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Making Buildings Better™

TO **Mr. Thomas Kirk**
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12787.001
Romex Testing
Freeze Thaw Testing

DATE September 1, 2021

REGARDING **Freeze Thaw Laboratory Test Results for the Romex Permeable Paver System (RSG10)**

Dear Mr. Kirk,

RDH Building Science Inc. (RDH) is pleased to provide these results from laboratory testing of the so called "RSG10" (ROMEX-SYSTEM-GUARANTEE- Paving bedding and grouting 10 Year Warranty/50 years lifetime expectancy) sample of the Romex permeable paver system, consisting of the products: ROMEX-Trass-Bed, ROMEX-Adhesion Elutriant and ROMPOX-D1, modern jointing mortar.

Permeable paving systems are becoming an increasingly common alternative to traditional impermeable paving systems as a means to reduce the impact on the environment of land development and associated runoff. Permeable paving systems help to improve the quantity and quality of water runoff to downstream sewer systems and watercourses by mitigating peak runoff flowrates and filtering particulate out of the runoff. They also help to reduce water from ponding on the surface of a paving system that can pose a safety and aesthetic concerns. Permeable paving systems are also typically not as strong as other traditional paving systems (i.e., asphalt, concrete, etc.) due to the porous structure of the permeable pavers that allow water to infiltrate through the material. One of the primary mechanisms associated with patio and roadway damage is freeze-thaw forces caused by water freezing below or within the paving system.

The intent of the conducted laboratory testing was to assess the freeze thaw tolerance of a sample of the ROMEX RSG10 permeable paving system according to relevant North American standards.

Testing Scope and Approach

ROMEX constructed and shipped a 12"x12" assembly sample to RDH's Waterloo Laboratory. The sample was composed of 9 granite paver units (approx. 3" X 3" X 2" thick), connected to each other by mortar joints (approx. ½" wide) and bonded to a gravel drainage base layer (approx. 3 inches thick) below. Photos provided by ROMEX of the sample construction are included in Appendix A. Photos of the sample as received at our Waterloo lab and during processing are shown in Appendix B.

Since there is currently no North American freeze-thaw testing standard for composite paving systems, a custom testing procedure was developed based on ASTM C67-Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, and ASTM C666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing, This custom testing procedure was designed to simulate an extreme, worse-case application where the materials are in direct contact with water at all times and are exposed to 50 daily freezing and thawing events.

The sample was assembled in the ROMEX facility and allowed to cure prior to being packaged and shipped to the RDH lab in Waterloo, Ontario. The sample arrived on September 22nd, 2020. On September 30th 2020, the sample was immersed in distilled water and remained immersed for 28 days.

Following this soaking procedure, the sample was subjected to freeze thaw cycling based on the protocol outlined in ASTM C67, Section 9 which is described below:

- The sample was set in a container made out of TPO roof membrane material with a liner of woven drainage mat below and on the 4 sides of the sample to create a small space surrounding the sample to ensure continuous water saturation (Figure 1).
- The sample was frozen to -5 C in a chest freezer. Temperatures were confirmed by measuring the core temperature of the sample using an embedded 10 k Ohm thermistor and a multimeter to read electrical resistance.
- The sample was then removed from the freezer and submerged in a tank of room temperature water for thawing to greater than 5 C, which was confirmed similarly through multimeter reading of the core sample temperature.
- It was determined that the sample could be frozen and thawed daily and this was repeated 50 times.

Following the freeze-thaw cycling, the sample was removed from the container and visually inspected for adhesion between the different materials that made up the sample and cohesion of the individual materials.

Figure 1- Sample set into the TPO container with drainage mat liner

Results

Following the freeze-thaw cycling protocol, the sample was visually inspected to determine the integrity of the bonds between the different materials that made up the sample (adhesion) and inter-material bonds that held the individual materials together (cohesion).

The following observations were made after completion of the 50 freeze thaw cycles.

- There was no visible decay of the nine individual paver units (Figure 2)
- There were no adhesive issues between the paver units and the mortar material (Figure 2)
- There was no visible decay of the mortar between the paving units (Figure 2)
- The drainage layer below the pavers generally maintained adhesion to the bottom surface of the paver units with approximately 1 ½ inches (37 mm) of thickness remaining bonded (Figure 3)
- There were some cohesive issues within the drainage layer with lower ½ inch of material becoming partially de-bonded

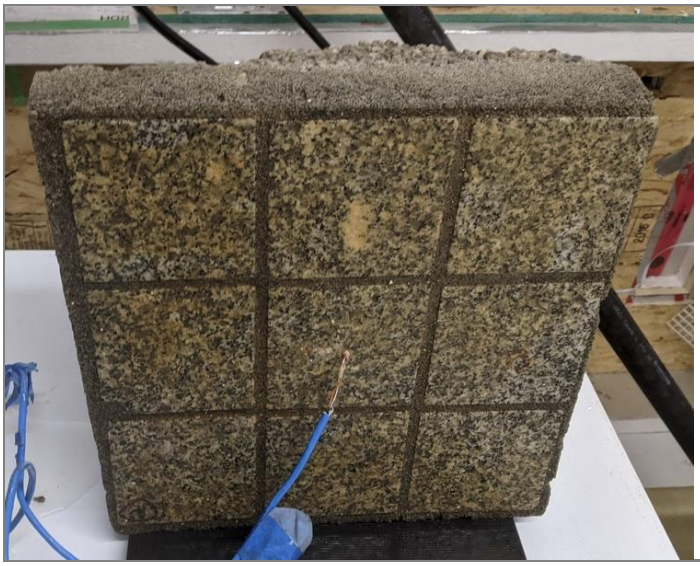

Figure 2- Photo of RSG10 sample after 50 freeze-thaw cycles

Figure 3 – Photo of RSG10 sample showing adhesion between paving units and drainage layer

Summary

The freeze-thaw decay testing as described above was performed on the ROMEX RSG10 permeable paver system. It is important to note that the testing methodology replicated and extreme, worst case scenario. The 28-day soaking procedure was used to saturate the sample and saturation was maintained throughout testing.

The test sample maintained adhesion between the pavers and the mortar, and between the pavers and the drainage layer and showed only minor cohesive issues within the drainage layer.

Once you have read this report in its entirety, please contact Trevor by phone or email with any questions or concerns.

Yours truly,

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Reviewed by:
Jonathan Smegal | M.A.Sc.,
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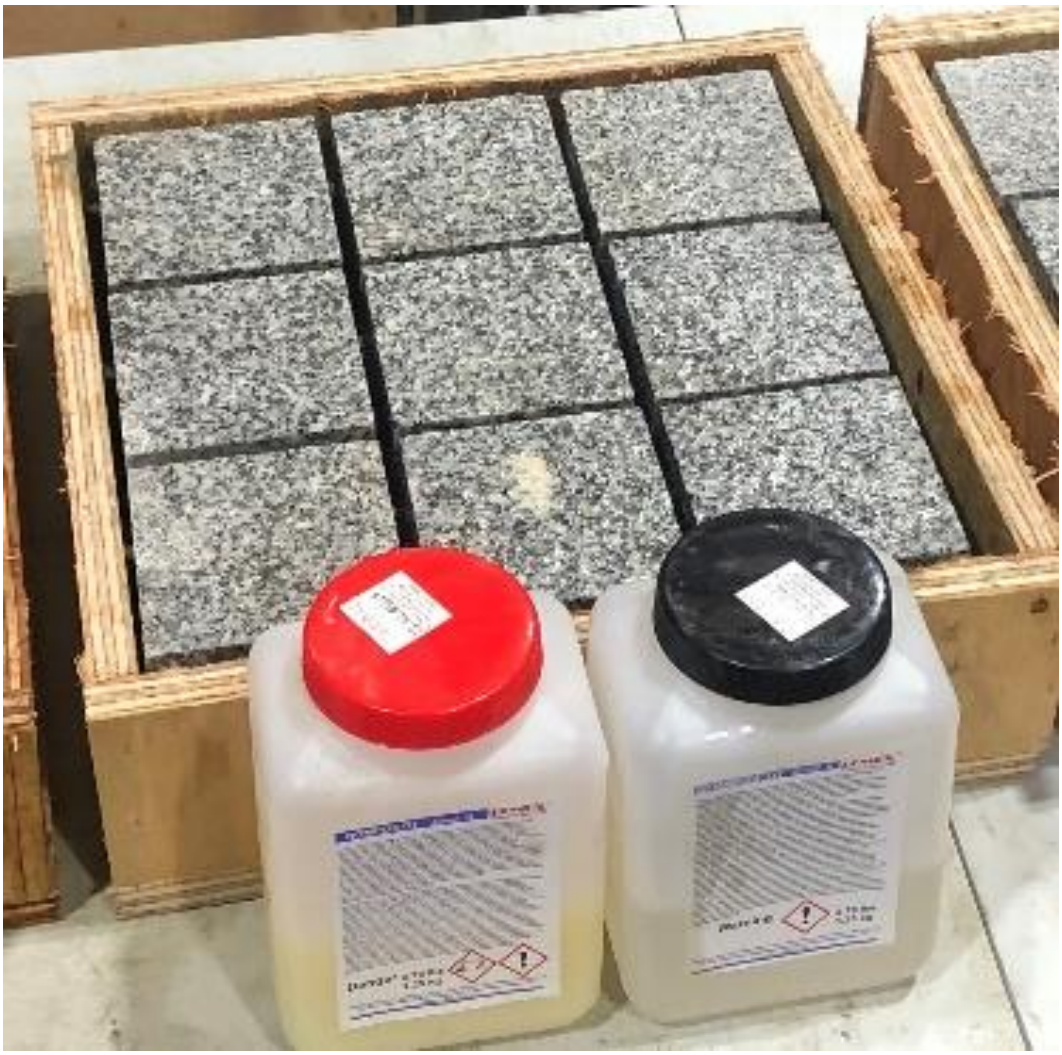
Appendix A

Romex Sample Preparation Photos

www.romex-ag.de



Appendix B

RDH Testing Photos

Figure B-1: Top view of sample as received

Figure B-2: Side view of sample as received

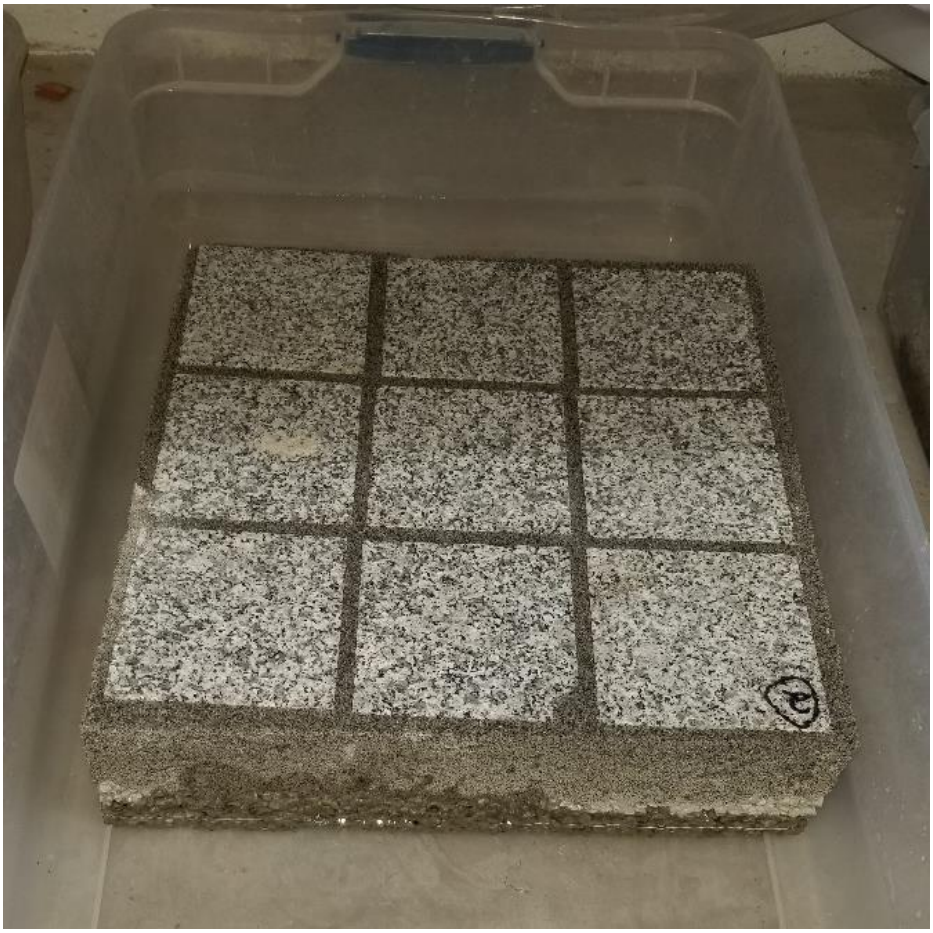


Figure B-3: Sample set in tray of water for 28 days prior to freeze thaw cycling

Figure B-4: Sample set in water bath for thawing