

This technical bulletin will outline both how cold weather can harm your tile installation as well as what you will need to do to mitigate cold weather. While the advice in this bulletin is generally applicable, always consult the manufacturer and follow their instructions for cold weather applications.

Before discussing what you need to do to mitigate the harm that can be caused by cold weather, it is important to know what the impact of cold weather can be as well as how it is defined by the industry. For the purposes of this bulletin, we will consider cold weather to be whenever the substrate, material, or ambient temperature is not above 50 °F. If this is not the case due to weather conditions, proper cold weather precautions must be taken.

Cold weather may not seem like a big deal, but the impact it can have on mortars, grouts, and adhesives can be drastic. These are some of the ways that cold weather will impact the tile installation materials:

- As temperature falls below 70 °F, cement hydration slows significantly. For every 15 °F to 20 °F, the amount of time it takes to reach full cure doubles. This will increase the amount of time you have to maintain your protection period. This includes both walk-on times for floor installation and immersion times for submerged installations. This can be problematic because it adds unpredictability to your protection period, especially if temperature fluctuates throughout the day.
- Freezing weather can ruin cementitious materials, so it is critical to protect your installation from freezing. When a cementitious material freezes before it is fully set, the remaining water in the cement matrix freezes and expands. This expansion forces the cement away from the sand and shatters the developing cement matrix. If this happens, it will ruin the material and it will need to be replaced.
- When set time is slowed due to cold weather, the product remains soft for longer which may cause efflorescence. While the product is setting, there is a much higher water content than the fully cured state. This water can serve as a path for salts to migrate through the material to the surface. These salts can come from the substrate, the installed tile, or from the installation material itself. This salt migration is efflorescence, which is a white powder that forms on the surface of the installation material.
- Epoxy materials will become much stiffer as their temperature decreases. This will make them difficult to mix as well as difficult to apply. They will

also have significantly slower cure times and strength gain.

The above impacts of cold weather show why it is important to take the proper precautions when working in cold weather. The most important advice is to always maintain your material, substrate, and ambient temperatures above 50 °F. While this is the most important, there are many other factors to consider when applying in cold weather and trying to mitigate its impact.

These are some of the basic things not to do when installing tile in cold weather:

- Do not apply material to a surface that has frost or condensation. This will put a layer of water between your material and the substrate. This will cause debonding and weakening in addition to the slow cure you will see when applying to a cold substrate.
- One of the most common ways to keep the temperature up on a jobsite is to use gas powered blower heaters. However, when using a blower heater, do not allow the air to blow directly on the installation. This will cause the surface to prematurely dry, leading to cracking and weakening of the surface.
- Do not store your tile or installation materials in a place where they will be subjected to freezing temperatures. Allowing your material to freeze significantly affects performance due to decreased temperatures and it may also cause frost to form. Any frost that forms on a tile will need to be removed before installation. Any frost that forms on a cementitious material may ruin the product.
- When heating the substrate, do not allow fluctuations in temp until material has reached full cure. This means if using a standard heater or below substrate heater, it will need to be maintained at a consistent level until the protection period ends.

While the impact of cold weather can ruin your tile installation, there are many ways to mitigate this and allow you to continue to work in cold weather:

- Use warm water to bring the temperature of the mix above 60 °F, ideally to 70 °F. This will allow the material to begin setting like normal without the impact of lower ambient temperatures. This will lower your needed protection period because the material will cure at a more normal pace. Be careful to not use water that is hot enough to cause flash setting in the mortar. Generally, water above 100 °F should be avoided.
- Using a fast-setting material that reaches final set faster will decrease the amount of time the material

needs to be protected from freezing temperatures. Once the material reaches final set, it will not be ruined if it is frozen.

- When using in-floor heating, heat the substrate from below to bring the substrate temp up to a minimum 50 F. This heating should begin 48 hours before the installation to ensure both the substrate and material temperature are at the proper temperature. Follow the heating manufacturer's instructions for implementation.
- Extend the protection period for the to allow for the material to reach full cure. During the protection period, the temperature must be maintained above 50 °F or per the manufacturer's recommendation. Curing is significantly slowed in cold weather, so you will have to wait longer before allowing traffic.
- After application, use an electric heating blanket to help maintain proper temperatures during the protection period.
- Tent the work area and use an electric or gas heater to maintain temperatures above 50 °F inside the protected area. Ensure that, when using a gas powered heater, your work area is properly ventilated for safety as well as preventing surface carbonation.
- Ensure that the previously applied installation material is fully cured before applying the next product. For example, if you grout the tiles before the thin-set is properly cured, the tiles may shift when applying the grout, breaking the bond between the tile and the substrate.

The use of heaters to maintain proper temperatures is one of the most common and effective ways to reduce the effects of cold weather on tile installations. However, keeping the inside of your job site at a higher temperature than the outside will cause condensation to form which may impact the installation. To prevent condensation, take the following precautions:

- Use an electric heater instead of a gas heater. Natural; gas produces CO₂ and water vapor when burned. The water vapor will form condensation on your installation materials which can cause discoloration and softness at the surface. The CO₂ will cause carbonation at the surface, leading to discoloration.
- If you have to use a gas-powered heater, do not use propane and ensure proper ventilation. Ideally, the water vapor and CO₂ should be vented directly out of the enclosed work area. Using a propane burning heater will significantly affect the bond of any material you are applying.
- Monitor the dew point of your application area to ensure condensation does not start forming. Even when properly ventilated, there will be ambient

moisture present. A dew point can be calculated using free online resources.

What steps do I need to take to address cold weather for polymer based and epoxy materials?

- Often, epoxy and polymer-based materials will have stricter temperature requirements than cementitious materials. Ensure you are following manufacturer's recommendations.
- For epoxy-based materials, use an electric bucket heater or store the material in a climate-controlled environment. If the material is cold, it will be hard to apply and will cure much slower.
- Ensure you are monitoring both the ambient temperature and substrate temperature as they can significantly differ depending on weather conditions.
- If an epoxy based material freezes, it may be able to be used if allowed to slowly defrost. Contact the manufacturer for their recommendation.

