# Practical Considerations for Shear Wall Connections and Details

in Light-Frame Wood Structures

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

AIA Approved Continuing Education

# Course Description

Light-frame wood structures typically rely on wood-sheathed shear walls as the lateral force-resisting system to withstand wind and seismic forces. While many resources exist to help engineers determine the load demand on these walls, specific connections and details are often rooted in conventional framing practices that can vary regionally. Whether you are new to multi-story light-frame wood construction or seeking a better understanding of typical shear wall details, this presentation will provide useful information for determining appropriate connections and addressing common challenges. Using a typical exterior shear wall detail, an example shear wall schedule will be developed, showing additional options for consideration. The presentation will conclude by showing how this detail can be extrapolated to other shear wall conditions.

# Learning Objectives

1. Develop a shear wall schedule using shear wall capacities defined in the American Wood Council's 2021 Special Design Provisions for Wind and Seismic (SDPWS).
2. Examine solutions for splitting issues that can be caused by high nail density in rim joists or blocking.
3. Understand when shear clips are required to transfer load from a rim joist to top plates and address unique spacing considerations when using this hardware.
4. Learn how to coordinate typical anchor bolts combined with hold down anchors located at each end of the shear wall.

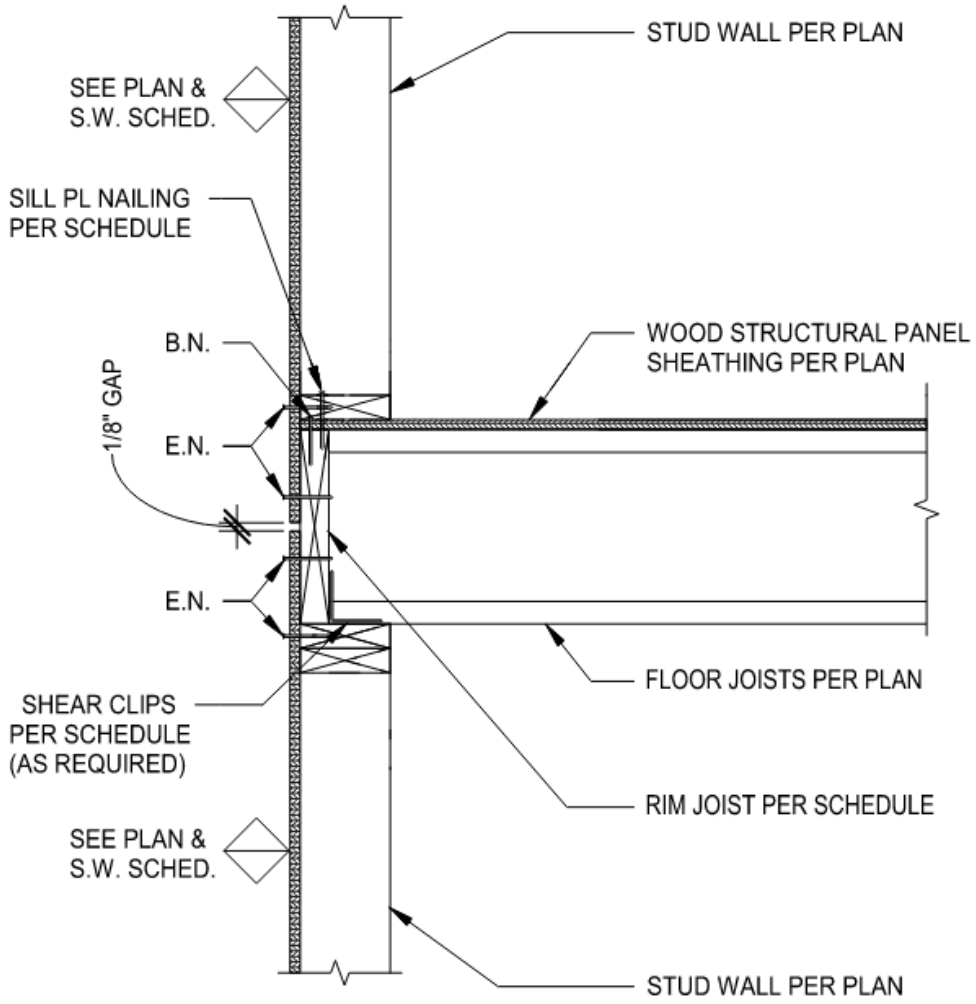
# What We *Won't* Cover Today…

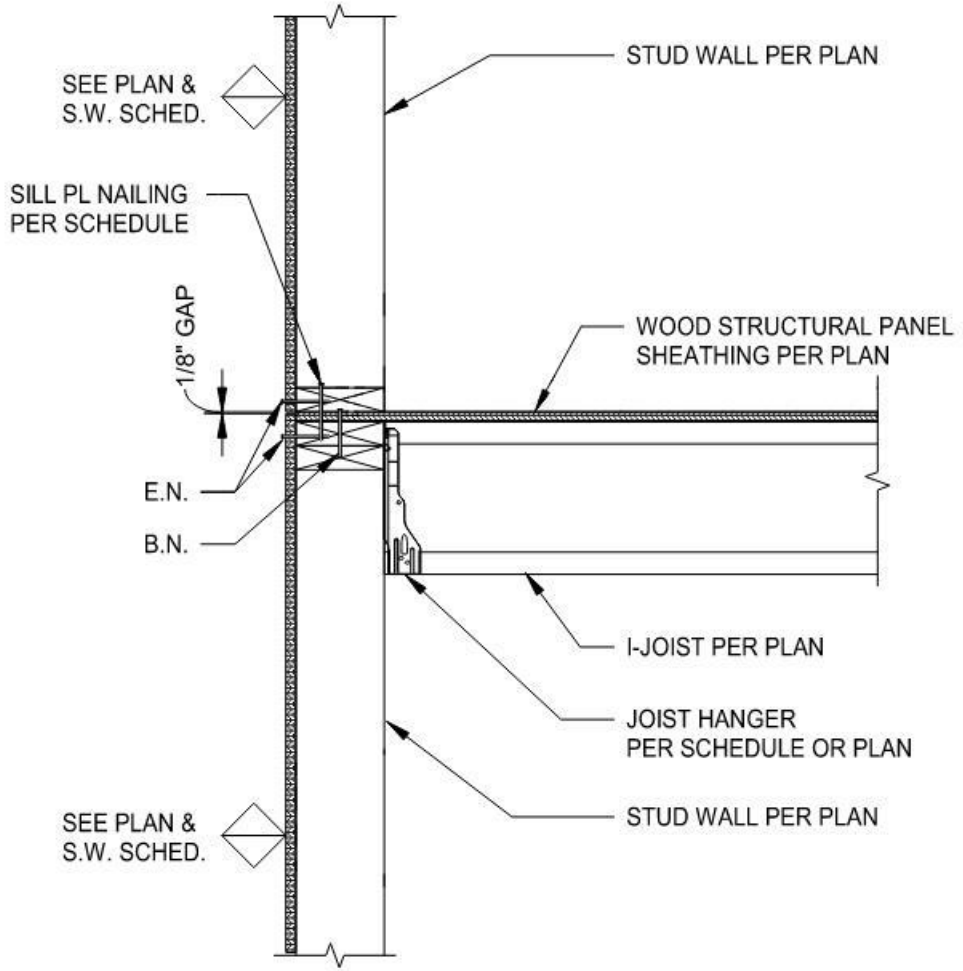
- Laying out shear walls for a building; calculating shear wall demand
  - **Common Challenges in Wood Lateral Systems Layouts**, Terry Malone, May 2022
  - **Five-Story Wood-Frame Structure Over Podium Slab**, Doug Thompson
- Diaphragm design
  - **A Master Class on Wood Lateral-Resisting Systems: In-Depth Diaphragm Layout and Analysis**, Terry Malone, December 2020
  - **The Analysis of Irregular Shaped Diaphragms**, Terry Malone
- Shear wall deflection, diaphragm deflection, rigid diaphragm analysis
  - **A Design Example of a Wood Cantilever Diaphragm** (Part 1, Part 2, Part 3, Part 4), Terry Malone, February 2020
  - **Design Example of a Cantilever Wood Diaphragm**, Terry Malone
- NEXT MONTH'S WEBINAR: **Force Transfer Around Openings**, Terry Malone

# What We *Will* Cover Today…

- How to make sure those demands are met in our details
- Common detailing challenges
- Additional detailing considerations

# Typical Exterior Wall Detail




https://www.woodworks.org/cad-revit

## Table 4.3A Nominal Unit Shear Capacities for Sheathed Wood-Frame Shear Walls [1,3,6]

### Wood-based Panels [4]

| Sheathing Material | Minimum Nominal Panel Thickness (in.) | Minimum Nail Bearing Length in Framing Member or Blocking, $\ell_m$ (in.) | Nail Type & Size [9] Length (in.) x Shank diameter (in.) x Head diameter (in.) | Panel Edge Nail Spacing (in.) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 6 | | | 4 | | | 3 | | | 2 | | |
| | | | | $v_n$ (plf) | $G_a$ (kips/in.) | | $v_n$ (plf) | $G_a$ (kips/in.) | | $v_n$ (plf) | $G_a$ (kips/in.) | | $v_n$ (plf) | $G_a$ (kips/in.) | |
| | | | | | OSB | PLY | | OSB | PLY | | OSB | PLY | | OSB | PLY |
| Wood Structural Panels – Structural I [4,5] | 5/16 | 1-1/4 | 6d common nail (2 x 0.113 x 0.266) [8] | 560 | 13 | 10 | 840 | 18 | 13 | 1090 | 23 | 16 | 1430 | 35 | 22 |
| | 3/8 [2] | 1-3/8 | 8d common nail (2-1/2 x 0.131 x 0.281) [8] | 645 | 19 | 14 | 1010 | 24 | 17 | 1290 | 30 | 20 | 1710 | 43 | 24 |
| | 7/16 [2] | | | 715 | 16 | 13 | 1105 | 21 | 16 | 1415 | 27 | 19 | 1875 | 40 | 24 |
| | 15/32 | | | 785 | 14 | 11 | 1205 | 18 | 14 | 1540 | 24 | 17 | 2045 | 37 | 23 |
| | 15/32 | 1-1/2 | 10d common nail (3 x 0.148 x 0.312) [8,10] | 950 | 22 | 16 | 1430 | 29 | 20 | 1860 | 36 | 22 | 2435 | 51 | 28 |
| Wood Structural Panels - Sheathing [4,5] | 5/16 | 1-1/4 | 6d common nail (2 x 0.113 x 0.266) [8] | 505 | 13 | 9.5 | 755 | 18 | 12 | 980 | 24 | 14 | 1260 | 37 | 18 |
| | 3/8 | | | 560 | 11 | 8.5 | 840 | 15 | 11 | 1090 | 20 | 13 | 1430 | 32 | 17 |
| | 3/8 [2] | 1-3/8 | 8d common nail (2-1/2 x 0.131 x 0.281) [8] | 615 | 17 | 12 | 895 | 25 | 15 | 1150 | 31 | 17 | 1485 | 45 | 20 |
| | 7/16 [2] | | | 670 | 15 | 11 | 980 | 22 | 14 | 1260 | 28 | 17 | 1640 | 42 | 21 |
| | 15/32 | | | 730 | 13 | 10 | 1065 | 19 | 13 | 1370 | 25 | 15 | 1790 | 39 | 20 |
| | 15/32 | 1-1/2 | 10d common nail (3 x 0.148 x 0.312) [8,10] | 870 | 22 | 14 | 1290 | 30 | 17 | 1680 | 37 | 19 | 2155 | 52 | 23 |
| | 19/32 | | | 950 | 19 | 13 | 1430 | 26 | 16 | 1860 | 33 | 18 | 2435 | 48 | 22 |
| Plywood Siding | 5/16 | 1-1/4 | 6d galv. [7] casing nail (2 x 0.099 x 0.142) | 390 | 13 | | 590 | 16 | | 770 | 17 | | 1010 | 21 | |
| | 3/8 | 1-3/8 | 8d galv. [7] casing nail (2-1/2 x 0.113 x 0.155) | 450 | 16 | | 670 | 18 | | 870 | 20 | | 1150 | 22 | |
| Particleboard Sheathing - (M-S "Exterior Glue" and M-2 "Exterior Glue") | 3/8 | | 6d common nail (2 x 0.113 x 0.266) [8] | 335 | 15 | | 505 | 17 | | 645 | 19 | | 840 | 22 | |
| | 3/8 | | 8d common nail (2-1/2 x 0.131 x 0.281) [8] | 365 | 18 | | 530 | 20 | | 670 | 21 | | 880 | 23 | |
| | 1/2 | | | 390 | 18 | | 590 | 20 | | 755 | 22 | | 980 | 24 | |
| | 1/2 | | 10d common nail (3 x 0.148 x 0.312) [8] | 520 | 21 | | 770 | 23 | | 1010 | 24 | | 1290 | 25 | |
| | 5/8 | | | 560 | 21 | | 855 | 23 | | 1105 | 24 | | 1455 | 26 | |
| Structural Fiberboard Sheathing | 1/2 | | 11 ga. galv. [7] roofing nail (1-1/2 x 0.120 x 7/16) | | | | 475 | 4.0 | | 645 | 5.0 | | 730 | 5.5 | |
| | 25/32 | | 11 ga. galv. [7] roofing nail (1-3/4 x 0.120 x 3/8) | | | | 475 | 4.0 | | 645 | 5.0 | | 730 | 5.5 | |

**"WSP"** **Gun nails?**

(8) Galvanized box nails may be substituted for the common nail specified in the box below.

| Nail Type & Size<br>Length (in.) x Shank diameter (in.) x Head diameter (in.) | |
|---|---|
| **Common Nail** | **Galvanized Box Nail [7]** |
| 6d (2 x 0.113 x 0.266) | 6d (2 x 0.099 x 0.266) |
| 8d (2-1/2 x 0.131 x 0.281) | 8d (2-1/2 x 0.113 x 0.297) |
| 10d (3 x 0.148 x 0.312) | 10d (3 x 0.128 x 0.312) |

Source: AWC SDPWS 2021

*Always check the footnotes!*

*(not shown)*

## Table 4.3A Nominal Unit Shear Capacities for Sheathed Wood-Frame Shear Walls [1,3,6]

**15/32" Sheathing 10d nails**

### Wood-based Panels [4]

| Sheathing Material | Minimum Nominal Panel Thickness (in.) | Minimum Nail Bearing Length in Framing Member or Blocking, $\ell_m$ (in.) | Nail Type & Size [9] Length (in.) x Shank diameter (in.) x Head diameter (in.) | Panel Edge Nail Spacing (in.) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 6 | | | 4 | | | 3 | | | 2 | | |
| | | | | $v_n$ (plf) | $G_a$ (kips/in.) | | $v_n$ (plf) | $G_a$ (kips/in.) | | $v_n$ (plf) | $G_a$ (kips/in.) | | $v_n$ (plf) | $G_a$ (kips/in.) | |
| | | | | | OSB | PLY | | OSB | PLY | | OSB | PLY | | OSB | PLY |
| Wood Structural Panels - Structural I [4,5] | 5/16 | 1-1/4 | 6d common nail (2 x 0.113 x 0.266) [8] | 560 | 13 | 10 | 840 | 18 | 13 | 1090 | 23 | 16 | 1430 | 35 | 22 |
| | 3/8 [2] | 1-3/8 | 8d common nail (2-1/2 x 0.131 x 0.281) [8] | 645 | 19 | 14 | 1010 | 24 | 17 | 1290 | 30 | 20 | 1710 | 43 | 24 |
| | 7/16 [2] | | | 715 | 16 | 13 | 1105 | 21 | 16 | 1415 | 27 | 19 | 1875 | 40 | 24 |
| | 15/32 | | | 785 | 14 | 11 | 1205 | 18 | 14 | 1540 | 24 | 17 | 2045 | 37 | 23 |
| | 15/32 | 1-1/2 | 10d common nail (3 x 0.148 x 0.312) [8,10] | 950 | 22 | 16 | 1430 | 29 | 20 | 1860 | 36 | 22 | 2435 | 51 | 28 |
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| | 3/8 | | | 560 | 11 | 8.5 | 840 | 15 | 11 | 1090 | 20 | 13 | 1430 | 32 | 17 |
| | 3/8 [2] | 1-3/8 | 8d common nail (2-1/2 x 0.131 x 0.281) [8] | 615 | 17 | 12 | 895 | 25 | 15 | 1150 | 31 | 17 | 1485 | 45 | 20 |
| | 7/16 [2] | | | 670 | 15 | 11 | 980 | 22 | 14 | 1260 | 28 | 17 | 1640 | 42 | 21 |
| | 15/32 | | | 730 | 13 | 10 | 1065 | 19 | 13 | 1370 | 25 | 15 | 1790 | 39 | 20 |
| | 15/32 | | 10d common nail (3 x 0.148 x 0.312) [8,10] | 870 | 22 | 14 | 1290 | 30 | 17 | 1680 | 37 | 19 | 2155 | 52 | 23 |
| | 19/32 | | | 950 | 19 | 13 | 1430 | 26 | 16 | 1860 | 33 | 18 | 2435 | 48 | 22 |
| Plywood Siding | 5/16 | 1-1/4 | 6d galv. [7] casing nail (2 x 0.099 x 0.142) | 390 | 13 | | 590 | 16 | | 770 | 17 | | 1010 | 21 | |
| | 3/8 | 1-3/8 | 8d galv. [7] casing nail (2-1/2 x 0.113 x 0.155) | 450 | 16 | | 670 | 18 | | 870 | 20 | | 1150 | 22 | |
| Particleboard Sheathing - (M-S "Exterior Glue" and M-2 "Exterior Glue") | 3/8 | | 6d common nail (2 x 0.113 x 0.266) [8] | 335 | 15 | | 505 | 17 | | 645 | 19 | | 840 | 22 | |
| | 3/8 | | 8d common nail (2-1/2 x 0.131 x 0.281) [8] | 365 | 18 | | 530 | 20 | | 670 | 21 | | 880 | 23 | |
| | 1/2 | | | 390 | 18 | | 590 | 20 | | 755 | 22 | | 960 | 24 | |
| | 1/2 | | 10d common nail (3 x 0.148 x 0.312) [8] | 520 | 21 | | 770 | 23 | | 1010 | 24 | | 1290 | 25 | |
| | 5/8 | | | 560 | 21 | | 855 | 23 | | 1105 | 24 | | 1455 | 26 | |
| Structural Fiberboard Sheathing | 1/2 | | 11 ga. galv. [7] roofing nail (1-1/2 x 0.120 x 7/16) | | | | 475 | 4.0 | | 645 | 5.0 | | 730 | 5.5 | |
| | 25/32 | | 11 ga. galv. [7] roofing nail (1-3/4 x 0.120 x 3/8) | | | | 475 | 4.0 | | 645 | 5.0 | | 730 | 5.5 | |

Source: AWC SDPWS 2021

*Always check the footnotes! (not shown)*

# 15/32” WSP Sheathing w/ 10d

1 1/2” minimum penetration into DF-L or SP members*

| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
|---|---|---|---|---|
| Nominal unit shear capacity, $v_n$ | 870 plf | 1290 plf | 1680 plf | 2155 plf |

**Always check the footnotes!!*

**Footnotes adjustments:**

- Stud spacing w/ 3/8” WSP increase
- Species
- Apparent shear value
- Framing w/ WSP both sides
- Galvanized nail substitution
- Hold down anchor eccentricity

# 15/32” WSP Sheathing w/ 10d

1 1/2” minimum penetration into DF-L or SP member

| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
|---|---|---|---|---|
| Nominal unit shear capacity | 870 plf | 1290 plf | 1680 plf | 2155 plf |

ASD allowable unit shear = nominal / 2.8 for seismic (/2.0 for wind)

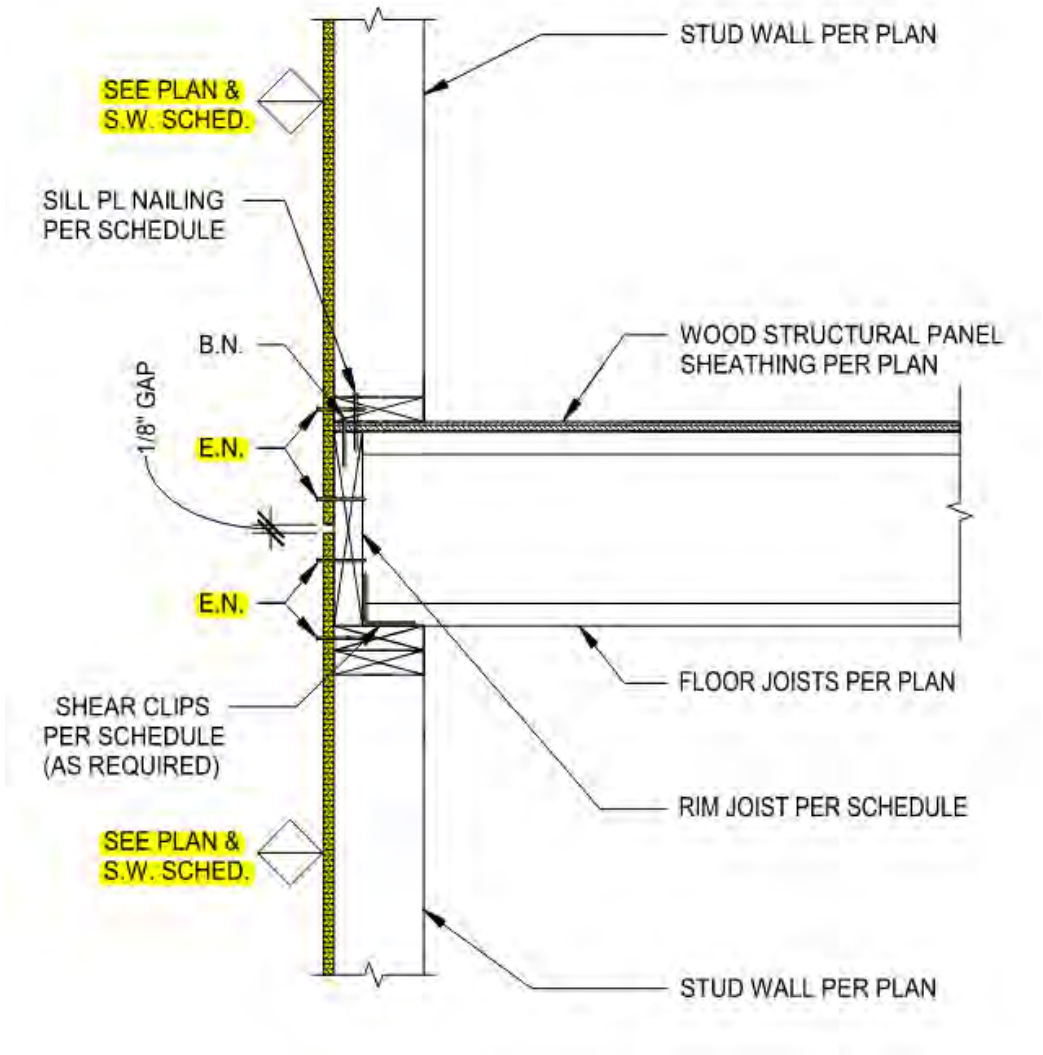
Allowable unit shear capacities per AWC SDPWS 4.3.3

# 15/32” WSP Sheathing w/ 10d

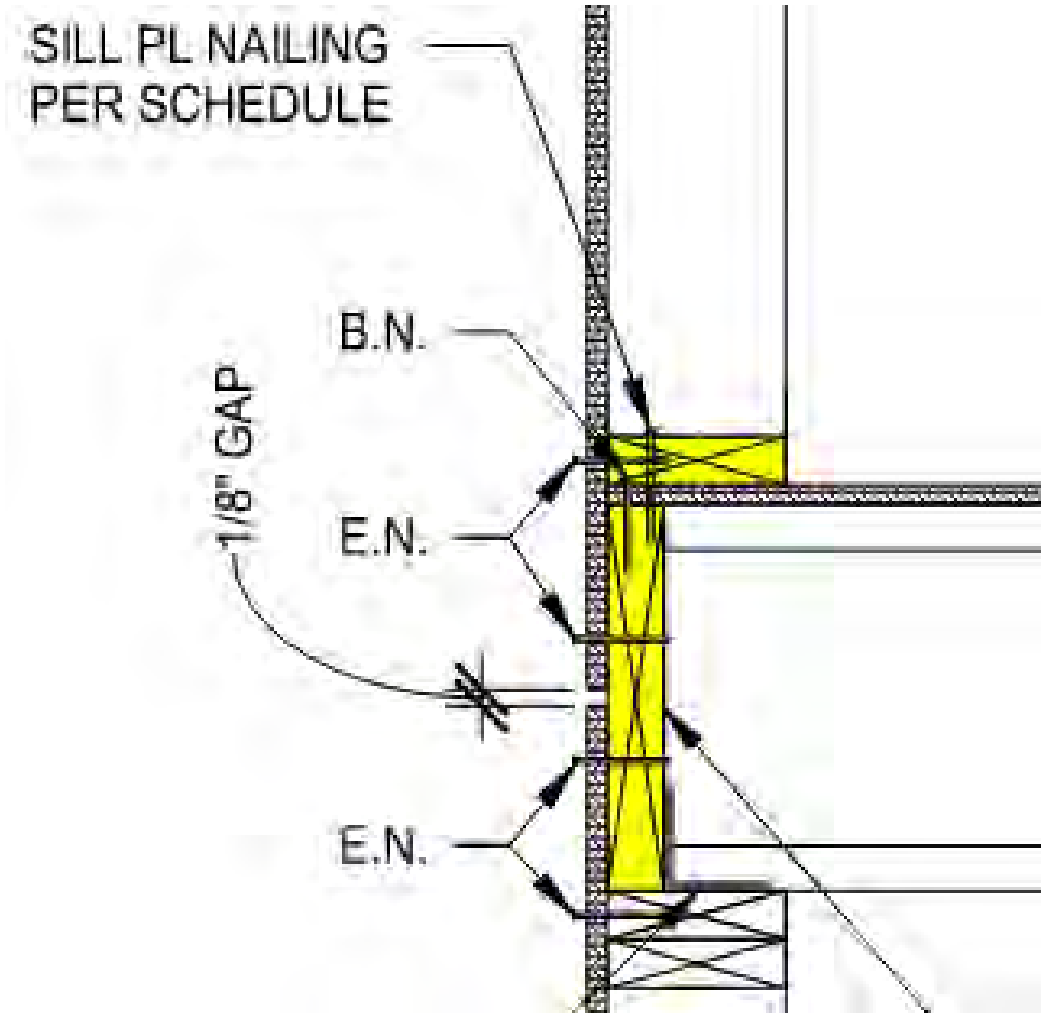
1 1/2” minimum penetration into DF-L or SP member

| | | | | | |
|---|---|---|---|---|---|
| | Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| | Nominal unit shear capacity | 870 plf | 1290 plf | 1680 plf | 2155 plf |
| Seismic | ASD allowable unit shear capacity | **310 plf** | **460 plf** | **600 plf** | **770 plf** |

# Detail: Shear Wall & Shear Wall Nailing



# Detail: Sill Plate and Sill Plate Nailing



# Sill Plate Nailing

- Assume DF-L
- 2x sill plate = 1.5”
- Choose nail type and size
  Assume **common nails**
- Check full penetration into main member (thru floor sheathing)

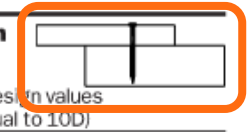


**Table 12N** **COMMON, BOX, or SINKER STEEL WIRE NAILS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections[1,2,3]**

for sawn lumber or SCL with both members of identical specific gravity (tabulated lateral design values are calculated based on an assumed length of nail penetration, p, into the main member equal to 10D)

| Side Member Thickness $t_m$ | Nail Diameter D | Common Wire Nail | Box Nail | Sinker Nail | G=0.67 Red Oak | G=0.55 Mixed Maple Southern Pine | G=0.5 Douglas Fir-Larch | G=0.49 Douglas Fir-Larch (N) | G=0.46 Douglas Fir(S) Hem-Fir(N) | G=0.43 Hem-Fir | G=0.42 Spruce-Pine-Fir | G=0.37 Redwood | G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods | G=0.35 Northern Species |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| in. | in. | Pennyweight | | | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. |
| 3/4 | 0.099 | | 6d | 7d | 73 | 61 | 55 | 54 | 51 | 48 | 47 | 39 | 38 | 36 |
| | 0.113 | 6d | 8d | 8d | 94 | 79 | 72 | 71 | 65 | 58 | 57 | 47 | 46 | 44 |
| | 0.120 | | | 10d | 107 | 89 | 80 | 77 | 71 | 64 | 62 | 52 | 50 | 48 |
| | 0.128 | | 10d | | 121 | 101 | 87 | 84 | 78 | 70 | 68 | 57 | 56 | 54 |
| | 0.131 | 8d | | | 127 | 104 | 90 | 87 | 80 | 73 | 70 | 60 | 58 | 56 |
| | 0.135 | | 16d | 12d | 135 | 108 | 94 | 91 | 84 | 76 | 74 | 63 | 61 | 58 |
| | 0.148 | 10d | 20d | 16d | 154 | 121 | 105 | 102 | 94 | 85 | 83 | 70 | 69 | 66 |
| | 0.162 | 16d | 40d | | 183 | 138 | 121 | 117 | 108 | 99 | 96 | 82 | 80 | 77 |
| | 0.177 | | | 20d | 200 | 153 | 134 | 130 | 121 | 111 | 107 | 92 | 90 | 87 |
| | 0.192 | 20d | | 30d | 206 | 157 | 138 | 134 | 125 | 114 | 111 | 96 | 93 | 90 |
| | 0.207 | 30d | | 40d | 216 | 166 | 147 | 143 | 133 | 122 | 119 | 103 | 101 | 97 |
| | 0.225 | 40d | | | 229 | 178 | 158 | 154 | 144 | 132 | 129 | 112 | 110 | 106 |
| | 0.244 | 50d | | 60d | 234 | 182 | 162 | 158 | 147 | 136 | 132 | 115 | 113 | 109 |
| 1 | 0.099 | | 6d | 7d | 73 | 61 | 55 | 54 | 51 | 48 | 47 | 42 | 41 | 40 |
| | 0.113 | 6d[4] | 8d | 8d | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 51 |
| | 0.120 | | | 10d | 107 | 89 | 81 | 80 | 76 | 71 | 69 | 60 | 59 | 56 |
| | 0.128 | | 10d | | 121 | 101 | 93 | 91 | 86 | 80 | 79 | 66 | 64 | 61 |
| | 0.131 | 8d | | | 127 | 106 | 97 | 95 | 90 | 84 | 82 | 68 | 66 | 63 |
| | 0.135 | | 16d | 12d | 135 | 113 | 103 | 101 | 96 | 89 | 86 | 71 | 69 | 66 |
| | 0.148 | 10d | 20d | 16d | 154 | 128 | 118 | 115 | 109 | 99 | 96 | 80 | 77 | 74 |
| | 0.162 | 16d | 40d | | 184 | 154 | 141 | 137 | 125 | 113 | 109 | 91 | 89 | 85 |
| | 0.177 | | | 20d | 213 | 178 | 155 | 150 | 138 | 125 | 121 | 102 | 99 | 95 |
| | 0.192 | 20d | | 30d | 222 | 183 | 159 | 154 | 142 | 128 | 124 | 105 | 102 | 98 |
| | 0.207 | 30d | | 40d | 243 | 192 | 167 | 162 | 149 | 135 | 131 | 111 | 109 | 104 |
| | 0.225 | 40d | | | 268 | 202 | 177 | 171 | 159 | 144 | 140 | 120 | 117 | 112 |
| | 0.244 | 50d | | 60d | 274 | 207 | 181 | 175 | 162 | 148 | 143 | 123 | 120 | 115 |
| 1-1/4 | 0.099 | | 6d[4] | 7d[4] | 73 | 61 | 55 | 54 | 51 | 48 | 47 | 42 | 41 | 40 |
| | 0.113 | 6d[4] | 8d | 8d[4] | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.120 | | | 10d | 107 | 89 | 81 | 80 | 76 | 71 | 69 | 62 | 60 | 59 |
| | 0.128 | | 10d | | 121 | 101 | 93 | 91 | 86 | 80 | 79 | 70 | 69 | 67 |
| | 0.131 | 8d[4] | | | 127 | 106 | 97 | 95 | 90 | 84 | 82 | 73 | 72 | 70 |
| | 0.135 | | 16d | 12d | 135 | 113 | 103 | 101 | 96 | 89 | 88 | 78 | 76 | 74 |
| | 0.148 | 10d | 20d | 16d | 154 | 128 | 118 | 115 | 109 | 102 | 100 | 89 | 87 | 84 |
| | 0.162 | 16d | 40d | | 184 | 154 | 141 | 138 | 131 | 122 | 120 | 103 | 100 | 95 |
| | 0.177 | | | 20d | 213 | 178 | 163 | 159 | 151 | 141 | 136 | 113 | 110 | 105 |
| | 0.192 | 20d | | 30d | 222 | 185 | 170 | 166 | 157 | 145 | 140 | 116 | 113 | 108 |
| | 0.207 | 30d | | 40d | 243 | 203 | 186 | 182 | 169 | 152 | 147 | 123 | 119 | 114 |
| | 0.225 | 40d | | | 268 | 224 | 200 | 193 | 177 | 160 | 155 | 130 | 127 | 121 |
| | [illegible] | | | | [illegible] | [illegible] | [illegible] | 197 | 181 | 163 | 158 | 133 | 129 | 124 |
| 1-1/2 | 0.099 | | | 7d[4] | 73 | 61 | 55 | 54 | 51 | 48 | 47 | 42 | 41 | 40 |
| | 0.113 | | 8d[4] | 8d[4] | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.120 | | | 10d | 107 | 89 | 81 | 80 | 76 | 71 | 69 | 62 | 60 | 59 |
| | 0.128 | | 10d | | 121 | 101 | 93 | 91 | 86 | 80 | 79 | 70 | 69 | 67 |
| | 0.131 | 8d[4] | | | 127 | 106 | 97 | 95 | 90 | 84 | 82 | 73 | 72 | 70 |
| | 0.135 | | 16d | 12d | 135 | 113 | 103 | 101 | 96 | 89 | 88 | 78 | 76 | 74 |
| | 0.148 | 10d | 20d | 16d | 154 | 128 | 118 | 115 | 109 | 102 | 100 | 89 | 87 | 84 |
| | 0.162 | 16d | 40d | | 184 | 154 | 141 | 138 | 131 | 122 | 120 | 106 | 104 | 101 |
| | 0.177 | | | 20d | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 123 | 121 | 117 |
| | 0.192 | 20d | | 30d | 222 | 185 | 170 | 166 | 157 | 147 | 144 | 128 | 126 | 120 |
| | 0.207 | 30d | | 40d | 243 | 203 | 186 | 182 | 172 | 161 | 158 | 135 | 131 | 125 |
| | 0.225 | 40d | | | 268 | 224 | 205 | 201 | 190 | 178 | 172 | 143 | 138 | 132 |
| | 0.244 | 50d | | 60d | 276 | 230 | 211 | 206 | 196 | 181 | 175 | 146 | 141 | 135 |
| | [illegible] | | | | [illegible] | [illegible] | [illegible] | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.120 | | | 10d[4] | 107 | 89 | 81 | 80 | 76 | 71 | 69 | 62 | 60 | 59 |
| | 0.128 | | 10d[4] | | 121 | 101 | 93 | 91 | 86 | 80 | 79 | 70 | 69 | 67 |
| | 0.135 | | 16d | 12d | 135 | 113 | 103 | 101 | 96 | 89 | 88 | 78 | 76 | 74 |
| | 0.148 | 10d[4] | 20d | 16d | 154 | 128 | 118 | 115 | 109 | 102 | 100 | 89 | 87 | 84 |
| | 0.162 | 16d | 40d | | 184 | 154 | 141 | 138 | 131 | 122 | 120 | 106 | 104 | 101 |
| | 0.177 | | | 20d | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 123 | 121 | 117 |
| | 0.192 | 20d | | 30d | 222 | 185 | 170 | 166 | 157 | 147 | 144 | 128 | 126 | 122 |
| | 0.207 | 30d | | 40d | 243 | 203 | 186 | 182 | 172 | 161 | 158 | 140 | 137 | 133 |
| | 0.225 | 40d | | | 268 | 224 | 205 | 201 | 190 | 178 | 174 | 155 | 151 | 144 |
| | 0.244 | 50d | | 60d | 276 | 230 | 211 | 206 | 196 | 183 | 179 | 159 | 154 | 147 |

Source: AWC NDS 2018

*Always check the footnotes! (not shown)*

# Nail Penetration: 16d Nail

Try 16d common nail:

- 3 ½” long
- 0.162” diameter

Table 12N requires 10D penetration into main member for full capacity:

= 10 * 0.162” = 1.62”

Nail passes through sill plate (1.5”) *and floor sheathing* (assume 0.75”):

3.5” long - 1.5” sill plate - 0.75” floor sheathing

= 1.25” penetration into main member < 1.62” required for full capacity

But try reduced capacity, using factor of p/10D = 1.25/1.62 = 0.77

Typical dimensions for common nails per AWC NDS Appendix L, Table L4

# Sill Plate Nailing

- Assume DF-L
- 2x sill plate = 1.5”
- Choose nail type and size
- Use **16d common nails**

From the table: Z = 141 lb per nail

Reduced for partial penetration:

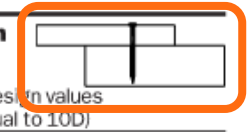
Z = 141 * 0.77 = **109 lb per nail**

Source: AWC NDS 2018

*Always check the footnotes! (not shown)*

**Table 12N** **COMMON, BOX, or SINKER STEEL WIRE NAILS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections[1,2,3]**

for sawn lumber or SCL with both members of identical specific gravity (tabulated lateral design values are calculated based on an assumed length of nail penetration, p, into the main member equal to 10D)



| Side Member Thickness $t_s$ in. | Nail Diameter D in. | Common Wire Nail Penny weight | Box Nail Penny weight | Sinker Nail Penny weight | G=0.67 Red Oak lbs. | G=0.55 Mixed Maple Southern Pine lbs. | G=0.5 Douglas Fir-Larch lbs. | G=0.49 Douglas Fir-Larch (N) lbs. | G=0.46 Douglas Fir(S) Hem-Fir(N) lbs. | G=0.43 Hem-Fir lbs. | G=0.42 Spruce-Pine-Fir lbs. | G=0.37 Redwood lbs. | G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods lbs. | G=0.35 Northern Species lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/4 | 0.099 | | 6d | 7d | 73 | 61 | 55 | 54 | 51 | 48 | 47 | 39 | 38 | 36 |
| | 0.113 | 6d | 8d | 8d | 94 | 79 | 72 | 71 | 65 | 58 | 57 | 47 | 46 | 44 |
| | 0.120 | | | 10d | 107 | 89 | 80 | 77 | 71 | 64 | 62 | 52 | 50 | 48 |
| | 0.128 | | 10d | | 121 | 101 | 87 | 84 | 78 | 70 | 68 | 57 | 56 | 54 |
| | 0.131 | 8d | | | 127 | 104 | 90 | 87 | 80 | 73 | 70 | 60 | 58 | 56 |
| | 0.135 | | 6d | 12d | 135 | 108 | 94 | 91 | 84 | 76 | 74 | 63 | 61 | 58 |
| | 0.148 | 10d | 10d | 16d | 154 | 121 | 105 | 102 | 94 | 85 | 83 | 70 | 69 | 66 |
| | 0.162 | 16d | 10d | | 183 | 138 | 121 | 117 | 108 | 99 | 96 | 82 | 80 | 77 |
| | 0.177 | | | 20d | 200 | 153 | 134 | 130 | 121 | 111 | 107 | 92 | 90 | 87 |
| | 0.192 | 20d | | 30d | 206 | 157 | 138 | 134 | 125 | 114 | 111 | 96 | 93 | 90 |
| | 0.207 | 30d | | 40d | 216 | 166 | 147 | 143 | 133 | 122 | 119 | 103 | 101 | 97 |
| | 0.225 | 40d | | | 229 | 178 | 158 | 154 | 144 | 132 | 129 | 112 | 110 | 106 |
| | 0.244 | 50d | | 60d | 234 | 182 | 162 | 158 | 147 | 136 | 132 | 115 | 113 | 109 |
| 1 | 0.099 | | 6d | 7d | 73 | 61 | 55 | 54 | 51 | 48 | 47 | 42 | 41 | 40 |
| | 0.113 | 6d[4] | 8d | 8d | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 51 |
| | 0.120 | | | 10d | 107 | 89 | 81 | 80 | 76 | 71 | 69 | 60 | 59 | 56 |
| | 0.128 | | 10d | | 121 | 101 | 93 | 91 | 86 | 80 | 79 | 66 | 64 | 61 |
| | 0.131 | 8d | | | 127 | 106 | 97 | 95 | 90 | 84 | 82 | 68 | 66 | 63 |
| | 0.135 | | 6d | 12d | 135 | 113 | 103 | 101 | 96 | 89 | 86 | 71 | 69 | 66 |
| | 0.148 | 10d | 10d | 16d | 154 | 128 | 118 | 115 | 109 | 99 | 96 | 80 | 77 | 74 |
| | 0.162 | 16d | 10d | | 184 | 154 | 141 | 137 | 125 | 113 | 109 | 91 | 89 | 85 |
| | 0.177 | | | 20d | 213 | 178 | 155 | 150 | 138 | 125 | 121 | 102 | 99 | 95 |
| | 0.192 | 20d | | 30d | 222 | 183 | 159 | 154 | 142 | 128 | 124 | 105 | 102 | 98 |
| | 0.207 | 30d | | 40d | 243 | 192 | 167 | 162 | 149 | 135 | 131 | 111 | 109 | 104 |
| | 0.225 | 40d | | | 268 | 202 | 177 | 171 | 159 | 144 | 140 | 120 | 117 | 112 |
| | 0.244 | 50d | | 60d | 274 | 207 | 181 | 175 | 162 | 148 | 143 | 123 | 120 | 115 |
| 1-1/4 | 0.099 | | 6d[4] | 7d[4] | 73 | 61 | 55 | 54 | 51 | 48 | 47 | 42 | 41 | 40 |
| | 0.113 | 6d[4] | 8d | 8d[4] | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.120 | | | 10d | 107 | 89 | 81 | 80 | 76 | 71 | 69 | 62 | 60 | 59 |
| | 0.128 | | 10d | | 121 | 101 | 93 | 91 | 86 | 80 | 79 | 70 | 69 | 67 |
| | 0.131 | 8d[4] | | | 127 | 106 | 97 | 95 | 90 | 84 | 82 | 73 | 72 | 70 |
| | 0.135 | | 6d | 12d | 135 | 113 | 103 | 101 | 96 | 89 | 88 | 78 | 76 | 74 |
| | 0.148 | 10d | 10d | 16d | 154 | 128 | 118 | 115 | 109 | 102 | 100 | 89 | 87 | 84 |
| | 0.162 | 16d | 10d | | 184 | 154 | 141 | 138 | 131 | 122 | 120 | 103 | 100 | 95 |
| | 0.177 | | | 20d | 213 | 178 | 163 | 159 | 151 | 141 | 136 | 113 | 110 | 105 |
| | 0.192 | 20d | | 30d | 222 | 185 | 170 | 166 | 157 | 145 | 140 | 116 | 113 | 108 |
| | 0.207 | 30d | | 40d | 243 | 203 | 186 | 182 | 169 | 152 | 147 | 123 | 119 | 114 |
| | 0.225 | 40d | | | 268 | 224 | 200 | 193 | 177 | 160 | 155 | 130 | 127 | 121 |
| | 0.244 | 50d | | 60d | 276 | 230 | 204 | 197 | 181 | 163 | 158 | 133 | 129 | 124 |
| 1-1/2 | 0.099 | | | 7d[4] | 73 | 61 | 55 | 54 | 51 | 48 | 47 | 42 | 41 | 40 |
| | 0.113 | | 6d[4] | 8d[4] | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.120 | | | 10d | 107 | 89 | 81 | 80 | 76 | 71 | 69 | 62 | 60 | 59 |
| | 0.128 | | 10d | | 121 | 101 | 93 | 91 | 86 | 80 | 79 | 70 | 69 | 67 |
| | 0.131 | 8d[4] | | | 127 | 106 | 97 | 95 | 90 | 84 | 82 | 73 | 72 | 70 |
| | 0.135 | | 6d | 12d | 135 | 113 | 103 | 101 | 96 | 89 | 88 | 78 | 76 | 74 |
| | 0.148 | | | | | | | 115 | 109 | 102 | 100 | 89 | 87 | 84 |
| | 0.162 | 16d | 10d | | 184 | 154 | 141 | 138 | 131 | 122 | 120 | 106 | 104 | 101 |
| | 0.177 | | | 20d | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 123 | 121 | 117 |
| | 0.192 | 20d | | 30d | 222 | 185 | 170 | 166 | 157 | 147 | 144 | 128 | 126 | 120 |
| | 0.207 | 30d | | 40d | 243 | 203 | 186 | 182 | 172 | 161 | 158 | 135 | 131 | 125 |
| | 0.225 | 40d | | | 268 | 224 | 205 | 201 | 190 | 178 | 172 | 143 | 138 | 132 |
| | 0.244 | 50d | | 60d | 276 | 230 | 211 | 206 | 196 | 181 | 175 | 146 | 141 | 135 |
| 1-3/4 | | | 8d[4] | | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.120 | | | 10d[4] | 107 | 89 | 81 | 80 | 76 | 71 | 69 | 62 | 60 | 59 |
| | 0.128 | | 10d[4] | | 121 | 101 | 93 | 91 | 86 | 80 | 79 | 70 | 69 | 67 |
| | 0.135 | | 16d | 12d | 135 | 113 | 103 | 101 | 96 | 89 | 88 | 78 | 76 | 74 |
| | 0.148 | 10d[4] | 20d | 16d | 154 | 128 | 118 | 115 | 109 | 102 | 100 | 89 | 87 | 84 |
| | 0.162 | 16d | 40d | | 184 | 154 | 141 | 138 | 131 | 122 | 120 | 106 | 104 | 101 |
| | 0.177 | | | 20d | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 123 | 121 | 117 |
| | 0.192 | 20d | | 30d | 222 | 185 | 170 | 166 | 157 | 147 | 144 | 128 | 126 | 122 |
| | 0.207 | 30d | | 40d | 243 | 203 | 186 | 182 | 172 | 161 | 158 | 140 | 137 | 133 |
| | 0.225 | 40d | | | 268 | 224 | 205 | 201 | 190 | 178 | 174 | 155 | 151 | 144 |
| | 0.244 | 50d | | 60d | 276 | 230 | 211 | 206 | 196 | 183 | 179 | 159 | 154 | 147 |

# ASD Adjusted Design Values

$$Z' = Z \times (C_D)(\cancel{C_M})(\cancel{C_t})(\cancel{C_g})(\cancel{C_\Delta})(\cancel{C_{eg}})(\cancel{C_{di}})(\cancel{C_{tn}})$$

$C_D$ = 1.6

$C_M$ = 1.0 (dry)

$C_t$ = 1.0 (≤ 100°F)

$C_g$ = 1.0 (for dowel type fasteners with D < ¼”)

$C_\Delta$ = 1.0 (for dowel type fasteners with D < ¼”)

$C_{eg}$ does not apply (not installed in end grain)

$C_{di}$ does not apply (not used in for diaphragm)

$C_{tn}$ does not apply (not toenailed)

Also include FRT adjustments!

# ASD Adjusted Design Values

$$Z' = Z \times (C_D)$$
$$Z' = 109 \times (1.6)$$
$$\mathbf{Z' = 174\ lb/nail}$$ (Not adjusted for FRT)

Recall our 10d @ 6”oc SW has a unit capacity of 310 plf.

$$\frac{174\ \text{lb/nail}}{310\ \text{lb/ft}} * 12\ \text{in/ft} = 6.7\ \text{in/nail}$$

**Use 16d nails @ 6”oc**

# Shear Wall Schedule

15/32” wall sheathing

| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate nailing | **16d @ 6”oc** | | | |

# Shear Wall Schedule

15/32” wall sheathing

| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate nailing | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc |



(Not adjusted for FRT)

# Shear Wall Schedule

15/32” wall sheathing

| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate nailing | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc |



12.1.6.5 Edge distances, end distances, and fastener spacings shall be sufficient to prevent splitting of the wood.

Source: AWC NDS 2018

# Recommended Nail Spacing

**Table C12.1.6.6 Recommended Minimum Spacing for Nails**

| | Wood Side Members | |
|---|---|---|
| | Not Prebored | Prebored |
| Edge distance | 2.5D | 2.5D |
| End distance | | |
| - tension load parallel to grain | 15D | 10D |
| - compression load parallel to grain | 10D | 5D |
| Spacing between fasteners in a row | | |
| - parallel to grain | 15D | 10D |
| - perpendicular to grain | 10D | 5D |
| Spacing between rows of fasteners | | |
| - in-line | 5D | 3D |
| - staggered | 2.5D | 2.5D |

Source: AWC NDS Commentary, Table C12.1.6.6

# Recommended Nail Spacing

**Table C12.1.6.6 Recommended Minimum Spacing for Nails**

| | Wood Side Members | |
|---|---|---|
| | Not Prebored | Prebored |
| Edge distance | 2.5D | |
| End distance | | |
| - tension load parallel to grain | 15D | 10D |
| - compression load parallel to grain | 10D | 5D |
| Spacing between fasteners in a row | | |
| - parallel to grain | 15D | |
| - perpendicular to grain | 10D | 5D |
| Spacing between rows of fasteners | | |
| - in-line | 5D | 3D |
| - staggered | 2.5D | 2.5D |

2.5 x 0.162” = **0.405”**

15 x 0.162” = **2.43”**

Source: AWC NDS Commentary, Table C12.1.6.6

# Rim Joist Limits

Check with rim joist manufacturer on limits:

## Nails Installed on the Narrow Face

| Product | Closest On-Center Spacing Per Row(1) | | | | |
|---|---|---|---|---|---|
| | Nail Size | | | | |
| | 8d (0.113" x 2½"), 8d (0.131" x 2½"), 10d (0.128" x 3"), 12d (0.128" x 3¼") | 10d (0.148" x 3"), 12d (0.148" x 3¼") | 16d (0.135" x 3½"), 16d (0.148" x 3¼") | 16d (0.162" x 3½") | (0.131" x 3"- 3½") |
| 1⅛" TJ® Rim Board | 6" | 6" | 16"(2) | 16"(2) | 12"(3) |
| 1¼" 1.3E TimberStrand® LSL | 4" | 4" | 4" | 6"(3) | 4" |
| 1½" 1.3E TimberStrand® LSL | 3" | 3" | 3" | 6"(3) | 3" |
| 1¾" and 3½" 1.55E TimberStrand® LSL | 3" | 3" | 3" | 6"(4) | 3" |

(1) To minimize splitting, maintain edge distance and row spacing of 2½ x nail diameter or ⅜", whichever is greater. Multiple rows must be staggered and equally spaced from the centerline of the narrow face axis.

(2) Can be reduced to 5" on-center with maximum nail penetration of 1¼" into the narrow edge (for example, nails that connect the sole plate above to the block or rim).

(3) Can be reduced to 4" on-center with maximum nail penetration of 1¼" into the narrow edge (for example, nails that connect the sole plate above to the block or rim).

(4) Can be reduced to 3½" on-center with maximum nail penetration of 1¼" into the narrow edge (for example, nails that connect the sole plate above to the block or rim).

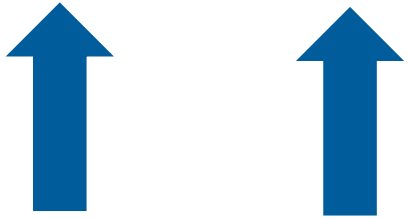
Source: Weyerhaeuser

*Check the footnotes!*

# Rim Joist Nailing

| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate nailing | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc |





What to do if we can’t get nails this tight?

# Option 1: Multiple Rows

Edge distance and space between staggered rows: 2.5 x 0.162” = **0.41”**

- Say (2) rows of nails on 1 ½” rim*
  - One row for sill plate nailing (16d @ 4” oc min)
  - One row for diaphragm nailing
- Say (3) rows of nails on 1 ¾” rim*
  - Two rows for sill plate nailing (16d @ 3 ½” oc min)
  - One row for diaphragm nailing
- Say up to (7) rows of nails on 3 ½” rim*
  - Multiple rows for sill plate nailing (16d @ 3 ½” oc min)
  - Multiple rows for diaphragm nailing

* Example only. Confirm with rim joist manufacturer for available widths and recommended fastener spacing.

# Rim Joist Nailing

| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Minimum rim joist width | 1 ¼” LSL* | 1 ½” LSL* | 1 ¾” LSL* | 1 ¾” LSL* |
| Sill plate nailing | 16d @ 6”oc | 16d @ 4”oc | 2 staggered rows, each with 16d @ 6”oc | 2 staggered rows, each with 16d @ 5”oc |



(Not adjusted for FRT)

* Confirm with rim joist manufacturer for available widths and recommended fastener spacing.

# Additional Rim Joist Considerations

- Vertical load-carrying capacity

**Available Sizes and Allowable Capacity(1)**

| Product Specification | Available Widths(2) | Available Depths(3) | Available Length | Material may be Supplied as: | Allowable Vertical Load (plf) | Allowable Shear Transfer (plf) |
|---|---|---|---|---|---|---|
| RedBuilt Rim Board | 1¼" | 9½", 11⅞" | 16' | LVL or LSL | 4,250 | See Footnote 5 |
| | | 14", 16", 18", 20" | | LSL | 3,700 | |
| | 1½" | 9½", 11⅞", 14"(4) | 16' | LVL or LSL | 4,160 | See Footnote 5 |
| | | 16", 18", 20" | | LSL | 4,000 | |
| | | 22", 24" | | LSL | 3,000 | |

(1) Allowable capacities represent controlling material at maximum depth.
(2) Contact you RedBuilt representative if larger width products are needed.
(3) Depth availability and compatibility matches joist depths up to 24". Rim board has depth tolerances that meet or exceed joist depths to ensure load transfer around the joists. Beam or header products should not be used as rim board.
(4) RedLam LVL is code-approved for 16" depths but is not recommended for use over 14" unless approved by RedBuilt Engineering.
(5) Subject to the minimum nail spacings below, RedBuilt Rim Board products may be designed as permitted by ANSI/AWC Special Design Provisions for Wind and Seismic for wood diaphragms with framing consisting of 2" nominal Douglas-fir larch or southern pine lumber. Product widths of 1½" may be designed as blocked or unblocked diaphragms; 1¼" width product may only be designed as unblocked diaphragms.

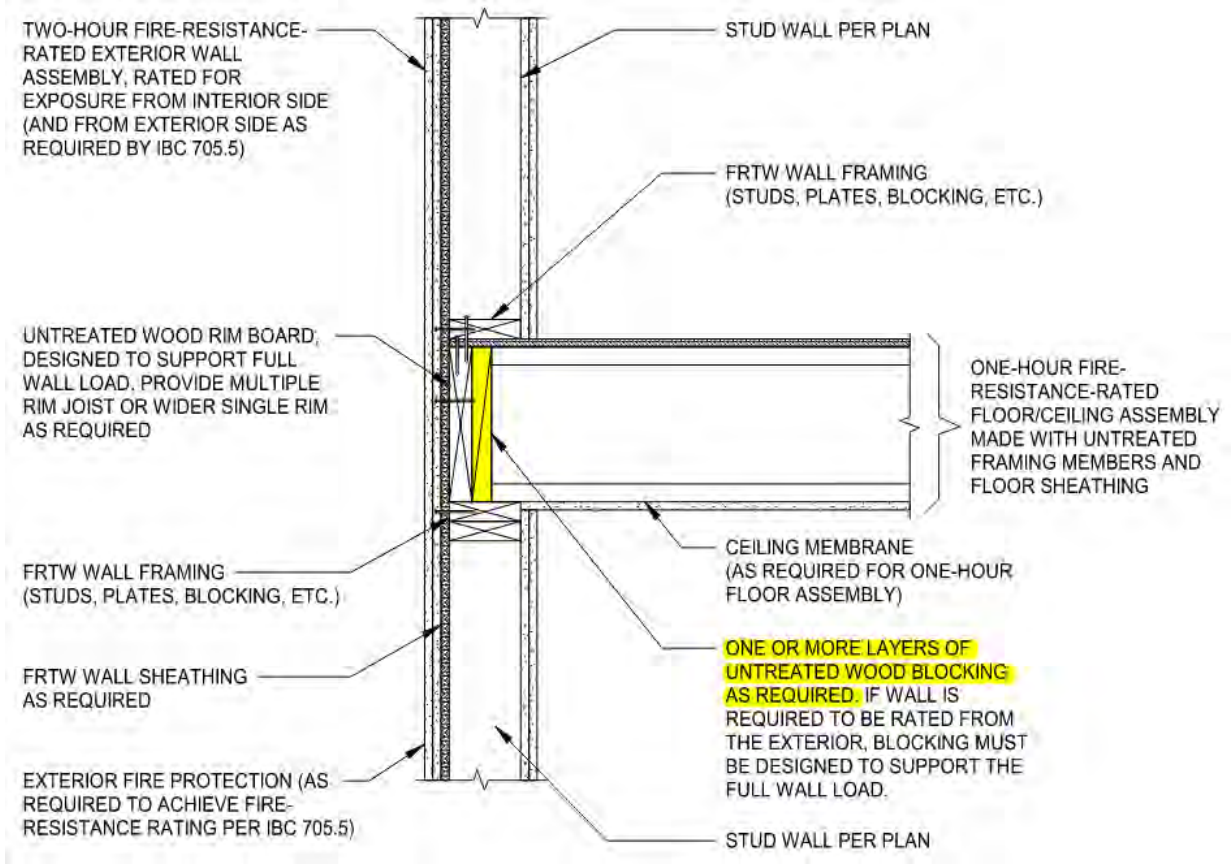
Source: RedBuilt
*Check the footnotes!*

# Additional Rim Joist Considerations

- Vertical load-carrying capacity
- Header applications
- Diaphragm chord/collector loads
- Adequate joist bearing area

# Additional Rim Joist Considerations

- Vertical load-carrying capacity
- Header applications
- Diaphragm chord/collector loads
- Adequate joist bearing area
- Fire-resistant intersection detailing



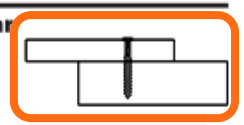

For more on Type III detailing:
https://www.woodinstitute.org/enrol/index.php?id=270

# Option 2: Use Screws

- Same approach as nails
- Assume DF-L, 1 ½” sill plate
- Consider penetration into main member

**Table 12L** **WOOD SCREWS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections[1,2,3]**

for sawn lumber or SCL with both members of identical specific gravity (tabulated lateral design values are calculated based on an assumed length of wood screw penetration, p, into the main member equal to 10D)



| Side Member Thickness $t_s$ in. | Wood Screw Diameter D in. | Wood Screw Number | G=0.67 Red Oak lbs. | G=0.55 Mixed Maple Southern Pine lbs. | G=0.5 Douglas Fir-Larch lbs. | G=0.49 Douglas Fir-Larch(N) lbs. | G=0.46 Douglas Fir(S) Hem-Fir(N) lbs. | G=0.43 Hem-Fir lbs. | G=0.42 Spruce-Pine-Fir lbs. | G=0.37 Redwood lbs. | G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods lbs. | G=0.35 Northern Species lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/2 | 0.138 | 6 | 88 | 67 | 59 | 57 | 53 | 49 | 47 | 41 | 40 | 38 |
| | 0.151 | 7 | 96 | 74 | 65 | 63 | 59 | 54 | 52 | 45 | 44 | 42 |
| | 0.164 | 8 | 107 | 82 | 73 | 71 | 66 | 61 | 59 | 51 | 50 | 48 |
| | 0.177 | 9 | 121 | 94 | 83 | 81 | 76 | 70 | 68 | 59 | 58 | 56 |
| | 0.190 | 10 | 130 | 101 | 90 | 87 | 82 | 75 | 73 | 64 | 63 | 60 |
| | 0.216 | 12 | 156 | 123 | 110 | 107 | 100 | 93 | 91 | 79 | 78 | 75 |
| | 0.242 | 14 | 168 | 133 | 120 | 117 | 110 | 102 | 99 | 87 | 86 | 83 |
| 5/8 | 0.138 | 6 | 94 | 76 | 66 | 64 | 59 | 53 | 52 | 44 | 43 | 41 |
| | 0.151 | 7 | 104 | 83 | 72 | 70 | 64 | 58 | 56 | 48 | 47 | 45 |
| | 0.164 | 8 | 120 | 92 | 80 | 77 | 72 | 65 | 63 | 54 | 53 | 51 |
| | 0.177 | 9 | 136 | 103 | 91 | 88 | 81 | 74 | 72 | 62 | 61 | 58 |
| | 0.190 | 10 | 146 | 111 | 97 | 94 | 88 | 80 | 78 | 67 | 65 | 63 |
| | 0.216 | 12 | 173 | 133 | 117 | 114 | 106 | 97 | 95 | 82 | 80 | 77 |
| | 0.242 | 14 | 184 | 142 | 126 | 123 | 115 | 106 | 103 | 89 | 87 | 84 |
| 3/4 | 0.138 | 6 | 94 | 79 | 72 | 71 | 65 | 58 | 57 | 47 | 46 | 44 |
| | 0.151 | 7 | 104 | 87 | 80 | 77 | 71 | 64 | 62 | 52 | 50 | 48 |
| | 0.164 | 8 | 120 | 101 | 88 | 85 | 78 | 71 | 69 | 58 | 56 | 54 |
| | 0.177 | 9 | 142 | 114 | 99 | 96 | 88 | 80 | 78 | 66 | 64 | 61 |
| | 0.190 | 10 | 153 | 122 | 107 | 103 | 95 | 86 | 83 | 71 | 69 | 66 |
| | 0.216 | 12 | 192 | 144 | 126 | 122 | 113 | 103 | 100 | 86 | 84 | 80 |
| | 0.242 | 14 | 203 | 154 | 135 | 131 | 122 | 111 | 108 | 93 | 91 | 87 |
| 1 | 0.138 | 6 | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 51 |
| | 0.151 | 7 | 104 | 87 | 80 | 78 | 74 | 69 | 68 | 60 | 59 | 56 |
| | 0.164 | 8 | 120 | 101 | 92 | 90 | 85 | 80 | 78 | 67 | 65 | 62 |
| | 0.177 | 9 | 142 | 118 | 108 | 106 | 100 | 94 | 90 | 75 | 73 | 70 |
| | 0.190 | 10 | 153 | 128 | 117 | 114 | 108 | 101 | 97 | 81 | 78 | 75 |
| | 0.216 | 12 | 193 | 161 | 147 | 143 | 131 | 118 | 114 | 96 | 93 | 89 |
| | 0.242 | 14 | 213 | 178 | 157 | 152 | 139 | 126 | 122 | 102 | 100 | 95 |
| 1-1/4 | 0.138 | 6 | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.151 | 7 | 104 | 87 | 80 | 78 | 74 | 69 | 68 | 60 | 59 | 57 |
| | 0.164 | 8 | 120 | 101 | 92 | 90 | 85 | 80 | 78 | 70 | 68 | 66 |
| | 0.177 | 9 | 142 | 118 | 108 | 106 | 100 | 94 | 92 | 82 | 80 | 78 |
| | 0.190 | 10 | 153 | 128 | 117 | 114 | 108 | 101 | 99 | 87 | 84 | 82 |
| | 0.216 | 12 | 193 | 161 | 147 | 144 | 137 | 128 | 125 | 108 | 105 | 100 |
| | 0.242 | 14 | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 115 | 111 | 106 |
| 1-1/2 | 0.138 | 6 | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.151 | 7 | 104 | 87 | 80 | 78 | 74 | 69 | 68 | 60 | 59 | 57 |
| | 0.164 | 8 | 120 | 101 | 92 | 90 | 85 | 80 | 78 | 70 | 68 | 66 |
| | 0.177 | 9 | 142 | 118 | 108 | 106 | 100 | 94 | 92 | 82 | 80 | 78 |
| | 0.190 | 10 | 153 | 128 | 117 | 114 | 108 | 101 | 99 | 88 | 87 | 84 |
| | 0.216 | 12 | 193 | 161 | 147 | 144 | 137 | 128 | 125 | 111 | 109 | 106 |
| | 0.242 | 14 | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 123 | 120 | 117 |
| 1-3/4 | 0.138 | 6 | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.151 | 7 | 104 | 87 | 80 | 78 | 74 | 69 | 68 | 60 | 59 | 57 |
| | 0.164 | 8 | 120 | 101 | 92 | 90 | 85 | 80 | 78 | 70 | 68 | 66 |
| | 0.177 | 9 | 142 | 118 | 108 | 106 | 100 | 94 | 92 | 82 | 80 | 78 |
| | 0.190 | 10 | 153 | 128 | 117 | 114 | 108 | 101 | 99 | 88 | 87 | 84 |
| | 0.216 | 12 | 193 | 161 | 147 | 144 | 137 | 128 | 125 | 111 | 109 | 106 |
| | 0.242 | 14 | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 123 | 120 | 117 |

Source: AWC NDS 2018

*Always check the footnotes! (not shown)*

# Screw Penetration: #14 Wood Screw

Try #14 wood screw:

- 0.242” diameter

Table 12L requires 10D penetration into main member for full capacity:

= 10 * 0.242” = 2.42”

Nail passes through sill plate (1.5”) *and floor sheathing* (assume 0.75”):

2.42” min penetration + 1.5” sill plate + 0.75” floor sheathing

= 4.67” long screw for full penetration into main member

Say 5” long screw

Typical dimensions for wood screws per AWC NDS Appendix L, Table L3

# Sill Plate Screws

- Same approach as nails
- Assume DF-L, 1 ½” sill plate
- Consider penetration into main member

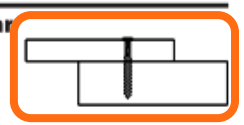
From the table: Z = 163 lb per screw with 10D penetration into the main member

Source: AWC NDS 2018

*Always check the footnotes! (not shown)*

**Table 12L** **WOOD SCREWS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections[1,2,3]**

for sawn lumber or SCL with both members of identical specific gravity (tabulated lateral design values are calculated based on an assumed length of wood screw penetration, p, into the main member equal to 10D)



| Side Member Thickness $t_s$ in. | Wood Screw Diameter D in. | Wood Screw Number | G=0.67 Red Oak lbs. | G=0.55 Mixed Maple Southern Pine lbs. | G=0.5 Douglas Fir-Larch lbs. | G=0.49 Douglas Fir-Larch(N) lbs. | G=0.46 Douglas Fir(S) Hem-Fir(N) lbs. | G=0.43 Hem-Fir lbs. | G=0.42 Spruce-Pine-Fir lbs. | G=0.37 Redwood lbs. | G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods lbs. | G=0.35 Northern Species lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/2 | 0.138 | 6 | 88 | 67 | 59 | 57 | 53 | 49 | 47 | 41 | 40 | 38 |
| | 0.151 | 7 | 96 | 74 | 65 | 63 | 59 | 54 | 52 | 45 | 44 | 42 |
| | 0.164 | 8 | 107 | 82 | 73 | 71 | 66 | 61 | 59 | 51 | 50 | 48 |
| | 0.177 | 9 | 121 | 94 | 83 | 81 | 76 | 70 | 68 | 59 | 58 | 56 |
| | 0.190 | 10 | 130 | 101 | 90 | 87 | 82 | 75 | 73 | 64 | 63 | 60 |
| | 0.216 | 12 | 156 | 123 | 110 | 107 | 100 | 93 | 91 | 79 | 78 | 75 |
| | 0.242 | 14 | 168 | 133 | 120 | 117 | 110 | 102 | 99 | 87 | 86 | 83 |
| 5/8 | 0.138 | 6 | 94 | 76 | 66 | 64 | 59 | 53 | 52 | 44 | 43 | 41 |
| | 0.151 | 7 | 104 | 83 | 72 | 70 | 64 | 58 | 56 | 48 | 47 | 45 |
| | 0.164 | 8 | 120 | 92 | 80 | 77 | 72 | 65 | 63 | 54 | 53 | 51 |
| | 0.177 | 9 | 136 | 103 | 91 | 88 | 81 | 74 | 72 | 62 | 61 | 58 |
| | 0.190 | 10 | 146 | 111 | 97 | 94 | 88 | 80 | 78 | 67 | 65 | 63 |
| | 0.216 | 12 | 173 | 133 | 117 | 114 | 106 | 97 | 95 | 82 | 80 | 77 |
| | 0.242 | 14 | 184 | 142 | 126 | 123 | 115 | 106 | 103 | 89 | 87 | 84 |
| 3/4 | 0.138 | 6 | 94 | 79 | 72 | 71 | 65 | 58 | 57 | 47 | 46 | 44 |
| | 0.151 | 7 | 104 | 87 | 80 | 77 | 71 | 64 | 62 | 52 | 50 | 48 |
| | 0.164 | 8 | 120 | 101 | 88 | 85 | 78 | 71 | 69 | 58 | 56 | 54 |
| | 0.177 | 9 | 142 | 114 | 99 | 96 | 88 | 80 | 78 | 66 | 64 | 61 |
| | 0.190 | 10 | 153 | 122 | 107 | 103 | 95 | 86 | 83 | 71 | 69 | 66 |
| | 0.216 | 12 | 192 | 144 | 126 | 122 | 113 | 103 | 100 | 86 | 84 | 80 |
| | 0.242 | 14 | 203 | 154 | 135 | 131 | 122 | 111 | 108 | 93 | 91 | 87 |
| 1 | 0.138 | 6 | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 51 |
| | 0.151 | 7 | 104 | 87 | 80 | 78 | 74 | 69 | 68 | 60 | 59 | 56 |
| | 0.164 | 8 | 120 | 101 | 92 | 90 | 85 | 80 | 78 | 67 | 65 | 62 |
| | 0.177 | 9 | 142 | 118 | 108 | 106 | 100 | 94 | 90 | 75 | 73 | 70 |
| | 0.190 | 10 | 153 | 128 | 117 | 114 | 108 | 101 | 97 | 81 | 78 | 75 |
| | 0.216 | 12 | 193 | 161 | 147 | 143 | 131 | 118 | 114 | 96 | 93 | 89 |
| | 0.242 | 14 | 213 | 178 | 157 | 152 | 139 | 126 | 122 | 102 | 100 | 95 |
| 1-1/4 | 0.138 | 6 | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.151 | 7 | 104 | 87 | 80 | 78 | 74 | 69 | 68 | 60 | 59 | 57 |
| | 0.164 | 8 | 120 | 101 | 92 | 90 | 85 | 80 | 78 | 70 | 68 | 66 |
| | 0.177 | 9 | 142 | 118 | 108 | 106 | 100 | 94 | 92 | 82 | 80 | 78 |
| | 0.190 | 10 | 153 | 128 | 117 | 114 | 108 | 101 | 99 | 87 | 84 | 82 |
| | 0.216 | 12 | 193 | 161 | 147 | 144 | 137 | 128 | 125 | 108 | 105 | 100 |
| | 0.242 | 14 | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 115 | 111 | 106 |
| 1-1/2 | 0.138 | 6 | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.151 | 7 | 104 | 87 | 80 | 78 | 74 | 69 | 68 | 60 | 59 | 57 |
| | 0.164 | 8 | 120 | 101 | 92 | 90 | 85 | 80 | 78 | 70 | 68 | 66 |
| | 0.177 | 9 | 142 | 118 | 108 | 106 | 100 | 94 | 92 | 82 | 80 | 78 |
| | 0.190 | 10 | 153 | 128 | 117 | 114 | 108 | 101 | 99 | 88 | 87 | 84 |
| | 0.216 | 12 | 193 | 161 | 147 | 144 | 137 | 128 | 125 | 111 | 109 | 106 |
| | 0.242 | 14 | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 123 | 120 | 117 |
| 1-3/4 | 0.138 | 6 | 94 | 79 | 72 | 71 | 67 | 63 | 61 | 55 | 54 | 52 |
| | 0.151 | 7 | 104 | 87 | 80 | 78 | 74 | 69 | 68 | 60 | 59 | 57 |
| | 0.164 | 8 | 120 | 101 | 92 | 90 | 85 | 80 | 78 | 70 | 68 | 66 |
| | 0.177 | 9 | 142 | 118 | 108 | 106 | 100 | 94 | 92 | 82 | 80 | 78 |
| | 0.190 | 10 | 153 | 128 | 117 | 114 | 108 | 101 | 99 | 88 | 87 | 84 |
| | 0.216 | 12 | 193 | 161 | 147 | 144 | 137 | 128 | 125 | 111 | 109 | 106 |
| | 0.242 | 14 | 213 | 178 | 163 | 159 | 151 | 141 | 138 | 123 | 120 | 117 |

# ASD Adjusted Design Values

$$Z' = Z \times (C_D)$$
$$Z' = 163 \times (1.6)$$
$$\boldsymbol{Z' = 260\ \text{lb/screw}}$$ (Not adjusted for FRT)

Recall our 10d @ 6”oc SW has a unit capacity of 310 plf.

$$\frac{260\ \text{lb/screw}}{310\ \text{lb/ft}} * 12\ \text{in/ft} = 10\ \text{in/screw}$$

**Use #14 x 5” screws @ 10”oc**

# Shear Wall Schedule

15/32” wall sheathing

| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate connection nails: | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc |
| Sill plate connection screws: | or **#14 x 5” @ 10”oc** | | | |

# Shear Wall Schedule

15/32” wall sheathing

| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
|---|---|---|---|---|
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate connection<br>nails:<br><br>screws: | 16d @ 6”oc<br>or<br>#14 x 5” @ 10”oc | 16d @ 4”oc<br>or<br>#14 x 5” @ 6”oc | 16d @ 3”oc<br>or<br>#14 x 5” @ 4”oc | 16d @ 2 ½”oc<br>or<br>#14 x 5” @ 4”oc |



(Not adjusted for FRT)

# Shear Wall Schedule

15/32” wall sheathing

| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
|---|---|---|---|---|
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate connection<br>nails:<br><br>screws: | 16d @ 6”oc<br>or<br>#14 x 5” @ 10”oc | 16d @ 4”oc<br>or<br>#14 x 5” @ 6”oc | 16d @ 3”oc<br>or<br>#14 x 5” @ 4”oc | 16d @ 2 ½”oc<br>or<br>#14 x 5” @ 4”oc |



(Not adjusted for FRT)

#14 screws @ 5”oc works,
but this is a somewhat
uncommon spacing
(use engineering judgement)

# Recommended Screw Spacing

**Table C12.1.5.7 Recommended Minimum Spacing for Wood Screws**

| | Wood Side Members | |
|---|---|---|
| | Not Prebored | Prebored |
| Edge distance | 2.5D | 2.5D |
| End distance | | |
| - tension load parallel to grain | 15D | 10D |
| - compression load parallel to grain | 10D | 5D |
| Spacing between fasteners in a row | | |
| - parallel to grain | 15D | 10D |
| - perpendicular to grain | 10D | 5D |
| Spacing between rows of fasteners | | |
| - in-line | 5D | 3D |
| - staggered | 2.5D | 2.5D |

Source: AWC NDS Commentary, Table C12.1.5.7

# Recommended Screw Spacing

**Table C12.1.5.7 Recommended Minimum Spacing for Wood Screws**

| | Wood Side Members | |
|---|---|---|
| | Not Prebored | Prebored |
| Edge distance | 2.5D | |
| End distance | | |
| - tension load parallel to grain | 15D | 10D |
| - compression load parallel to grain | 10D | 5D |
| Spacing between fasteners in a row | | |
| - parallel to grain | 15D | |
| - perpendicular to grain | 10D | 5D |
| Spacing between rows of fasteners | | |
| - in-line | 5D | 3D |
| - staggered | 2.5D | 2.5D |

2.5 x 0.242” = **0.605”**

15 x 0.242” = **3.63”**

Source: AWC NDS Commentary, Table C12.1.6.6

# Rim Joist Limits

Check with rim joist manufacturer on limits:

**TABLE 2: STRUCTURAL COMPOSITE LUMBER[1] (NOT FOR SHEAR WALL NAILING APPLICATIONS)**

| Nail | | | Nails into Wide Face (Perpendicular to Strands) | | Nails into Narrow Edge (Parallel to Strands) | | | | | | Minimum End Distance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Length | Diameter | Microllam® LVL, Parallam® PSL | TimberStrand® LSL, TJ® Rim Board | Microllam® LVL | Parallam® PSL | TimberStrand® LSL, TJ® Rim Board | | | | |
| | | | | | | | 1⅛" | 1¼" | 1½" | 1¾" - 3½" | |
| | | | On-Center Spacing | | On-Center Spacing | | | | | | |
| 6d common | 2" | 0.113" | 2" | 2" | 3" | 3" | 6" | 4" | 3" | 3" | 2½" |
| 8d box | 2½" | 0.113" | 2" | 2" | 3" | 3" | 6" | 4" | 3" | 3" | 2½" |
| 8d common | 2½" | 0.131" | 2" | 2" | 4" | 4" | 6" | 4" | 3" | 3" | 2¾" |
| 8d N8 or NA11 | 1½" | 0.131" | 2" | 2" | 4" | 4" | 6" | 4" | 3" | 3" | 2¾" |
| 10d box | 3" | 0.128" | 2" | 2" | 4" | 4" | 6" | 4" | 3" | 3" | 2¾" |
| 12d box | 3¼" | 0.128" | 2" | 2" | 4" | 4" | 6" | 4" | 3" | 3" | 2¾" |
| 10d common | 3" | 0.148" | 3" | 2½" | 5" | 4" | 6" | 4" | 3" | 3" | 3" |
| 12d common | 3¼" | 0.148" | 3" | 2½" | 5" | 4" | 6" | 4" | 3" | 3" | 3" |
| 10d N10 or NA9D | 1½" | 0.148" | 3" | 2½" | 5" | 4" | 6" | 4" | 3" | 3" | 3" |
| 16d box | 3½" | 0.135" | 3" | 2½" | 5" | 4" | 16" [2] | 4" | 3" | 3" | 2¾" |
| 16d sinker | 3¼" | 0.148" | 3" | 2½" | 5" | 4" | 16" [2] | 4" | 3" | 3" | 3" |
| 16d common | 3½" | 0.162" | 4" | 3" | 8" [2] | 6" | 16" [2] | 6" [3] | 6" [3] | 6" [4] | 3¼" |
| Pneumatic | 3", 3¼", 3½" | 0.131" | 2" | 2" | 4" | 4" | 12"[3] | 4" | 3" | 3" | 2¾" |
| Proprietary Wood Screws[5][6] | Varies | 0.250" | - [10] | | - [7] | - [7][8] | N/A | - [7][9] | | | - [10] |
| Framing Angles: A34, A35, LTP4, LTP5, MP34, MPA1, MPA1F, MP4F | | | OK | | N/A | | | | | | 2¾" |

[1] See **General Notes** on page 3.
[2] Can be reduced to 5" o.c. with maximum nail penetration of 1¼" into narrow edge (e.g. nails that connect sole plate above to blocking or rim).
[3] Can be reduced to 4" o.c. with maximum nail penetration of 1¼" into narrow edge (e.g. nails that connect sole plate above to blocking or rim).
[4] Can be reduced to 3½" o.c. with maximum nail penetration of 1¼" into narrow edge (e.g. nails that connect sole plate above to blocking or rim).
[5] Proprietary wood screws are Simpson Strong-Tie® SDS, SDW and Mitek® WS, WSWH structural wood screws.
[6] 6" long Mitek® WS structural wood screws are not recommended for TimberStrand® LSL or Parallam® PSL.
[7] Space proprietary wood screws at 6" o.c. minimum, into the narrow edge. For alternative spacing, reference Simpson Strong-Tie® *Fastening Systems Technical Guide 2019* (C-F-2019TECHSUP).
[8] Two (2) staggered rows of proprietary wood screws are permitted in the narrow edge of Parallam® PSL for members 3½" thick. Three (3) staggered rows of proprietary wood screws are permitted in the narrow edge of Parallam® PSL for members greater than or equal to 5¼" thick. For multiple rows, edge distance may be designed according to NDS® Table 12.5.1c or be a minimum of 1" and spacing between staggered rows is a minimum of 1½".
[9] One (1) row of proprietary wood screws is permitted in the narrow edge of TimberStrand® LSL for members 1¼", 1½", and 1¾" thick. Two (2) staggered rows of proprietary wood screws are permitted in the narrow edge of TimberStrand® LSL for members 3½" thick. For multiple rows, edge distance may be designed according to NDS® Table 12.5.1c or be a minimum of 1" and spacing between staggered rows is a minimum of 1½".
[10] See screw manufacturer's recommendations for spacing and capacity of connections. End distances, edge distances, and capacity of the screws must be sufficient to minimize splitting.

Source: Weyerhaeuser

*Check the footnotes!*

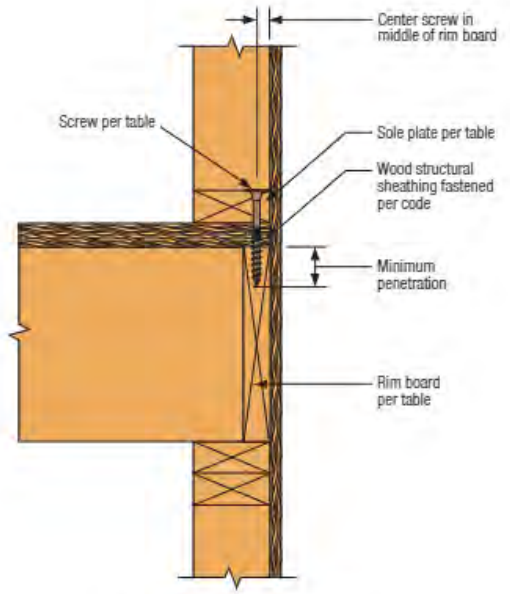
# Proprietary Screws

- Manufacturer published design values
- Check load duration factor ($C_D$) for allowable increases
- Minimum spacing, end and edge distances

SDWS Timber Screw — Allowable Shear Loads for Sole-to-Rim Connections

| Size (in.) | Model No. | Sole Plate Nominal Thickness (in.) | Minimum Penetration into Rim Board (in.) | Reference Allowable Loads (lb.) per Screw | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2x DFL/SP Rim Board | | 2x SPF/HF Rim Board | | 1¼" Min. LVL Rim Board | | 1¼" Min. LSL Rim Board | |
| | | | | DFL/SP Sole Plate | SPF/HF Sole Plate | DFL/SP Sole Plate | SPF/HF Sole Plate | DFL/SP Sole Plate | SPF/HF Sole Plate | DFL/SP Sole Plate | SPF/HF Sole Plate |
| 0.22 x 4 | SDWS22400DB | 2x | 1.75 | 345 | 295 | 295 | 295 | 275 | 275 | 275 | 275 |
| 0.22 x 5 | SDWS22500DB | 2x | 2 | 345 | 295 | 295 | 295 | 275 | 275 | 275 | 275 |
| 0.22 x 6 | SDWS22600DB | 2x, 3x, (2)-2x | 2 | 345 | 295 | 295 | 295 | 275 | 275 | 275 | 275 |

1. Allowable loads are based on testing per ICC-ES AC233 and are limited to parallel-to-grain loading.
2. Allowable loads are shown at the wood load duration factor of $C_D$ = 1.00. Loads may be increased for load duration by the building code up to a $C_D$ = 1.60.
3. Minimum spacing of the SDWS is 6" o.c., minimum end distance is 6", and minimum edge distance is ⅜".
4. Wood structural panel up to 1⅛" thick (2⅝" for SDWS22400DB) is permitted between the sole plate and rim board provided it is fastened to the rim board per code and the minimum penetration of the screw into the rim board is met.
5. A double 2x sole plate/top plate is permitted provided it is independently fastened per the code and the minimum screw penetration per the table is met.
6. Minimum rim board height shall be 9¼" when using SDWS screws for sole and top plate fastening.
7. Sole-to-rim loads can be achieved without a wall below.



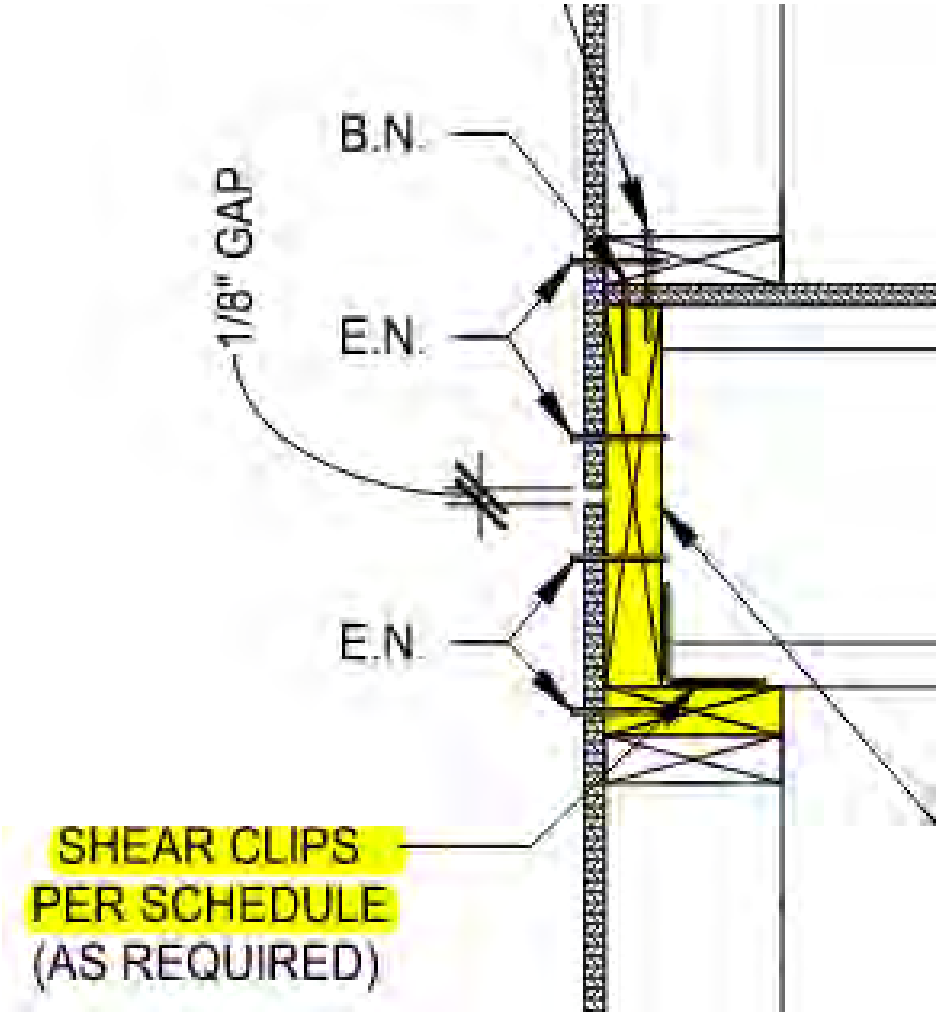

**Sole-to-Rim Board Assembly**
*(Other fasteners not shown for clarity)*

Source: Simpson Strong-Tie
*Check the footnotes!*

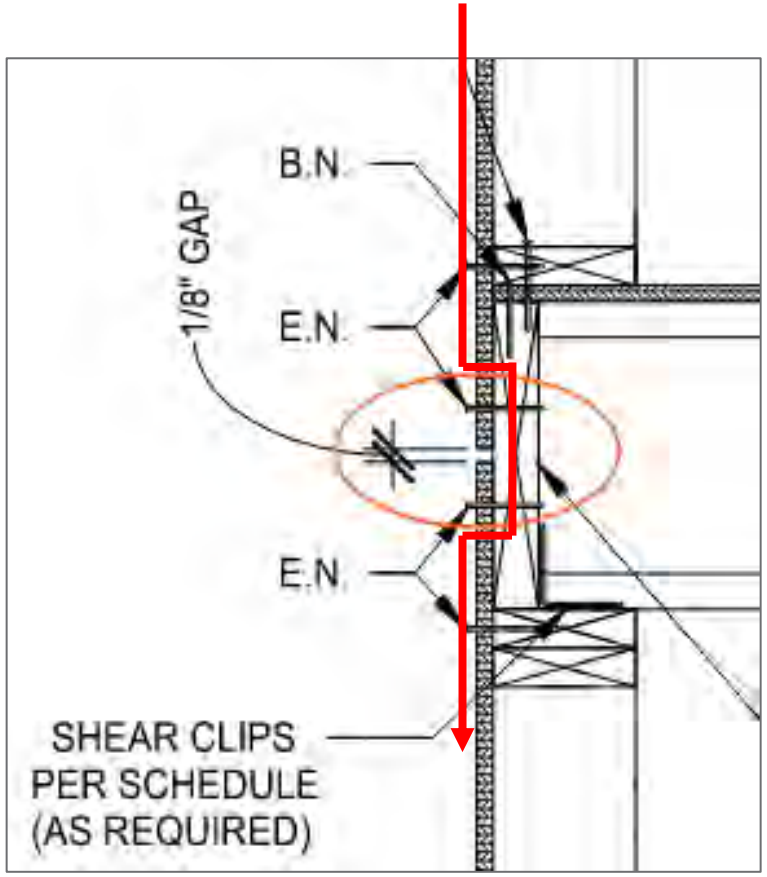
# Optional: Multiple Rows

- Can provide multiple rows of screws
- Consider required rim joist width
  - Remember diaphragm nailing
  - Other rim joist considerations

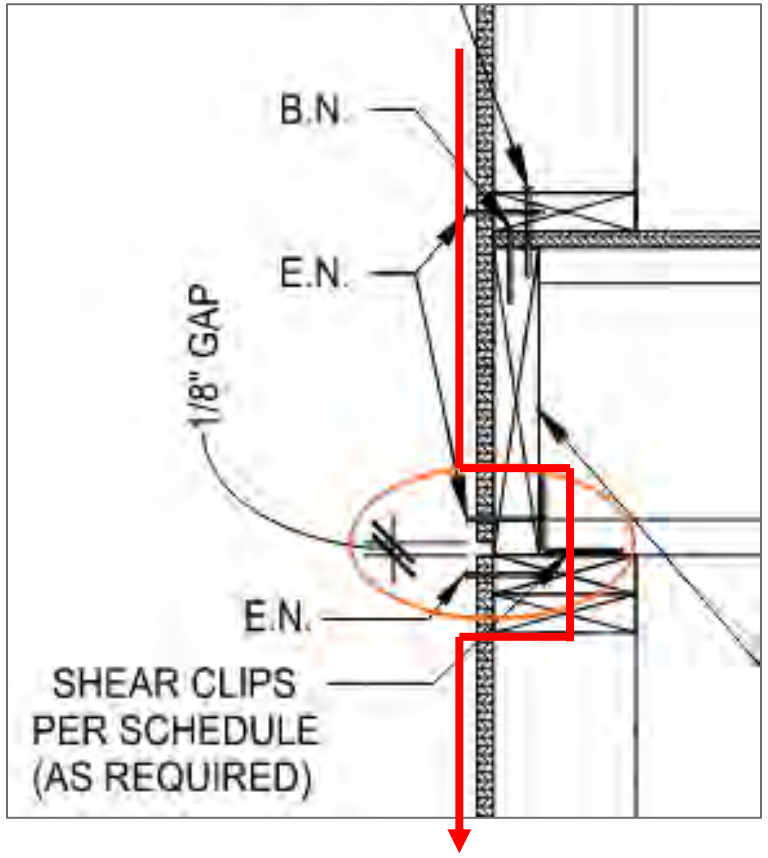
# Detail: Rim Joist to Top Plates



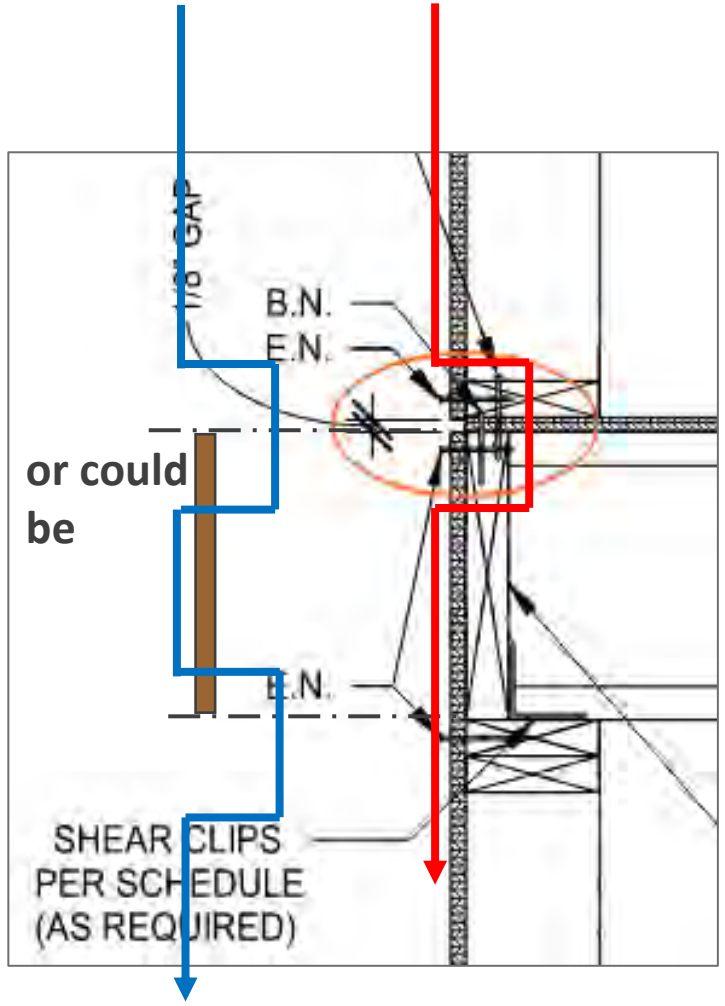
# Detail: Rim Joist to Top Plates




Option 1



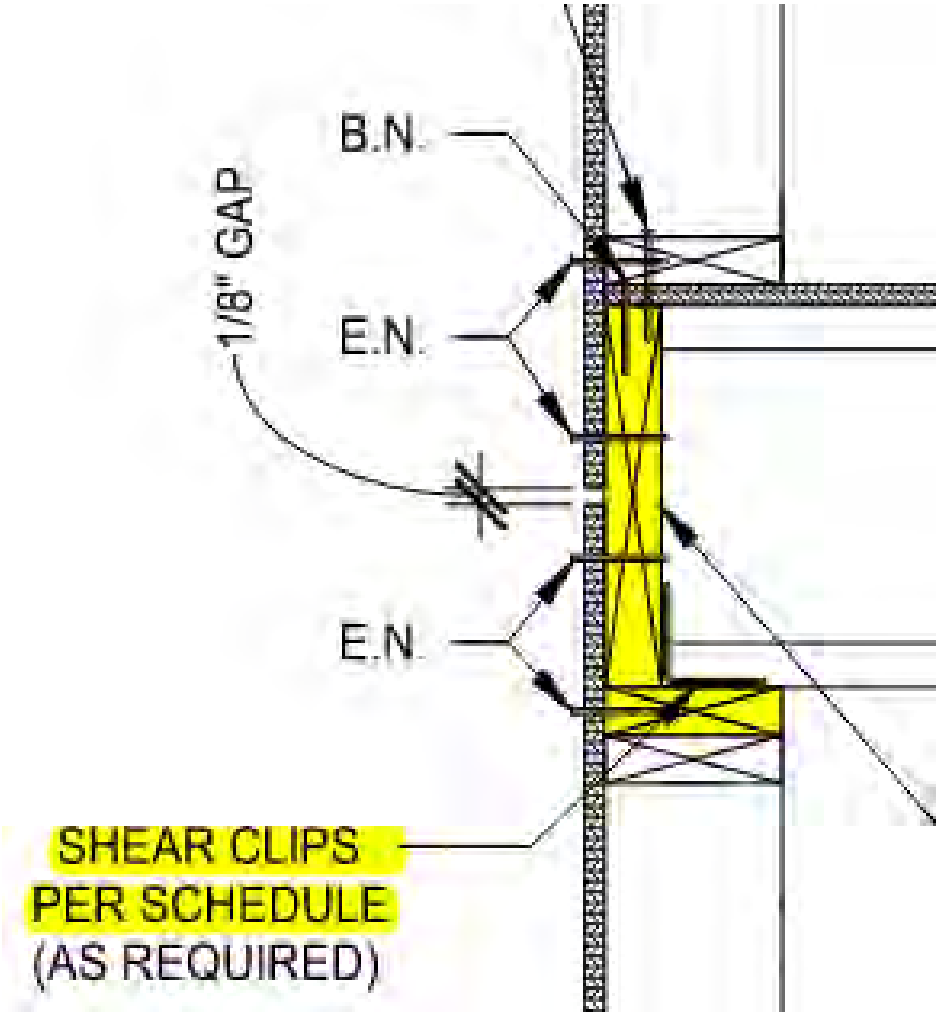

Option 2




Option 4

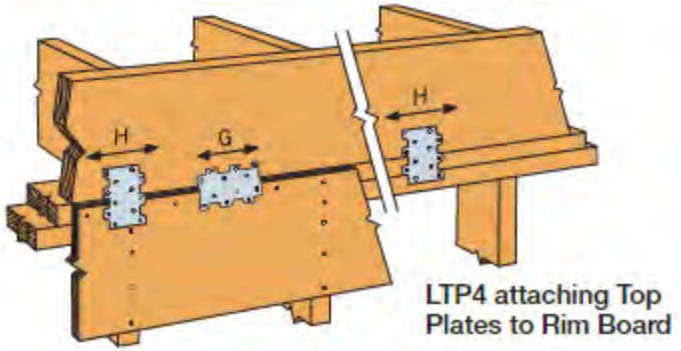
Option 3

# Detail: Rim Joist to Top Plates



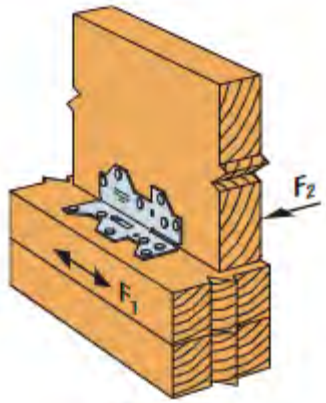
# Proprietary Shear Clips

- Manufacturer published design values
- Check load duration factor ($C_D$)
- Dimensions for spacing




LTP4 attaching Top Plates to Rim Board

7 LTP4 Installed over Wood Structural Panel Sheathing




4 A35

| Model No. | Type of Connection | Fasteners (in.) | Direction of Load | DF/SP Allowable Loads | | | SPF/HF Allowable Loads | | | Code Ref. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Floor (100) | Roof (125) | (160) | Floor (100) | Roof (125) | (160) | |
| A34 | 1 | (8) 0.131 x 1½ | $F_1$ | 395 | 480 | 545 | 340 | 415 | 480 | IBC, FL, LA |
| | | | $F_2$[6] | 395 | 430 | 430 | 340 | 370 | 370 | |
| | | (8) #9 x 1½" SD | $F_1$ | 640 | 640 | 640 | 550 | 550 | 550 | |
| | | | $F_2$ | 495 | 495 | 495 | 425 | 425 | 425 | |
| | | | Uplift | 240 | 240 | 240 | 170 | 170 | 170 | — |
| A35 | 2 | (9) 0.131 x 1½ | $A_1$ | 295 | 350 | 350 | 255 | 300 | 300 | IBC, FL, LA |
| | | | E | 295 | 360 | 385 | 255 | 310 | 330 | |
| | | | $C_1$ | 185 | 185 | 185 | 160 | 160 | 160 | |
| | 3 | (12) 0.131 x 1½ | $A_2$ | 295 | 325 | 325 | 255 | 280 | 280 | |
| | | | $C_2$ | 295 | 330 | 330 | 255 | 285 | 285 | |
| | | | D | 225 | 225 | 225 | 195 | 195 | 195 | |
| | 4 | (12) 0.131 x 1½ | $F_1$ | 590 | 650 | 650 | 510 | 560 | 560 | |
| | | | $F_2$[6] | 590 | 670 | 670 | 510 | 575 | 575 | |
| | 5 | (12) 0.131 x 1½ | $F_1$ | 555 | 555 | 555 | 475 | 475 | 475 | |
| | 6 | (12) PH612I | $F_1$ | 420 | 420 | 420 | 360 | 360 | 360 | — |
| LTP4 | 7 | (12) 0.131 x 1½ | G | 580 | 715 | 715 | 500 | 615 | 615 | IBC, FL, LA |
| | | | H | 525 | 525 | 525 | 450 | 450 | 450 | |
| LTP5 | 8 | (12) 0.131 x 1½ | G | 565 | 565 | 565 | 485 | 485 | 485 | |
| | | | H | 490 | 490 | 490 | 420 | 420 | 420 | |

Source: Simpson Strong-Tie

*Check the footnotes! (not shown)*

# Example Shear Clip Calculation

Say each shear clip is good for 600 lb ($C_D$ = 1.6)

(Not adjusted for FRT)

Recall our 10d @ 6”oc SW has a unit capacity of 310 plf.

$$\frac{600\ \text{lb/clip}}{310\ \text{lb/ft}} * 12\ \text{in/ft} = 23\ \text{in/clip}$$

**Use shear clips @ 16”oc**

(consider joist spacing,
use engineering judgement)

# Shear Wall Schedule

15/32” wall sheathing

| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate connection nails: | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc |
| Sill plate connection | or | or | or | or |
| Sill plate connection screws: | #14 x 5” @ 10”oc | #14 x 5” @ 6”oc | #14 x 5” @ 4”oc | #14 x 5” @ 4”oc |
| Shear clips | **[x] clips @ 16”oc** | | | |



(Not adjusted for FRT)

# Shear Wall Schedule

15/32” wall sheathing

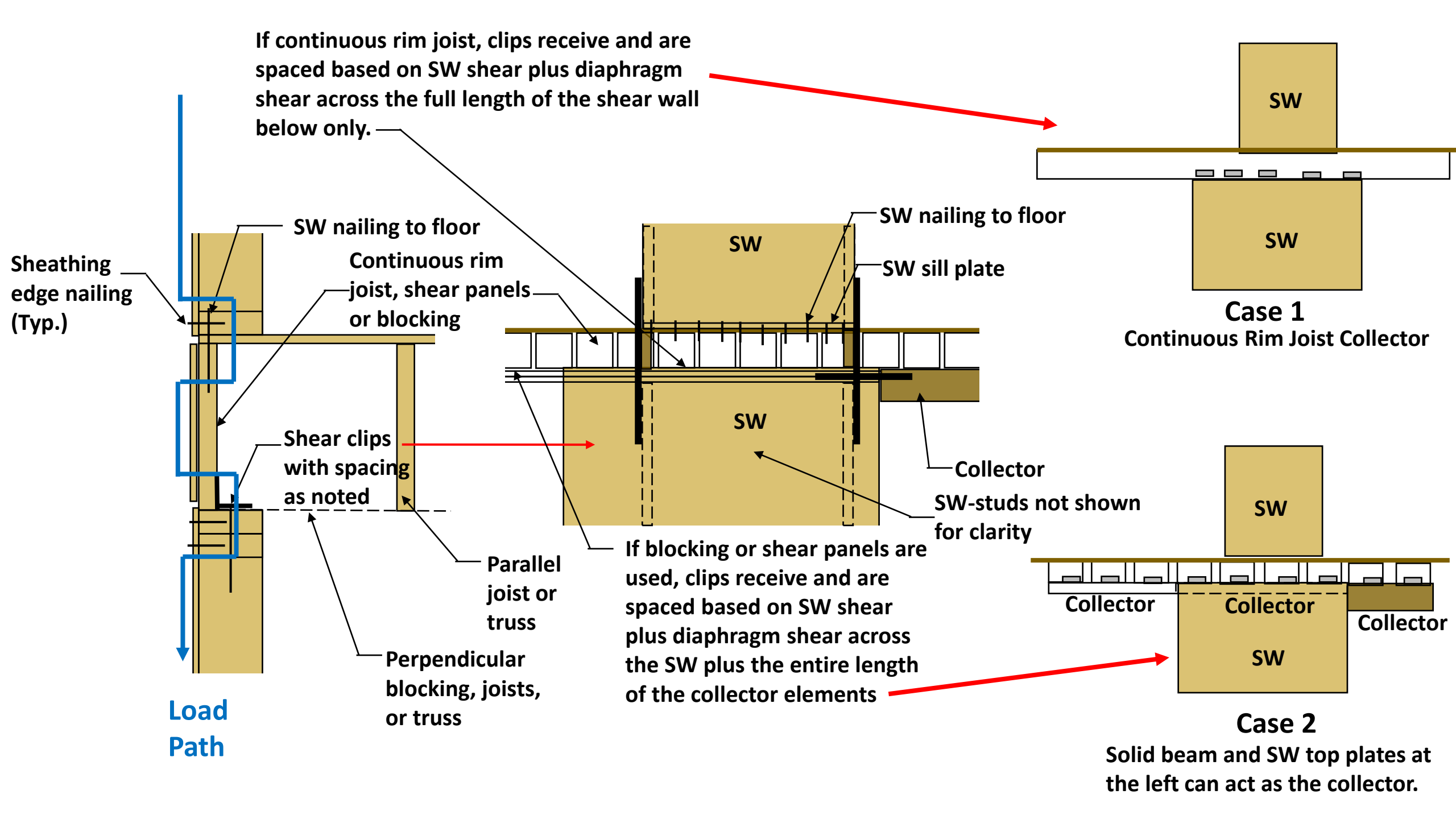
| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate connection nails: | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc |
| Sill plate connection | or | or | or | or |
| Sill plate connection screws: | #14 x 5” @ 10”oc | #14 x 5” @ 6”oc | #14 x 5” @ 4”oc | #14 x 5” @ 4”oc |
| Shear clips | [x] clips @ 16”oc | [x] clips @ 12”oc | [x] clips @ 12”oc | [x] clips @ 8”oc |



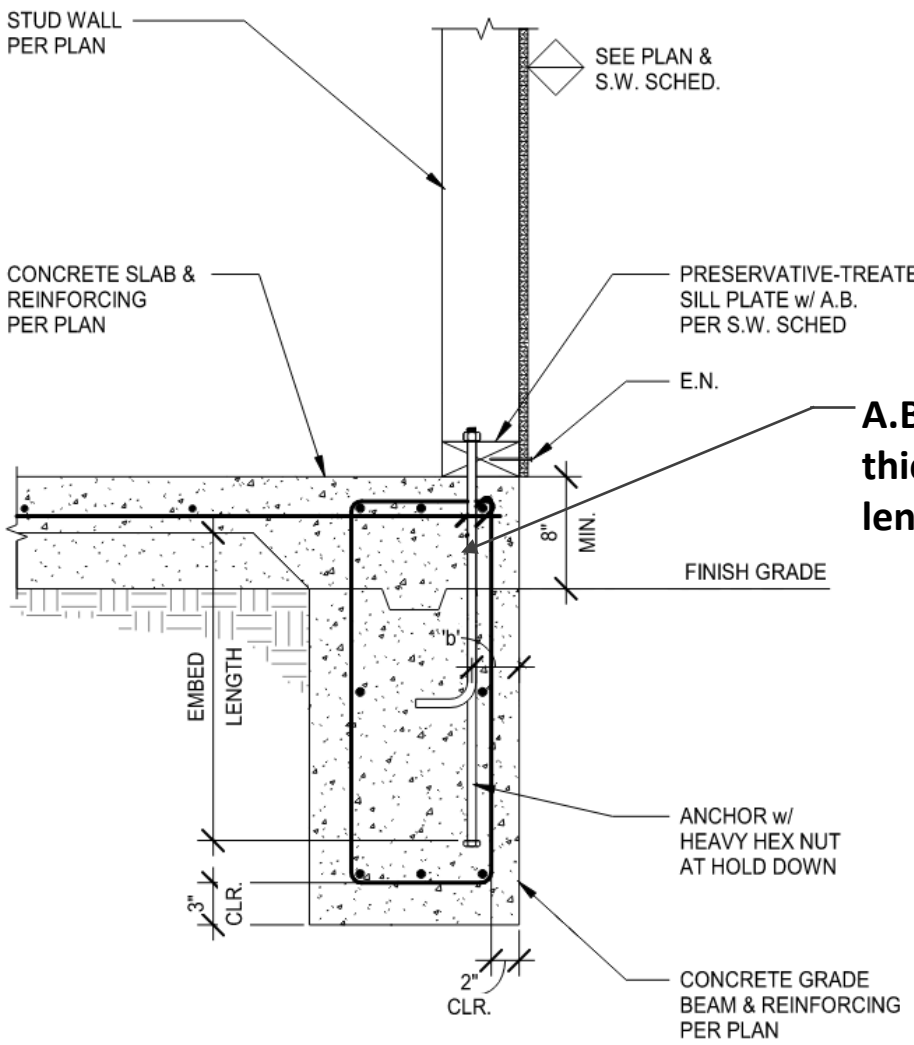
(Not adjusted for FRT)

# Diaphragm Load Transfer

- In addition to transferring SW load from above, need to consider the addition of diaphragm loading
- Depends on collector configuration
  - If rim acts as collector, shear clips need to transfer load from rim to top plate
  - If continuous top plates or dropped beam acts as collector, blocking or shear panels must transfer load directly into top plate and beam collector.

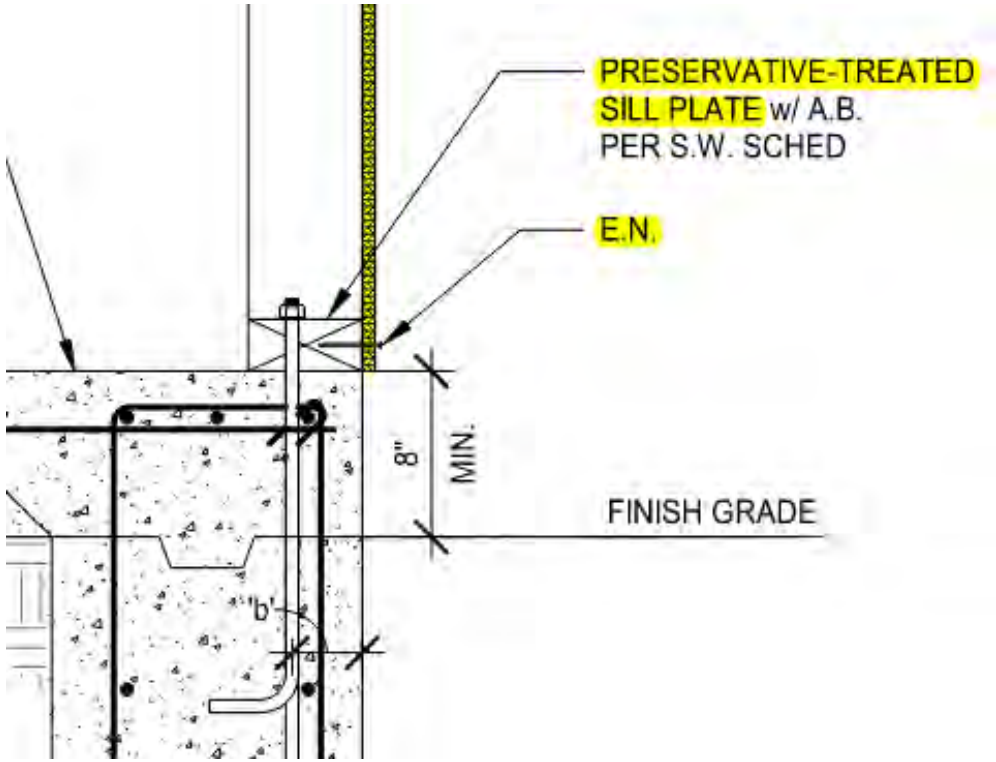

If continuous rim joist, clips receive and are spaced based on SW shear plus diaphragm shear across the full length of the shear wall below only.
SW
SW
Case 1
Continuous Rim Joist Collector
SW nailing to floor
Sheathing edge nailing (Typ.)
Continuous rim joist, shear panels or blocking
SW
SW nailing to floor
SW sill plate
Shear clips with spacing as noted
SW
Collector
SW-studs not shown for clarity
Parallel joist or truss
If blocking or shear panels are used, clips receive and are spaced based on SW shear plus diaphragm shear across the SW plus the entire length of the collector elements
SW
Collector
Collector
Collector
SW
Perpendicular blocking, joists, or truss
Load Path
Case 2
Solid beam and SW top plates at the left can act as the collector.

# Typical Foundation Detail

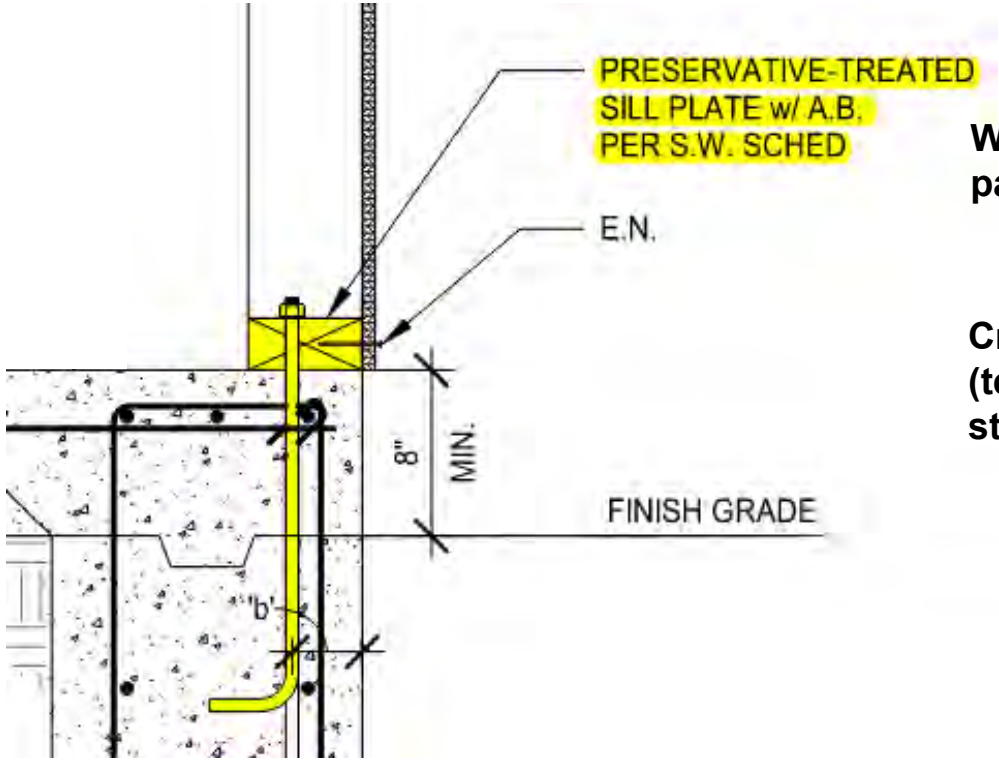


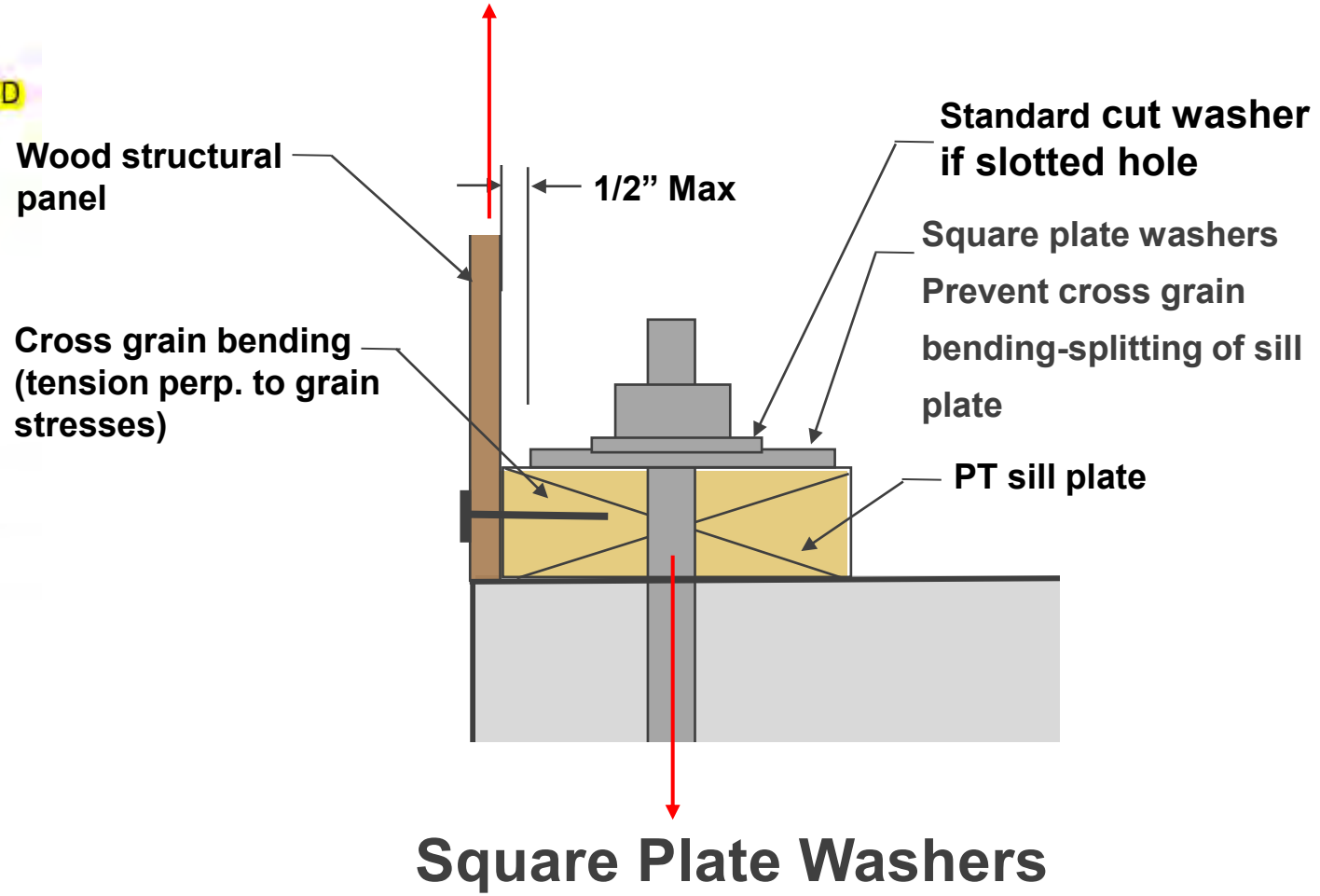

**A.B. only needs to extend into thickened slab if embedment length can be obtained**

# Detail: Shear Wall Nailing



# Detail: Anchor Bolts



# Sill Plate Anchor Bolts

- Assume DF-L
- Sill plate thickness
  - 2x, 3x, 4x
- 6” embed min
- $Z_{II}$ for in-plane shear

Assume 3x sill plate with 5/8” A.B.
$Z_{II}$ = 1180 lb

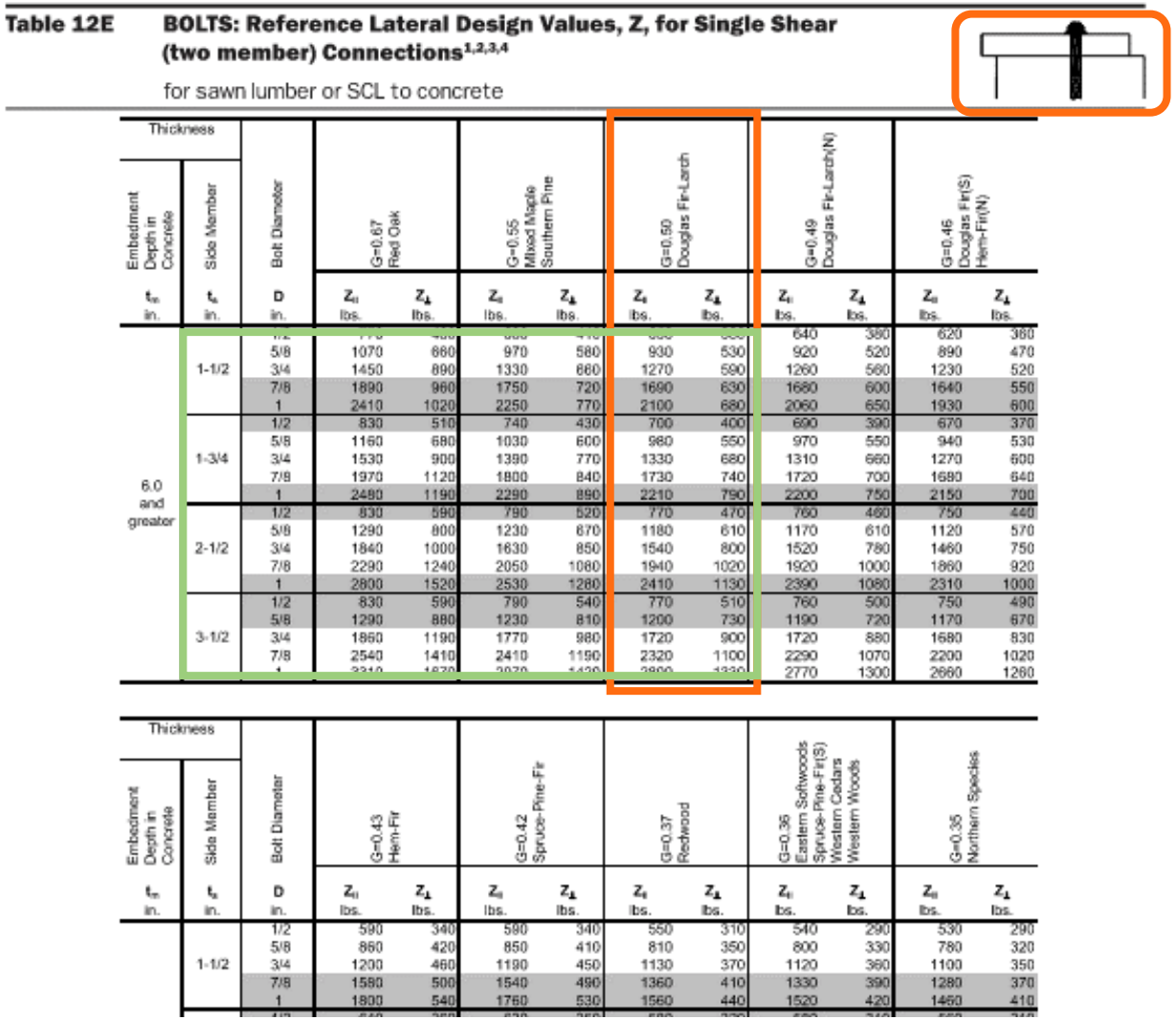


**Table 12E** **BOLTS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections[1,2,3,4]**

for sawn lumber or SCL to concrete

| Embedment Depth in Concrete $t_m$ in. | Thickness Side Member $t_s$ in. | Bolt Diameter D in. | G=0.67 Red Oak $Z_{II}$ lbs. | G=0.67 Red Oak $Z_{\perp}$ lbs. | G=0.55 Mixed Maple Southern Pine $Z_{II}$ lbs. | G=0.55 Mixed Maple Southern Pine $Z_{\perp}$ lbs. | G=0.50 Douglas Fir-Larch $Z_{II}$ lbs. | G=0.50 Douglas Fir-Larch $Z_{\perp}$ lbs. | G=0.49 Douglas Fir-Larch(N) $Z_{II}$ lbs. | G=0.49 Douglas Fir-Larch(N) $Z_{\perp}$ lbs. | G=0.46 Douglas Fir(S) Hem-Fir(N) $Z_{II}$ lbs. | G=0.46 Douglas Fir(S) Hem-Fir(N) $Z_{\perp}$ lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.0 and greater | 1-1/2 | 1/2 | | | | | | | 640 | 380 | 620 | 380 |
| | | 5/8 | 1070 | 660 | 970 | 580 | 930 | 530 | 920 | 520 | 890 | 470 |
| | | 3/4 | 1450 | 890 | 1330 | 660 | 1270 | 590 | 1260 | 560 | 1230 | 520 |
| | | 7/8 | 1890 | 960 | 1750 | 720 | 1690 | 630 | 1680 | 600 | 1640 | 550 |
| | | 1 | 2410 | 1020 | 2250 | 770 | 2100 | 680 | 2060 | 650 | 1930 | 600 |
| | 1-3/4 | 1/2 | 830 | 510 | 740 | 430 | 700 | 400 | 690 | 390 | 670 | 370 |
| | | 5/8 | 1160 | 680 | 1030 | 600 | 980 | 550 | 970 | 550 | 940 | 530 |
| | | 3/4 | 1530 | 900 | 1390 | 770 | 1330 | 680 | 1310 | 660 | 1270 | 600 |
| | | 7/8 | 1970 | 1120 | 1800 | 840 | 1730 | 740 | 1720 | 700 | 1680 | 640 |
| | | 1 | 2490 | 1190 | 2290 | 890 | 2210 | 790 | 2200 | 750 | 2150 | 700 |
| | 2-1/2 | 1/2 | 830 | 590 | 790 | 520 | 770 | 470 | 760 | 460 | 750 | 440 |
| | | 5/8 | 1290 | 800 | 1230 | 670 | 1180 | 610 | 1170 | 610 | 1120 | 570 |
| | | 3/4 | 1840 | 1000 | 1630 | 850 | 1540 | 800 | 1520 | 780 | 1460 | 750 |
| | | 7/8 | 2290 | 1240 | 2050 | 1080 | 1940 | 1020 | 1920 | 1000 | 1860 | 920 |
| | | 1 | 2800 | 1520 | 2530 | 1280 | 2410 | 1130 | 2390 | 1080 | 2310 | 1000 |
| | 3-1/2 | 1/2 | 830 | 590 | 790 | 540 | 770 | 510 | 760 | 500 | 750 | 490 |
| | | 5/8 | 1290 | 880 | 1230 | 810 | 1200 | 730 | 1190 | 720 | 1170 | 670 |
| | | 3/4 | 1860 | 1190 | 1770 | 980 | 1720 | 900 | 1720 | 880 | 1680 | 830 |
| | | 7/8 | 2540 | 1410 | 2410 | 1190 | 2320 | 1100 | 2290 | 1070 | 2200 | 1020 |
| | | 1 | | | | | | | 2770 | 1300 | 2660 | 1260 |

| Embedment Depth in Concrete $t_m$ in. | Thickness Side Member $t_s$ in. | Bolt Diameter D in. | G=0.43 Hem-Fir $Z_{II}$ lbs. | G=0.43 Hem-Fir $Z_{\perp}$ lbs. | G=0.42 Spruce-Pine-Fir $Z_{II}$ lbs. | G=0.42 Spruce-Pine-Fir $Z_{\perp}$ lbs. | G=0.37 Redwood $Z_{II}$ lbs. | G=0.37 Redwood $Z_{\perp}$ lbs. | G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods $Z_{II}$ lbs. | G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods $Z_{\perp}$ lbs. | G=0.35 Northern Species $Z_{II}$ lbs. | G=0.35 Northern Species $Z_{\perp}$ lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-1/2 | 1/2 | 590 | 340 | 590 | 340 | 550 | 310 | 540 | 290 | 530 | 290 |
| | | 5/8 | 860 | 420 | 850 | 410 | 810 | 350 | 800 | 330 | 780 | 320 |
| | | 3/4 | 1200 | 460 | 1190 | 450 | 1130 | 370 | 1120 | 360 | 1100 | 350 |
| | | 7/8 | 1580 | 500 | 1540 | 490 | 1360 | 410 | 1330 | 390 | 1280 | 370 |
| | | 1 | 1800 | 540 | 1760 | 530 | 1560 | 440 | 1520 | 420 | 1460 | 410 |

**NDS Table 12E** for bolts from wood to concrete

Source: AWC NDS 2018
*Always check the footnotes! (not shown)*

# ASD Adjusted Design Values

$$Z' = Z \times (C_D)(\cancel{C_M})(\cancel{C_t})(\cancel{C_g})(C_\Delta)(\cancel{C_{eg}})(\cancel{C_{di}})(\cancel{C_{tn}})$$

$C_D$ = 1.6

$C_M$ = 1.0 (dry)

$C_t$ = 1.0 (≤ 100°F)

$C_g$ does not apply to sill plates

$C_\Delta$ = 1.0 *if end distance & spacing requirements are met*

$C_{eg}$ does not apply (not installed in end grain)

$C_{di}$ does not apply (not used in for diaphragm)

$C_{tn}$ does not apply (not toenailed)

Also include FRT adjustments!

# Concrete Anchorage

- Typically need to follow ACI 318 Ch 17 for concrete anchorage
- **IBC exception for sill plates-Light framed sill plates** (Section 1905.1.8):

  *For the calculation of the **in-plane shear strength of anchor bolts attaching wood sill plates** of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane shear strength in accordance with 17.5.2 and 17.5.4 need not be computed and 17.2.3.5.3 shall be deemed to be satisfied provided all of the following are met:*

  - In-plane shear strength per NDS Table 12E
  - Max anchor bolt size 5/8”
  - Min 7” embed
  - 1 ¾” min concrete edge distance (parallel to load)
  - 15D min concrete edge distance (perp to load)
  - 2x or 3x sill plate

# ASD Adjusted Design Values

$$Z' = Z \times (C_D)$$
$$Z' = 1180 \times (1.6)$$
$$\boldsymbol{Z' = 1888\ \text{lb/bolt}}$$

(Not adjusted for FRT)

Recall our 10d @ 6”oc SW has a unit capacity of 310 plf.

$$\frac{1888\ \text{lb/bolt}}{310\ \text{lb/ft}} * 12\ \text{in/ft} = 73\ \text{in/bolt}$$

**Use 5/8” A.B. @ 48”oc**

(use engineering judgement)

# Shear Wall Schedule

15/32” wall sheathing

| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate connection nails: screws: | 16d @ 6”oc or #14 x 5” @ 10”oc | 16d @ 4”oc or #14 x 5” @ 6”oc | 16d @ 3”oc or #14 x 5” @ 4”oc | 16d @ 2 ½”oc or #14 x 5” @ 4”oc |
| Shear clips | [x] clips @ 16”oc | [x] clips @ 12”oc | [x] clips @ 12”oc | [x] clips @ 8”oc |
| Anchor bolts | **5/8” A.B. w/ 7” min embed @ 48” oc** | | | |

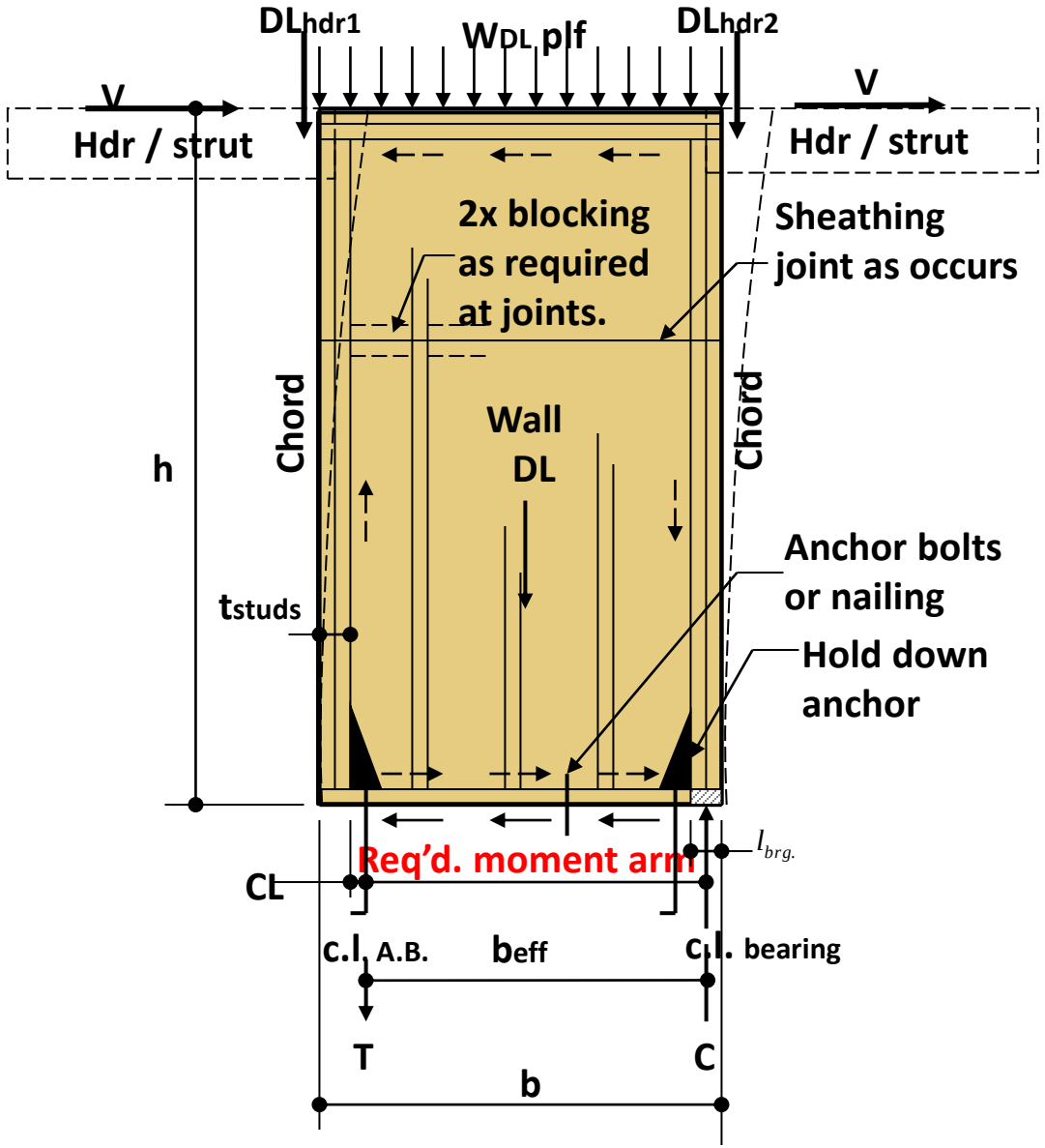
# Shear Wall Schedule

15/32” wall sheathing

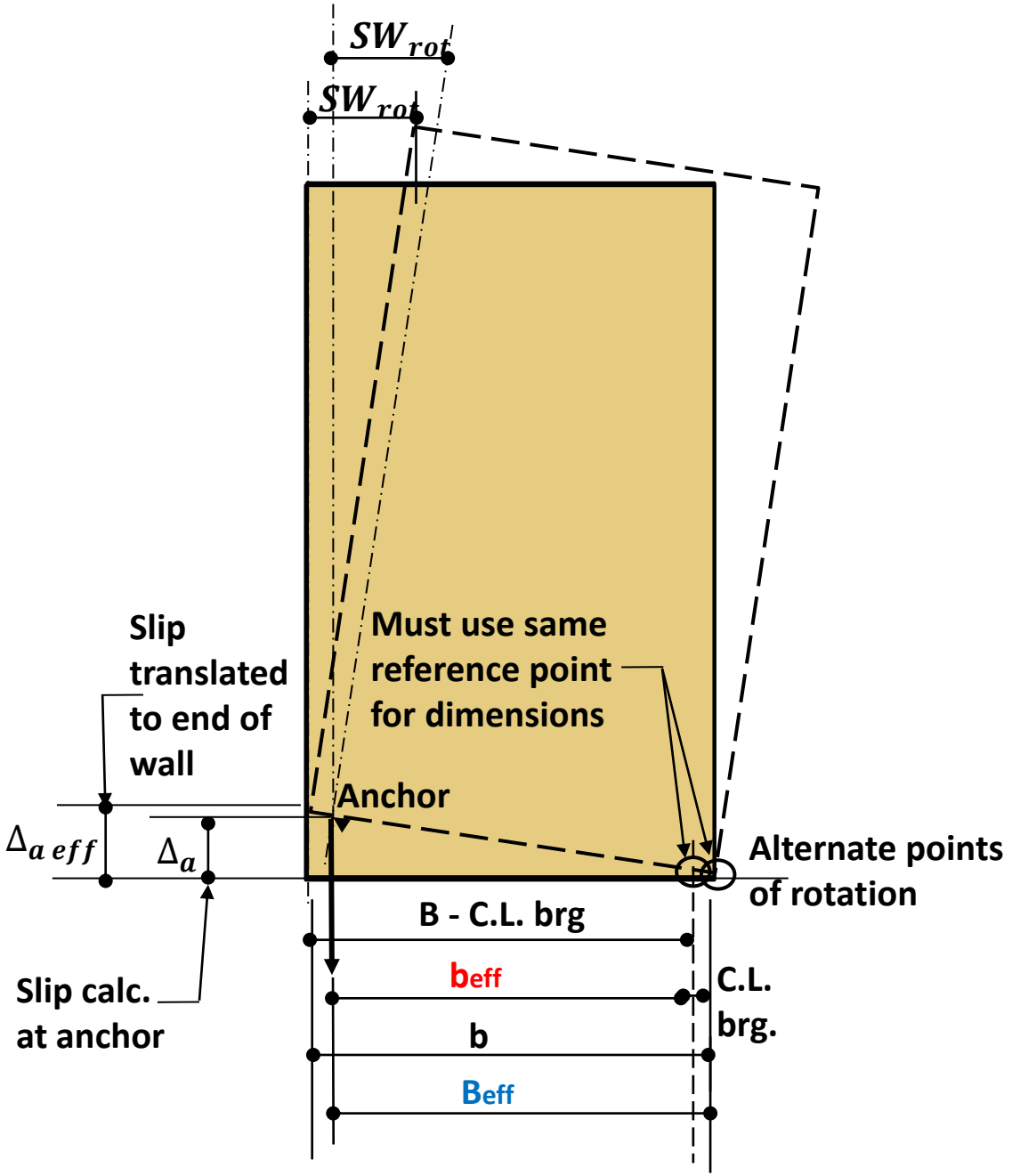
| | | | | |
|---|---|---|---|---|
| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc |
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf |
| Sill plate connection nails: / screws: | 16d @ 6”oc or #14 x 5” @ 10”oc | 16d @ 4”oc or #14 x 5” @ 6”oc | 16d @ 3”oc or #14 x 5” @ 4”oc | 16d @ 2 ½”oc or #14 x 5” @ 4”oc |
| Shear clips | [x] clips @ 16”oc | [x] clips @ 12”oc | [x] clips @ 12”oc | [x] clips @ 8”oc |
| Anchor bolts | 5/8” A.B. w/ 7” min embed @ 48” oc | 5/8” A.B. w/ 7” min embed @ 48” oc | 5/8” A.B. w/ 7” min embed @ 36” oc | 5/8” A.B. w/ 7” min embed @ 24” oc |



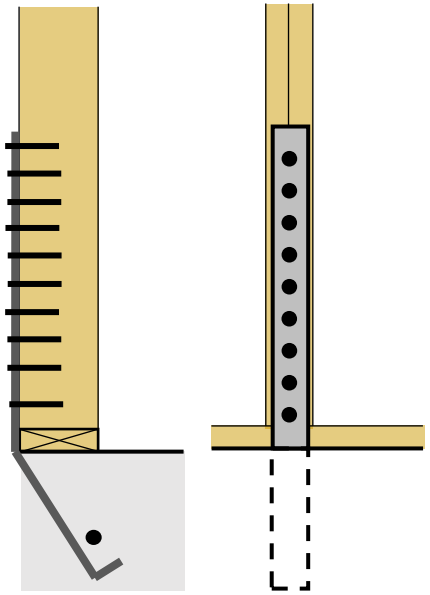
(Not adjusted for FRT)



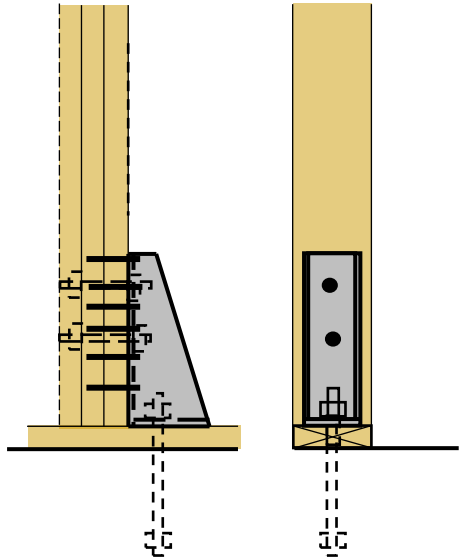

Typical Shear Wall Forces




Shear Wall Rotation

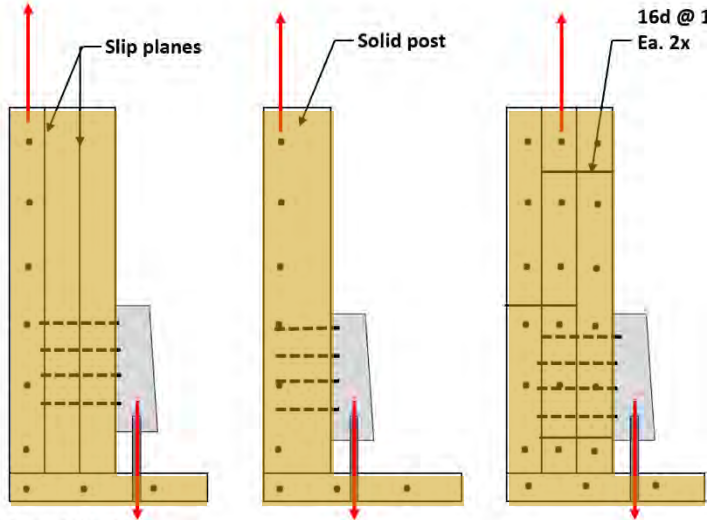


Strap Hold Down Installation



Standard Hold Down Installation (Bucket Style)

Eccentricities are present

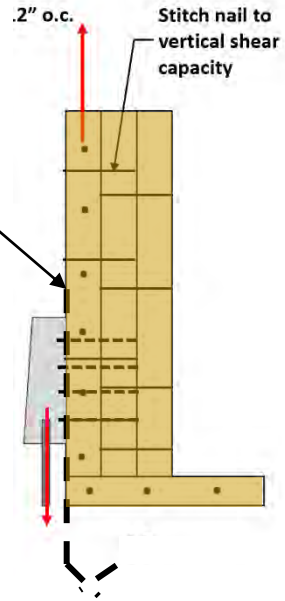



Option A

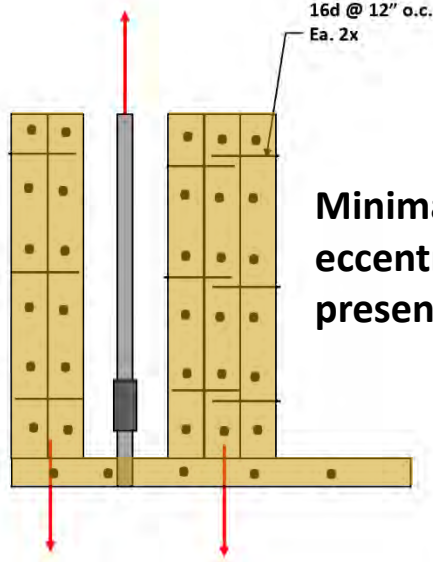
Option B

Option C

Optional tie-strap anchor




Option D

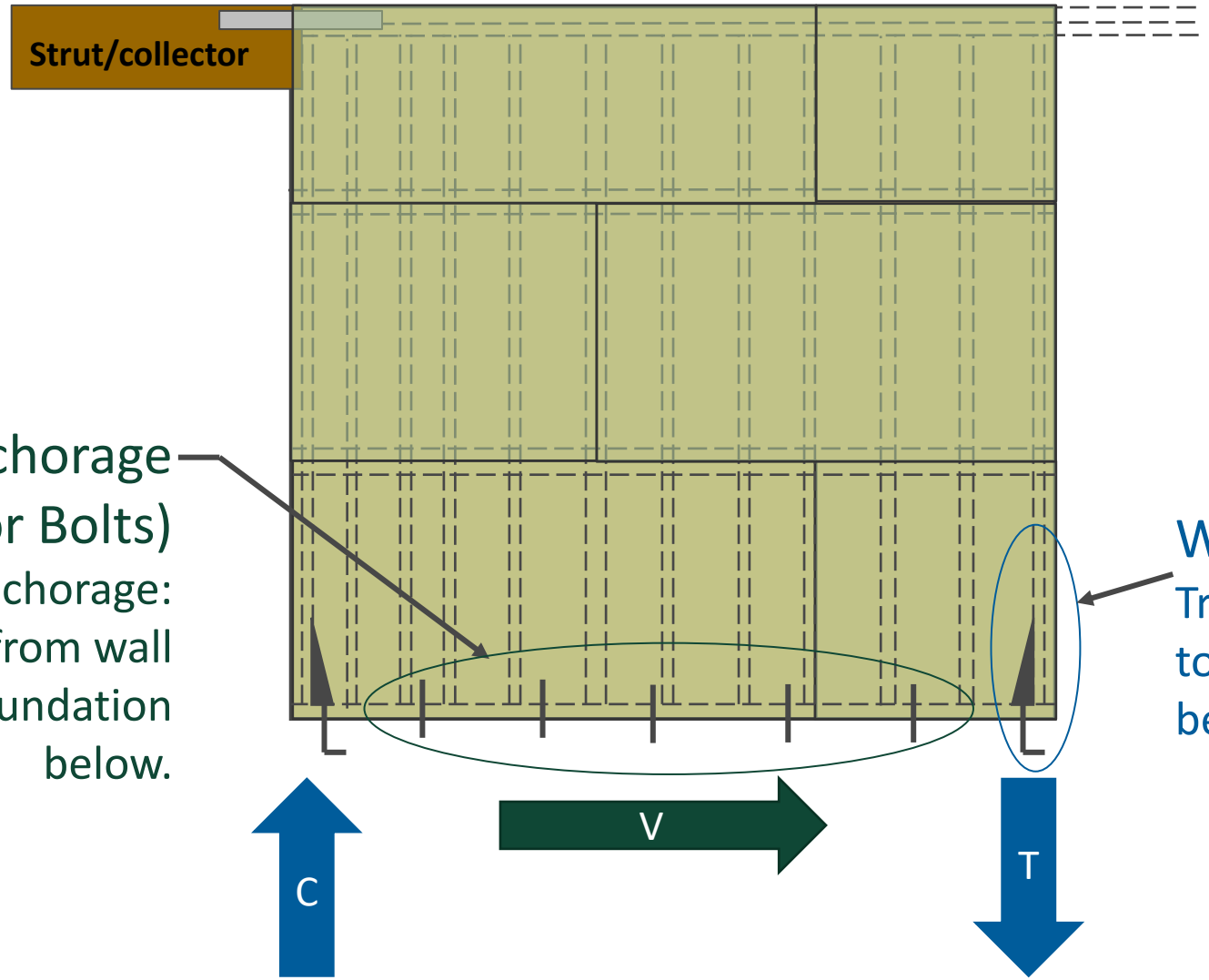



Minimal or no eccentricities are present

Continuous Tie-rod System

**Footnote 10**-Where tension force induced by shear wall overturning is resisted by a hold down attached to the inside face of the end post, nominal unit shear capacity for shear walls using 10d common nails shall be multiplied by 0.92.

# Sill Plate Anchors vs Hold Down Anchors



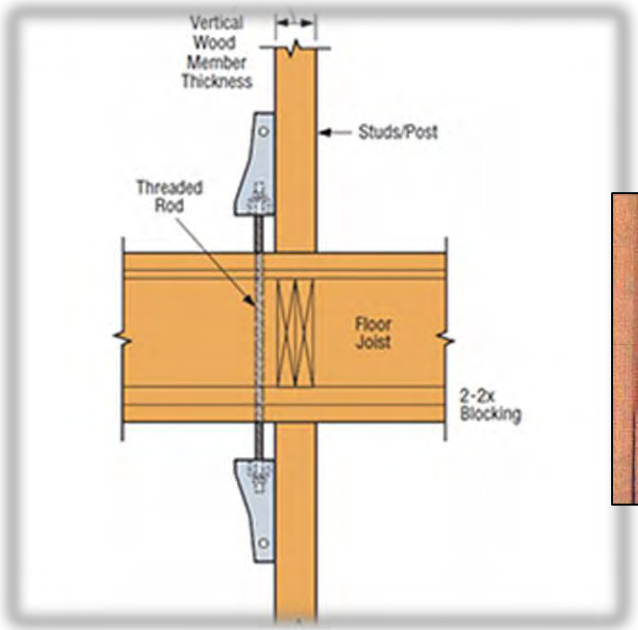

Sill Plate Anchorage (Anchor Bolts)

Uniform anchorage: Transfers shear from wall sill plate to foundation below.

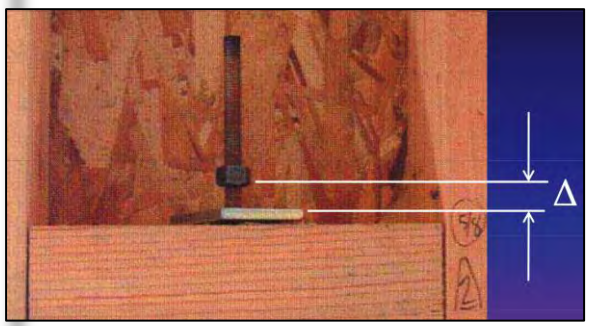
Wall Hold Down

Transfers vertical tension forces to floor/wall or foundation below.

# Hold Downs & Tie Downs



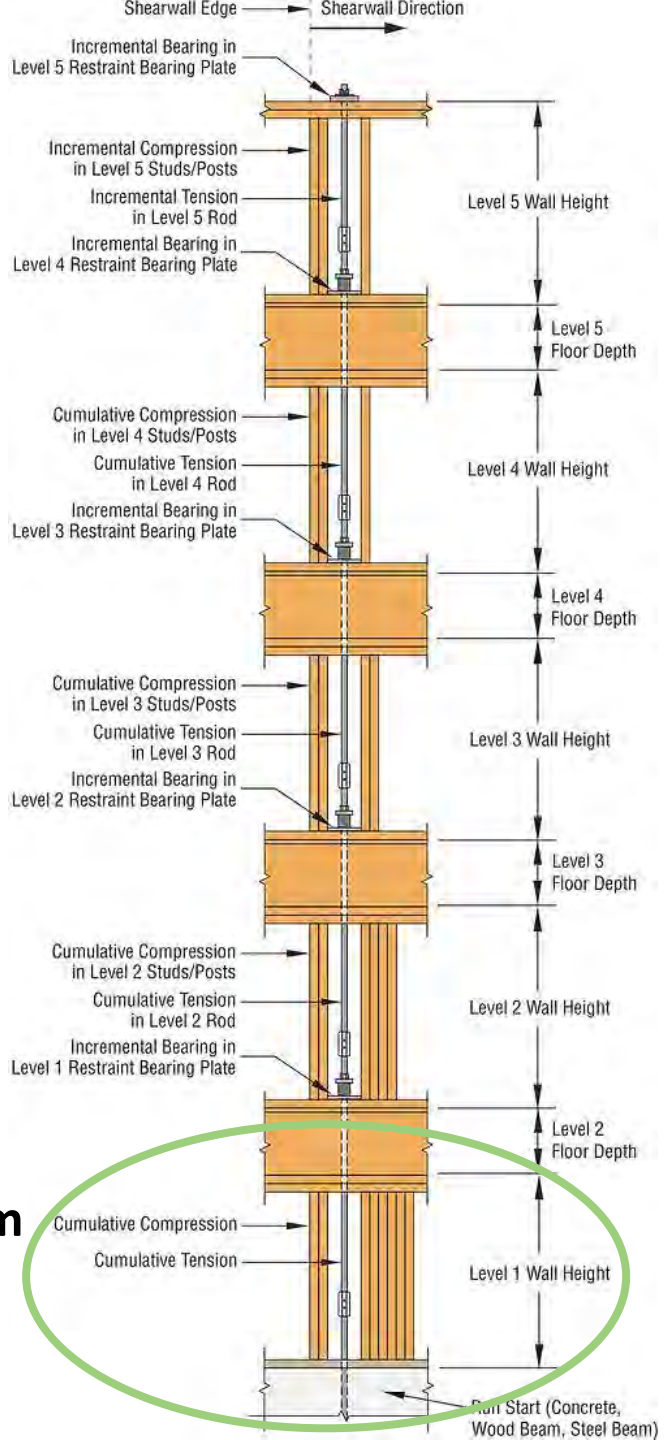

**Loose bolted connection due to vertical shrinkage of framing. Tighten after shrinkage**



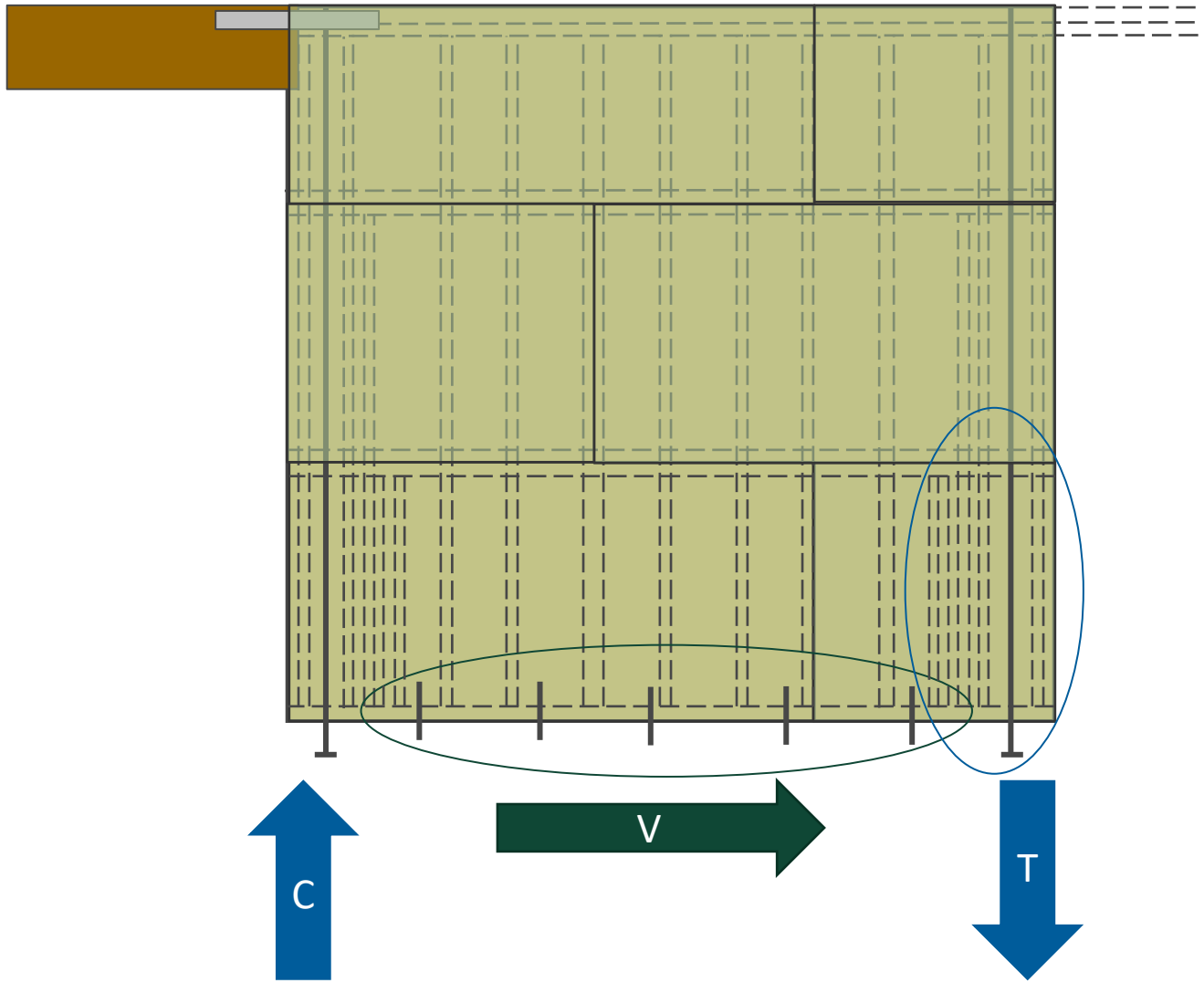

**VS.**

**Continuous Tiedown System**

Source: Simpson Strong-Tie



# Anchor Bolt Layout: Tiedowns



# Anchor Bolt Spacing

**Example:**

600 plf shear wall (10d @ 3”oc)

8 ft long (96” total wall length)

=4,800 lb capacity

Anchor Bolts @ 36”oc = 3 bolts

=5,664 lb capacity **OK**

But what if our tiedown system takes up 18” at each end of the wall?

# Anchor Bolt Spacing

**Example:**

But what if our tiedown system takes up 18” at each end of the wall?

Recall: 96” total wall length
(4,800 lb capacity)

But only 60” available for anchor bolts

Anchor Bolts @ 36”oc = 2 bolts

=3,776 lb capacity **No good!**

# Anchor Bolt Spacing

**Example:**

600 plf shear wall (10d @ 3”oc)

8 ft long (96” total wall length)

60” available for anchor bolts

Adjust spacing:

$$\frac{1888\ \text{lb/bolt}}{600\ \text{lb/ft}} * \frac{60\ \text{in}}{8\ \text{ft}} = 23\ \text{in/bolt}$$

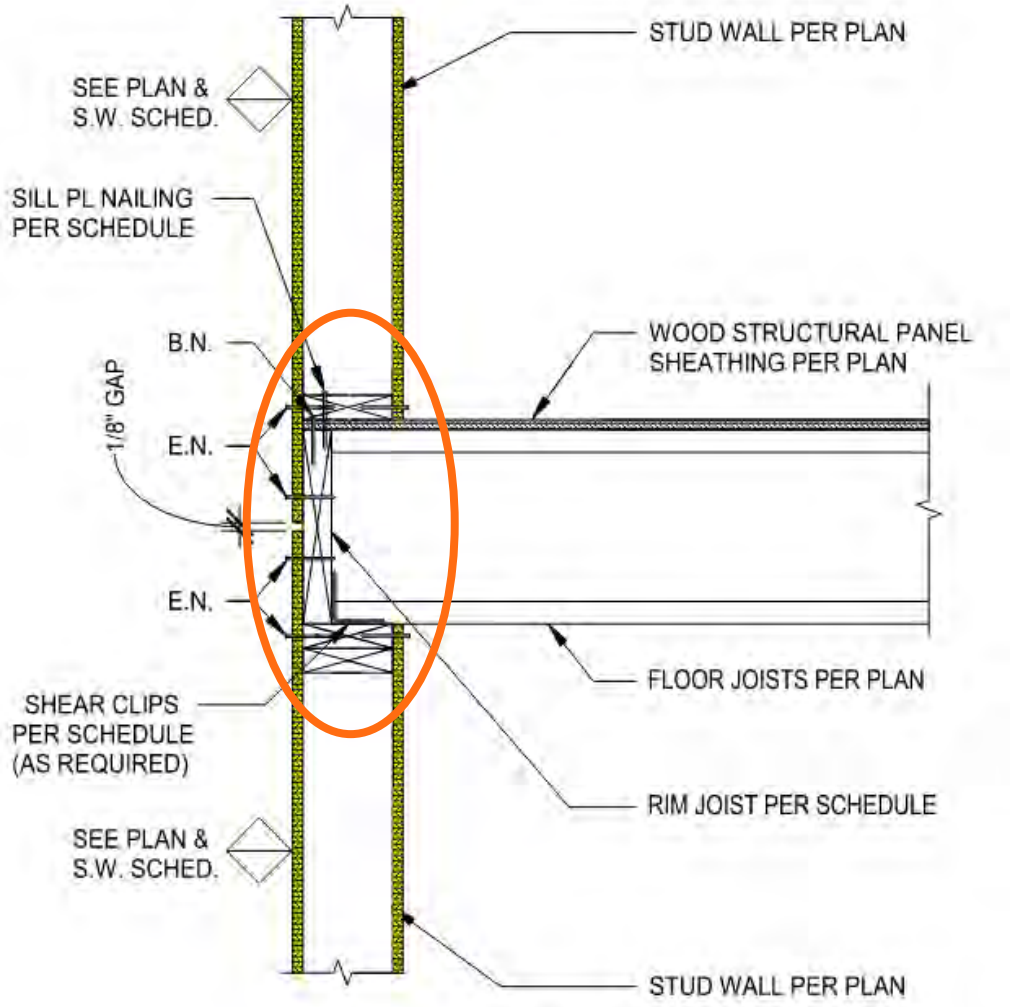
**Use 5/8” A.B. @ 22”oc**

Gives us 3 bolts in 60”

= 5,664 lb capacity **OK**

# Other Considerations

# Double-Sided Shear Walls



# Shear Wall Schedule

15/32” wall sheathing

| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc | 2 sides 10d @ 6”oc | 2 sides 10d @ 4”oc | 2 sides 10d @ 3”oc | 2 sides 10d @ 2”oc |
|---|---|---|---|---|---|---|---|---|
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf | 620 plf | 920 plf | 1200 plf | 1540 plf |
| Sill plate nailing: | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc | 16d @ 3”oc | 2 staggered rows, each w/ 16d @ 4”oc | 2 staggered rows, each w/ 16d @ 3”oc | 2 staggered rows, each w/ 16d @ 2 ½”oc |
| Shear clips | [x] clips @ 16”oc | [x] clips @ 12”oc | [x] clips @ 12”oc | [x] clips @ 8”oc | [x] clips @ 10”oc | [x] clips @ 6”oc | [x] clips @ 6”oc | [x] clips @ 4 ½”oc |
| Anchor bolts (7” min embed) | 5/8” @ 48”oc | 5/8” @ 48”oc | 5/8” @ 36”oc | 5/8” @ 24”oc | 5/8” @ 36”oc | 5/8” @ 24”oc | 5/8” @ 18”oc | 5/8” @ 12”oc |



(Not adjusted for FRT)

# Shear Wall Schedule

15/32” wall sheathing

| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc | 2 sides 10d @ 6”oc | 2 sides 10d @ 4”oc | 2 sides 10d @ 3”oc | 2 sides 10d @ 2”oc |
|---|---|---|---|---|---|---|---|---|
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf | 620 plf | 920 plf | 1200 plf | 1540 plf |
| Sill plate nailing: | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc | 16d @ 3”oc | 2 staggered rows, each w/ 16d @ 4”oc | 2 staggered rows, each w/ 16d @ 3”oc | 2 staggered rows, each w/ 16d @ 2 ½”oc |
| Shear clips | [x] clips @ 16”oc | [x] clips @ 12”oc | [x] clips @ 12”oc | [x] clips @ 8”oc | [x] clips @ 10”oc | [x] clips @ 6”oc | [x] clips @ 6”oc | [x] clips @ 4 ½”oc |
| Anchor bolts (7” min embed) | 5/8” @ 48”oc | 5/8” @ 48”oc | 5/8” @ 36”oc | 5/8” @ 24”oc | 5/8” @ 36”oc | 5/8” @ 24”oc | 5/8” @ 18”oc | 5/8” @ 12”oc |



(Not adjusted for FRT)

# Shear Wall Schedule

## 15/32” wall sheathing

| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc | 2 sides 10d @ 4”oc | 2 sides 10d @ 3”oc | 2 sides 10d @ 2”oc |
|---|---|---|---|---|---|---|---|
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf | 920 plf | 1200 plf | 1540 plf |
| Sill plate nailing: | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc | 2 staggered rows, each w/ 16d @ 4”oc | 2 staggered rows, each w/ 16d @ 3”oc | 2 staggered rows, each w/ 16d @ 2 ½”oc |
| Shear clips | [x] clips @ 16”oc | [x] clips @ 12”oc | [x] clips @ 12”oc | [x] clips @ 8”oc | [x] clips @ 6”oc | [x] clips @ 6”oc | [x] clips @ 4 ½”oc |
| Anchor bolts (7” min embed) | 5/8” @ 48”oc | 5/8” @ 48”oc | 5/8” @ 36”oc | 5/8” @ 24”oc | 5/8” @ 24”oc | 5/8” @ 18”oc | 5/8” @ 12”oc |



(Not adjusted for FRT)

# Shear Wall Schedule

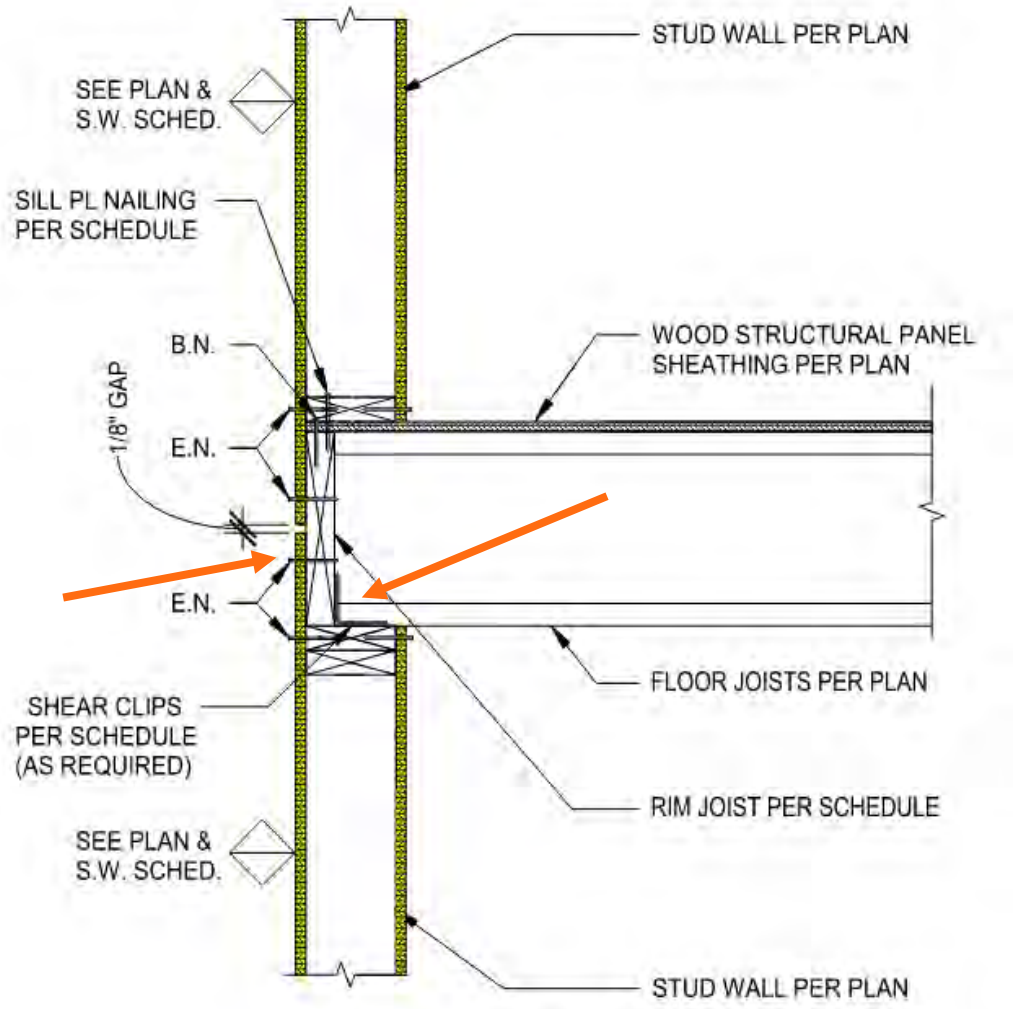
## 15/32” wall sheathing

| Nailing at panel edges | 10d @ 6”oc | 10d @ 4”oc | 10d @ 3”oc | 10d @ 2”oc | 2 sides 10d @ 4”oc | 2 sides 10d @ 3”oc | 2 sides 10d @ 2”oc |
|---|---|---|---|---|---|---|---|
| ASD allowable unit shear capacity | 310 plf | 460 plf | 600 plf | 770 plf | 920 plf | 1200 plf | 1540 plf |
| Sill plate nailing: | 16d @ 6”oc | 16d @ 4”oc | 16d @ 3”oc | 16d @ 2 ½”oc | 2 staggered rows, each w/ 16d @ 4”oc | 2 staggered rows, each w/ 16d @ 3”oc | 2 staggered rows, each w/ 16d @ 2 ½”oc |
| Shear clips | [x] clips @ 16”oc | [x] clips @ 12”oc | [x] clips @ 12”oc | [x] clips @ 8”oc | [x] clips @ 6”oc | [x] clips @ 6”oc | [x] clips @ 4 ½”oc |
| Anchor bolts (7” min embed) | 5/8” @ 48”oc | 5/8” @ 48”oc | 5/8” @ 36”oc | 5/8” @ 24”oc | 5/8” @ 24”oc | 5/8” @ 18”oc | 5/8” @ 12”oc |



(Not adjusted for FRT)

# Double-Sided Shear Walls



# Fire Retardant-Treatment

### 11.3.5 Fire Retardant Treatment

Adjusted design values for connections in lumber and structural glued laminated timber pressure-treated with fire retardant chemicals shall be obtained from the company providing the treatment and redrying service (see 2.3.4). The impact load duration factor shall not apply to connections in wood pressure-treated with fire retardant chemicals (see Table 2.3.2).

- Strength reduction factors: Check with FRTW manufacturer
- Corrosion-resistant fasteners

**Design Value Adjustment Factors for PYRO-GUARD® FRT Lumber**

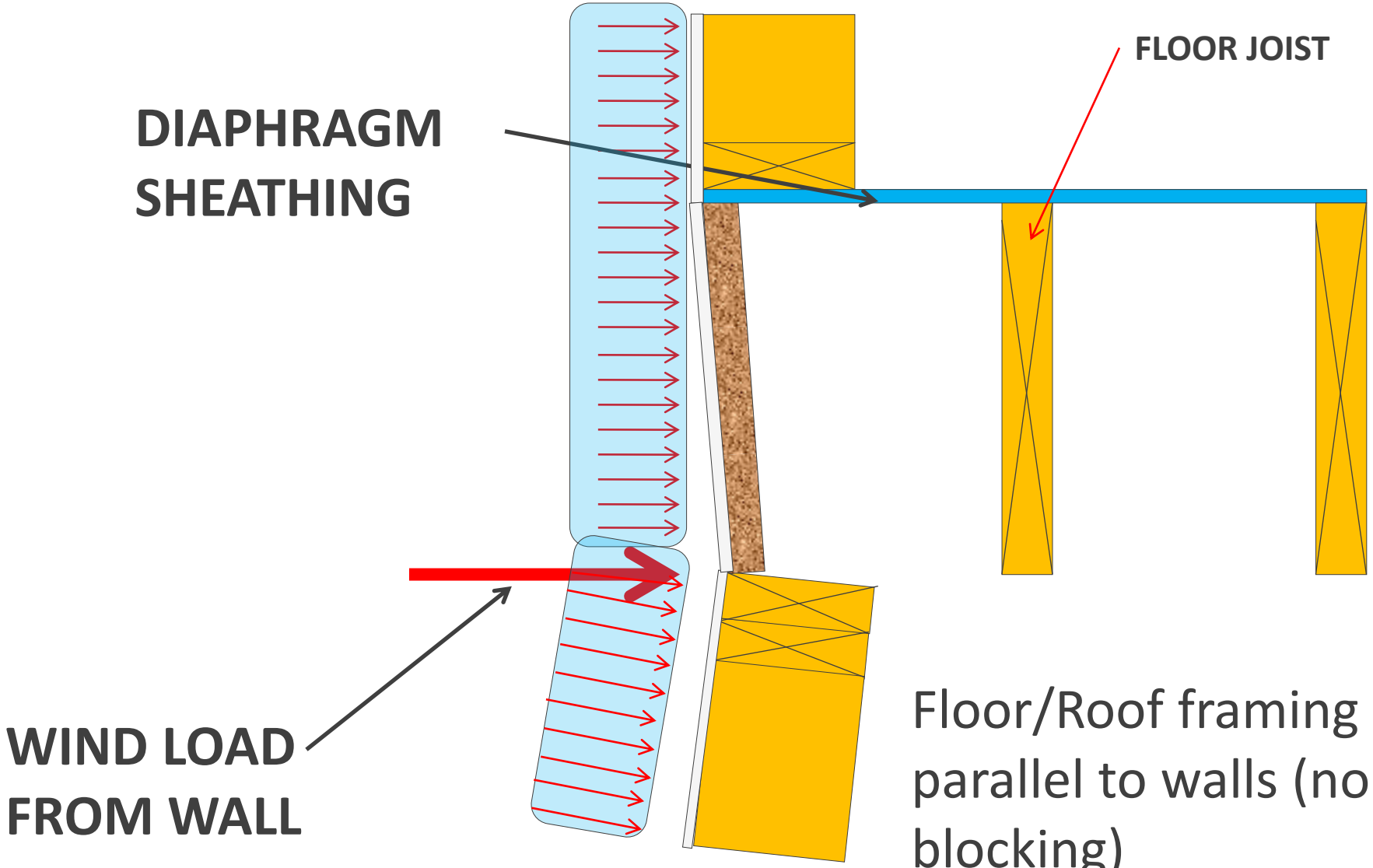
| Physical Property | PYRO-GUARD® Wall/Floor Service Temperature to 100°F | | | PYRO-GUARD® Roof Framing Service Temperature to 150°F | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Douglas Fir | Southern Pine | Other Species | Douglas Fir Climate Zone | | | Southern Pine Climate Zone | | |
| | | | | 1A | 1B | 2 | 1A | 1B | 2 |
| Extreme Fiber Stress in Bending, $F_b$ | 0.97 | 0.91 | 0.88 | 0.90 | 0.93 | 0.96 | 0.80 | 0.85 | 0.89 |
| Tension Parallel to Grain, $F_t$ | 0.95 | 0.88 | 0.83 | 0.80 | 0.87 | 0.93 | 0.80 | 0.84 | 0.88 |
| Compression Parallel to Grain, $F_c$ | 1.00 | 0.94 | 0.94 | 0.94 | 0.98 | 1.00 | 0.94 | 0.94 | 0.94 |
| Horizontal Shear, $F_v$ | 0.96 | 0.95 | 0.93 | 0.95 | 0.95 | 0.96 | 0.92 | 0.93 | 0.94 |
| Modulus of Elasticity, E | 0.96 | 0.95 | 0.94 | 0.96 | 0.96 | 0.96 | 0.95 | 0.95 | 0.95 |
| Compression Perpendicular to Grain, $F_{c\perp}$ | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Fasteners/Connections | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |

Source: Hoover Treated Wood Products

*Check the footnotes! (not shown)*

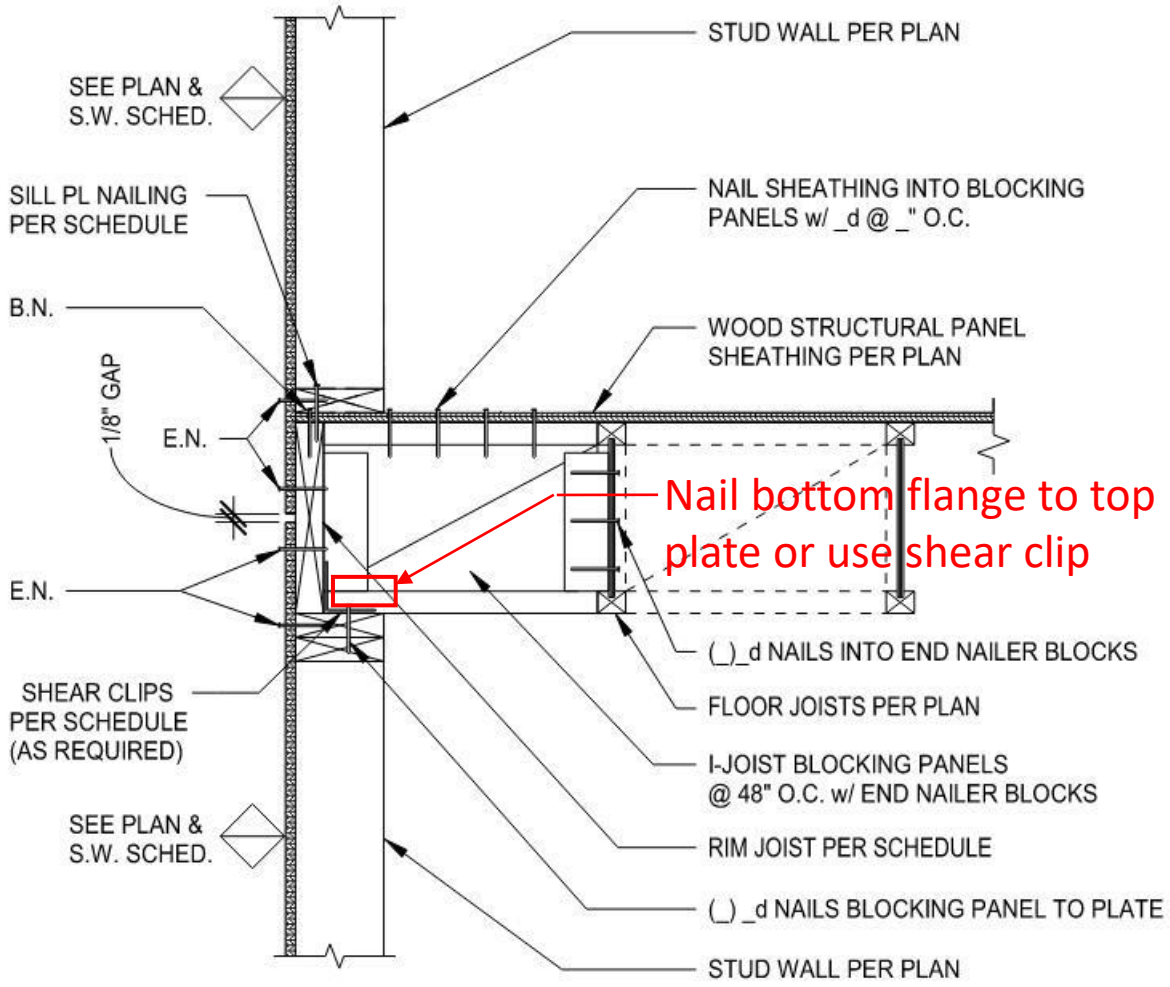
# SW Detail Variations

# Stud to Diaphragm

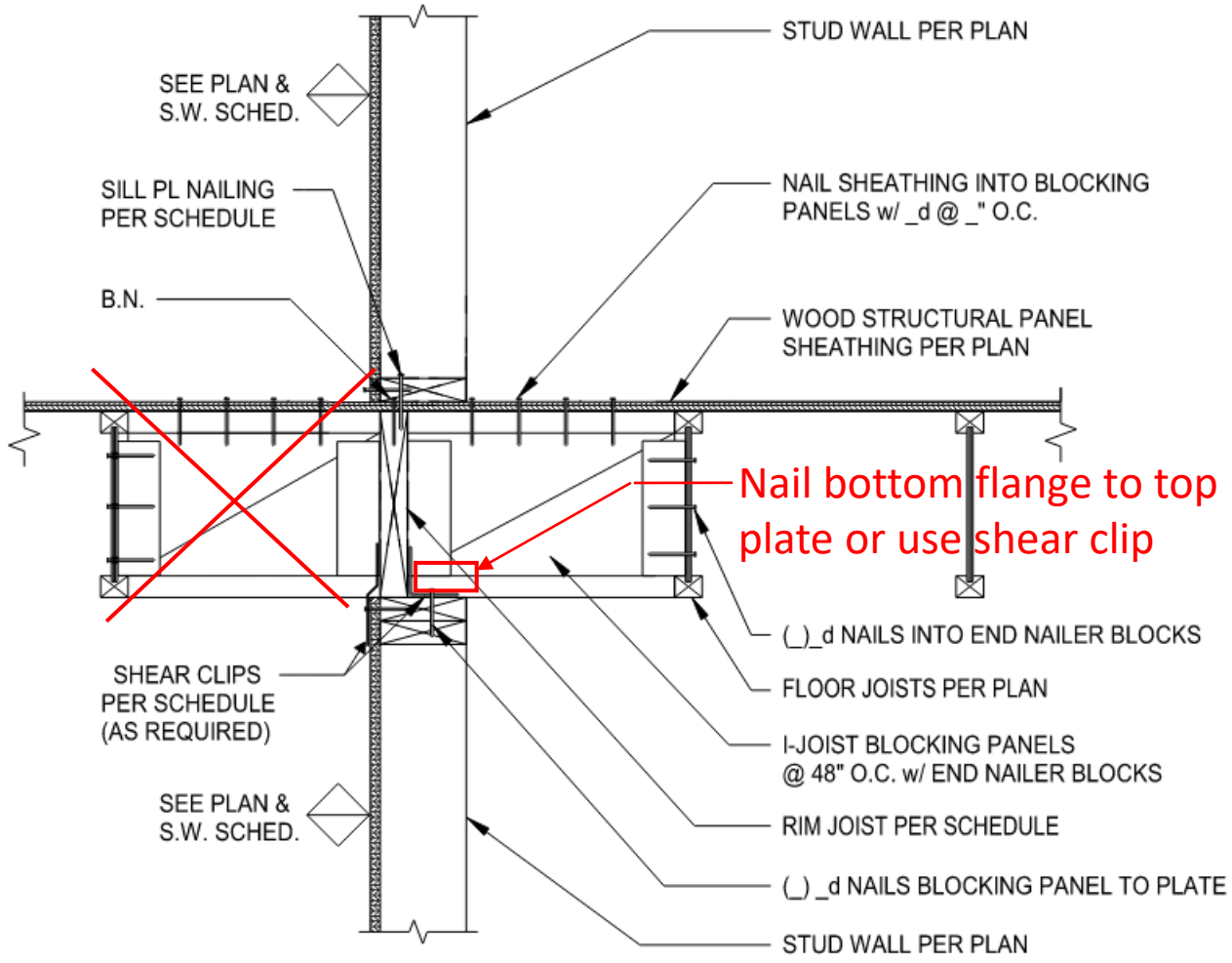



Floor/Roof framing parallel to walls (no blocking)

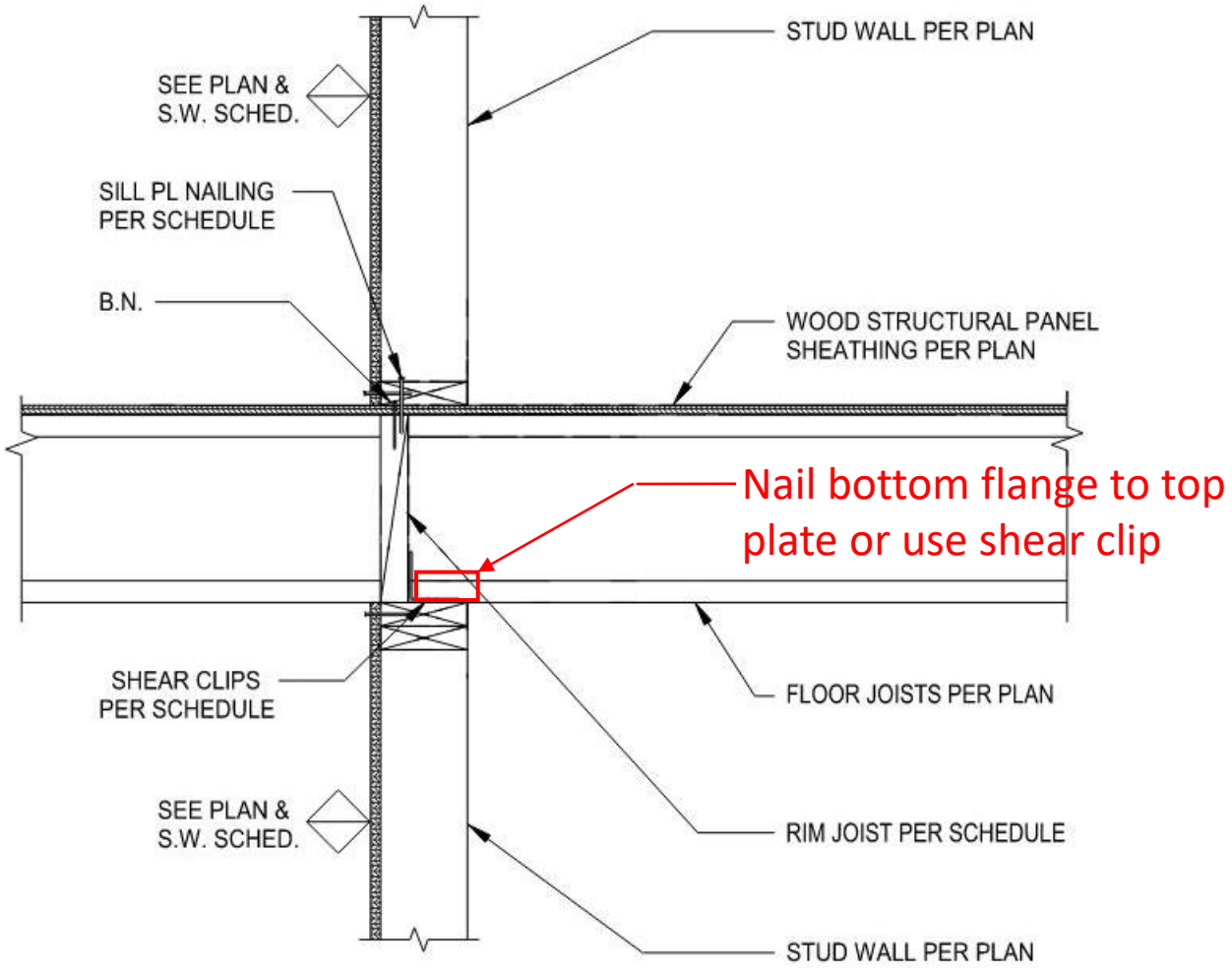
# Joists Parallel to Wall



# Interior Shear Wall: Joists Parallel



# Interior Shear Wall: Joists Perpendicular



# QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

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