To help ensure the safety of deck occupants, the deck guard rail system must be securely fastened to the framing of the deck. Simpson Strong-Tie has designed and tested new code-compliant solutions for attaching wood guard posts, rails and balusters without the use of typical hardware and through-bolts.

**Guard Post Installations**

The guard posts and the related framing elements are fastened with Simpson Strong-Tie® Strong-Drive® SDWS Timber screws and have been tested in accordance with ICC-ES AC273 (Acceptance Criteria for Handrails and Guards). With its bold thread pattern and large washer head (see Figure 2), the Strong-Drive SDWS Timber screw provides maximum holding power as an easy-to-install, high-strength alternative to through-bolting and traditional lag screws. It has been tested for a variety of structural applications and is code listed under IAPMO UES ER-192. The double-barrier coating on the screw provides corrosion resistance equivalent to ASTM A153 Class D hot-dip galvanization, making it suitable for interior, certain exterior, and preservative-treated wood applications.

The details illustrated in this technical bulletin provide a lateral load path between the guard post and the deck framing. The installation details apply to the following applications:

- Internal post on band joist
- Internal post at corner
- Internal post on rim joist with adjacent joist
- Internal post on rim joist between joists

Internal post installations position the post inside the rim and band joists.

The installation details meet the 600 lb. concentrated ultimate load requirements, where force was applied to a single guard post 42° above the deck surface in an outward direction. The details also meet the post deflection limit of 3° at the 200 lb. service level. The acceptance criteria apply to one- and two-family dwellings for compliance with the 2015–2006 International Residential Code (IRC) and International Building Code (IBC). The SDWS Timber screws used in the guard post installations do not replace the required connections to the rim joist or the ledger.
Code-Compliant Guard Post Connection Details

Installation scope:

- Deck framing follows AWC, DCA6
- Maximum 42" guard post height (above deck surface)
- Nominal 4x4 guard post
- Nominal 2x8 band/rim joist minimum, 2x blocking and 4x blocking
- HF, DFL or SP framing lumber
- Full-depth blocking required
- Internal post installation (post positioned inside the rim/band joist — see Figure 3)
- Fastener position tolerance: ± ¼"
- Maximum guard post spacing of 6'

The following table indicates the number of screws required to meet the installation requirements of each detail, A through D.

<table>
<thead>
<tr>
<th>Detail</th>
<th>Model No.</th>
<th>Quantity Required</th>
<th>Length (in.)</th>
<th>Shank Diameter (in.)</th>
<th>Major Diameter (in.)</th>
<th>Minor Diameter (in.)</th>
<th>Thread Length (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SDWS22500DB</td>
<td>4</td>
<td>5</td>
<td>0.220</td>
<td>0.305</td>
<td>0.198</td>
<td>2.75</td>
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<tr>
<td></td>
<td>SDWS22800DB</td>
<td>10</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>SDWS22800DB</td>
<td>16</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>SDWS22500DB</td>
<td>8</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SDWS22800DB</td>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>SDWS22500DB</td>
<td>8</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SDWS22800DB</td>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. Strong-Drive® SDWS Timber screws install best with a low-speed ½" drill and a T40 6-lobe bit. The matched bit included with the screws is recommended for best results.
2. Predrilling is typically not required. Where predrilling is necessary, use a ¾" drill bit for Strong-Drive SDWS Timber screws.
3. Screw heads that are countersunk flush to the wood surface are acceptable if the screw has not spun out.
4. Deck joists shall be fastened to rim joist and ledger as required by the code.
**Detail A — Interior Post on Band Joist**

1. Band joist to 2x blocking 1½” from top and bottom edges using 8” SDWS22800DB.
2. Band joist to post and 4x blocking 2” from top and bottom edges using 8” SDWS22800DB.

1. Band joist to 2x blocking 1¾” from top and bottom edges using 8” SDWS22800DB.
2. Band joist to post and 4x blocking 2” from top and bottom edges using 8” SDWS22800DB.

**Detail B — Interior Post on Corner**

1. Rim joist to band or deck joists 1½” from top and bottom edges, ¾” from side edge using 8” SDWS22800DB.
2. Rim joist to post and 2x blocking 2” from top and bottom edges, centered on post using 8” SDWS22800DB.
3. Rim joist to 4x blocking and 2x blocking 1½” from top and bottom edges centered on 4x blocking using 8” SDWS22800DB.

**Note:** For fastening rim joist to band and deck joists, predrilling for the SDWS22800DB screws is recommended using a ¾” drill bit.
1. Rim joist to deck joist 1½" from top and bottom edges using 8" SDWS22800DB.
2. Rim joist to post and 2x blocking 2" from top and bottom edges using 8" SDWS22800DB.

1. Deck joist to 2x blocking 1¾" from top and bottom edges using 5" SDWS22500DB.
2. Rim joist to post and 2x blocking 2" from top and bottom edges using 8" SDWS22800DB.
Guard Rail Installations

The Simpson Strong-Tie Strong-Drive® SDWS Framing screws (SDWS16300) were evaluated for use as fasteners in the guard handrail-to-post connection. SDWS Framing screws are evaluated for structural and corrosion resistance in IAPMO UES ER-192. Testing and evaluation for guard handrail connections followed the sections 4.6 and 4.7 of ICC-ES AC273, Acceptance Criteria for Handrails and Guards. Details of the connection shown in Figures 22 through 29 meet or exceed horizontal and vertical concentrated load of the 600 lb. required for wood guard handrails with a maximum guard post spacing of 6’.

These details are applicable to systems where the guard post has a minimum specific gravity of 0.42 (hem-fir), and the handrail has a minimum specific gravity of 0.36 (western cedar). The guard handrail must be fastened on the guard post from flush with the outer edge of the guard post to the center of the guard post surface, and may be used as the handrail (top rail), as shown in Figure 22, and the bottom rail of the guard assembly. The SDWS Framing screws shall be installed from the exterior side of the rail. Predrilling using a ¼” diameter drill bit may be required to prevent rail splitting. Install screws at a 30º angle into the post, making sure screws seat/finish 1” from where the rails join the post. A cap handrail was not included in the testing, and if installed, a cap handrail would further enhance the performance of the guard system.

Code-Compliant Handrail Connection Details

Installation Scope:
- Maximum guard post spacing of 6’
- Nominal 2x4 top and bottom guard rail (AWC, DCA6)
- Nominal 4x4 guard post, min. specific gravity 0.42; min. guard rail specific gravity 0.36

The following table indicates the number of screws required to meet the installation requirements of each detail.

<table>
<thead>
<tr>
<th>Detail</th>
<th>Model No.</th>
<th>Quantity Required</th>
<th>Length (in.)</th>
<th>Shank Diameter (in.)</th>
<th>Major Diameter (in.)</th>
<th>Minor Diameter (in.)</th>
<th>Thread Length (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SDWS16300</td>
<td>2</td>
<td>3</td>
<td>0.156</td>
<td>0.212</td>
<td>0.140</td>
<td>1.63</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 21 — Strong-Drive SDWS FRAMING Screw (SDWS16300)

Figure 22 — Overall Perspective View of Deck

For internal guard post installations using Strong-Drive SDWS Timber screws, refer to pp. 1-4.
1. 4x4 post opposing screws, 1⅛" from top and bottom edges using 3" SDWS16300.
2. Install 1" from where guard rails join guard post at 30° angle.

Interior
Exterior

Figure 23 — Detail A: Plan View

Figure 24 — Detail A: Rail-to-Post Perspective View

1. Fasten guard rail to guard post 1¼" from top and bottom edges using 3" SDWS16300.
2. Install 1" from where guard rails join guard post at 30° angle into post.

Figure 25 — Detail A: Elevation View

Figure 26 — Detail B: Plan View

Figure 27 — Detail B: Perspective View

1. Fasten guard rail to guard post ¾" from top and bottom edge using 3" SDWS16300.
2. Install 1" from where guard rails join guard post at 30° angle into post.

Figure 28 — Detail B: Elevation View (Front)

Figure 29 — Detail B: Elevation View (Side)
Wood Baluster Installations

The Simpson Strong-Tie Strong-Drive® SDWS Framing screws (SDWS16212), Deck-Drive™ DSV Wood screw (DSVT212) and Deck-Drive DWP Wood SS screw (S08250WP) were evaluated for use as fasteners in the wood baluster-to-top and bottom rail connections.

The proposed fasteners – SDWS16212, DSVT212, and S08250DWP – can be used to fasten wooden balusters to wooden rails using one screw in each end of the baluster. For a nominal 2x2 baluster, the screws can be located on center of the baluster width, not closer than 7/8” to the baluster end, and not closer than 3/8” to the edge of the rail. Predrilling may be required to prevent baluster splitting.

Evaluation for the wood baluster connections utilized the geometry of ASTM E935-Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings as prescribed by ICC-ES AC273. Details of the connection shown in Figures 34 through 38 meet or exceed the load of 150 lb. applied to a one square foot area normal to the infill, as required for wood balusters with a maximum spacing of 4” (per DCA6 requirement). To maximize the connection load, it is assumed that 150 lb. is applied to two balusters at one end of the baluster pair, producing a maximum withdrawal force of 62 lb.

Code-Compliant Baluster Connection Details

Installation Scope:

- Maximum space between adjacent balusters is 4” (AWC, DCA6).
- Baluster is nominal 2x2 (1.5” x 1.5” actual, per AWC, DCA6).
- Each of the screws has 1” of thread length embedment in the main member based on nominal baluster thickness of 1.5”.
- Baluster and guard rail min. specific gravity of 0.36.
The following table indicates the number of screws required to meet the installation requirements of the baluster detail.

<table>
<thead>
<tr>
<th>Fastener Option</th>
<th>Detail</th>
<th>Model No.</th>
<th>Quantity Required per Baluster</th>
<th>Length (in.)</th>
<th>Head Diameter (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>SDWS16212</td>
<td>2</td>
<td>2½</td>
<td>0.450</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>DSVT212</td>
<td>2</td>
<td>0.333</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>S08250WP</td>
<td></td>
<td>0.340</td>
<td></td>
</tr>
</tbody>
</table>

The results of the withdrawal analysis show that the DSVT212, SDWS16212 and S08250WP have allowable withdrawal and pull-through resistances that meet or exceed the maximum load on the baluster-to-rail connection.