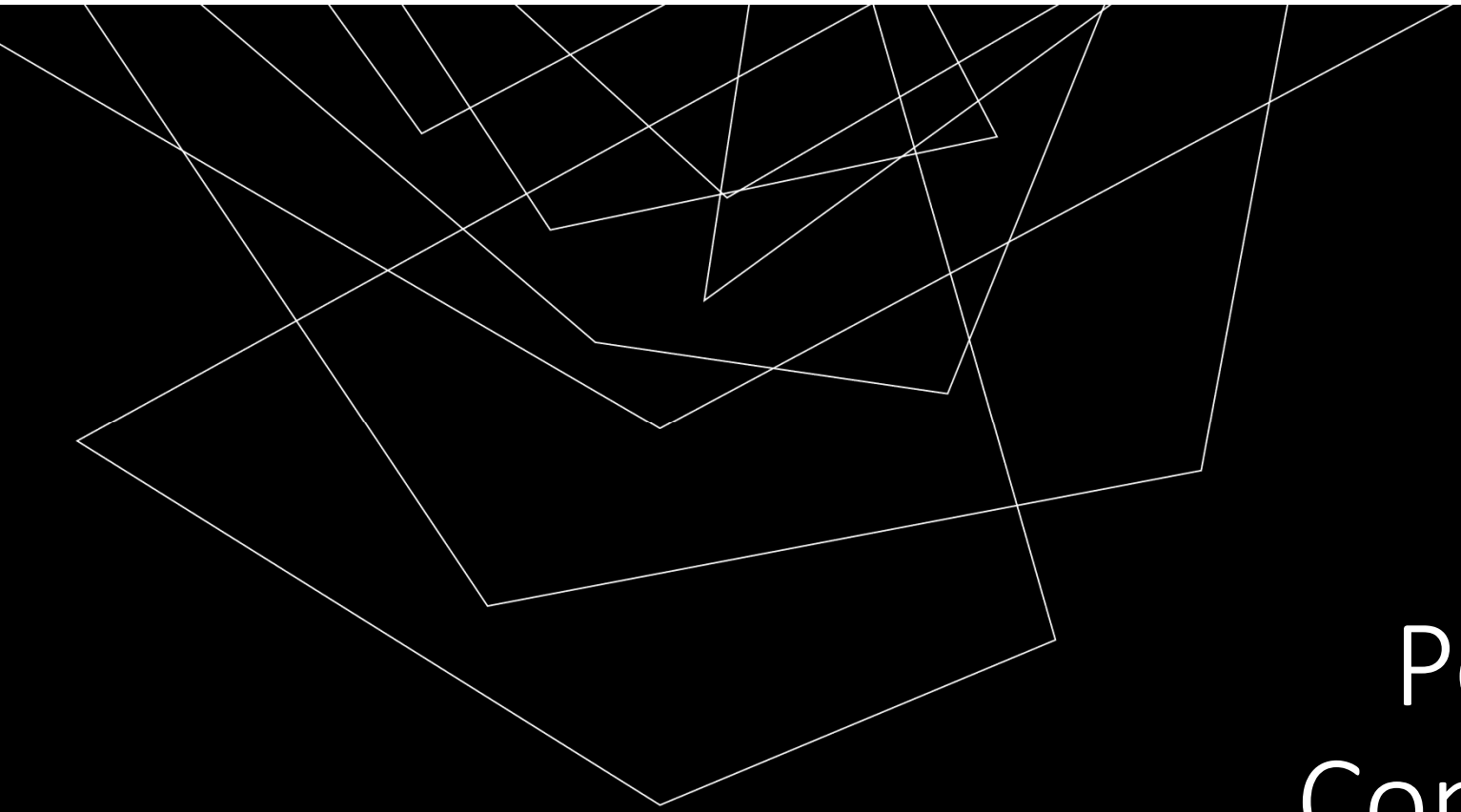

Post-frame Construction Tolerances

Today's Presentation:

History – Development of "Tolerance Documents"
Part 1 – Framing Tolerances
Part 2 – Cladding and Trim Tolerances
Where to Find these Documents
Audience Questions and/or User Experiences

WHY did we get “Tolerance Documents”?

1969 – Indiana: Post-Frame Builders needed support for being allowed in the building code.

1993 – Wisconsin: A lawsuit about a poorly constructed post-frame building exposed the lack of appropriate quality standards.

Timeline

1996 Begel and Bohnhoff measure Post-Frame Buildings (Framing)

1997 ASAE Paper #974087 “Accuracy of Post-Frame Building Construction”

1998 ASAE Paper #984002 “Construction Tolerances Standard…” (Framing)

2003/04 Bohnhoff and Cockrum measure Post-Frame Cladding and Trim

2004 Paper #044113 “Quality Assessment of Metal Cladding and Trim…”

2005 ASAE Paper #054117 “Metal Panel and Trim Installation Tolerances”

Paper No. 974087
An ASAE Meeting Presentation

ACCURACY OF POST-FRAME BUILDING CONSTRUCTION

by

Marshall E. Begel, Graduate Rese
and
David R. Bohnhoff, Associate
Department of Biological Systems
University of Wisconsin-M
Madison, Wisconsin

Written for Presentation
1997 ASAE Annual Internation
Sponsored by ASAE

Minneapolis Convention C
Minneapolis, Minneso
August 10-14, 1997

Paper No. 984002
An ASAE Meeting Presentation

Construction Tolerances Standard for Post-Frame Buildings

by

D. R. Bohnhoff
Associate Professor
Biological Systems Engineering Department
University of Wisconsin-Madison
Madison, Wisconsin, USA

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Accepted Practices for Post-Frame Building Construction: Framing Tolerances

NFBA NATIONAL FRAME BUILDING ASSOC.

The Society for engineering in agricultural, food, and biological systems

The Canadian Society for Engineering in Agricultural, Food, and Biological Systems

An ASAE/CSAE Meeting Presentation *Paper Number: 044113*

Quality Assessment of Light-Gauge Metal Cladding and Trim Installation

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University of Wisconsin-Madison, 460 Henry Mall, Madison, W

David K. Cockrum, Graduate Research Assistant
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1 - 4 August 2004

The Society for engineering in agricultural, food, and biological systems

An ASAE Meeting Presentation

Paper Number: 054117

Metal Panel and Trim Installation Tolerances

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Written for presentation at the
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Tampa Convention Center
Tampa, Florida
17 - 20 July 2005

Abstract. *The fourth draft of a document containing installation tolerances for presented. This draft contains an extensive commentary, as well as appendic panel fabrication tolerances, galvanic action, and panel and trim design/select*

Keywords. Construction, Construction Tolerances, Metal Panels, Metal Trim, Metal Siding, Siding Installation.

Accepted Practices for Post-Frame Building Construction:
Metal Panel and Trim Installation Tolerances

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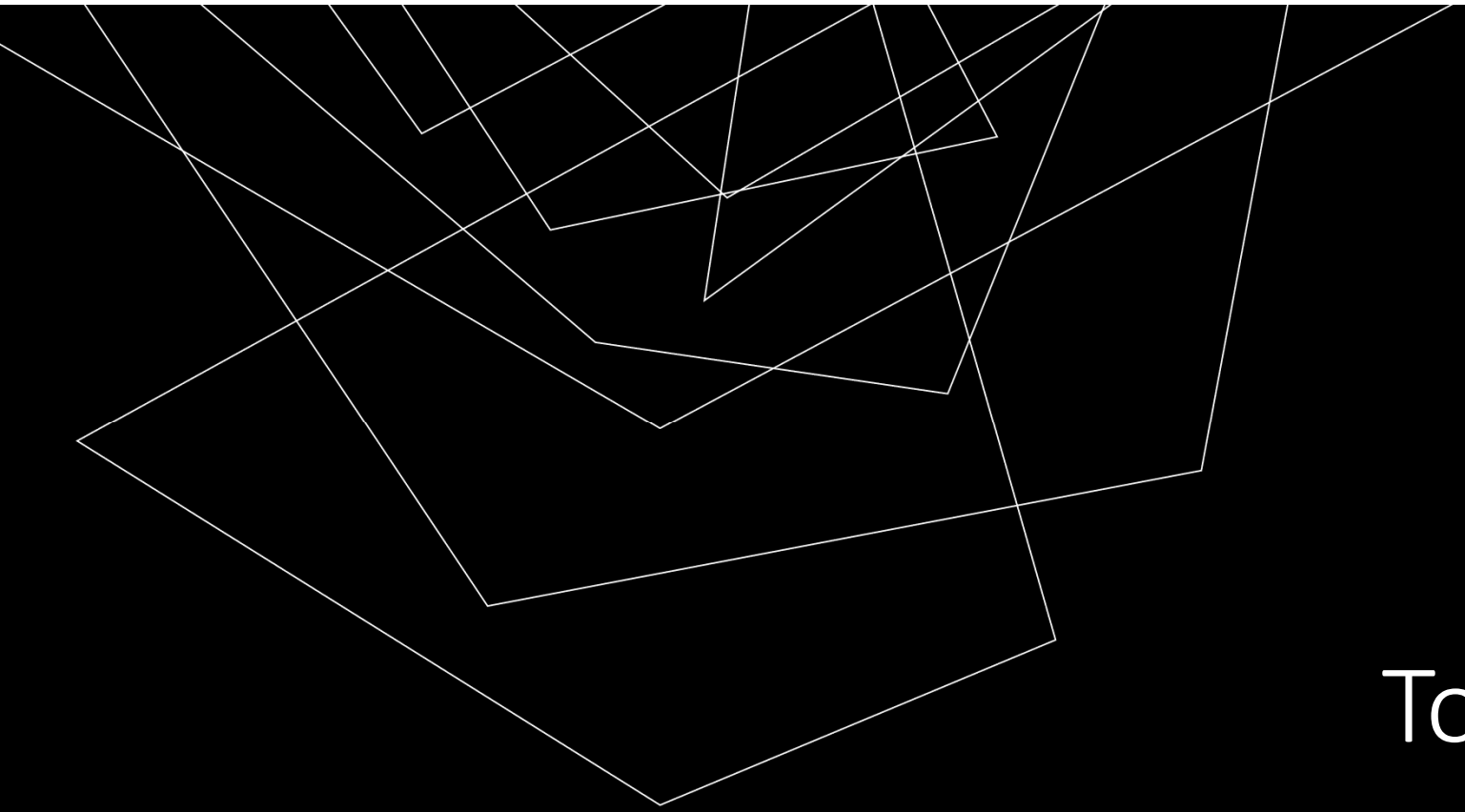


Part 1 – Framing Tolerances

Marshall Begel and David Bohnhoff

Developed between 1993-1998

Post-Frame “specific” features considered:

- Post Embedment Depth
- Post & Footing Concentricity
- Posts: Plumb (2 directions), Spacing, Alignment
- Building: Length & Width, Diagonal (squareness)
- Trusses: Height, Bow, Plumb
- Girts: Alignment, slope, spacing, and sag
- Also, Girders and Purlins

Post Embedment Depth

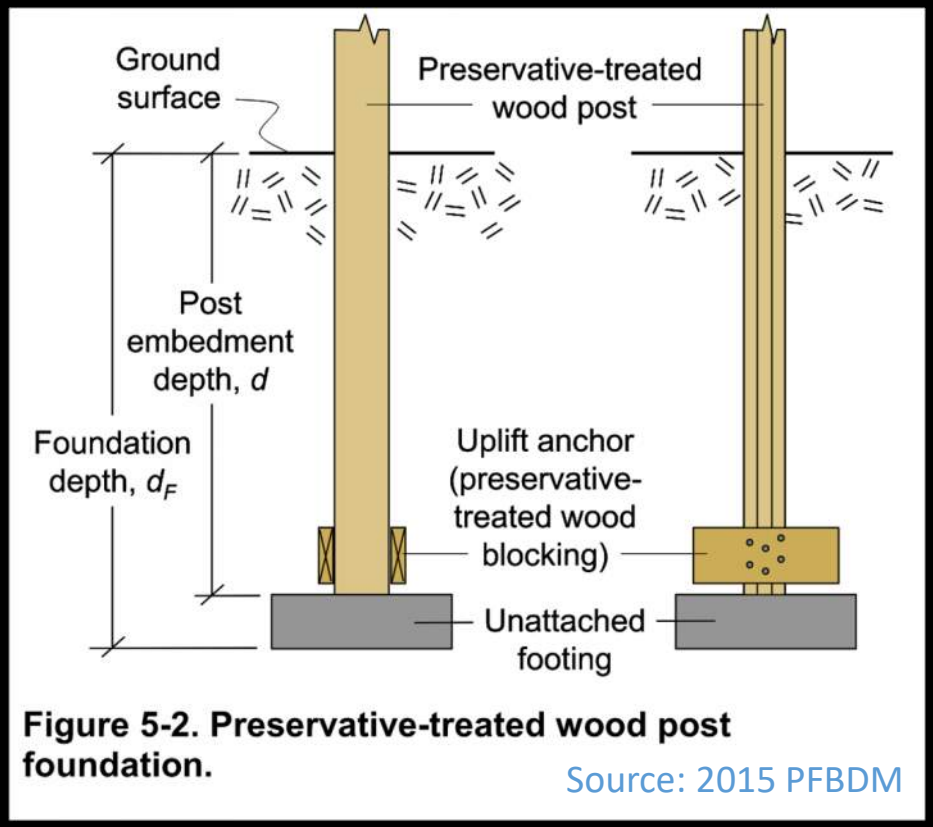


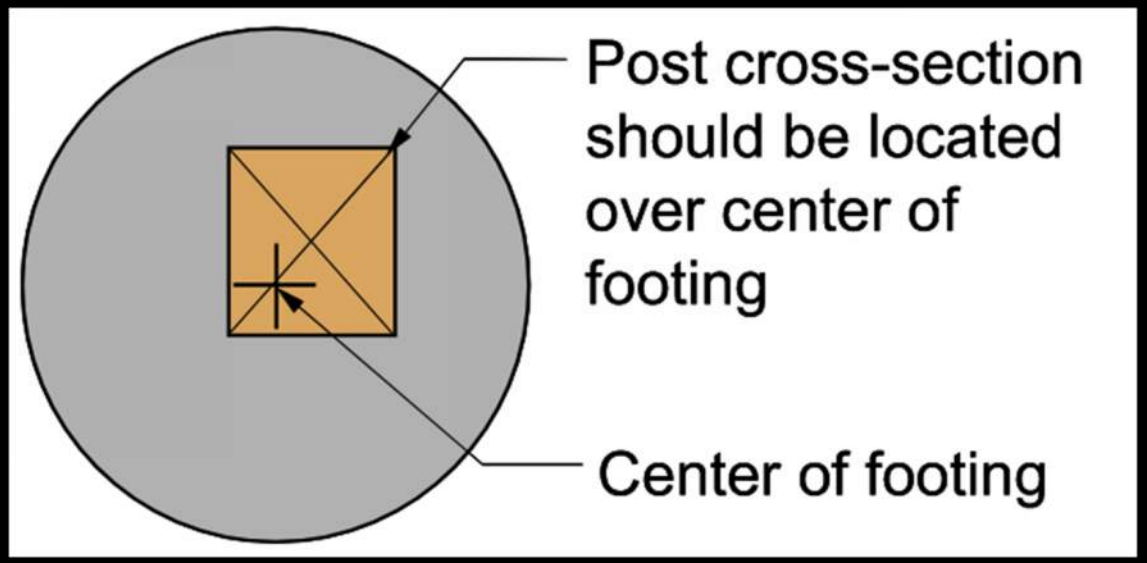
Figure 5-2. Preservative-treated wood post foundation.

Source: 2015 PFBDM

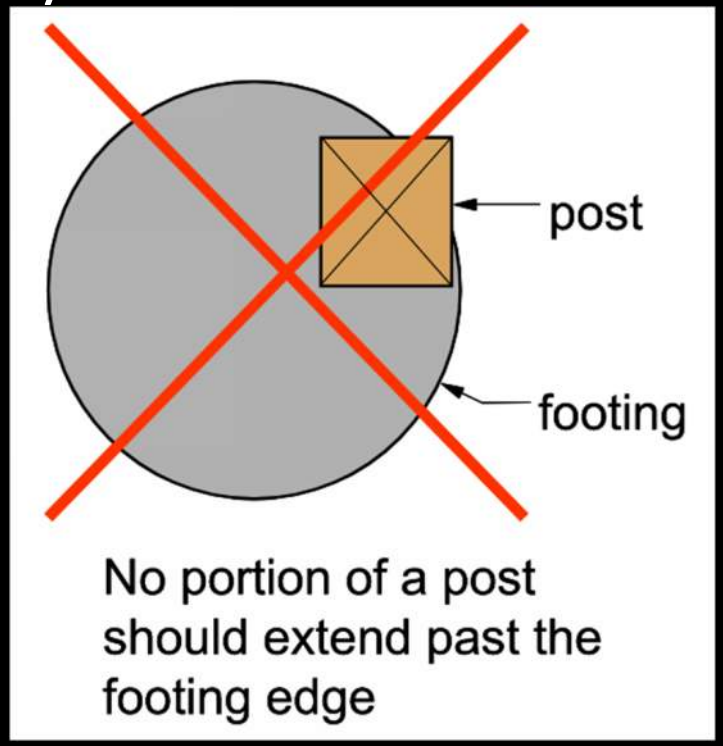
Post embedment minimum = 90% of specified depth.

(If exceeding depth, maintain minimum preservative treatment distance above grade)

Post and Footing Concentricity



Source: NFBA Accepted Framing Practices



Post Plumbness

Maximum deviation distance from plumb line:

1% of Post Height

Maximum slope of any post surface:

1.5% from plumb

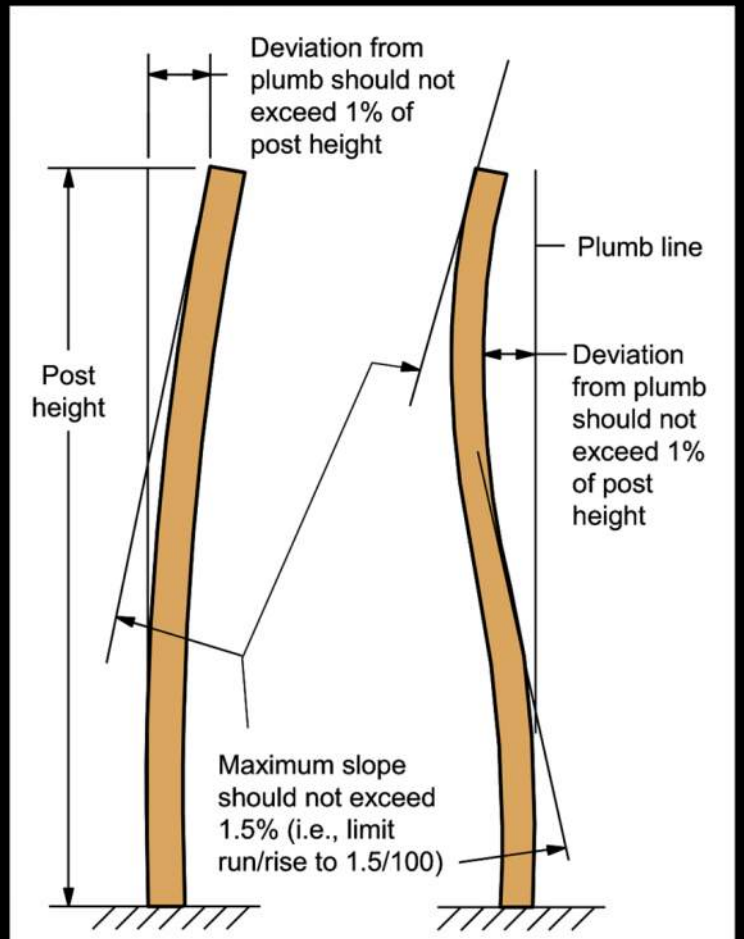
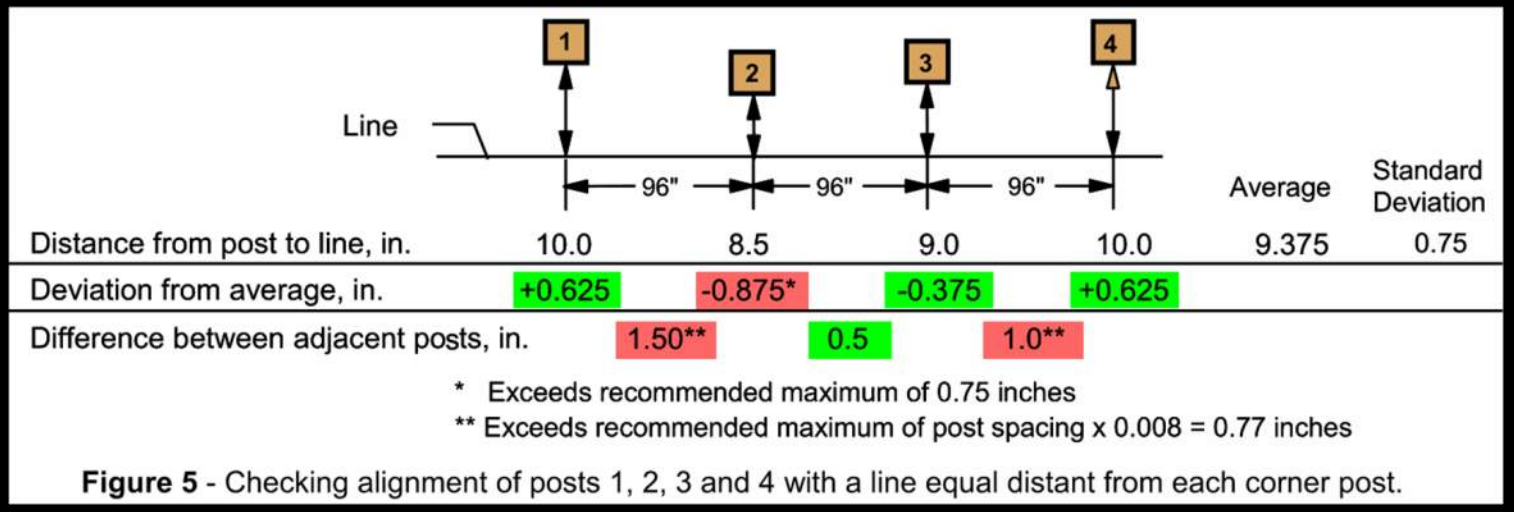


Figure 4 - Post plumbness criteria.

Post Alignment

- Spacing within 2” of the specified field spacing
- Alignment: Each post within ¾” of the average
- Difference between adjacent posts is within 0.8% of the spacing between posts.



	1	2	3	4	Average	Standard Deviation
Distance from post to line, in.	10.0	8.5	9.0	10.0	9.375	0.75
Deviation from average, in.	+0.625	-0.875*	-0.375	+0.625		
Difference between adjacent posts, in.		1.50**	0.5	1.0**		

* Exceeds recommended maximum of 0.75 inches

** Exceeds recommended maximum of post spacing x 0.008 = 0.77 inches

Figure 5 - Checking alignment of posts 1, 2, 3 and 4 with a line equal distant from each corner post.

Source: NFBA Accepted Framing Practices (color highlights added to show “pass/fail”)

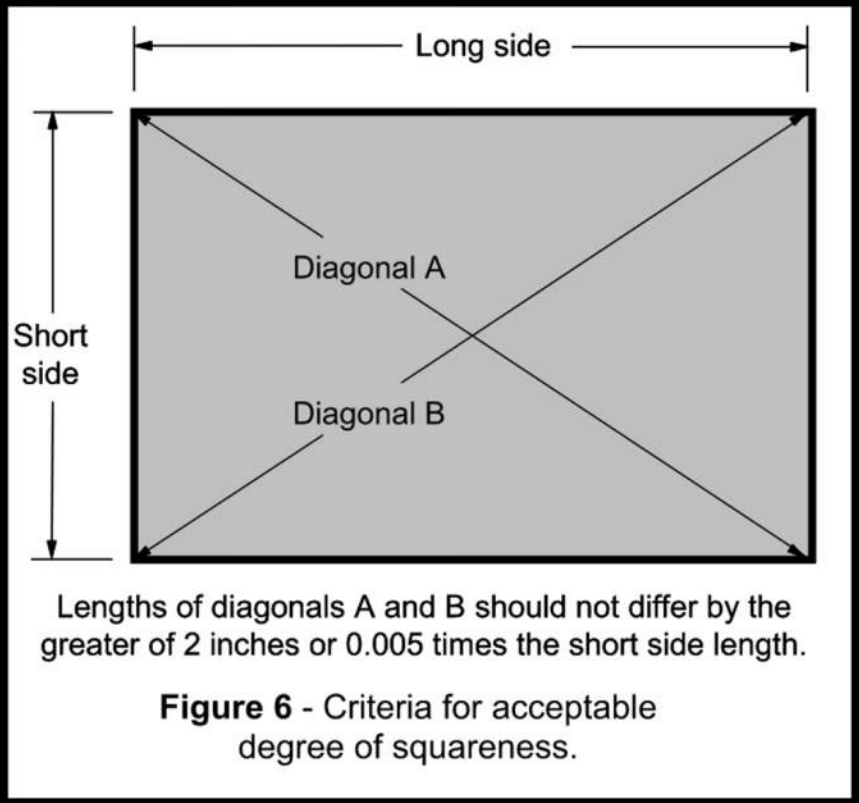
Building Size / Post Layout

Opposing Wall Lengths:

within 2” of each other

Diagonals within larger of:

2” or 0.5% of the short side



Lengths of diagonals A and B should not differ by the greater of 2 inches or 0.005 times the short side length.

Figure 6 - Criteria for acceptable degree of squareness.

Source: NFBA Accepted Framing Practices

Truss Placement

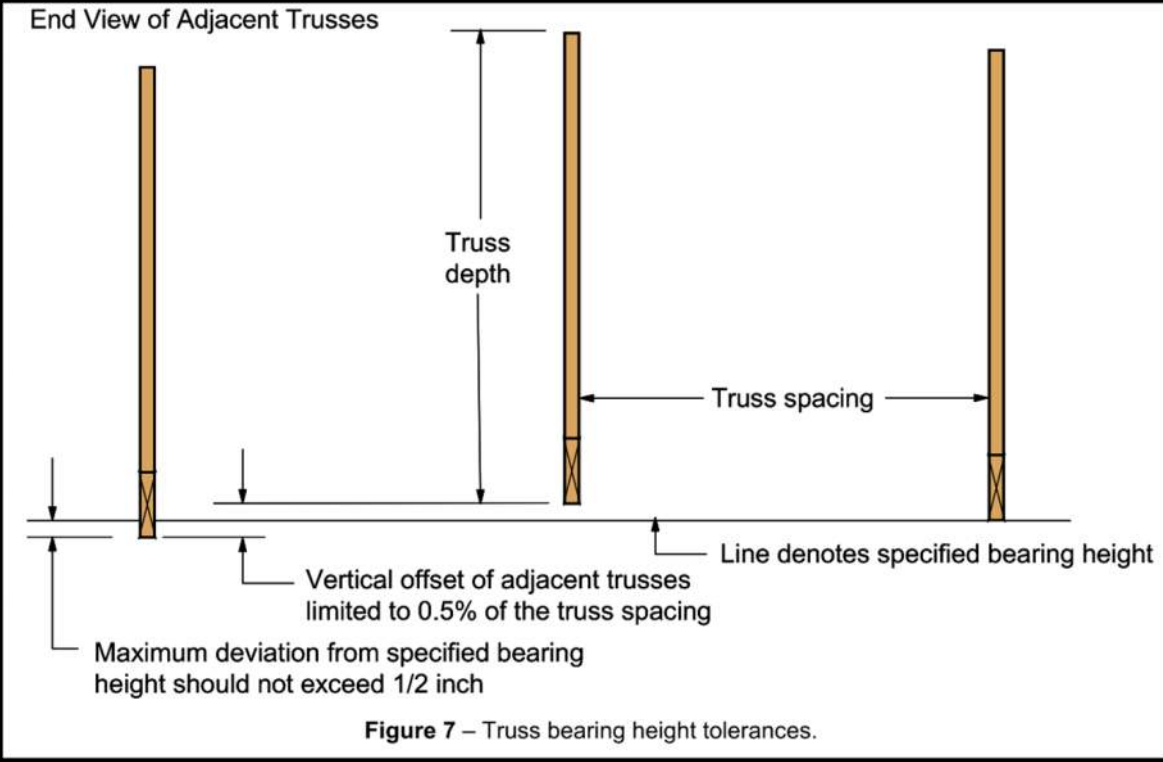


Figure 7 – Truss bearing height tolerances.

Source: NFBA Accepted Framing Practices

Truss Placement

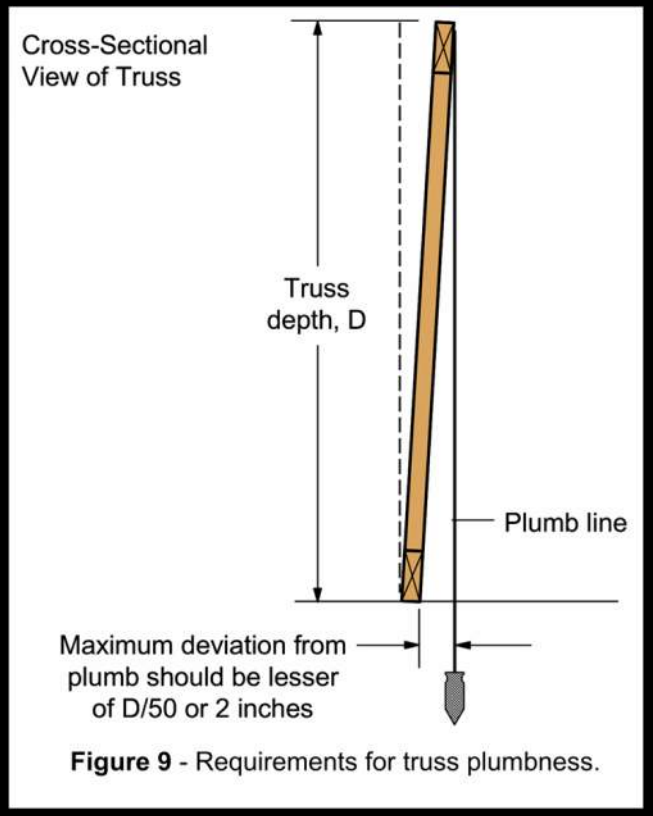


Figure 9 - Requirements for truss plumbness.

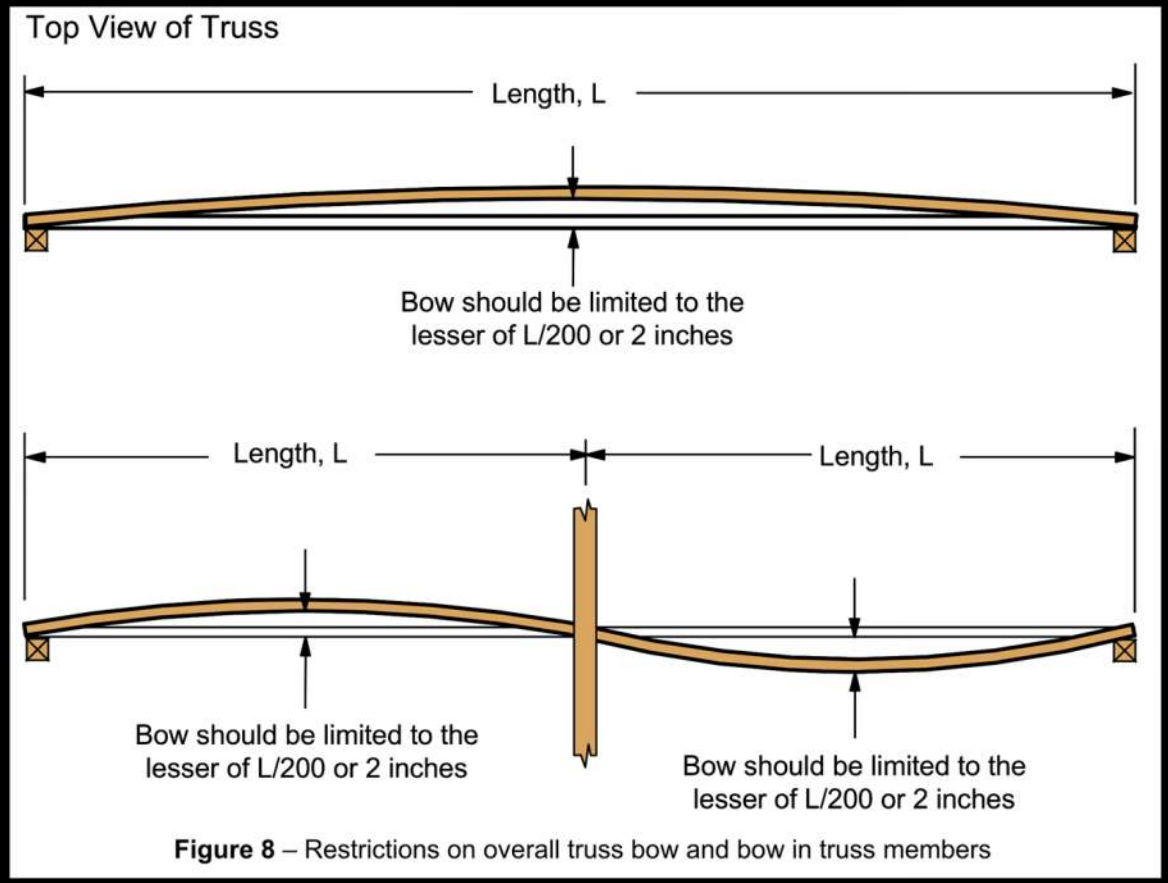


Figure 8 – Restrictions on overall truss bow and bow in truss members

Source: NFBA Accepted Framing Practices

Girt Placement

- Installed within 3/8” of horizontal line.
- Spacing within ½” of target
- Splices not offset by more than ¼”
- Slope 1% or less at any point
- Sag to be 0.6% of span or less

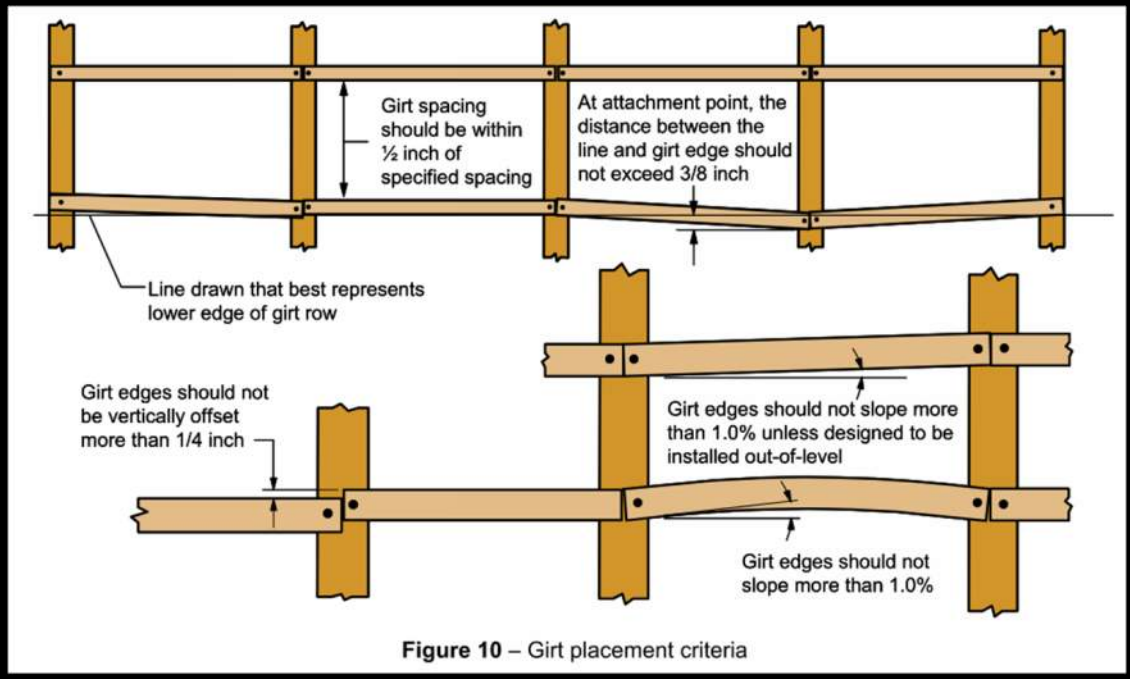


Figure 10 – Girt placement criteria

Source: NFBA Accepted Framing Practices

Girder and Purlin Placement

- Girder height within 1/2” of specified height
- Adjacent Girder bearing point heights within 0.5% of spacing between bearing points
- Spacing between purlin rows within ½” of specified spacing

Part 2
Cladding and Trim Installation Tolerances

David Bohnhoff and David Cockrum
UW-Madison
Developed between 2002-2005

Metal Panel Plumbness

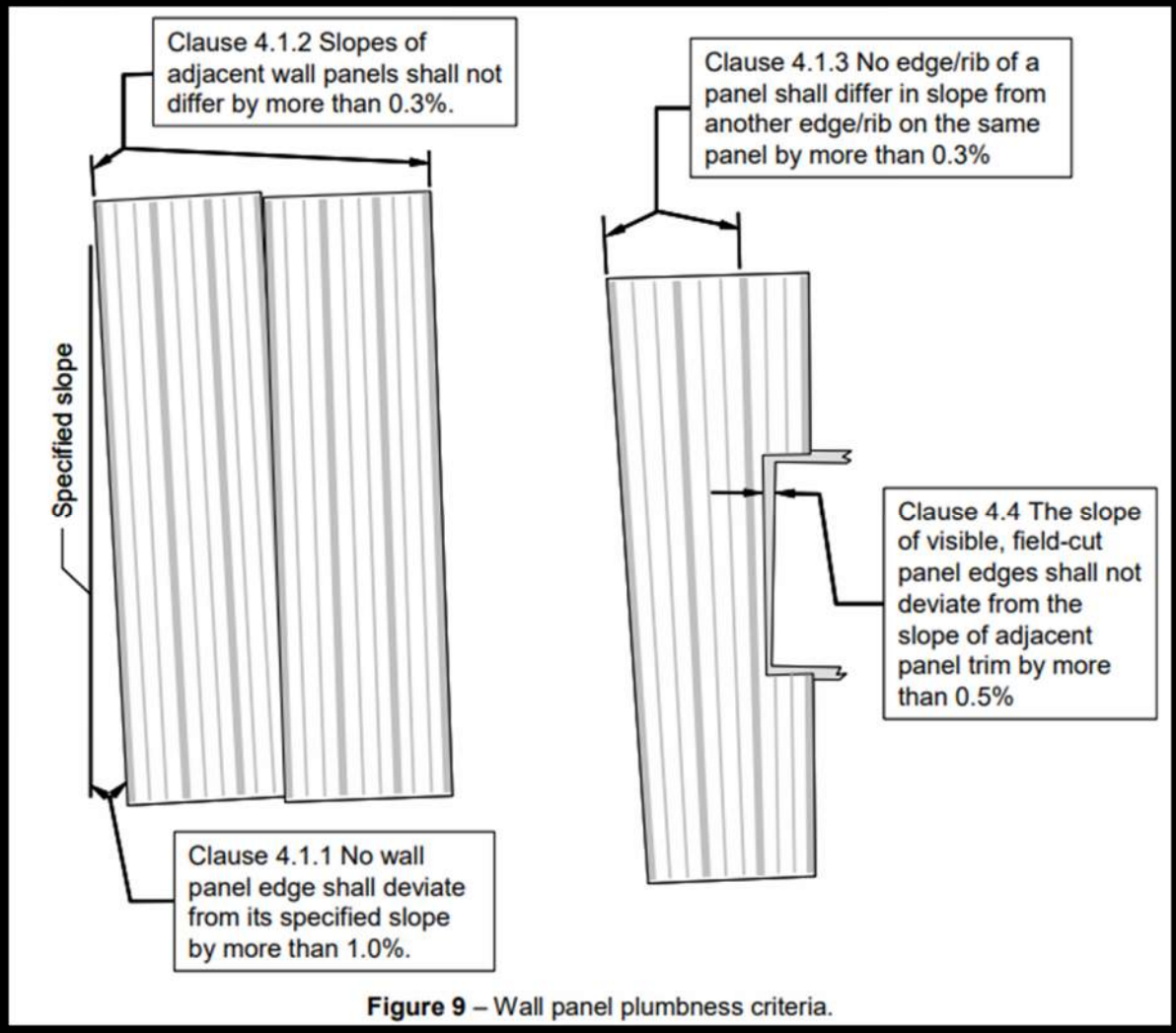


Figure 9 – Wall panel plumbness criteria.

Wall Panel Positioning

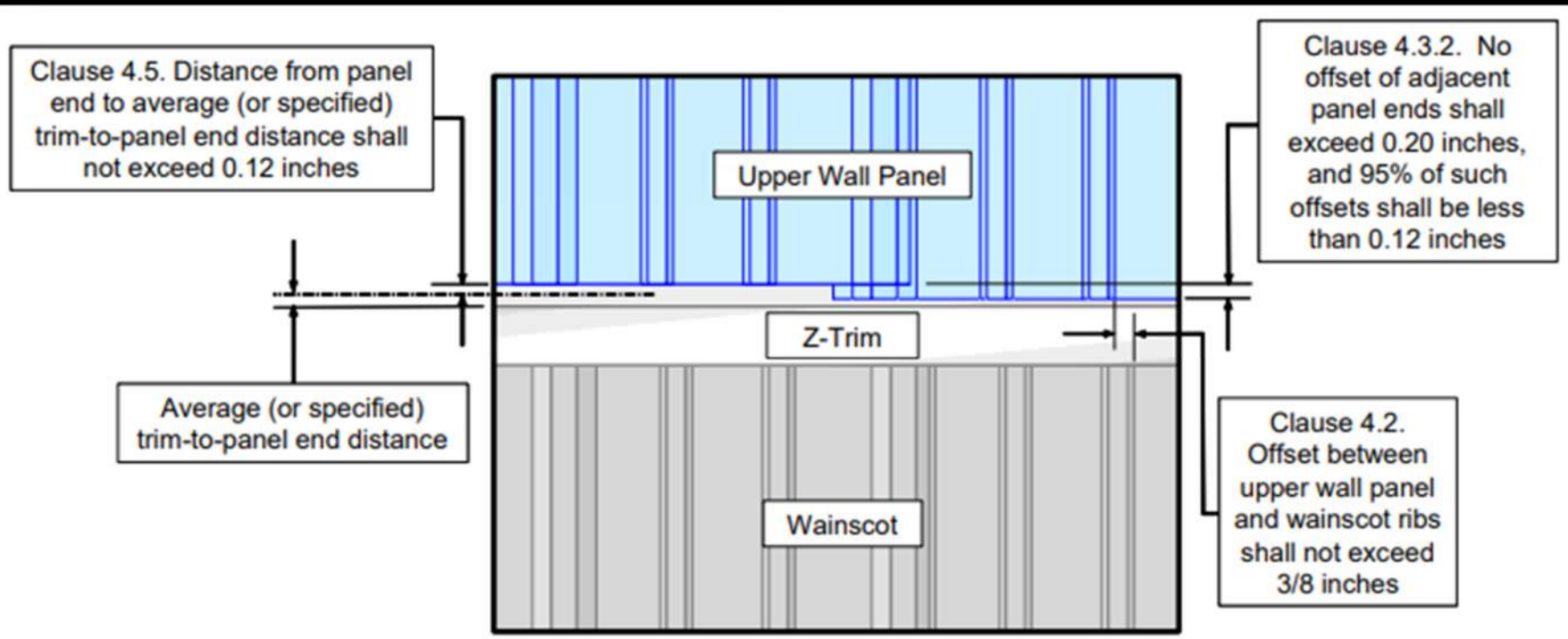


Figure 10 - Wall panel positioning criteria.

Roof Panel Positioning

- Adjacent roof panel edges not offset more than 0.38"
  - 95% of offsets less than 0.24"
- Roof panel overhang shall not differ from average by more than ¾"

Metal Trim Positioning

- Orientation should not vary more than 1.0% from specified
- Camber shall not exceed lesser of: 0.3% of distance between the two points or .5"

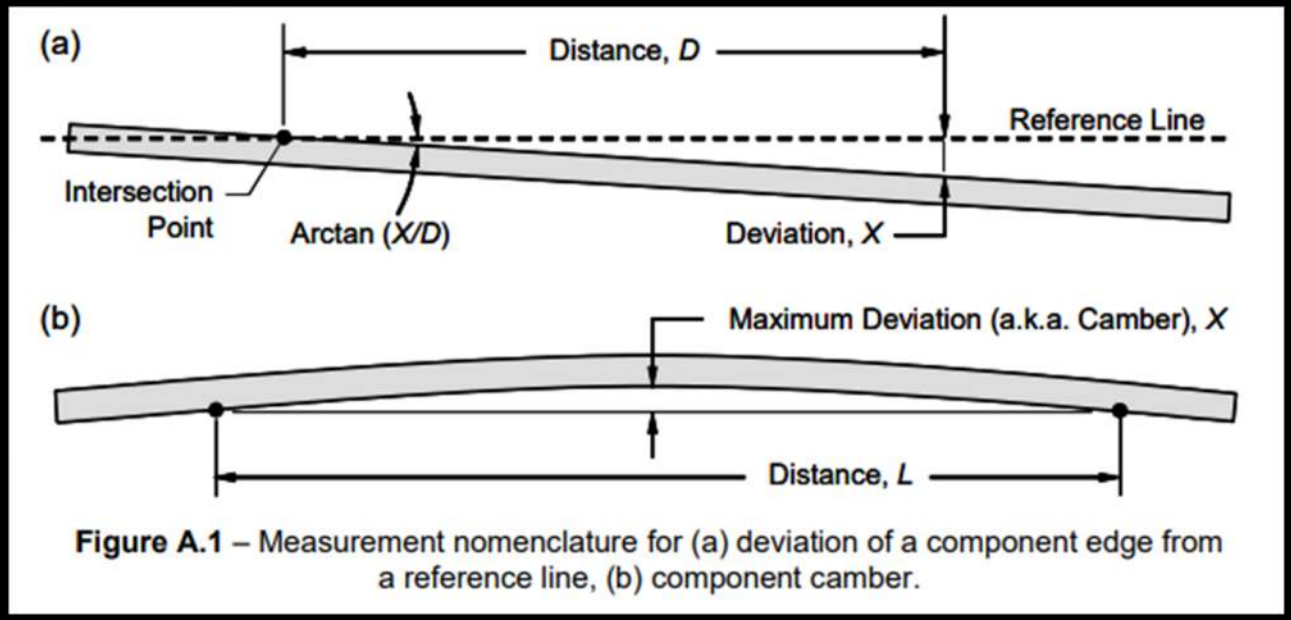
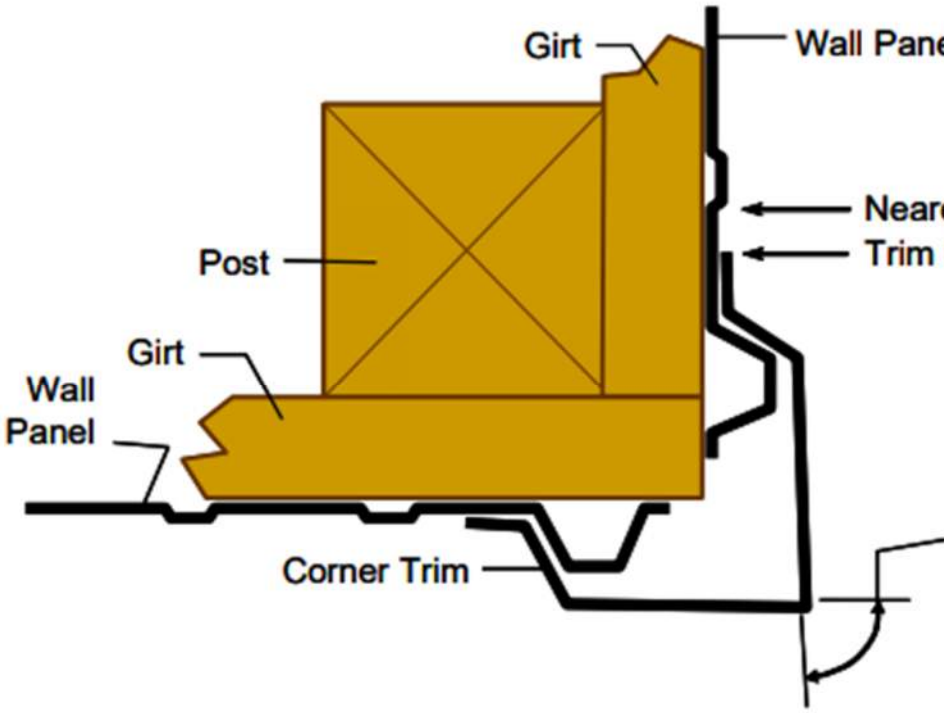


Figure A.1 – Measurement nomenclature for (a) deviation of a component edge from a reference line, (b) component camber.

Metal Trim Positioning



Clause 5.3. The slope of a trim edge shall not deviate from the slope of the nearest panel rib by more than 0.5%.

Clause 5.4. At no point along its length shall the major corner trim bend angle deviate from square (90 degrees) more than 8.0 degrees, nor shall the bend angle change more than 1.0 degree per foot of trim length

Figure 11 – Trim positioning criteria.

Wall Fastener alignment

- Horizontal: distance between any one fastener and a 12-foot line parallel to the row does not deviate from average by more than 0.38"
  - Vertical offset between adjacent fasteners shall not exceed 0.38"
- Vertical: Distance between an individual fastener and adjacent rib/seam shall not deviate from the average by more than 0.38"

Wall Fastener Installation

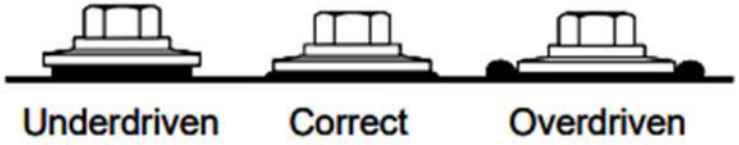


Figure 6 – Fastener washer compression level.

- Sealing washer to be compressed to manufacturer's recommended level
- Drive angle shall not exceed manufacturer's specified limit, or 15 degrees if no limit exists
- Penetrate wood framing to greater of 0.75" or 75% of specified embedment depth
- Fasteners missing a component necessary to proper sealing shall not be used

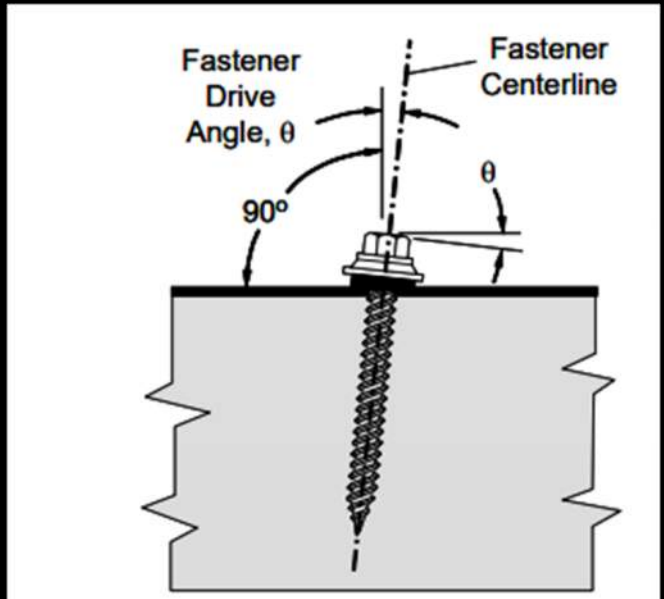
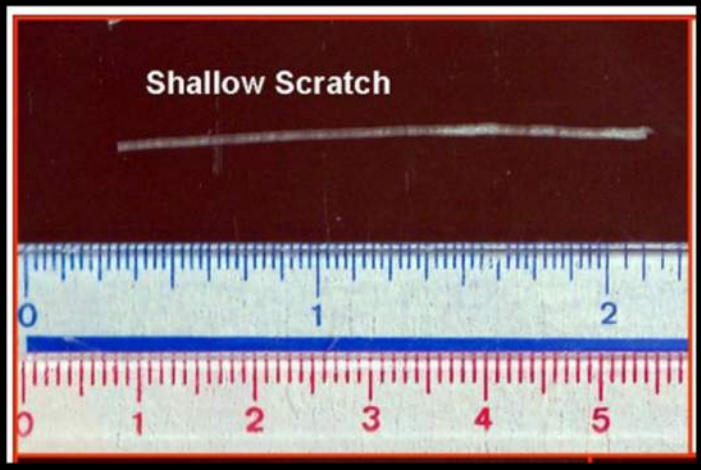


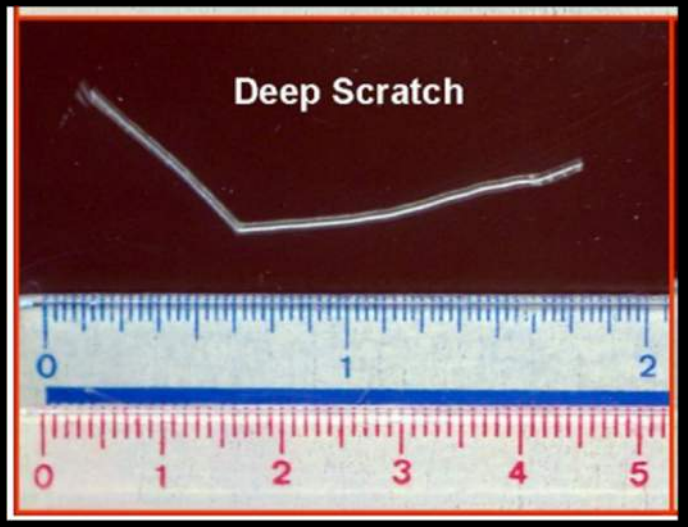
Figure 5 – Fastener drive angle

Scratches

- Aggregate length of all shallow scratches shall not exceed 0.5" per foot of panelized perimeter

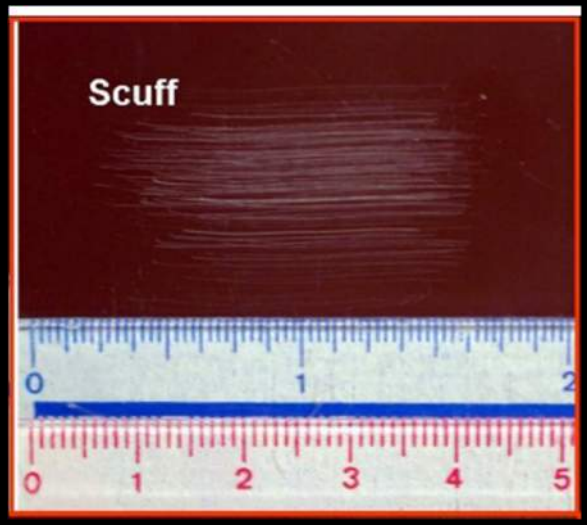
- Aggregate length of all deep scratches shall not exceed .25" per foot of panelized perimeter

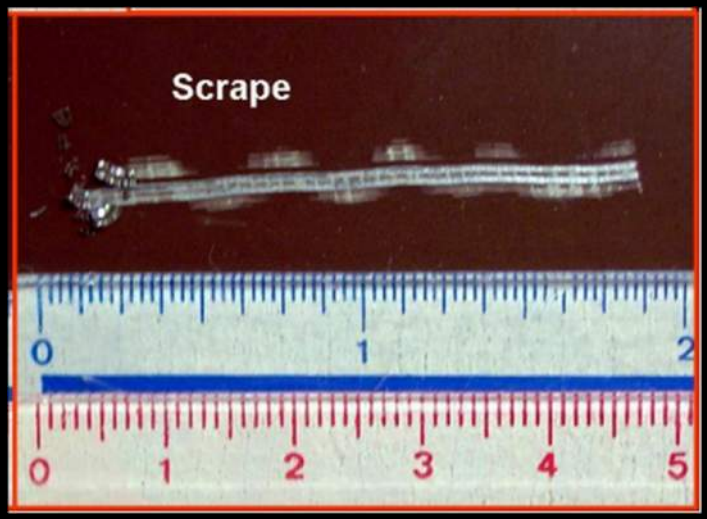




Scuffs and Scrapes

- Total area of all scuffs shall not exceed 0.02 in^2 per foot of panelized perimeter
- Total area of all scrapes shall not exceed 0.005 in^2 per foot
- No single scrape shall expose more than 0.1 in^2 of underlying metal





Dents

- Total number of wall dents shall not exceed 1 per 100 ft
- 1.0" maximum dimension, 0.12" maximum depth
- If paint is cracked, panel must be replaced

Rib and Edge Kinks

- Rib kinks not allowed unless covered by another component or will not affect structural integrity
- Total edge kinks shall not exceed 1 per 100 ft

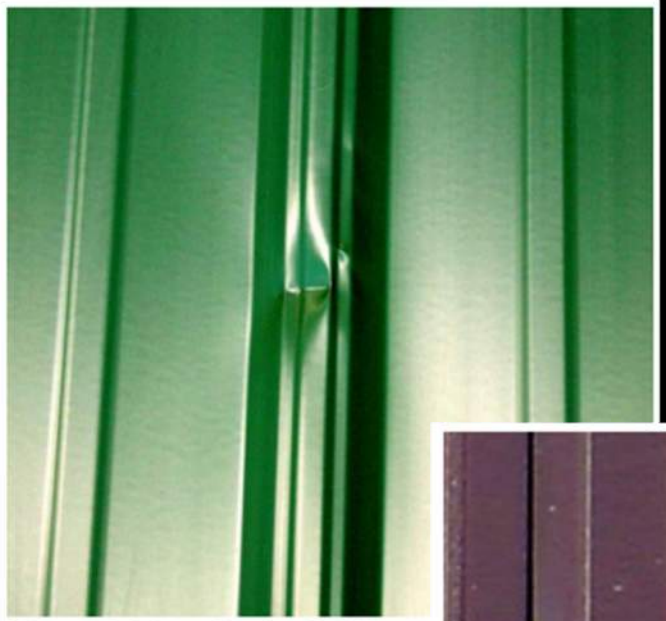


Figure 7 - Example of a rib kink.

Figure 3 - Example of edge kinking.

Cutting of Panels

- Outwardly visible panel edge shall not be field cut
- Metal chips from drilling or cutting shall be immediately removed from panel and trim
- Any metal panel or trim edge that will be visible after building completion shall not be cut with an abrasive blade

WHERE TO FIND THESE DOCUMENTS?

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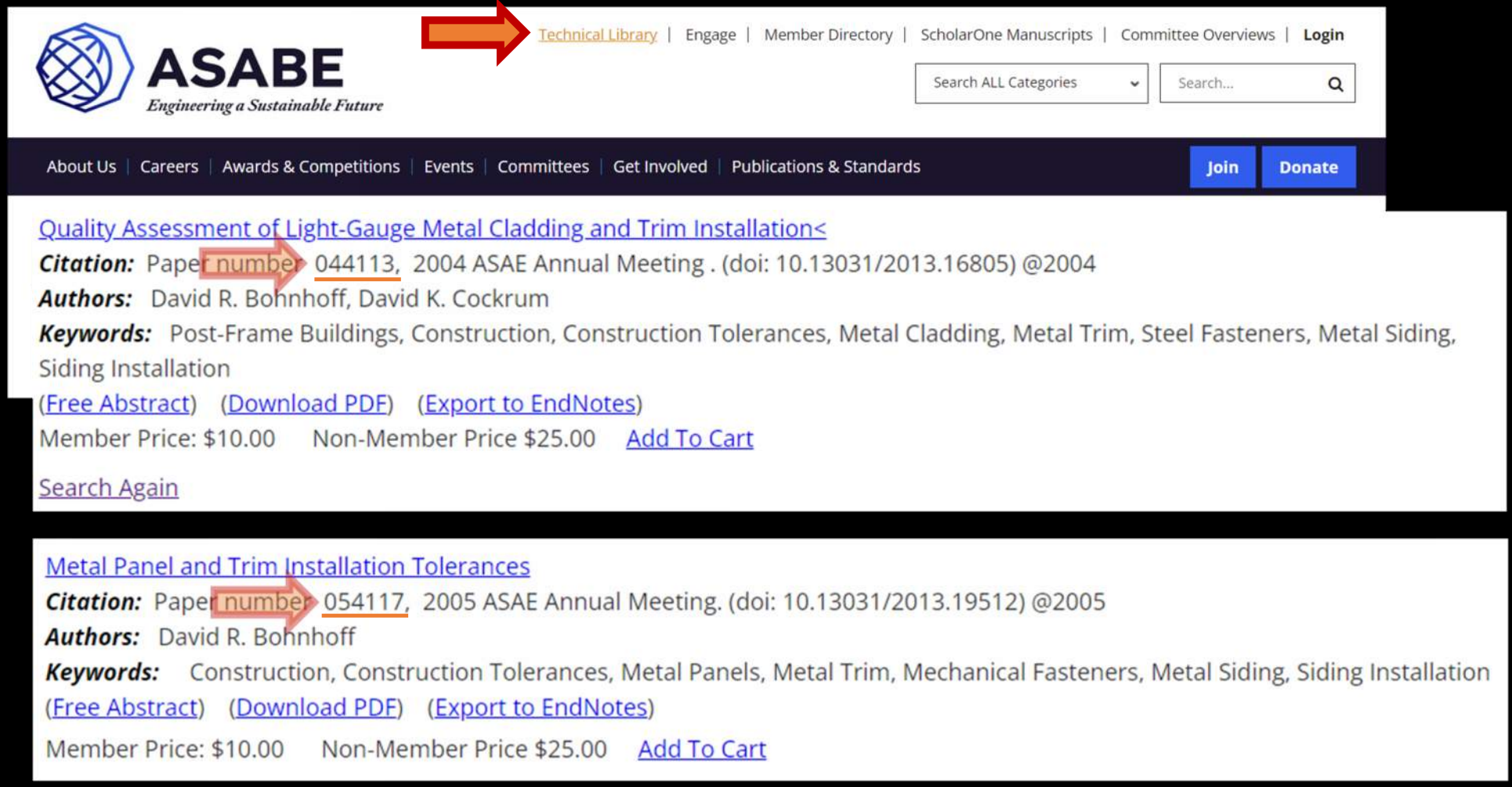

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Finding good applicants to add to your team can be a real challenge. Also, looking for a new career within the Post-frame Construction Industry can also be a difficult task. This section of our website is designed to help with both.

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Metal Panel and Trim Installation Tolerance

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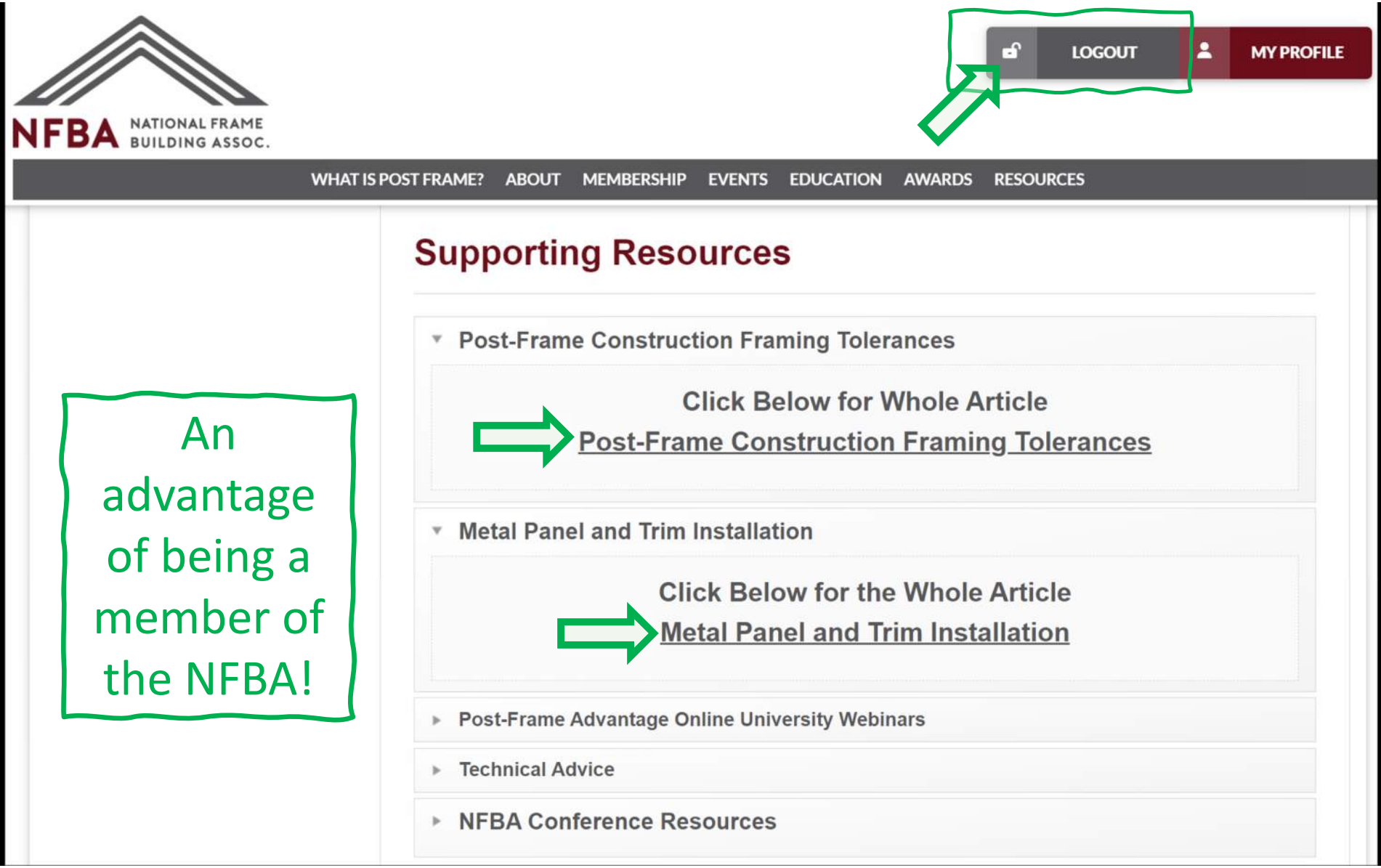
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Post-Frame Advantage Online University Webinars
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CONCLUSION

ANY QUESTIONS?

EXPERIENCES WITH THE TOLERANCE DOCUMENTS OR RELATED ISSUES?

THANK YOU

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