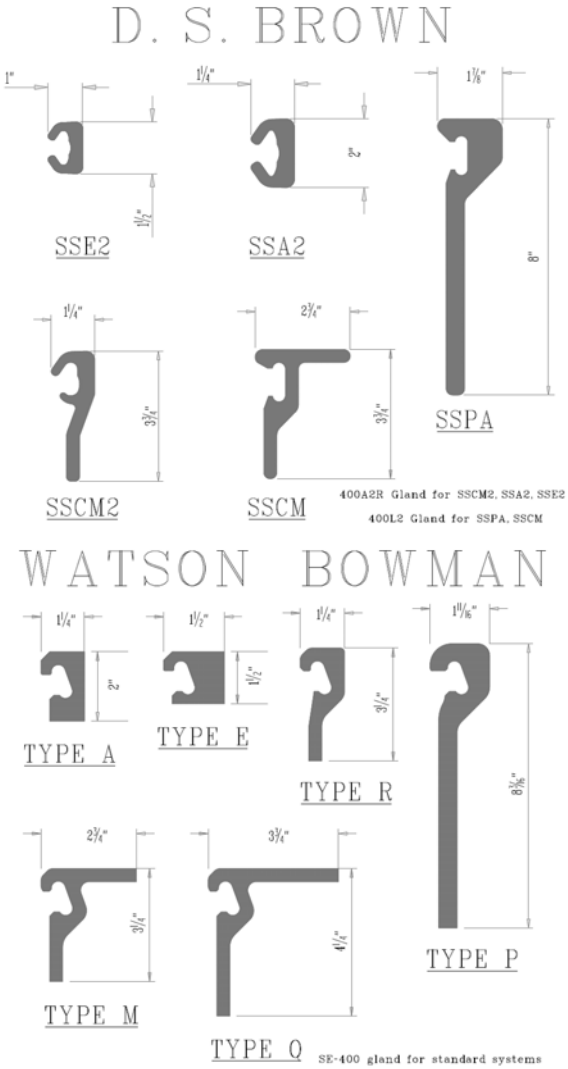
STEP 1. Ensure Rail Is Secure

STEP 2. Determine Profile



Replacing Strip Seal Glands (Cont.)

An easy way to differentiate between the two is by looking at the upper and lower jaws at an upturn. If the jaws line up vertically with one another it is a D.S. Brown device, and if the lower jaw is offset the rail was manufactured by Watson Bowman.

STEP 3. By comparing the cross section with the illustrations the correct gland may be ordered. Watson Bowman profiles are interchangeable with every style of Watson Bowman gland; however, the same rule does not apply to D.S. Brown. Styles SSCM2, SSA2, SSE2 require 400A2R gland and styles SSPA, SSCM utilize 400L2 gland. Glands cost approximately $20 per foot, and ordering extra will eliminate expensive splices. The Region Bridge Support Unit has a small inventory of gland, and seasonally stocks lubricant adhesive. Please contact the Region Bridge Support Unit if you need any material.

STEP 4. To determine the limits of replacement use a pair of pliers to detect where the gland is secure. Leaving loose gland will not provide a watertight seal and lead to another failure. Cut the gland perpendicular to the rail at each end to allow for neat splices at the end of the project.

STEP 5. Next, cut the damaged neoprene seal down the center. If the gland is very loose it may also be torn by hand to remove a substantial portion of it. Removing as much rubber as possible will help when it is time to remove material left in the channels.

STEP 6. Small steel picks are useful to pull some of the existing neoprene gland from the channels. Four to six inches are needed prior to wrapping it around a piece of steel. A simple removal tool may be made by holding a tire spoon vertically upside down in conjunction with a crescent wrench. Wrap the loosened gland around the round steel handle and spin it slowly. After a few feet the excess must be cut off to allow for additional rubber to be removed.

STEP 7. After the channels are empty and free of rubber they should be cleaned. A sand blaster is generally faster than using a wire brush to remove debris and old glue. After blasting use an air wand to remove any abrasive material. The rail must be dry during the installation, so there is no reason to clean the channels if precipitation is imminent.

STEP 3. Order Gland & Lubricant Adhesive

STEP 4. Determine Replacement Limits

STEP 5. Cut Down Center

STEP 6. Remove From Rail

STEP 7. Clean the Channels

Replacing Strip Seal Glands (Cont.)

STEP 8. Unroll the gland next to the rail with the top facing up. Apply lubricant adhesive liberally to the top, side, and bottom edges. Lubricant adhesive is packaged in 1 gallon containers that have a one year shelf life. After it has been opened it is difficult to reseal. A one gallon container will lubricate approximately 200' of gland if applied with a paint brush, and even more when a four inch wide roller is used.

STEP 9. Starting at one end, press the gland down into the opening so the edges are lined up with the steel channels. Use tire spoons to seat the rubber by pressing in and pulling up simultaneously. It is often best to have someone else performing the same process directly on the opposite side.

STEP 10. Splicing the gland is very simple but requires care for proper adhesion. To begin, clean at least six inches on each side of the splice location with a wire brush or wire wheel attached to an angle grinder. A wire brush is required to reach the bottom of the gland where a wheel can not. Scarify the rubber surface until it is rough and clean. A proprietary kit contains a special cleaner, primer, fiberglass mesh, and a two part epoxy used for repairing rubber. Apply the cleaner liberally to remove any debris and wipe dry with a rag. Allow the surface to dry for ten minutes before using the primer. Apply the primer to the cleaned area and wait ten minutes before adding any epoxy. The patching material will only stick to surfaces that have been primed. Thoroughly mix one packet of A and B together with a plastic spatula for two minutes. Spread all of the material on the primed surface and bed one layer of fiberglass mesh on top of the wet epoxy. Mix at least two additional packets of A and B together and cover the reinforcement.

STEP 8. Unroll & Lubricate Gland

STEP 9. Install Gland

STEP 10. Splice

Replacing a leaking gland is a simple process that protects and preserves vital components beneath the deck. Timely maintenance will mitigate deterioration and costly repairs. If you would like assistance or need materials please contact the Region Bridge Support Unit.

Structural Crack Injection Training

On August 16, structural concrete crack injection training was hosted at the International Bridge and conducted by staff from the Zilwaukee Bridge Crew. The material, equipment, and application procedures vary significantly compared to the method used for hydrophilic and hydrophobic grout injection. During the injection process one is unable to see the epoxy fill the crack, so previous experience is vital to perform the work correctly.

Structural Crack Injection Training (Cont.)

Moisture may be present in the crack, and certain blends allow treatments to be performed when surface and air temperatures are as low as 32ºF. To start, plastic ports must be attached to the concrete surface and centered on the crack to be injected.

Spacing of the ports is determined by the width of the crack being sealed. When sealing hairline cracks a 6” spacing is often adequate, but the distance between the injection points may be increased for measurable cracks. Most wide cracks can be filled with the injection ports spaced up to 12”. If efflorescence is present on the surface it must be removed with a flexible knife prior to attaching the port. The plastic surface contacting the concrete receives a bead of glue, and a special fast setting activator is then sprayed on the concrete. The glue must be placed on the port sparingly so it does not clog the inlet, but enough must be used

to resist the pressure applied while attached to the pump. The port is then pressed onto the surface and held until the glue sets; usually occurring in approximately 5 seconds. After installing the ports an automobile bondo or similar proprietary product must be used to cover the cracks to be sealed. The overlay material is a two part product that is mixed with an accelerator and acts as a temporary seal to contain the liquid resin. Spreading it thin with a putty knife reduces cure time and the area around each port must be built up to reduce leaks during pumping.

Warming the epoxy to at least 40ºF is a crucial step prior to mixing, and a temperature ranging between 65ºF and 75ºF is optimum. Standard caulk guns may be used for very small repairs, but most projects require the use of a two-component mixing pump. After priming the pump material should be discharged into a small portion waste container to ensure any residual cleaner has been flushed and to test the mixture. Many epoxy manufacturers add color to each part as an added factor of safety for mixing. For example, Axson Akabond 818 has a yellow part “A” and blue part “B” that turns green when mixed properly.

Vertical cracks are normally injected from the lowest point working up. Pressure must be slowly applied and range from 75 psi to 100 psi. If material is no longer consumed in an individual port after several minutes the mixing head should be moved to the next port above before returning later. If epoxy flows to an open port above, the crack has been filled, and additional injection on the existing port is no longer required.

Pot life of the mixed product varies according to manufacturer but is often 20 minutes. Thinning the product may lead to improper curing and should not be done. Final cure often occurs in approximately seven days achieving a tensile strength of approximately 10,000 psi, flexural strength of 14,000 psi, and compressive strength of 15,000 psi. If you’re interested in becoming familiar with the process please contact the Region Bridge Support Unit.

Cold Weather Crack Chasing

Michigan's variable climate often creates havoc for scheduled preventive bridge maintenance because of material temperature requirements. All durable maintenance repair products have temperature ranges in which they must be applied. Many patching products require ambient and surface temperatures of 40ºF and rising, but penetrating epoxy sealers usually require a temperature of 50ºF or more. While this may not be a significant problem for scheduled thin-overlay or healer sealer floodcoats that usually occur during the months of June thru August, it does hamper crack chasing efforts performed during cooler months.

Crack chasing is usually performed when deck cracks are more than 2 feet apart. Additional information for choosing the method of application may be found in the *Thin Epoxy Overlay/Healer Sealer Treatments on Bridge Decks* reference guide for bridge personnel posted on the bridge maintenance website. Prior to mixing any material the cracks should be sandblasted to round edges to aid penetration.

Over the past several seasons an emphasis has been placed on crack chasing while performing other activities. Deck patching is just one example of when there may be enough time to seal cracks without prolonging time at the work site. Crack chasing can be completed after a pour while concrete is curing, or it could be used as a welcomed break from jack hammering during large deck repair jobs. Approved healer sealers work well during warm temperatures, but they usually do not cure fast enough for daytime closures during cool temperatures.

Last May, the Region Bridge Support Unit began to experiment with new generation methyl methacrylate (MMA) products, with higher flash points than the previous MMA products that had caused a great concern for worker safety. Due to a wide amount of variability between products, care and caution should be exercised. It is important to always read the material safety data sheets prior to using the materials, and request assistance from the manufacturer until you are familiar with their mixing procedures.

Two MMA's were tested, and the first was placed in quart size ketchup bottles and used promptly. The ambient temperature was 55ºF and the material had to be placed in 10 to 15 minutes. The 5 to 10 cps viscosity of the material was noticeably less than that of healer sealer, and the MMA was applied in the same fashion as crack chasing with epoxy. The cold weather MMA product can be applied as low as 14°F without affecting viscosity by using additional bags of a hardening agent. If the high temperature is not expected to reach 40°F a cold weather additive must be used.

Cold Weather Crack Chasing (Cont.)

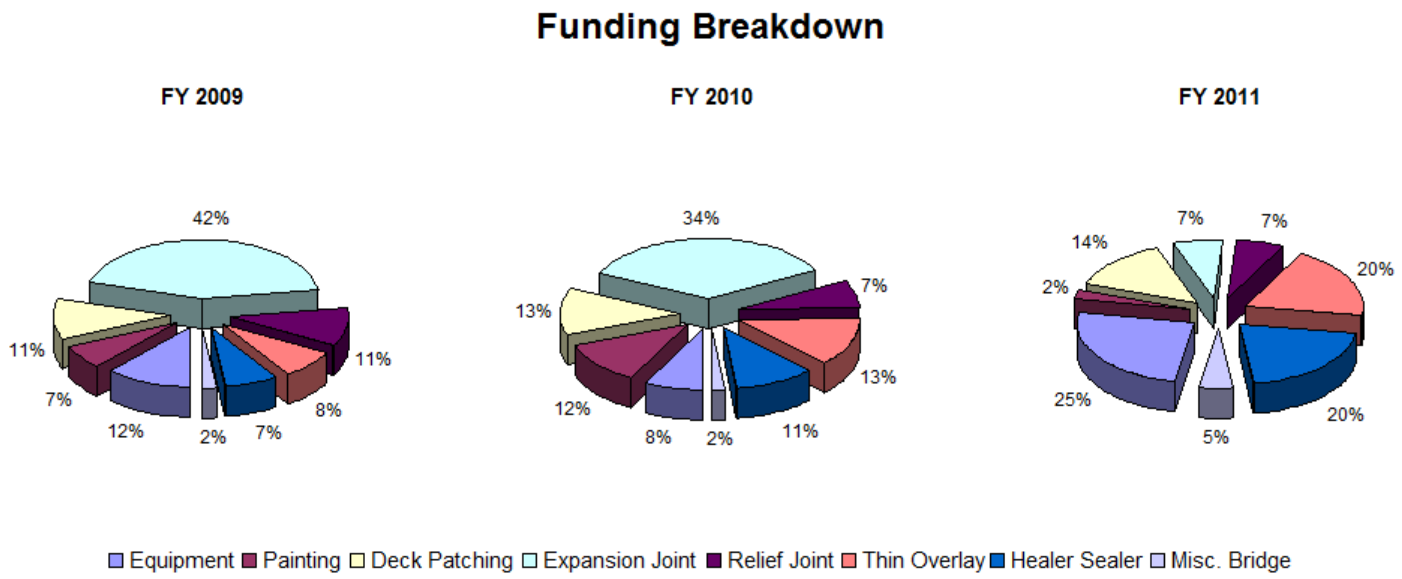
During the trial the material set within 15 minutes, and we quickly learned filling the ketchup bottles half full would reduce wasted material.

The second MMA used was a standard curing blend that is recommended for use in warm weather. Quart size batches were mixed by hand and poured into ketchup bottles to chase cracks. A premeasured amount of cobalt napthenate was placed in the mixing container with the resin. After stirring for two minutes the initiator was added and the product was mixed again for two minutes. The mixed suspension was placed in the bottles immediately, and the cracks were filled to refusal. Pot life varies according to temperatures, but on days warmer than 80°F the containers should be emptied every 15 minutes.

The material filled the cracks well, and three applications were usually required to fill each one. Because the viscosity is similar to water it took less than 30 seconds for the material to flow beneath the surface before and another pass was repeated. The light brown color was helpful in determining the level of the liquid in the measurable cracks. Since improper mixing may cause the warm weather product to spontaneously combust its future use is questionable.

Cores were extracted on July 26 along portions of the sidewalk. The average depth of penetration measured was 1.25” for the cold weather material, and 1.50” for the warm weather product. This spring a second trial will be completed with the manufacturer. Please join us if you are interested in learning more about cold weather MMA products.

Statewide Partial Paint Contract



In 2011, only 2% of the annual maintenance budget was used to contract steel painting; 10% less than in 2010. We would like to remind region bridge engineers that a partial painting contract is available. The contract is normally utilized for zone painting beneath joints where corrosion has occurred and also after high load hit damage that requires heat straightening, or lead removal prior to repairs. Due to the relatively small contract amounts the jobs are typically performed in early spring and late fall. Proper planning and coordination are required to insure minimal impacts to traffic and other projects in the area.

Equipment Reminders…

Lightweight Signs
Statewide Signs has streamlined the process of producing corrugated plastic signs that are night-work compliant. Please contact the Region Bridge Support Unit for funding signs that will aid preventive bridge maintenance and repair.

Portable Signal Rental
A blanket purchase order is available with Bell Equipment for the rental of portable traffic signals. If you plan to rent signals from any other company three bids have to be solicited.

Air Meter
If you are planning to enter a confined space and need access to an air meter please contact Paul Schiefer at (517) 242-5784.

Sandblasting Trailer
We have access to a trailer mounted sandblast pot and 100 cfm air compressor. The tandem axle unit may be hauled with most 03 and any 04 unit. If you are interested in borrowing the trailer please contact Aaron Porter at (517) 242-5788.

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