

Roof Decks: Accommodating Movement

It has been said that the roof is the “fifth wall” of a building. Indeed this is true, but, given its importance, the roof might be better described as a building’s “first wall.” As much or more than any other building system, the roof endures environmental stresses every minute of every day, as well as stresses caused by foot traffic and roof-mounted equipment operations.

Buildings are not stationary objects. They are in a constant state of subtle but very definite movement, caused by changing thermal conditions as well as seismic activity acting upon building foundation systems. One of the design professional’s key responsibilities is anticipating how buildings will move during their lifecycles and how to accommodate them. If movement design is not carefully considered and meticulously detailed, the stresses naturally imposed on the building enclosure will result in certain and costly failures. James M. Fisher, S.E., wrote “In the most basic sense, the need for an expansion joint in a structure depends on the consequence of not having an expansion joint.”

Reference standards and roofing manufacturer instructions provide some of the information necessary for design. The *NRCA Roofing Manual: Membrane Roof Systems – 2019* provides design professionals with general guidelines for accommodating building movement with **expansion joints** and **roof area dividers**. To size, locate, and detail expansion joints properly, the design professional should consider the following factors:

- The climate and location of the building and its anticipated thermal movement.
- The roof structural system and deck.
- How different roof systems respond to building movement.

Expansion joints, also known as movement joints, are designed to allow differential expansion and contraction of separate building areas. They are weather-resistant, and some contain fire-resistive components to stop the spread of flames. They should be constructed to a minimum height of 8 inches above the finished roof surface and located as follows:

- Where expansion joints already occur in the building structural system. Coordination with the project structural engineer is necessary for this.
- Where roof structural systems change direction and where different roof deck materials interface.
- Wings abutting the main portion of a building and where building additions occur.
- Where interior heating conditions change.
- Anywhere else significant movement is anticipated.

Low-profile expansion joints also exist, but they should be used judiciously according to roofing manufacturer recommendations.

Area dividers are fixed raised curbs attached to the roof deck that separate large expanses of roofs into smaller areas or to separate different types of roofs on the same building from each other. Unlike expansion joints, they do not allow movement; they merely help mitigate stresses on the roof system by limiting its expanse to a manageable size. Like expansion joints, they should be constructed to a minimum height of 8 inches above the finished roof surface. Roofing manufacturer recommendations should be followed when it comes to the proper spacing of area dividers.

Under no circumstances should water be allowed to flow over an expansion joint or roof divider. They are best constructed at high points so that water flows away from them in both directions.



Sources and Additional Reading:

The NRCA Roofing Manual: Membrane Roof Systems – 2019, Chapter 2 – Roof Decks.

Architectural Sheet Metal Manual – Sixth Edition, Chapter 5 Building Expansion, p 5.1-5.17.

“Technical Details: How to Accommodate Differential Movement,” John D’Annunzio, *Roofing Contractor*, May 2007 (<https://www.roofingcontractor.com/articles/85429-technical-details-how-to-accommodate-differential-movement>)

“Expansion Joints: When, Where, and How,” James M. Fisher, S.E., *Modern Steel Construction*, April 2005. (https://www.aisc.org/globalassets/modern-steel/archives/2005/04/2005v04_expansion_joints.pdf)

NRDCA Publications (Available free online at nrdca.org)

NRDCA 100 – Guideline for Field Application of Aggregate Insulating Concrete Roof Deck Systems

NRDCA 175 – Guideline for Field Application of Cellular Insulating Concrete Roof Deck Systems

NRDCA 600 – Guideline for Application of Cementitious Wood Fiber Roof Deck Systems

Technical Bulletin 1001: Venting LWIC Installed Over Structural Concrete and Other Non-Venting Substrates

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