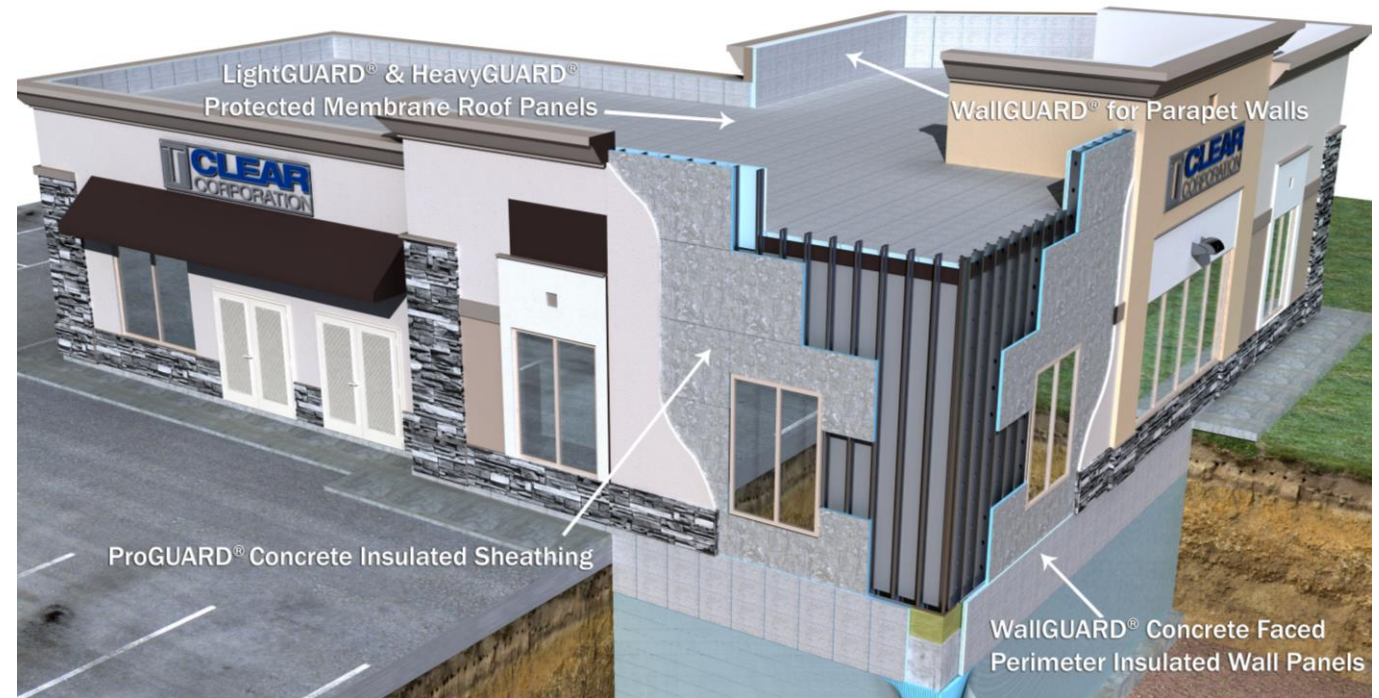




Concrete Building Envelope Products

Durability, Sustainability, Energy Efficiency

**Panel
Performance
&
Aesthetic
Expectations**



A History of Innovation and Long-Term Performance

LightGUARD and HeavyGUARD PMR systems have protected and extended the life of roofing membranes across North America and beyond for more than 40 years. T Clear pioneered and developed the first IRMA (PMR) roof system in conjunction with DOW Chemical in the late 1970's. Our commitment to provide durable, sustainable and energy efficient products has expanded to offer proven concrete thermal envelope solutions for roofs and walls, including WallGUARD which was brought to market in the mid 2000's.

It is our goal to communicate and be as transparent as possible in terms of what to expect from LightGUARD, HeavyGUARD or WallGUARD from a functionality and aesthetics standpoint. Setting proper expectations up front will make your long-term investment with our products a pleasant experience for both of us. And you can rest assure that a T Clear product is manufactured for years of durable and energy efficient performance.

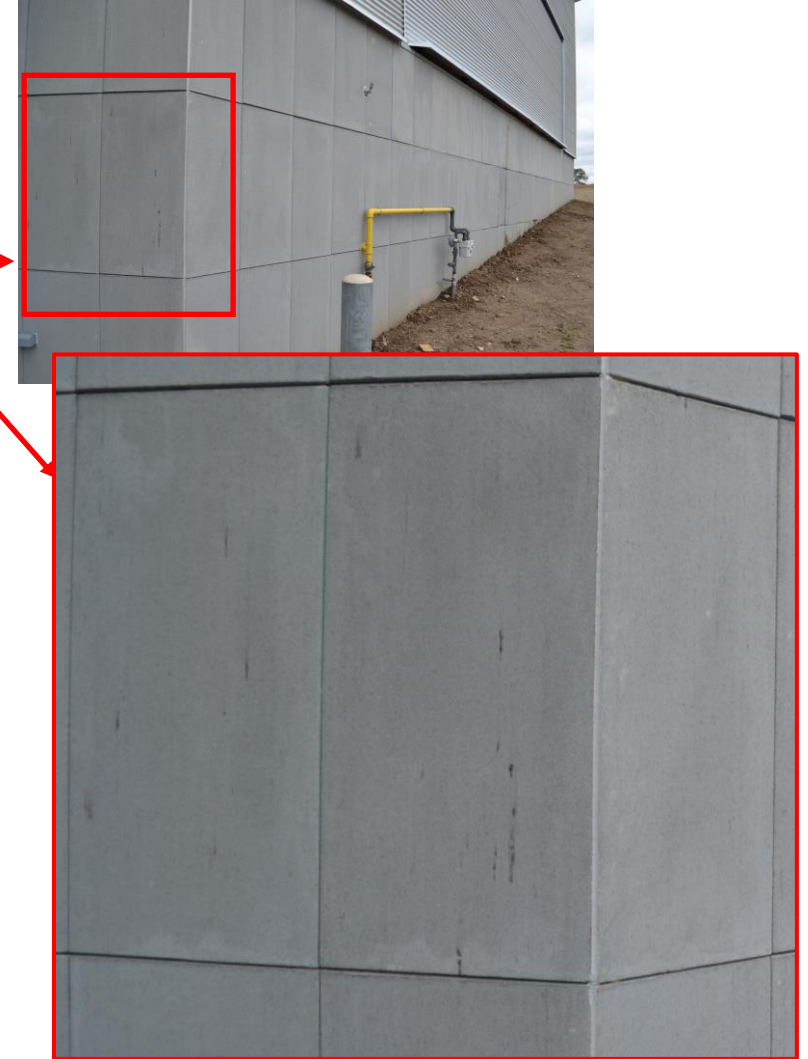
Concrete Faced Panel's Overview

- T Clear's concrete faced panels have been manufactured in the same manner for over 40 years. As a result, we have 40 plus years of field performance to reference.
- T Clear's concrete faced panels are batch manufactured using 40 psi extruded polystyrene with a latex-modified concrete surface of varying thickness on one side. The thickness depends on the specific panel, but the methodology remains the same for all options.
 - **The XPS material used in our manufacturing is not a standard consumer product, but rather is custom made for T Clear. We are not able to substitute with other XPS materials due to the specific nature of our panels that have a concrete surfacing applied to one side of the panel only.**
- There is no reinforcement within the concrete component of the panel outside of the latex binder used within the mix. This results in a relatively low tensile strength which lends to the potential of micro-cracking during shipping and handling.
 - **If the panel was made with reinforcing wire, fabric, fiber, etc. to provide for greater strength under tension it would lose many of the benefits that make it a preferred protected membrane roof option, such as weight per square foot and affordability, among others. As a result, there remains some weakness until the panel is in situ at which point it becomes extremely strong and durable under a compressive state.**

Concrete Faced Panel's Overview

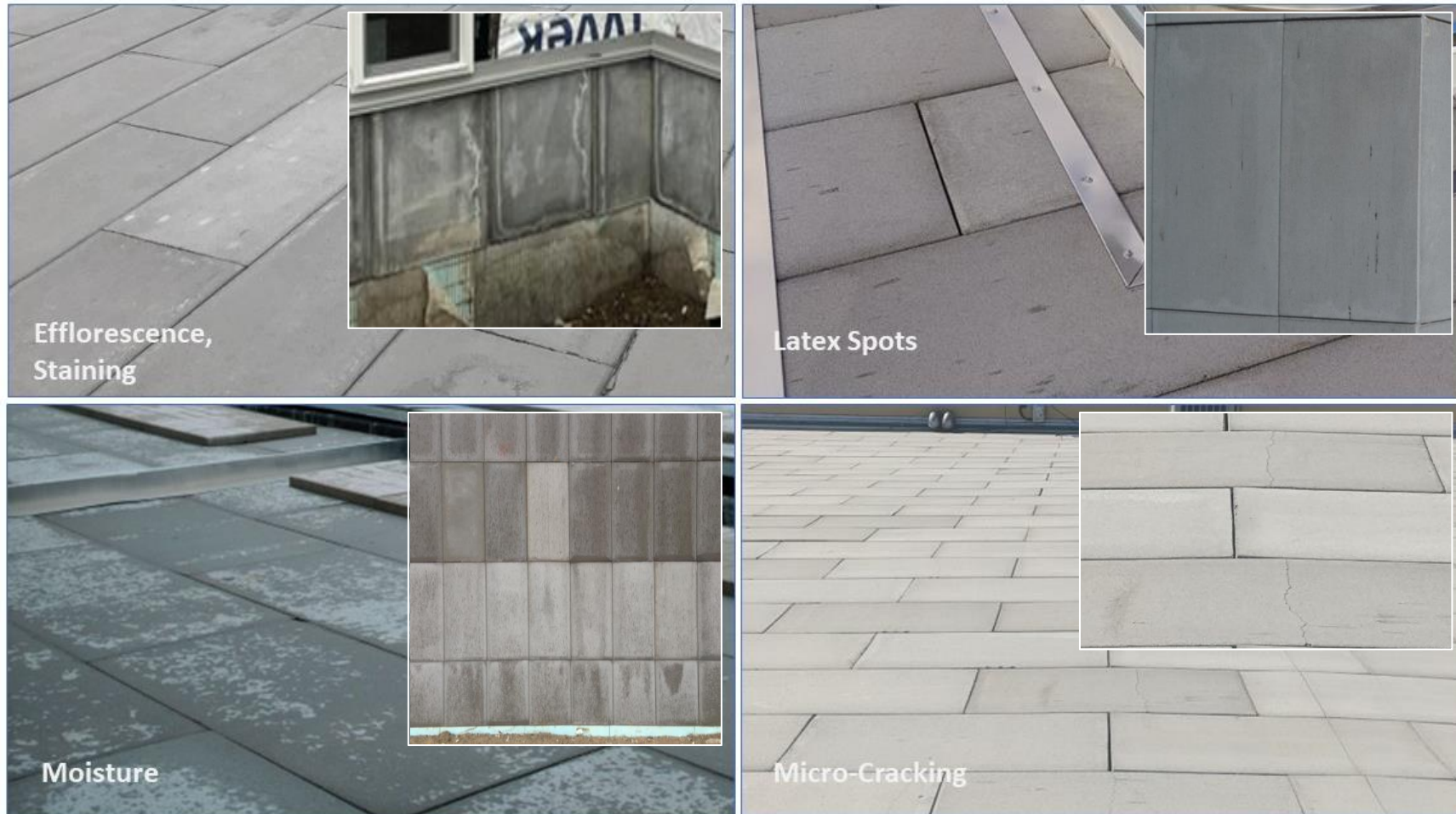
- T Clear's concrete faced panels are not marketed or sold specifically for aesthetics. These are all performance-based insulating and protection panels. Like most concrete items the product can look attractive from a distance but the closer you get the more imperfections you notice.
 - **Pictures on our website display this phenomena quite well. When you zoom in on a WG picture for example, you can see the imperfections that you don't necessarily notice from a thumbnail.**
- To reinforce the aesthetic expectations messaging, we clearly state on our website the following:

As with any cement-based product, color variation, efflorescence, and/or hairline cracking of the cementitious facing may occur. The phenomenon will not affect the performance of the panels and will not affect the warranty. If uniform or matching coloring is required, a quality latex masonry coating must be applied.



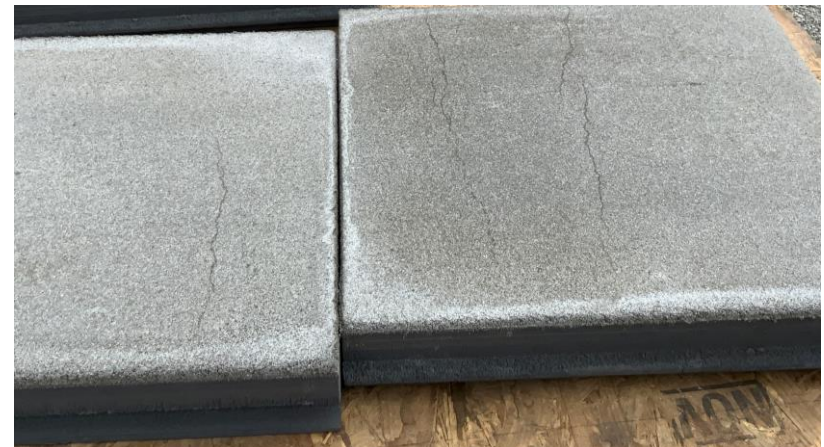
Managing Expectations

Potentialities with Concrete Faced Panels



Micro-Cracking of Concrete Surface

- Micro-cracking of the concrete surface is a common phenomena that can occur as a result of several factors that tie back to the relatively low tensile strength of the panel.
 - uneven supporting surfaces
 - strap damage in shipping
 - product handling on the jobsite during installation
 - foot or maintenance equipment traffic on roof or job site
- Micro-cracking is an aesthetic issue and will not affect the long-term performance of the panels.
- No deleterious effects on warranty result from micro-cracking.



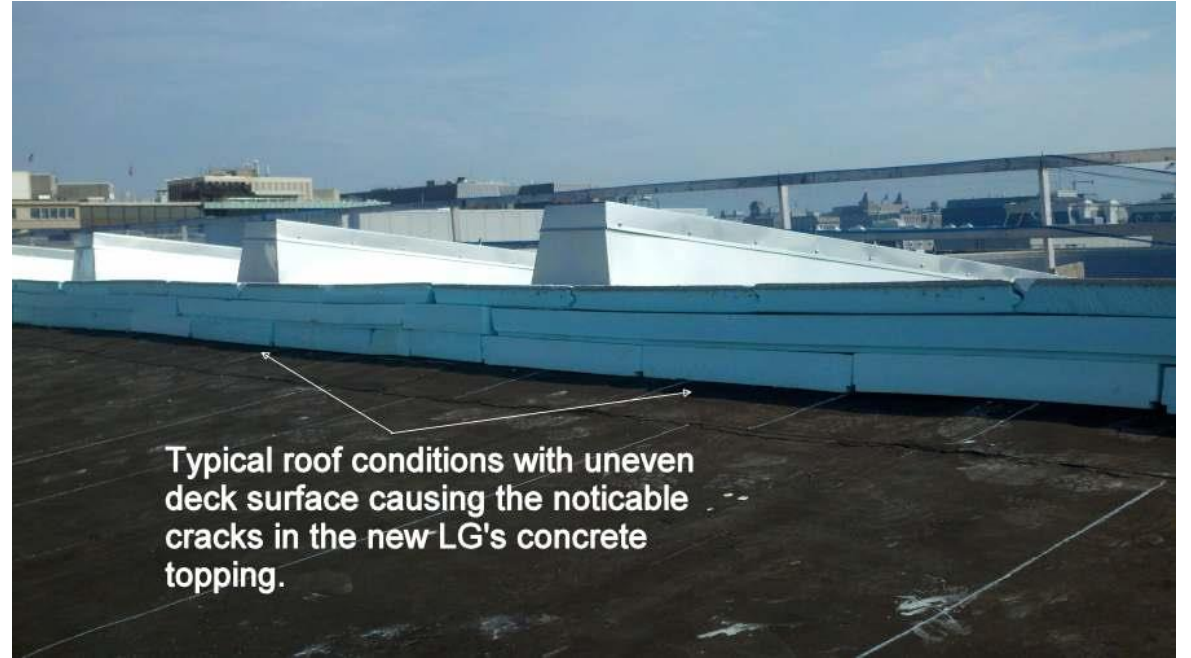
Micro-Cracking of Concrete Surface



- Made with 40 psi extruded polystyrene, T Clear concrete faced panels are stiff and will not conform to unlevel surfaces. As a result, the panels under compressive force can develop micro-cracks which act as a stress relief and allow the panel to, essentially, find its level. When the panel has cracked and therefore conformed to the surface below (or behind), it then becomes extremely durable and will provide protection for decades without further degradation.
 - The picture to the right shows micro-cracking in LightGUARD pavers which was present when they were installed in Chicago in 1996. The contractor was advised by a consultant to strap over these panels out of fear of expansion due to unfamiliarity with the product. The cracks seen here have been present and in the field of the roof for 26 years and they have not spalled nor expanded.



Micro-Cracking of Concrete Surface

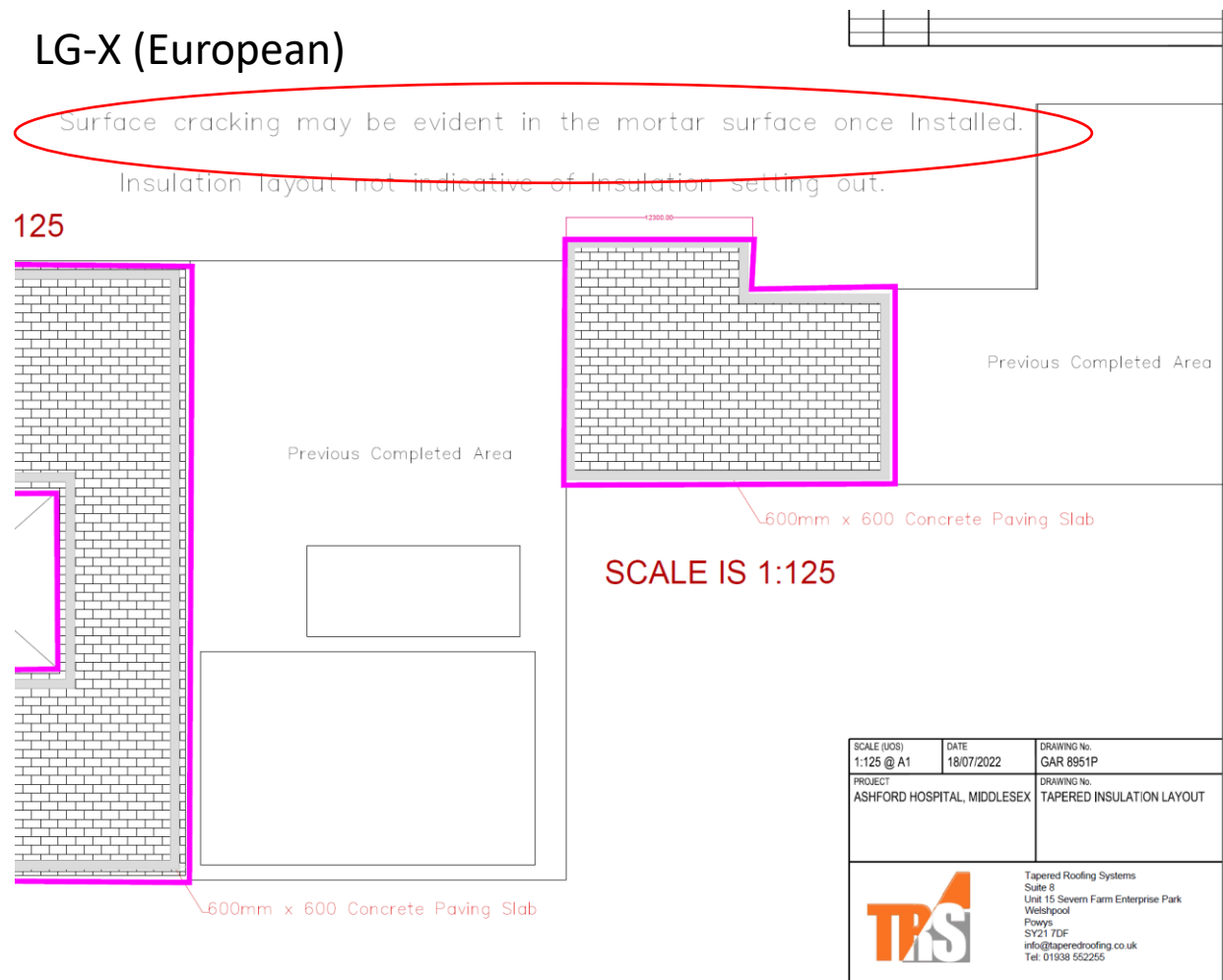


Micro-Cracking of Concrete Surface

- The physics of our system are the same as those for all latex-modified concrete. The freeze-thaw resistance and endurance of latex-modified concrete performs better than air-entrained concrete because the latex contributes some tensile strength. The micro cracks do not spread because the high compressive strength of the concrete prevents ice expansion, and the foam tensile strength resists loads. It appears that any force created by the water freezing is directed upward. Over time, this is likely to result in a minute quantity of material washing to the surface. However, none of these phenomena result in loss of product integrity.
- The concrete used in the manufacture of our panels has a compressive strength greater than 4,500 pounds per square inch. Most engineering manuals require concrete to have a compressive strength greater than 3,000 pounds per square inch to have good freeze-thaw resistance and durability. Typical concrete will have tensile strengths of 25 to 50 pounds per square inch while the concrete used in T. Clear panels, typically, has tensile strengths of 50 pounds per square inch. This tensile strength helps prevent cracking, but it cannot overcome all of the forces that are on the concrete during handling and use.

Micro-Cracking of Concrete Surface: Competitive Products

LG-X (European)



MICRO CRACKING AND REPAIRS:

The latex modified concrete topping on **CTI**[®] and **SRI**[®] roof panels is an attractive, tough, and durable surface, designed to provide ballast and to protect the insulation and membrane below. However, like any cementitious wearing surface, this topping is subject to micro-cracking. Extensive testing and in-service experience has shown that cracking in the panel surface will not delaminate or compromise the integrity of the system.

Unevenness in the deck surface can create stress points on the panel or result in “bridging”. Under traffic loads these peaks and valleys may cause random micro-cracking. Excessive or unusual traffic, using the deck as a staging platform during or after construction, or improper or careless handling of the panels can all contribute to excessive cracking. Micro-cracking can be minimized by adhering to the storage, handling, and installation recommendations.

Repair minor damages to the concrete topping with a quality latex modified pre-mixed exterior patching cement. For **SRI**[®] roof panels, apply a quality exterior latex masonry white stain to the patch once cured to match the surrounding panels. For best results, inspect panels before installation and set damaged panels aside to use for fills or in areas where special cutting is required.

Color Variation

- The color differences between panels is a typical situation that occurs with batch concrete, along with the possibility that the panels were manufactured on completely different run days. Color variation is due to different cure cycles with the latex modified concrete and as a result of batch manufacturing where there are several batch mixer cycles per run, which creates the opportunity for color differences even though all the mix design ingredients are the same.
- Over time as the panels continue to cure, they will even out in appearance. Length of time will vary widely based on local environment.
 - If the owner is looking for a more uniform color, they have the option to apply a concrete coating or paint panels with an exterior grade masonry paint.



Efflorescence

- Efflorescence is a crystalline deposit of water-soluble salts (usually white) on the surface of masonry. All masonry materials are susceptible to efflorescence. Water-soluble salts that appear in chemical analysis in only a few tenths of one percent are sufficient to cause efflorescence on a masonry surface. The amounts of salts and character of the deposits can vary widely, according to the nature of the soluble materials present and atmospheric conditions.
- Temperature, humidity, and wind affect efflorescence. In the summer, even after long rainy periods, moisture evaporates fast and small amounts of salt or efflorescence are brought to the surface. This efflorescence is more common in the winter, when the slow rate of evaporation allows the migration of salts to the surface.
- Efflorescence that occurs on new construction after the masonry dries is referred to as "new building bloom". New building bloom is generally an unsightly nuisance and no cause for concern, as it will normally weather off within a few months to a year.
 - Power washing can help remove efflorescence. After power washing allow to dry before painting or coating if so desired.



Latex Spots

- Spots that appear on the surface of the latex-modified concrete topping is what we refer to as “latex balls”. T. Clear uses a liquid latex adder within the core mix. Within the liquid latex there are higher concentrations of solids that hold more moisture within the ball of the latex. Experience has shown that over time these “latex balls” will cure out and look very similar to the rest of the panels.
- This is commonly seen in the panels and is only cosmetic in nature. There have never been any performance issues related to this naturally occurring phenomena and thus will not prematurely deteriorate or affect the panels performance in the field.



Aged Concrete Faced Panels



33 years

Installed 1988 / Picture from 2021



34 years

Installed 1986 / Picture from 2020



26 years

Installed 1996 / Picture from 2022

Aged Concrete Faced Panels



40 years

Installed 1982 / Picture from 2022



26 years

Installed 1994 / Picture from 2021



33 years

Installed 1988 / Picture from 2021

After Installation Considerations

- The use of de-icing salts is not recommended. Shoveling snow from the surface of LightGUARD or HeavyGUARD modified latex concrete topping and letting the sun do the rest of the work has always been our recommendation.
- If de-icing salts are absolutely necessary to eliminate ice on the T. Clear topping, the least damaging recommendation would be **potassium chloride**, since the majority of de-icers are salt based and do some type of damage to concrete over time.
 - **Pictures on the right demonstrate damage from de-icing salt**
- T. Clear will not be held responsible for damage caused to the concrete topping due to the use of the de-icing compounds.



After Installation Considerations

- Protected Membrane Roof Insulation systems require periodic inspection and maintenance. It is extremely important to keep the roof and drains free of debris. The media necessary for the germination of vegetation, with rotting of leaves and constant barrage of blowing grit on the roof surface, can be abundant in the cracks and crevices of the surface.
- The two herbicides that are recognized to control the unsightly vegetation on the surface are:
 - 1) SURFLAN® is a pre-emergent herbicide (applied to seed) for the control of annual grass and broadleaf weeds that germinate from seed. The mixture to be sprayed should consist of a mixture of 1.5 – 2.0 ounces of herbicide per gallon of water. All instructions and cautions on the manufacturer’s label should be followed.
 - 2) ROUNDUP® is a herbicide that is sprayed directly on the leaves. The mixture to be sprayed should consist of a mixture of 2.0 – 2.5 ounces of herbicide per gallon of water. All instructions and cautions on the manufacturer’s label should be followed.
 - See T. Clear Technical Note 97.15 at www.tclear.com



Panel Performance & Aesthetic Expectations

This presentation was assembled in effort to clearly highlight and communicate some of the naturally occurring characteristics of LightGUARD, HeavyGUARD and WallGUARD panels when received and installed on the job.

By focusing on sound communication throughout the buying process, we are confident that your experience with T Clear will be one to build a solid relationship for years to come.

Please visit www.tclear.com