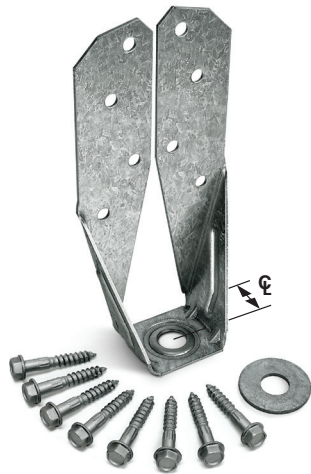


Code-Compliant Guardrail Post Connections

The railing connection is a crucial deck connection, and it is often inadequately constructed. In order to provide the required load resistance at the hand rail, the post must not only be fastened to the rim joist, but also be tied back into the joist framing. Machine bolts or lag screws through the post and rim joist alone do not typically meet the performance requirements of the building code.



DTT2Z
(DTT2SS similar)

The details on page 2 show various methods by which the guardrail post connection can be made using either the Simpson Strong-Tie® DTT2 deck tension tie or HD3BHDG holdown. These details allow for a connection to the deck framing at the joists or blocking. All details meet the IRC code-required load at a maximum guardrail height of 36" above the deck surface in an outward direction.

Details on page 3 meet the IBC code requirements for a one- or two-family dwelling at a maximum guardrail height of 42" above the deck surface in an outward direction.



The DTT2 deck tension tie was designed to satisfy code requirements for guardrail-post connections in wood decks. Versatile and cost-effective, the DTT2 installs using Simpson Strong-Tie Strong-Drive® SDS screws which install with no predrilling and are included with each connector.

Material / Finish: DTT2Z — 14 ga. carbon steel with ZMAX® galvanized coating
DTT2SS — 14 ga. Type 316 stainless steel

Fasteners (Included): DTT2Z — (8) Strong-Drive SDS screws, double-barrier coating
DTT2SS — (8) Strong-Drive SDS screws, Type 316 stainless steel

Installation:

- Use all specified fasteners. Refer to the General Notes in the current *Wood Construction Connectors* catalog for additional important information.
- The supplied cut washer must be installed between the nut and the seat.
- SDS screws install best with a low-speed, high-torque drill with a 3/8" hex driver.

This product is available with additional corrosion protection.

Model No.	ϕ (in.)	Anchor Diameter (in.)	Fasteners
DTT2	13/16	1/2	(8) 1/4" x 1 1/2" SDS

1. The information shown in this table is applicable to both the DTT2Z and DTT2SS.

The HD3BHDG has also been evaluated as a lateral anchor for the guardrail post and installs using 5/8"-diameter machine bolts.

Finish: Hot-dip galvanized

Installation:

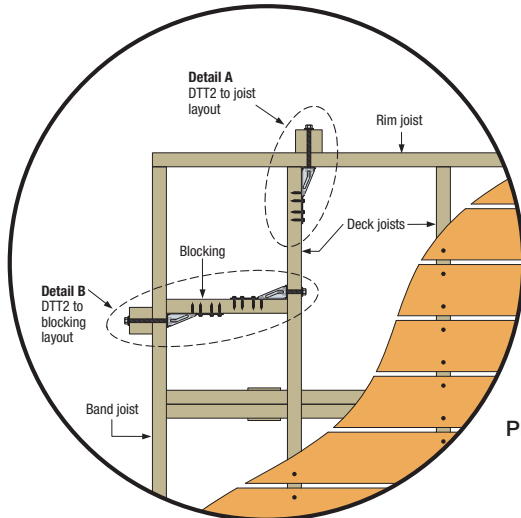
- Use all specified fasteners. Refer to the General Notes in the current *Wood Construction Connectors* catalog for additional important information.
- Bolt holes shall be a minimum of 1/32" to a maximum of 1/16" larger than the bolt diameter (per NDS section 11.1.2).
- A washer is not required between the base plate of the holdown and the anchor nut.

Model No.	ϕ (in.)	Anchor Diameter (in.)	Machine Bolts
HD3BHDG	1 5/16	5/8	(2) 5/8" dia.

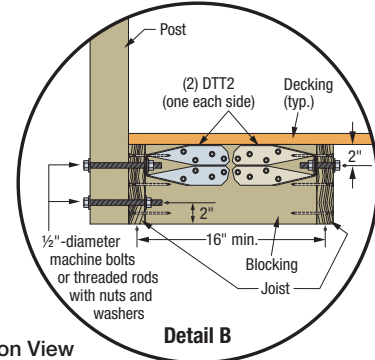
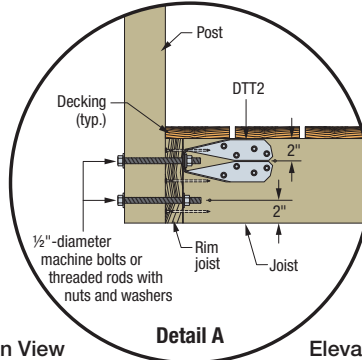


HD3BHDG

Code-Compliant 36" Guardrail Post Connections



DTT2 Attachment of Guardrail Post *Outside* Rim/Joist

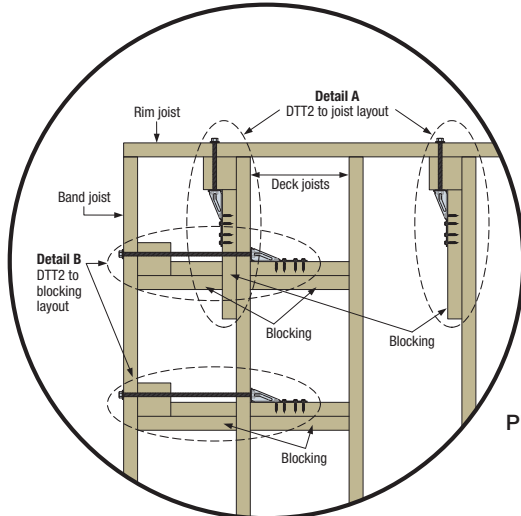


Plan View

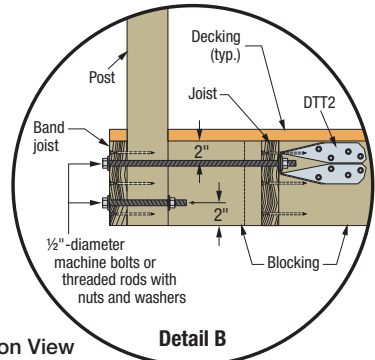
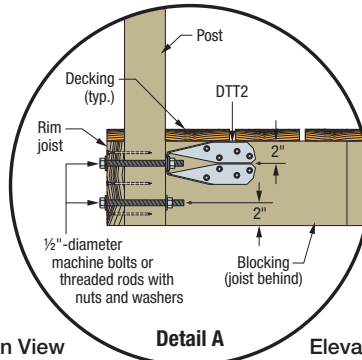
Detail A

Elevation View

Detail B



DTT2 Attachment of Guardrail Post *Inside* Rim/Joist



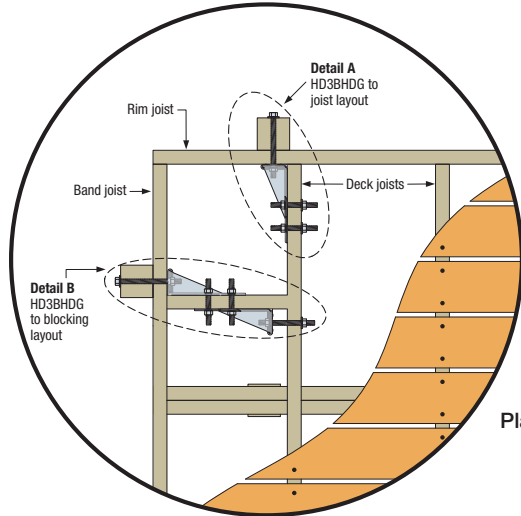
Plan View

Detail A

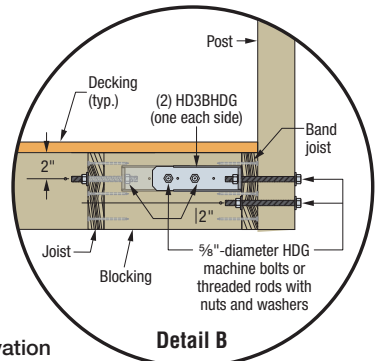
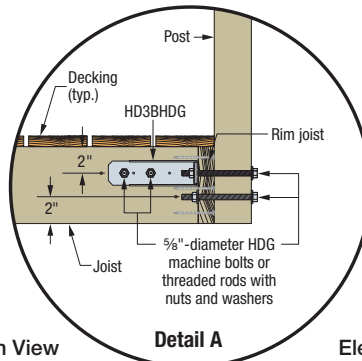
Elevation View

Detail B

Detail A: Fasten blocking to joist with (24) 10d common nails (0.148" x 3")
Detail B: Fasten blocking together with (12) 10d common nails (0.148" x 3")



HD3BHDG Attachment of Guardrail Post *Outside* Rim/Joist



Plan View

Detail A

Elevation

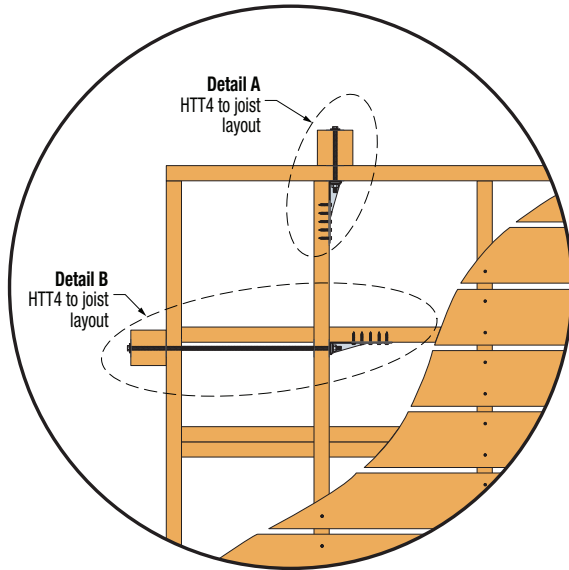
Detail B

When using ZMAX® or hot-dip galvanized connectors, use hot-dip galvanized fasteners that meet the specifications of ASTM A153. Simpson Strong-Tie® stainless-steel connectors are manufactured from Type 316 stainless-steel and therefore require Type 316 stainless-steel fasteners.

All details assume the following:

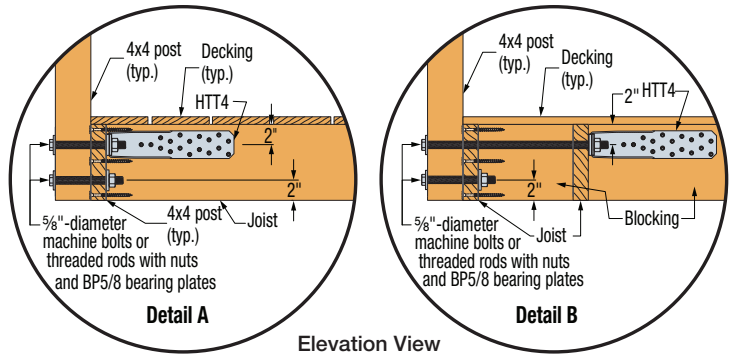
- Maximum 36" guardrail height
- Minimum nominal 2x8 rim joist, joists and blocking
- Minimum nominal 4x4 guardrail post
- DF or SP framing lumber

Code-Compliant 42" Guardrail Post Connections



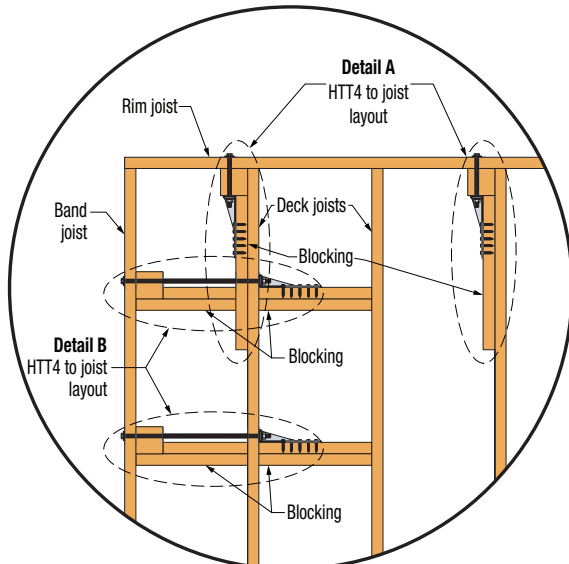
Plan View

HTT4 Attachment of Guardrail Post *Outside* Rim/Joist



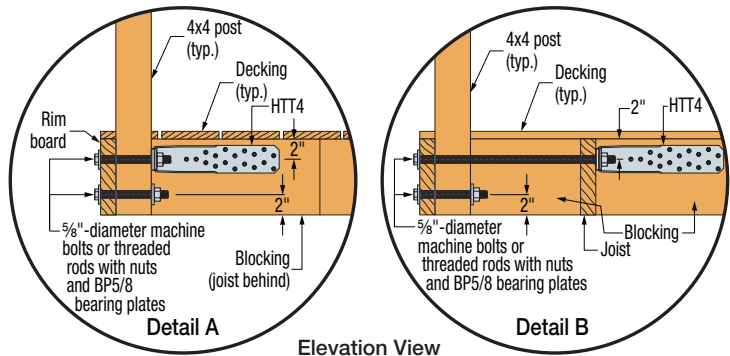
Elevation View

Alt: DTT2Z or DTT2SS with SDS1/4 x 1 1/2" and 1/2" machine bolt or threaded rod with nuts and BP1/2 bearing plates for min. 2x10 framing lumber



Plan View

HTT4 Attachment of Guardrail Post *Inside* Rim/Joist



Elevation View

Alt: DTT2Z or DTT2SS with SDS1/4 x 1 1/2" and 1/2" machine bolt or threaded rod with nuts and BP1/2 bearing plates for min. 2x10 framing lumber

Post Inside Rim/Joist:

- Detail A: Fasten blocking to joist with (26) 10d common nails (0.148" x 3")
- Detail B: Fasten blocking together with (13) 10d common nails (0.148" x 3")

Details Assume the Following:

- Maximum 42" guardrail height and minimum nominal 4x4 guardrail post
- HTT4 with #10 x 1 1/2" SD screws and minimum 2x8 HF or SPF framing lumber
- HTT4 with 0.148" x 1 1/2" nails and minimum 2x8 DF or SP framing lumber
- DTT2Z with 1/4" x 1 1/2" SDS screws and minimum 2x10 DF, HF, SP or SPF framing lumber
- DTT2Z uses 1/2"-diameter machine bolts or threaded rods with nuts and BP1/2 bearing plates



Code-Compliant Guardrail Post Connections

Guards: What the Codes Require

The 2015 International Residential Code (IRC) and 2015 International Building Code (IBC) each have specific requirements for the design, construction and use of guards. Some of these requirements are shown below.

When is a guard required?

“Guards shall be located along open-sided walking surfaces, including stairs, ramps, and landings, that are located more than 30 inches measured vertically to the floor or grade below...”

IRC 2015, Section R312.1

“Guards shall be located along open-sided walking surfaces... that are located more than 30 inches measured vertically to the floor or grade below...”

IBC 2015, Section 1015.2

If a guard is not required because the deck or porch is 30 inches or less above the floor or grade, does the guard have to be code compliant?

All guards must be designed and constructed in accordance with the governing building code, including guards that are not required. The general public expects all guards to perform and falls resulting from guard failures can cause serious injury regardless of the fall height.

What is the guard height requirement?

In the IRC, “guards at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches high...”

IRC 2015, Section R312.2

In the IBC, “required guards shall be not less than 42 inches high...”

IBC 2015, Section 1015.3

How much force must a guard be capable of resisting?

For one- and two- family dwellings, both the IRC and IBC require guards be designed to resist a single concentrated load of 200 lb. applied in any direction at any point along the top.

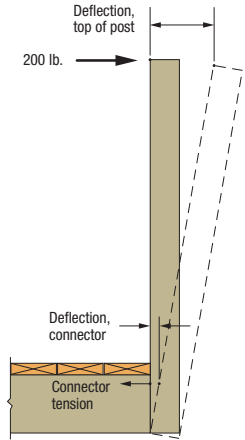
IRC 2015, Table R301.5; IBC 2015, Section 1607.8

What is the allowable deflection of a fully loaded guard post?

The building codes do not contain deflection limits for guards however the *International Code Council Evaluation Service Acceptance Criteria 273 for Handrails and Guards (AC273)* places reasonable limits on tested assemblies. The maximum permissible deflection in AC273 for 36"-high guards is 3".

How does load or deflection at the top of a guard post relate to a connector at the base of a guard post?

As a result of the large leverage arm of a guard post, the tension force in the post-to-deck connector will be much larger than the force at the top of the post. Similarly, any deflection at the post-to-deck connector will result in amplified deflection at the top of the post. For a 36" post connected to a 2x8 deck joist, a 200 lb. force at the top will result in about an 1,800 lb. force in a connector located 2" from the top of the joist. A ¼" of deflection in this connector will result in over 2" of deflection at the top of the post.



Do the Simpson Strong-Tie details address load applied in all directions?

The details in this technical bulletin address an outward force on the guardrail. An additional connector can be installed on the lower bolt to resist an inward force.

Why have the code requirements changed?

The 200 lb. point load requirement in the code is not new. However there has been an increased focus on this requirement in recent years. Research and testing conducted at Virginia Tech on post-to-rim-joist connections indicated common bolted or lag screwed connections to a rim joist alone did not meet the load requirements in the code.

Why the Simpson Strong-Tie solution?

The connection details shown have been designed to meet the requirements in the building code. Simpson Strong-Tie also performed testing on several full-scale assemblies. Some of this testing is summarized in the table below.

Connector	Post-Fastening Assembly	Average Test Ultimate	Average Deflection at 200 lb. ¹
DTT2	Outside rim joist, fastened to joist	635 lb.	2 5/8"
	Outside rim joist, fastened to blocking	650 lb.	1 5/8"
HD3BHDG ²	Outside rim joist, fastened to joist	790 lb.	1 1/2"
	Outside rim joist, fastened to blocking	655 lb.	1 1/2"

1. Applied load and measured deflection shown are at top of post.
 2. HD3B values based on testing with a lower-capacity holdown.

*The 2009 and 2012 International Residential Code and 2009 and 2012 International Building Code each have similar requirements. For simplicity, this document references the 2015 edition of each code.