



Tech- Bond Solutions (TBS)

Geis-IL Project Installation Summary

12/13/2023-12/14/2023

Techs: Eric Vacheresse & Jake Vacheresse

Overview

There are three core technologies integral to the Tech-Patch Repair System (TPRS), as follows:

- **Tech-Bond's patented Polymer Bonding Process (Process)**

Over the last seven years, plumbing companies, engineers, manufacturers, entrepreneurs, scientists, intelligence agencies, artisans, governmental bodies, and ordinary people have verified that the Process bonds any polymer to itself, to any other polymer and to almost any other substrate. We emphasize that the Process can bond disparate polymers.

- **Tech-Bond's patented Tech-Patches**

Tech-Patches are made of either fluorosilicone (FVMQ) or PTFE (Teflon™). Both fluorosilicone and PTFE have higher resistance to oil, gasoline, diesel, aromatic fuels, weather, etc., than HDPE.

Recently, the Borouge Company extensively tested the Tech-Patches on SDR 11 HDPE pipe. There are cracks in two 78pinch diameter HDPE pipes that need repaired. One of the cracks is over 50 percent deep into 4-inch thick pipe. There are also five other YDPE pipes that need repaired. Borouge has told us that there might be other pipes to be fixed once we are in country.

Tech-Patches bonded onto the SDR 11 HDPE, PE 100 pipe generated the following results:

- Passed a water line test.
- Lasted over 100 hours at 1800 psi with the temperature at 20 degrees C (68 degrees F).
- Lasted over 100 hours at 800 psi with the temperature at 80 degree C (176 degrees F).

These numbers were based on the pressure in water lines and, for the 1800 psi test, in oil and gas pipelines. The Borouge Company is sending back these samples, which eventually failed, so that Tech-Bond can wrap the pipes with a Tech-Wrap in order to test the repaired pipes at even higher pressure. The Tech-Wrap repaired wraps will pass the standards required to repair ruptured pipe.

- **Poly Fill**

Tech-Bond gets the polypropylene micro-balloons from a 3D printer manufacturer. 3D printing companies across the US use these micro-balloons to manufacturer 3D printed partes. When a plastic is used, 3D printers use a low odor CA to bond the micro-balloons together. Low odor CA's do not have nearly the strength that Tech-Bond's SI adhesive do. Additionally, the Poly Fill is used to create a protective barrier for the Tech-Patch, strengthening the entire system.

The Tech-Patch Repair System has proven that it will reliably repair HDPE pipe. One final note, we are pursuing receiving UL certification for TPRS.

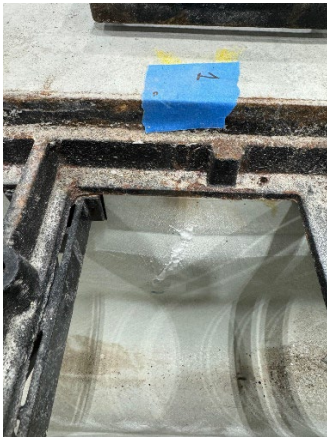
Pictures and comments on the repair made at Lake Pontoon.

Crack-1



Step 1. Surface Prep, Surface Prep, Surface Prep

When bonding polymers, the surface must be roughed to below the sheen. At the Lake Pontoon site, TBS used various tools and sandpaper grits to rough the area around the crack.

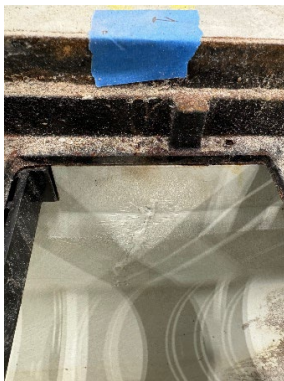


Steps 2 Drilling holes

It is imperative to drill a small hole at each end of the crack so that the crack does not propagate. In the test conducted in the UAE, holes were drilled at each end of every crack. Not one of the cracks propagated.

Filling cracks with Poly Fill

Every discernible crack should be filled with the Polly Fill. This filling provides a final barrier against fluids leaking into the ground. To apply the Fill, run a bead of the adhesive into the crack of problem area, spread, sprinkle or blow the Fill onto or into the damaged area. Brush off excess Fill. Repeat as necessary. Final step is to spray with AA.



Step 4. Sanding the Poly Fill

Though it is not necessary, we sand the Poly Fill to create a smooth surface to apply the patch onto.

Step 5. Priming the prepared surface

These walls are HDPE, a polymer. After surface prep, to bond a polymer, you must start by saturating the poly surface with Tech-Bond's Poly Prep.

Step 6. Spraying the area with our Activator/Accelerator (AA)

The AA is the catalyst that is the first half of the formula necessary to produce the exothermic reaction necessary to create a bond.

Step 7. Applying the adhesive to the patch

The application of adhesive must be thorough but not heavy.



Step 8. Applying the patch to the HDPE surface

Pick up the patch, apply tension, press the patch on the HDPE, press down the edges.

Step 8. Applying pressure with the glue squeegee

Attaining excellent contact between the two surfaces is critical.

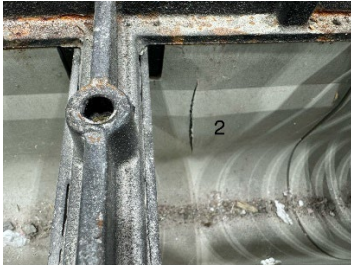
Step 8. Applying the Poly Fill protective coat(s)

Apply beads of the SI adhesive to the patch. Spread with glue squeegee. Sprinkle or blow the Poly Fill onto the adhesive. Repeat as necessary based on the stress that the repair will be subjected to. When finished, spray with AA.

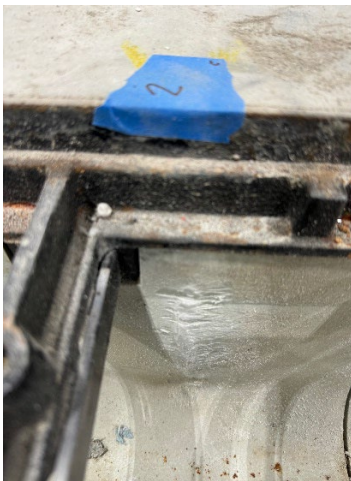
Step 9. Heating the area with a heat source.

The other half of the formulate for generating an exothermic reaction. Once the heat reaches about 116 – 120 degrees F, the surface gets hot. At that point, you know you're good. The patch will never come undone on its own.

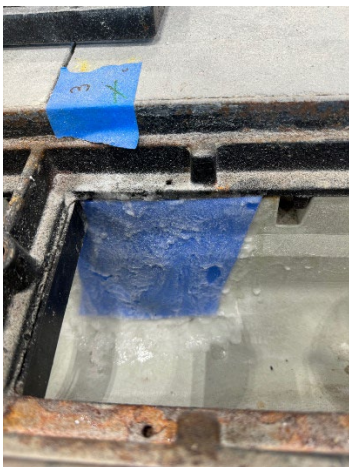
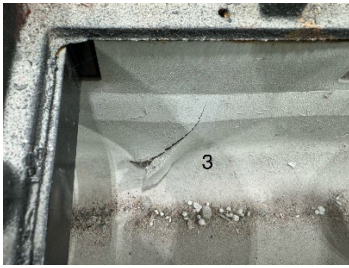
Crack-2



Crack 2 followed the same procedure as crack 1.



Crack/Protrusion-3



Handling a protrusion

There are three methods for handling a protrusion, as follows;

1. Use the Polymer Bonding Process to bond the torn pieces back together. Heat makes this possible. Then use the Poly Fill to fill any cracks. Sand if necessary.
2. **Done in this case.** Cut off the protrusion. Fill the crack with the Poly Fill. Sand if necessary.
3. Cut off the protrusion. Fill the gap behind the plastic with polyurethane foam. Let the foam harden.
4. Then fill the remainder of the hole with Poly Fill and/or poly pieces. Sand if necessary.

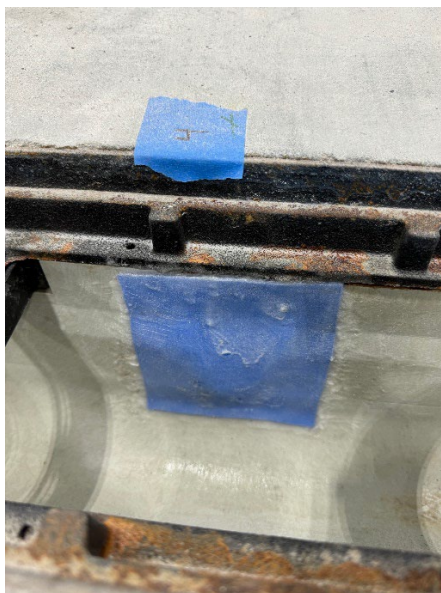
Protrusion/Hole-4



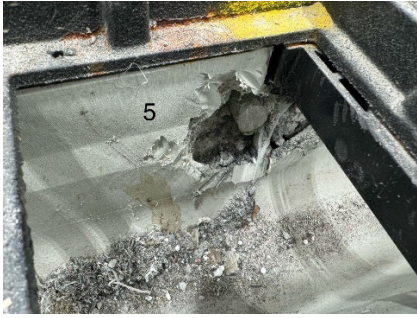
Restoring a large gap behind the hole/protrusion.

Though not strictly necessary, TBS considers it to be best practices to put a backstop to a hole in a pipe or tank whenever there is a large gap behind the damaged pipe. TBS uses urethane foam to provide that backstop.

If there are gaps or cracks present when the foam dries, apply the Poly Fill or use poly bits to fill gaps. Sand smooth. When finished spray with AA and then apply the patch and the Poly Fill as required.



Hole-5 Crack/Gash on side/bottom of drain



With Hole 5, the gap behind the hole was filled with urethane foam. After the hole is filled, it is not necessary for the foam to be smooth. In this environment, the patch by itself is capable of handling all the stress that could arise. The patch is the critical component of RPRS.



Crack-6

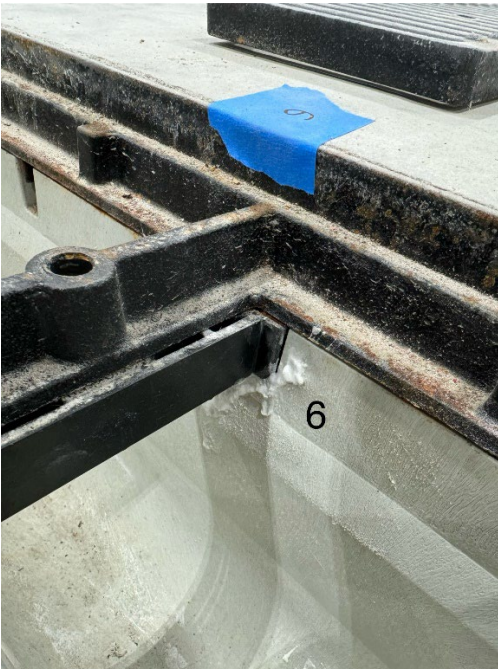
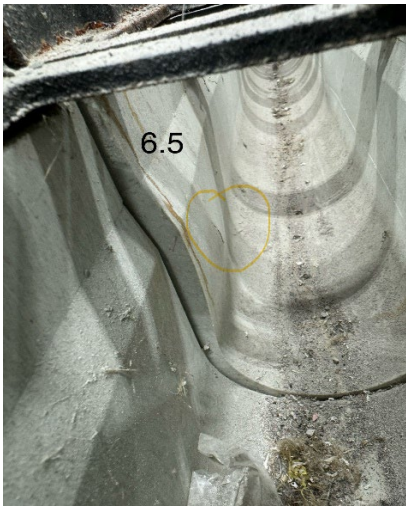
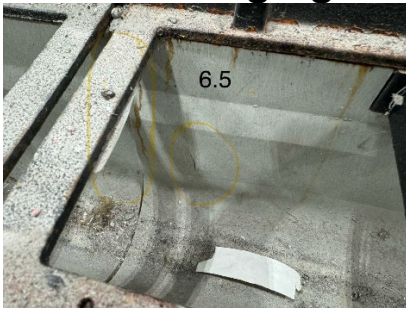


Photo Series 6 represents a standard crack repair.



Crack & Bulging side- 6.5



Crack and bulge 6.5

6.5 shows a bulge in one section of HDPE pipe. TBS has encountered this situation, in a more severe fashion, previously. In 2017 in Florida, two HDPE drain lines encased in concrete did not meet correctly. The misalignment between the two pipes was similar.

In this situation, because the entire pipe was available, the decision was made to wrap the entire pipe with an eight-inch wide Tech-Wrap. This wrap used the same fluorosilicone TBS used in our current Tech-Patches/ As of now, the wrap is holding perfectly.

With the bulge apparent in the picture, obviously a wrap was not practical. What our field Tech's did was to layer the Tech-Patch material so that the patch would be bonded not only to the bottom/side of the drain, but also to the edge of the bulged pipe.

TBS is confident that this repair will be in place six years from now, twelve years from now, etc.

Hole-7



Hole 7 – Standard hole repair.



Hole-8



Hole 8 – Standard hole repair.



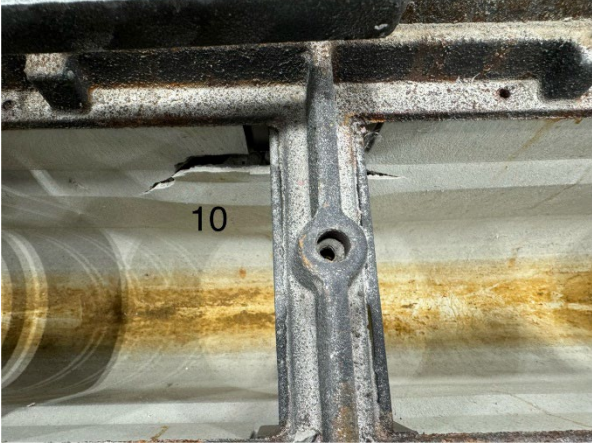
Hole-9



Hole 9 – Standard hole repair.



Crack-10



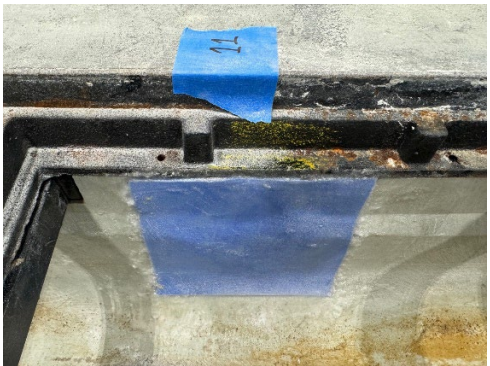
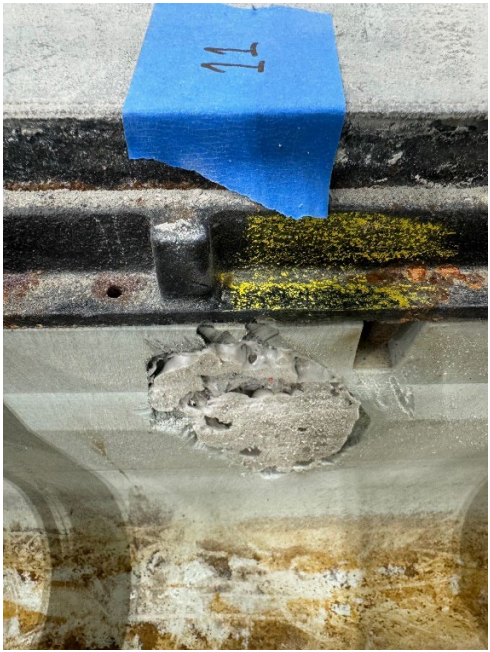
Crack 10 – Standard crack repair.



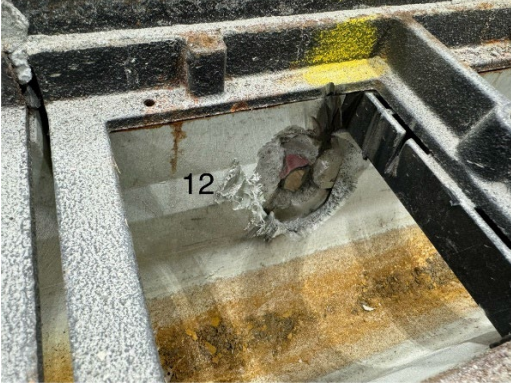
Hole-11



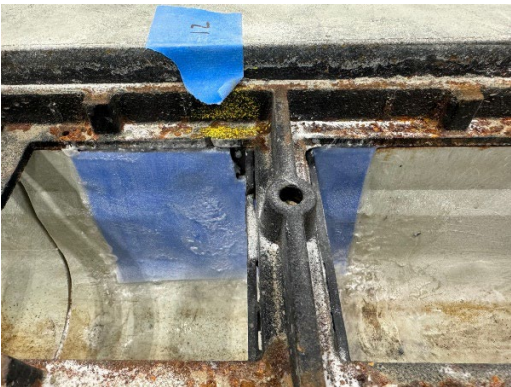
Hole 11 – Standard hole repair.



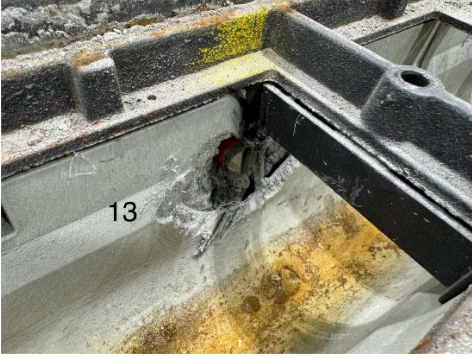
Hole-12



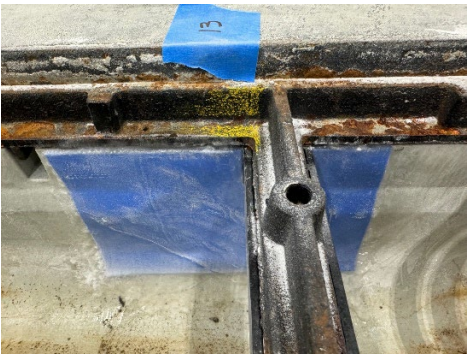
Hole 12 – Standard hole repair.



Hole-13



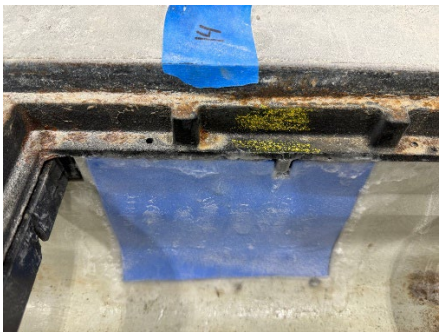
Hole 13 – Standard hole repair.



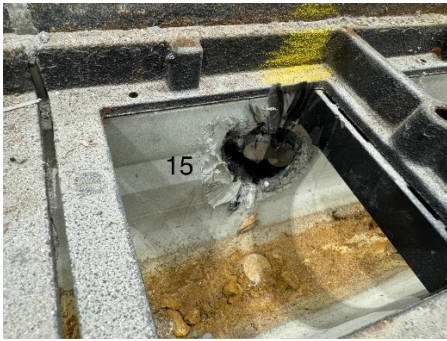
Hole-14



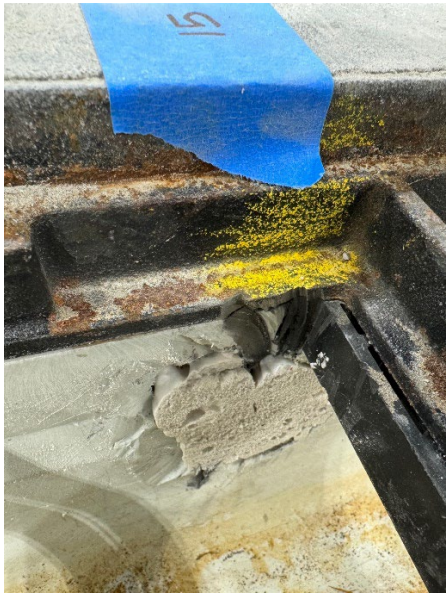
Hole 14 – Standard hole repair.



Hole-15



Hole 15 – Standard hole repair.



Crack-15.5



Hole 15.5 – Standard crack repair.



Crack-16



Crack 16 – Standard crack repair.



Hole-17



Hole 17 – Standard hole repair.



Crack-18



Crack 18 – Standard crack repair.



Hole-19



Hole 19 – Standard hole repair.



Crack-20



Crack 20 – Standard crack repair.



Crack-21



Crack 21 – Standard crack repair.



Crack-22



Crack 22 – Standard crack repair.

