

MUNICIPALITY OF ANCHORAGE

Development Services Department



Building Safety

Policy S.12 Wood Truss Roof Framing Due Diligence Investigation

Scope

This policy applies to buildings having metal plate connected wood trusses (also called pre-engineered wood trusses or gang nail trusses) generally constructed prior to 1990 that have experienced distress, failure and/or collapse.

Background

In recent winters Anchorage has experienced several commercial building roof failures attributable to metal plate connected wood trusses where the failures occurred under snow loads substantially less than expected minimum design levels. This includes one building suffering two instances of truss failure with each instance occurring in different portions of the building in separate years.

Code

Anchorage Municipal Code (AMC) 23.70 covers the abatement of dangerous buildings. It is the determination of the MOA that buildings covered under the scope of this policy qualify for the provisions stated herein due to:

- failures occurring at significantly less than code-prescribed minimum loads,
- the difficulty identifying a cause in many of the collapses, and
- the uncertainty in establishing the strength of truss components with traditional engineering analysis due to proprietary metal connector plates.

A due diligence beyond the conventional repair provisions in the International Existing Building Code (IEBC) adopted under AMC 23.65 is warranted to reduce the risk of future structural failure.

Exception: The due diligence investigation outlined in this Policy does not apply where:

1. The cause of the failure is obvious, such as decay from moisture or an unauthorized structural modification (and not the failure of plate connections on otherwise functioning trusses).
2. All trusses of similar construction and similar or greater loading are being replaced.

Reporting, Shoring and Occupancy

Roofs found to be exhibiting distress, failure or collapse shall be reported to MOA Code Abatement. Emergency stabilization (shoring) measures are allowed where safe to do so. Occupancy of a building supported under temporary shoring for reasons other than construction and evaluation of the structure shall not be permitted without authorization from the Building Official. The **Optional Roof and Roof Truss Review Form** (see below) can be used to assist with the evaluation process.

Permit Required

All permanent structural repairs require a Building Permit.

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All trusses of similar construction and similar (or greater) loading to those experiencing distress shall be visually inspected by a civil or structural engineer registered in the state of Alaska. This could involve a portion of the building or the entire building. A reasonable level of investigation should be performed to determine the extent and cause of the distress with the goal of ensuring structural collapse does not occur in the future. A report by the engineer shall be submitted with the Building Permit application. At a minimum, the report shall address the following:

- Damage to any wood truss members.
- If metal plates are exhibiting signs of separation, withdrawal, or peeling.
- If stability bracing exists to keep web slenderness to code-allowable limits.
- If problematic snow drift zones exist that were not accounted for in the original design/construction.
- Whether roof construction conditions exist that allow for the accumulation of water and/or ice:
 - Describe roof drainage strategy.
 - Describe how roof is insulated and ventilated.
 - Note if roof has low (less than $\frac{1}{4}$ inch per foot) to no slope.
 - The IEBC accepts existing noncompliant roof slope as long as the roof has positive drainage. Positive drainage means no ponding.
 - Note any roof depressions where ponding occurs.
 - Correcting or improving roof slope and drainage may substantially reduce risk of structural failure by reducing the potential for excessive roof loading.
 - Note if roof is drained by scuppers only.
 - Roofs drained by scuppers (only) have the potential to accumulate substantial ice and standing water due to the scuppers becoming blocked by ice. The UPC does not intend scuppers be used as primary drainage. The UPC intends scuppers be used as secondary (overflow) drainage. Existing buildings using scuppers as primary drainage may remain as is if the roof structure can support expected ponding.
- Determine approximate roof capacity (i.e., meeting minimum code required loading or overstressed and the percent overstressed)
- Determine potential reason(s) for truss distress, failure, or collapse.

Plans and Calculations

Damaged trusses to be repaired, or new trusses to be installed, shall include plans and calculations prepared by a civil or structural engineer registered in the State of Alaska.

Reroof

Reroof provisions in MOA Policy A.03 apply if applicable.

Ross Noffsinger, Acting Building Official
November XX, 2023

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Optional Roof and Roof Truss Review Form

The following form may be used by engineers to document findings in the field or may be used as a preliminary checklist by building owners to review their building prior to engaging an engineer. Depending on the results of this review, additional inspections by an engineer may be warranted.

Project Name: Click or tap here to enter text.

Date: Click or tap to enter a date.

Building Address:

Click or tap here to enter text.

Inspector (owner or owner's agent):

Click or tap here to enter text.

Email:

Click or tap here to enter text.

Checklist

Notes

<p>Is there damage to any roof truss? Are any plate connections failing or appear to be inadequate?</p> <p><i>Review for common issues as shown in the attached photos. Common issues can include truss plates completely disconnected or only partly connected (Item A, Item B, and Item E), truss plates that are inadequate (common condition being plates at bearing lapping the top chord to less than half the depth of the top chord, see Item F and Item G), broken wood members (Item C and Item D), and water damaged members (not shown in figures). Please list these deficiencies and/or failures or provide a plan showing approximate locations were encountered. If the whole roof is not inspected, please note the area observed (limits of inspection).</i></p>	<p>Click or tap here to enter text.</p>
<p>Do long web members have stability bracing?</p> <p><i>Deep trusses or pitched roof trusses may have web members (the diagonal members connecting the top and bottom chord) that are long. When web members subjected to compression loading are too long without lateral bracing, their capacity can be reduced or considered negligible. A common limit for unbraced length of a web member on dimensional lumber is about 6 feet. This length is the distance from the top chord to the bottom chord or from a chord to a lateral brace. Since it may be difficult to identify which members are in compression, only identify if there is no stability bracing on web members longer than 6 feet. See Item H.</i></p>	<p>Click or tap here to enter text.</p>

<p>Do potential snow drift zones exist that may not have been considered at the time of construction?</p> <p><i>To be verified by an engineer. Note any locations on roof that have obstructions taller than 3 feet and are longer than 15 feet on any side. These would be zones on the roof prone to additional snow accumulation that were not fully considered in design standards until the mid-1980's and may not have been adopted in Anchorage until even later. Signs of snow drifts being considered would be trusses being heavier or spaced closer together in areas where snow drifting is expected to occur.</i></p>	<p>Click or tap here to enter text.</p>
<p>Does the roof have low or no slope?</p> <p><i>Common slopes for roofs expected to sheet drain would be 2" vertical to 12" horizontal or steeper (like asphalt shingle or metal panel roofs which sheet drain to the eaves). Common slopes for effectively draining "flat roofs" would be ¼" vertical to 12" horizontal or steeper (like EPMD or tar roofs). If the roof has less than ¼" vertical to 12" horizontal slope, the IEBC accepts existing noncompliant roof slopes if the roof has positive drainage (i.e. no signs of ponding). Correcting or improving roof slope and drainage may substantially reduce risk of structural failure by reducing the potential for excessive roof loading (i.e. rain/snow/ice ponding).</i></p>	<p>Click or tap here to enter text.</p>
<p>Is ponding occurring?</p> <p><i>Ponding occurs in depressions on roofs having low or no slope. Ponding can indicate the framing is too flexible creating troughs for water to collect. Since this can occur under snow without visible signs from above, it's easiest to observe when there is no snow on the roof. Google earth is a convenient means of observing ponding. Typical signs include dark stains. Small stains around drains may be inconsequential, but large stains indicate water is standing for extended periods of time. See Item I.</i></p>	<p>Click or tap here to enter text.</p>
<p>If the roof does not sheet drain over an open eave, what is the drainage system? Does the roof have parapets with interior roof drains or is it drained by scuppers only?</p> <p><i>Roofs that do not sheet drain are required to have a primary and secondary drainage system by current code standards. If the primary drain clogs, the secondary drain takes over. Typically, each primary roof drain has a near-by secondary drain having a flood level 2 inches higher than the primary drain. Scuppers are sometimes used as the secondary drain (see Item J). Roofs drained by scuppers only (meaning there is no primary/secondary drainage system) have the potential to accumulate substantial ice and standing water due to the scuppers becoming blocked by ice. The Uniform Plumbing Code (UPC) does not intend scuppers be used as primary drainage. The UPC intends scuppers be used as secondary (overflow) drainage. Existing buildings using scuppers as primary drainage may remain as-is if the roof structure can support expected ponding.</i></p>	<p>Click or tap here to enter text.</p>

Attach to this document any supporting pictures or drawings collected or created as part of this inspection.

Appendix – Examples of Truss and Roof Failures and Deficiencies



Item A: Incomplete plate connection.



Item B: Fully detached plates.



Item C: Web chord broken (likely during construction).



Item D: Bottom chord failure at large knot.



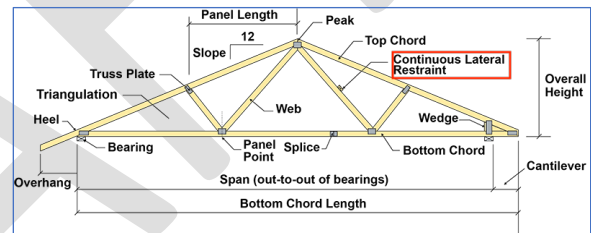
Item E: Truss plate peeling (maximum gap of plate allowed = 1/32", TPI 1-2014).



Item F: Truss plate not extending high enough at bearing location (beyond middle depth of the top chord at a minimum)



Item G: Example of short truss plate causing cross grain tension failure of truss top chord.



Item H: Continuous lateral restraint on a web member, typically required on 2x compression members longer than 6 feet.



Item I: Evidence of ponding, dark stains from standing water away from drainage systems.



Item J: Primary roof drain next to secondary roof scupper. It is not required that they be next to each other.