



building experience

insights on building & site construction

The Essentials of Roof Load Capacity

When working on a recent project, Hixson was able to review the original, 1960's-era drawings of the client's facility. Those drawings, along with historical data on joist types, enabled Hixson to determine the capacity of the original joists, a calculation that showed the building was designed for loads approximately 10 pounds per square foot above current code requirements. In addition to the minor miracle of having the drawings themselves, the fact that the original load capacity was still able to meet current code requirements was also big news. With that capacity, and by changing out the multiply asphalt roof to new membrane-based roofing, Hixson was able to complete the planned renovations without adding the cost of any extra structural capacity, providing a significant savings to the client.

Since original drawings for older buildings are often lost or discarded over time, many renovation projects are not as fortunate as the project noted above. In such cases, teams must spend significant time trying to determine whether a roof can sustain additional weight. Yet trying to get more load capacity from an existing roof can be difficult even for more modern facilities where drawings do exist. If your facility is planning to add equipment or other additional weight to your roof structure, here is a list of factors to consider:

1. Roofs have limits to their structural capacity, as defined by code or other means. This may seem fairly obvious but sometimes this fact is overlooked. Remember that only so much load can be placed on a roof.
2. Have you ever had to shovel snow off your roof? Piles of wet snow can cause overloaded roofs to collapse. Consider the weather conditions for your site when planning to add weight to the roof or an adjacent addition that is taller than the existing building.
3. It is much easier to build capacity at the beginning than add it later. This is even more true for pre-engineered buildings, for which it is typically difficult to find documentation and even more difficult to add loads to later on.
4. Sizing is important. For joist buildings, check web members...are they all different or the same? Often the web members will vary in size across the length of a joist based on the loading. Heavier loading requires larger web members near the supports. In addition, when reinforcing a roof member, it is important to physically measure construction elements as all items may not be uniform in size. For example, adding new steel plates to beams can cause trouble because welding adds heat to the steel, temporarily weakening it due to the heat generated. Unless those sections are spaced apart, the structure can be weakened. Welding should be performed in segments to limit the heat's effect on the steel member.

Due to the factors listed above, it is best to have a professional engineer evaluate the existing roof structure before making changes that add or move loads on the roof.

experience in brief

Roof capacity issues can also begin due to issues created during construction. For example, in one project, Hixson's Structural Engineers were alerted by our Construction Administration (CA) team to a potential problem discovered while reviewing the installation of a platform for a new refrigeration make-up unit (RMAU) on the roof of a food production facility. The Hixson CA had observed that the roof joist tail extensions were improperly being used to support piping from prior installations, causing several inches of deflection. Hixson's Structural Engineer provided a sketch detailing the correction of the issue to help prevent possible structural failures.

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