Conklin Company Inc.
TECHNICAL BULLETIN
B-10-19-71
Ponding Water

Ponding Water

In an effort to explain the reasons why ponding water should be avoided and to help contractors understand the proper way to retrofit these roofs, The Conklin Roofing Division has produced the following technical bulletin. (See figure #4)

Before the later part of the 20th century a flat roof was a common design feature in Commercial buildings. Asphalt and Coal Tar Pitch were common roofing products at the time also, yet they were vulnerable to solar gain, they were not affected by ponding water like modern roofing systems are. On asphalt or Coal Tar Pitch built up roofs the water would pond because the roof had to be designed with a very low pitch or with no pitch at all. The roofs were designed this way to keep the roof from melting and running off the building. As the sun would heat up the roof, the asphalt or pitch would melt and repair any cracks that might have formed, although these roofs only had a ten year life span, they were considered self-healing and efficient. Ponding water is no longer acceptable in the industry or by the International Code Council. Ponding water can have a negative effect on any of today's roofing systems and should be avoided at all times.

Weight Considerations

Over the years, many questions have been asked concerning ponding water and what type of long-term effect this water has on a roof. One of the biggest concerns can be weight; ponding water weighs approximately 5 lbs. per inch, per each square foot of roof surface. For example, a 20'x20' ponding area at 1" deep would equal 400 total square feet at 5 lbs. per foot, or a roof live weight of 2,000 pounds! That can be an additional ONE TON of live roof load adding stress to your building's roof! (See figure #3)

Conklin's specifications follow the NRCA recommendation for ponding water:
(NRCA): Any area 36 or more square feet of water that is ¼" deep or more, 48 hours after a rain, is unacceptable. Small "bird baths" cannot account for more than 5% of the entire roof surface. Slope of the roof area must be at ¼ inch per foot.
(International Building Code 2009): Roof shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage.

In areas where it is not feasible to accomplish this, like around sky lights, then positive drainage can be created with the use of crickets.

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Effects

Acrylic roof coatings are not designed to be applied in areas where ponding water will occur. When Conklin acrylic roof coatings are applied in these areas, product failure is imminent. Conklin specifications are to be followed at all times and any deviation from these specifications will result in all warranties becoming null and void. Ponding water can even reduce the expected lifespan of a single ply roof system though solar gain.

Causes

Active leaking and vapor migration are two of the most common causes for ponding water. This moisture can cause the existing roof insulation to become saturated and compress, leaving the affected area lower than the rest of the roof. Structural components of a roof can become saturated and sag or deflect also. Any damaged roof components should be removed and replaced with dry material. Proper roof repairs can eliminate moisture intrusion and eliminate vapor migration. (See figure #1)

Repair Options

Ponding water can be a result of the original roof design, but these areas could also be a result of active leaking or moisture migration. When repairing or redesigning these areas, the contractor should follow some basic rules of physics. If an area in the middle of the roof is ponding and a patch or repair is attempted only in this area, the repair will be susceptible to moisture migration and the repair will fail. Think of this type of repair as a band aid that you put on your arm, the wound is protected and the band aid is secure, until you get into the shower or get caught in a heavy rain and the band aid loses all adhesion. (See figure #1) This might be a simple analogy, but the physics of ponding water are very similar. Even if the product being used to repair these areas is considered water proof or non-perming, when it is applied in the center of an existing system, water will migrate under the repair causing adhesion failure. This loss of adhesion will affect most repair products, like Roof Coatings, Spray Polyurethane Foam and Concrete. Not only will the repair fail, but this type of repair is a direct violation of Conklin specifications and the ICC code that requires all wet insulation and substrates be replaced with dry material.

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Structural Concerns

The dangers of leaving ponding water or snow on a commercial roof are very real and should be avoided at all times. The following information was compiled from several different sources. (See figure #2)

Travelers Companies Inc.

- First, you should know how much snow your building can safely handle. Be aware that building codes and design criteria based on building usage vary across the U.S. Contact a licensed structural engineer to help you determine the snow load design for your building, and if any improvements are needed to help prevent a future collapse. If it was built recently, this information may be available from your general contractor.
- Consider any weight that may have been added to the roof since its original design. This could include HVAC units, new roof coverings, solar panels or hanging equipment from the roof steel.
- Be aware of the potential for drifting snow, which could result from new additions with different roof heights or large roof-mounted signs.
- Inspect the roof and structure (inside and out) for any damage, such as cracks or corrosion.
- Inspect all roof drains and gutters to ensure they are clear of any debris. Ice accumulation along the eave can contribute to roof collapses.
- If your building has a wood bowstring truss roof, be aware that this type of roof is historically prone to failure, particularly due to truss deterioration where it meets the wall. A structural engineer should inspect these types of roofs on a periodic basis.
- If your building has a structural standing-seam metal roof and was built before the year 2000, a design weakness may be present.
    - Pre-engineered metal buildings with structural standing-seam metal roofs can be particularly susceptible to collapse from excess snow loading.
    - Studies and testing performed by the Metal Building Manufacturers Association (MBMA) and the American Iron and Steel Institute (AISI) in the mid-1990s found that existing metal roof system designs may not have fully accounted for the potential for structural failure under heavy loading conditions, such as drifting snow and ice or wind uplift.

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Figure #1

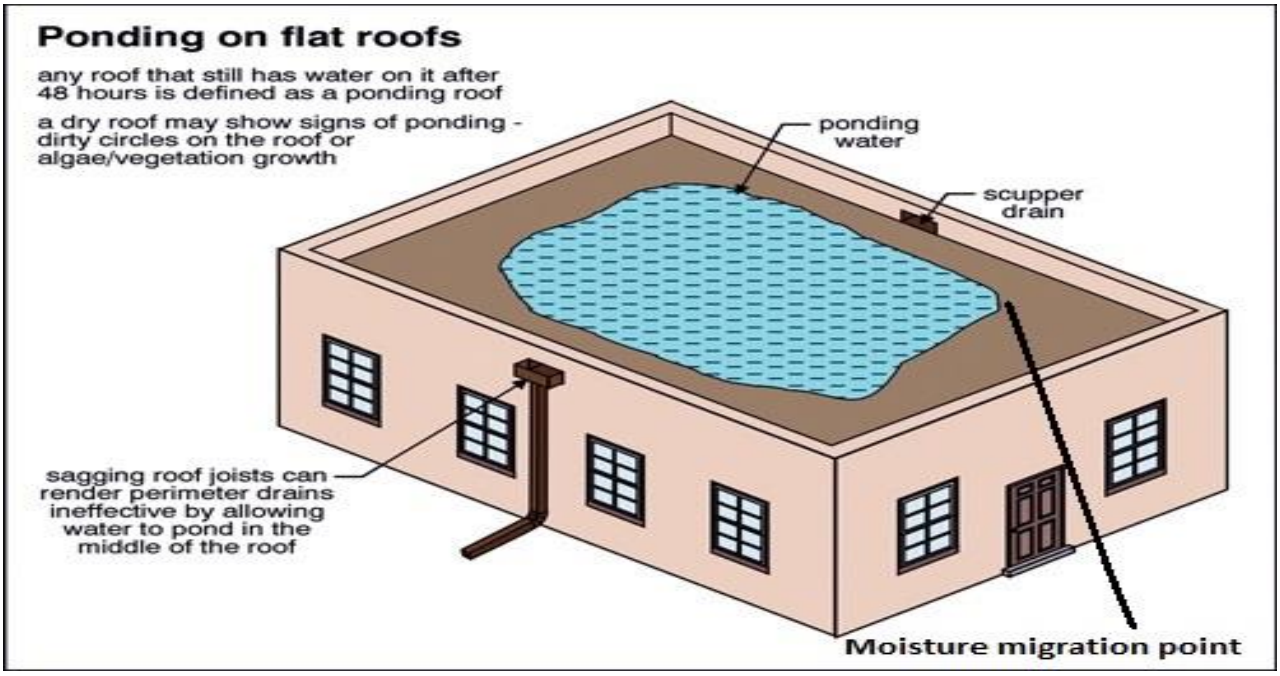

Figure #2

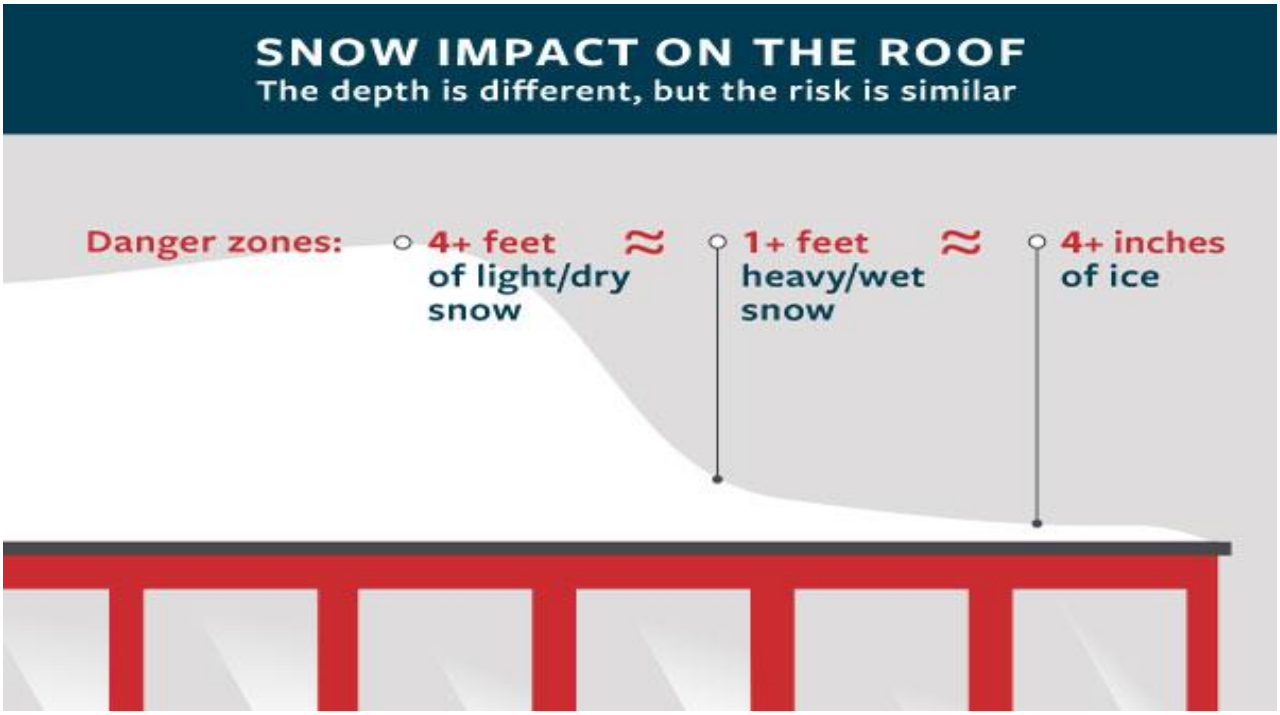

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Figure #3

Figure #4