

ROOFTOP CURBS and the 2024 MINNESOTA COMMERCIAL ENERGY CODE

Minnesota Department of Labor and Industry

The latest Minnesota Commercial Energy Code became effective Jan. 5, 2024, and includes the following two code provisions that amend the 2019 ASHRAE Standard 90.1 Sections 5.5.3.1 and 6.1.1.3.6 affecting rooftop curbs.

Minnesota Rules 1323.0553, subp. 1 Roof insulation. (Amends Section 5.5.3.1)

All roofs shall comply with the insulation values specified in Tables 5.5-0 through 5.5-8. Skylight curbs, mechanical curbs, and other roof curbs shall be insulated to the level of roofs with insulation entirely above deck or R-10, whichever is less.

Exception: Historical buildings with roof slopes two units vertical in 12 units horizontal (2:12) or less.

Minn. R. 1323.0611, subp. 1 Rooftop HVACR. (Amends Section 6.1.1.3)

Unless technically infeasible, new and replacement rooftop equipment shall be provided with new insulated curbs in accordance with Section 5.5.3.1. The replacement curbs shall be of sufficient height to permit the installation of insulation that complies with Tables 5.5-6 and 5.5-7 when roof replacement occurs.

Exceptions to 6.1.1.3:

Compliance shall not be required

1. for *equipment* that is being modified or repaired but not replaced, provided that such modifications and/or *repairs* will not result in an increase in the annual *energy* consumption of the *equipment* using the same *energy* type;
2. where a replacement or *alteration of equipment* requires extensive revisions to other *systems, equipment, or elements of a building*, and such replaced or altered *equipment* is a like-for-like replacement;
3. for a refrigerant change of *existing* equipment;
4. for the relocation of *existing equipment*; or
5. for ducts and *pipng* where there is insufficient *space* or access to meet these requirements.

What does this mean and what is the intent?

These provisions affect rooftop heating, ventilation, air-conditioning and refrigeration (HVACR) mechanical equipment installed on commercial buildings. Each piece of mechanical equipment is typically installed on a curb, elevating it above the roof surface and effects of water, ice and snow. It also provides a method of attaching the equipment to the roof structure. The code provisions listed above are located in separate sections but work together.

Minn. R. 1323.0553, subp. 1 Roof insulation. (Minnesota Commercial Energy Code Section 5.5.3.1)

The intent of this amendment is to address energy loss through curbs that have either low levels of insulation, or in most cases, no insulation at all. Curbs are made of metal and are highly conductive when not insulated. If the curb does not get insulated, it continues to be a thermal bridge and conduit of energy loss between the interior and exterior of the building.



Example of curb elevated for future insulation.

Minn. R. 1323.0611 subp. 1 Rooftop HVACR. (Minnesota Commercial Energy Code Section 6.1.1.3.6)

The intent of this amendment is to raise the equipment higher above the roofing surface to provide the space to add additional insulation for inadequately insulated roofs with an insulated curb. The Minnesota Commercial Energy Code requires minimum levels of insulation when roof coverings are replaced, and this prepares the roof for the additional insulation thickness when required. If curbs are not elevated at the time of equipment replacement, insulation levels may not be able to be increased due to the lack of clearance between the equipment and the roof surface. The equipment cannot sit lower than the adjacent roof surface or it would be sitting in a pool of water, ice or snow. If this was deferred to the time of roof replacement, the outcome would be impractical and costly. Further, the code does not require the equipment to be raised at the time of roof replacement based on Minnesota amendment 1323.0513 subp. 3 to Section 5.1.3:

9. Where insulation is provided above the roof deck, and the required R-value for a roof replacement cannot be provided because of existing structural capacity limitations or because of the thickness limitations that occur with the existing rooftop conditions, including heating, ventilation and air conditioning equipment curbs, low door or glazing heights, parapet heights, or proper roof flashing heights, the maximum insulation compatible with the available space and existing rooftop conditions shall be installed, as approved by the building official. New insulation shall have the highest R-value per inch available, and in no case shall the R-value of the roof insulation be reduced or the U-factor of the roof assembly be increased as part of the roof replacement.

What type of equipment does the provision affect?

This applies to rooftop mechanical equipment such as heating or air-conditioning units, supply or exhaust fans, air handling units, Type 1 kitchen exhaust systems, or other items that are part of the HVACR system and utilize a curb as part of the installation.

What does “technically infeasible” include?

Technical infeasibilities are occurrences where what the code requires is not possible or practical. Examples of technical infeasibilities may include but are not limited to the following: adding the weight of additional insulation to an existing roof that is already at its maximum design capacity, and in some cases, ductwork for factory-built Type 1 kitchen exhaust systems may not accommodate modifications due to ductwork availability.



What is the difference between a curb, curb adaptor and a curb extension?

These are technical terms not specifically defined. However, the following explanations help outline how industry typically refers to these components in the context of roofing and mechanical equipment.

Curb: A roof **curb** is a frame, usually constructed from aluminum or galvanized steel, with a wood strip to hold fasteners, and functions as a base and mounting mechanism to secure mechanical equipment to the roof of the building. Typically, mechanical equipment that utilizes a curb includes heating or air-conditioning units, supply or exhaust fans or other items that are part of the HVACR system.

Curb Adapter: A **curb adapter** is a customized component that serves as the interface between the equipment and the curb. New equipment may fit slightly different than what was previously installed, so the curb adaptor will be fit to both the equipment and the curb.

Curb extension: A **curb extension** is essentially a curb that is installed on top of the existing curb. It elevates the equipment without requiring the removal of the existing curb. It is fastened to the existing curb and incorporates a gasket and/or flashing to ensure no water penetrates the connecting seam. Extending a curb avoids roofing alterations that are necessary when a curb is entirely replaced with a new one.

Curb Rail (sleeper): A curb rail or sleeper functions just like a curb to support mechanical equipment, but has no opening through the roof surface and sits above the structural roof deck.

Does the existing curb have to be completely replaced when new or replacement equipment is installed?

Maybe. Looking at the exceptions to Section 6.1.1.3, exception No. 2 may apply to situations where like-for-like equipment is being replaced, and extensive revisions to the building would be required as a result of replacing the curb. This exception could be used to allow for the installation of a **curb extension** instead of replacing it with a taller curb. The use of this exception is decided on a case-by-case basis at the discretion of the local designated building official.

Does the existing curb need to be insulated when equipment is replaced?

Yes. The existing curb must be insulated to a minimum of R-10 by either adding or replacing insulation within the curb. Even if the curb is extended instead of replacing it, the existing portion must still be insulated. The insulation requirement refers to a total R-value and may include other components of the curb assembly in addition to the insulation to achieve a minimum R-10. The insulation may be any material installed in accordance with the manufacturer's listing and permitted by code.

If the existing curb is tall enough to accommodate the installation of additional roof insulation, does the curb still need to be replaced?

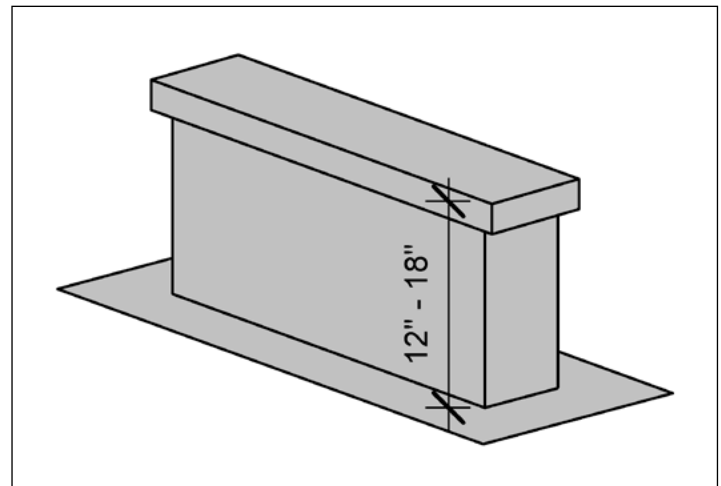
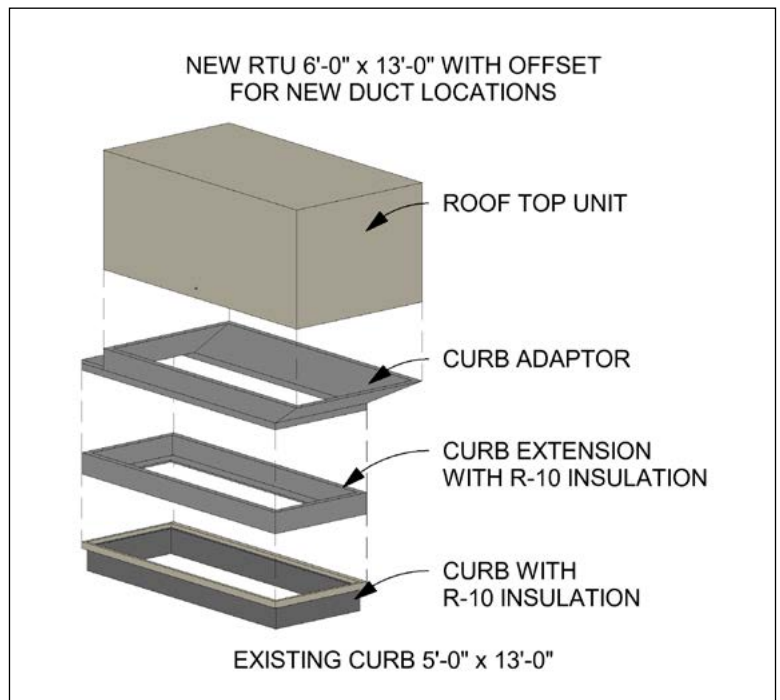
No. If the curb height is tall enough to accommodate the required above-the-deck insulation based on climate zone, the intent to provide room for future additional roof insulation has been met. However, the existing curb must be insulated to a minimum of R-10. If R-10 cannot be accomplished, then it will need to be replaced with a curb meeting the minimum insulation value.

If the existing curb already has some insulation, is that good enough?

Probably not, as most curbs will not be adequately insulated. The total R-value of the curb must be at least R-10 including existing insulation and any new insulation if needed.

Does this provision affect all roof types?

It depends. Curb insulation requirements in Section 5.5.3.1 apply to all roof types with insulation entirely above the deck. The requirement in Section 6.1.1.3.6 to raise the mechanical equipment with a taller curb only applies to situations where achieving the minimum roof R-value would require additional above-the-deck insulation, and doing so would result in a curb height that does not meet design requirements because it is too short.



Curb rail

Does the code specify a minimum or maximum curb height?

No. The code does not provide specific height requirements. The equipment manufacturer, designer, or other requirements may specify a required height above the roof surface. In most cases, a 12-18 inch curb height (above the roof surface) would leave room to add future roof insulation and will be a sufficient height for mechanical equipment.

Can the curb simply be tall enough that verifying the existing roof insulation is not necessary?

Yes. The contractor might elect to elevate the equipment high enough to ensure that the required above-the-deck roof insulation can be achieved, regardless of the current R-value of the roof.



Continuous roof insulation typically has an R-value of 4-5 per inch. The roof could be considered as though it had no insulation and depending on climate zone, 6-8 inches of insulation would meet the minimum above-the-deck insulation requirement, plus the height the manufacturer or designer requires the equipment to sit above the roof surface.

Do curbs need to be insulated or raised if the scope of work is roof replacement?

Curbs must be insulated to a minimum of R-10. However, roof replacement does not require alterations to curb heights.

Do curbs need to be insulated or raised if the scope of work is roof recovering?

No. ASHRAE 90.1 defines *roof recovering* as “the process of installing an additional *roof covering* over an existing *roof covering* without removing the existing *roof covering*.” Section 5.1.3 exempts roof recovering from the requirements of Section 5 under exception No. 5.

Do these provisions affect other types of roof curbs?

Maybe. All curbs must be insulated, but not all curbs must be raised. Section 5.5.3.1 states “*All roofs shall comply with the insulation values specified in Tables 5.5-0 through 5.5-8. Skylight curbs, mechanical curbs, and other roof curbs shall be insulated to the level of roofs with insulation entirely above deck or R-10, whichever is less.*” An exception to Section 5.5.3.1 exempts historical buildings with roof slopes 2:12 or less. However, Section 6.1.1.3.6 requiring new curbs only applies to rooftop mechanical equipment.

Do these provisions apply to equipment installed on curb rail supports?

Maybe. Unless the curb rails are replaced, no additional insulation is required, even if they are extended to accommodate longer equipment. However, if the curb rails are replaced, they should be insulated to a minimum R-10 to limit the effects of thermal bridging. Just like other curbs requirements, curb rails will need to be taller to accommodate additional future roof insulation.

When does an architect or engineer need to be involved?

All state projects require the involvement of a licensed design professional. These may include schools, hospitals, jails, assisted care and medical facilities or others as defined by Minnesota Statutes 326B.103. A design professional must be consulted when additional load is imposed to the roof. Lastly, there may be other situations where the local building official may require it based on special circumstances. [[Minn. Stat. 326B.103, Subd. 11 and 13](#)]

Does the insulation require an additional inspection?

The local building official will determine methods of verification.

How is the insulation verified after installation?

The local building official will determine methods of verification.

What building types and occupancy classifications do these code provisions affect?

These provisions affect all buildings scoped to the Minnesota Commercial Energy Code.



If the curb is raised and insulated for one piece of new or replaced equipment, do other curbs have to be raised to match at the same time?

No. The curb height does not have to change unless the equipment is replaced.

If the equipment is serviced or repaired, does the curb have to be raised or replaced?

No. Only if the equipment is replaced.

Code fact sheets are written by Construction Codes and Licensing staff and are intended to provide insight about particular sections of Minnesota State Building Code and are only intended to be used as a guide. The building official has the authority to render interpretations of the code. [Minn. R. 1300.0110, subp. 1]