

Wood Pile-to-Beam Connections

Purpose: To illustrate typical wood pile-to-beam connections, provide basic construction guidelines on various connection methods, and show pile bracing connection techniques.

Key Issues

- Verify pile alignment and correct, if necessary, before making connections.
- Carefully cut piles to ensure required scarf depths.
- Limit cuts to no more than 50 percent of pile cross section.
- Use corrosion-resistant connectors and fasteners such as those fabricated from stainless steel, or connectors and fasteners with corrosion protection such as provided by hot-dip galvanized coating (see Fact Sheet No. 1.7, *Coastal Building Materials*).
- Accurately locate and drill bolt holes.
- Field-treat all cuts and holes to prevent decay.
- Use sufficient pile and beam sizes to allow proper bolt edge distances.

Built-up beams should be designed as continuous members and not be broken over the piles. Some homebuilders are using engineered wood products, such as glued laminated timber and parallel strand lumber, which can span longer distances without splices. The ability to span longer distances without splices eases installation and reduces fabrication costs.

Note: Pile-to-beam connections must be designed by an engineer.

Figure 1. Pile-to-beam bolted connection.

Pile-to-beam connections must:

1. Provide required **bearing** area for beam to rest on pile.
2. Provide required **uplift** (tension) resistance.
3. Maintain beam in an **upright** position.
4. Be capable of resisting **lateral** loads (wind and seismic).
5. Be constructed with **durable** connectors and fasteners from corrosion-resistant materials or with corrosion protection in accordance with minimum requirements of the International Residential Code. The level of corrosion protection that can be expected will vary depending on the type of wood treatment and fastener type. Make sure the fastener is compatible with the wood variety selected for construction.

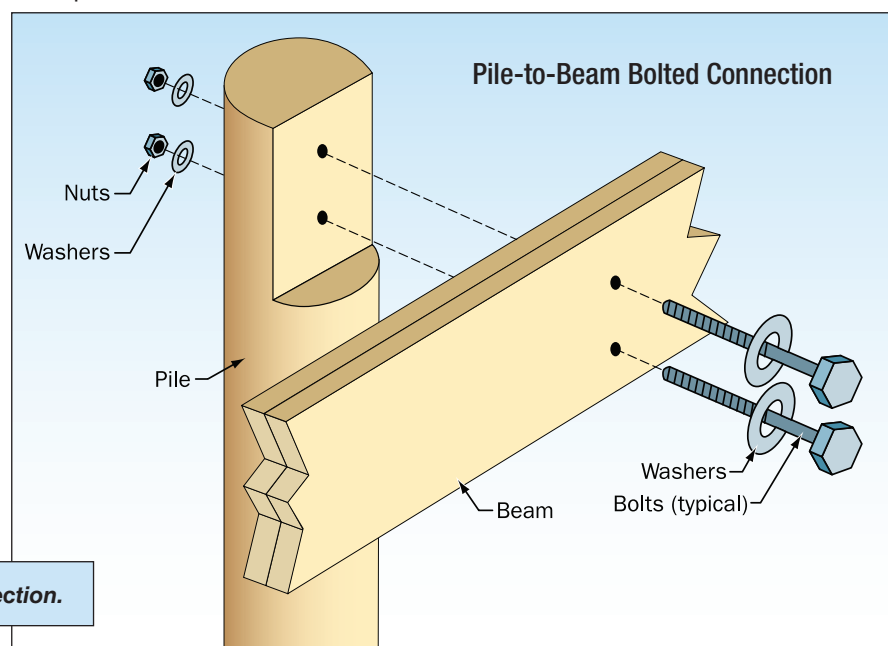
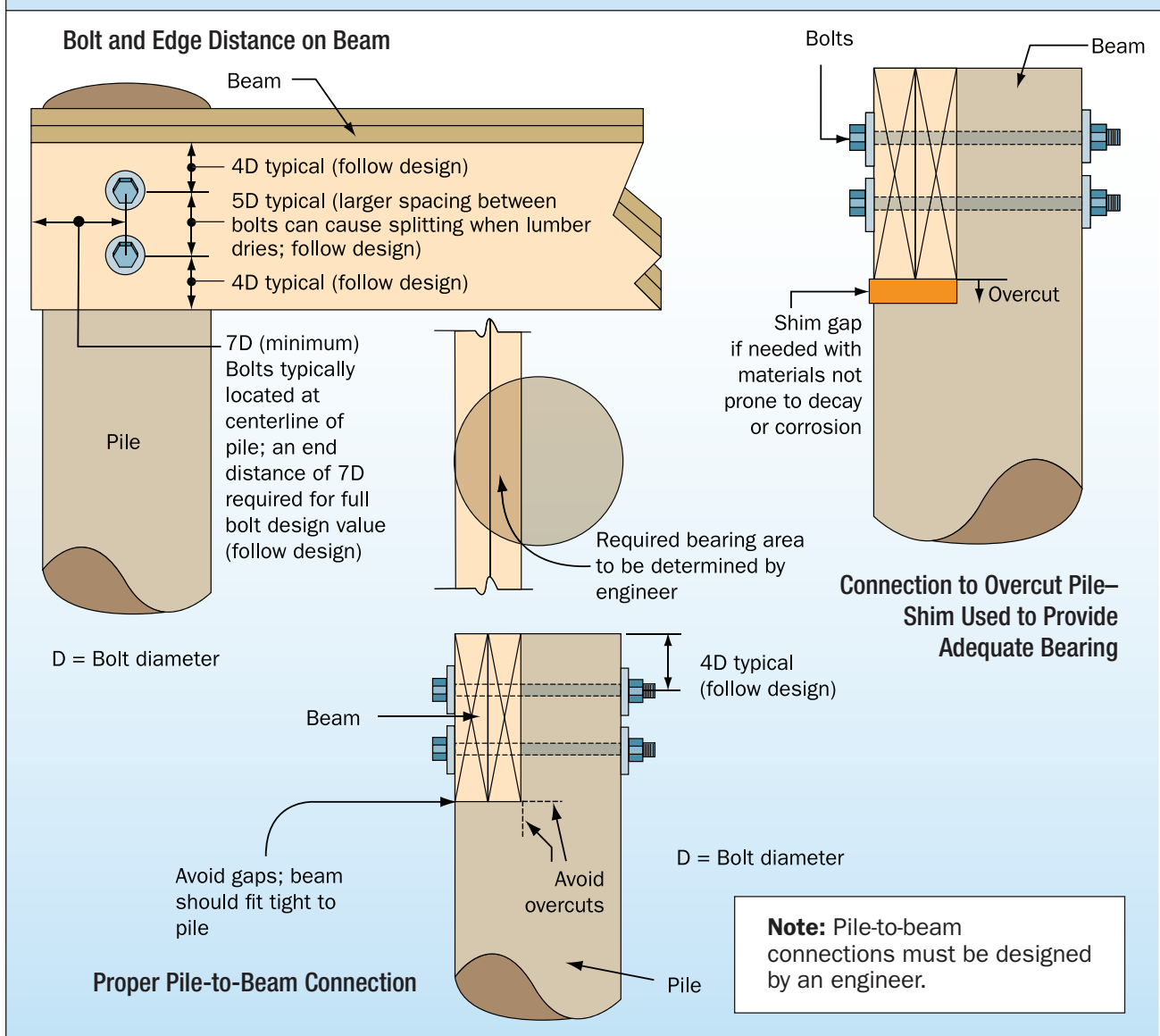


Figure 2. Proper pile-to-beam bolted connection.



Problem: misaligned piles—some piles are shifted in or out from their intended (design) locations.

There are five possible solutions to fix the problem. (See figure 3 and details in figure 4):

Option 1 – beam cannot be shifted.

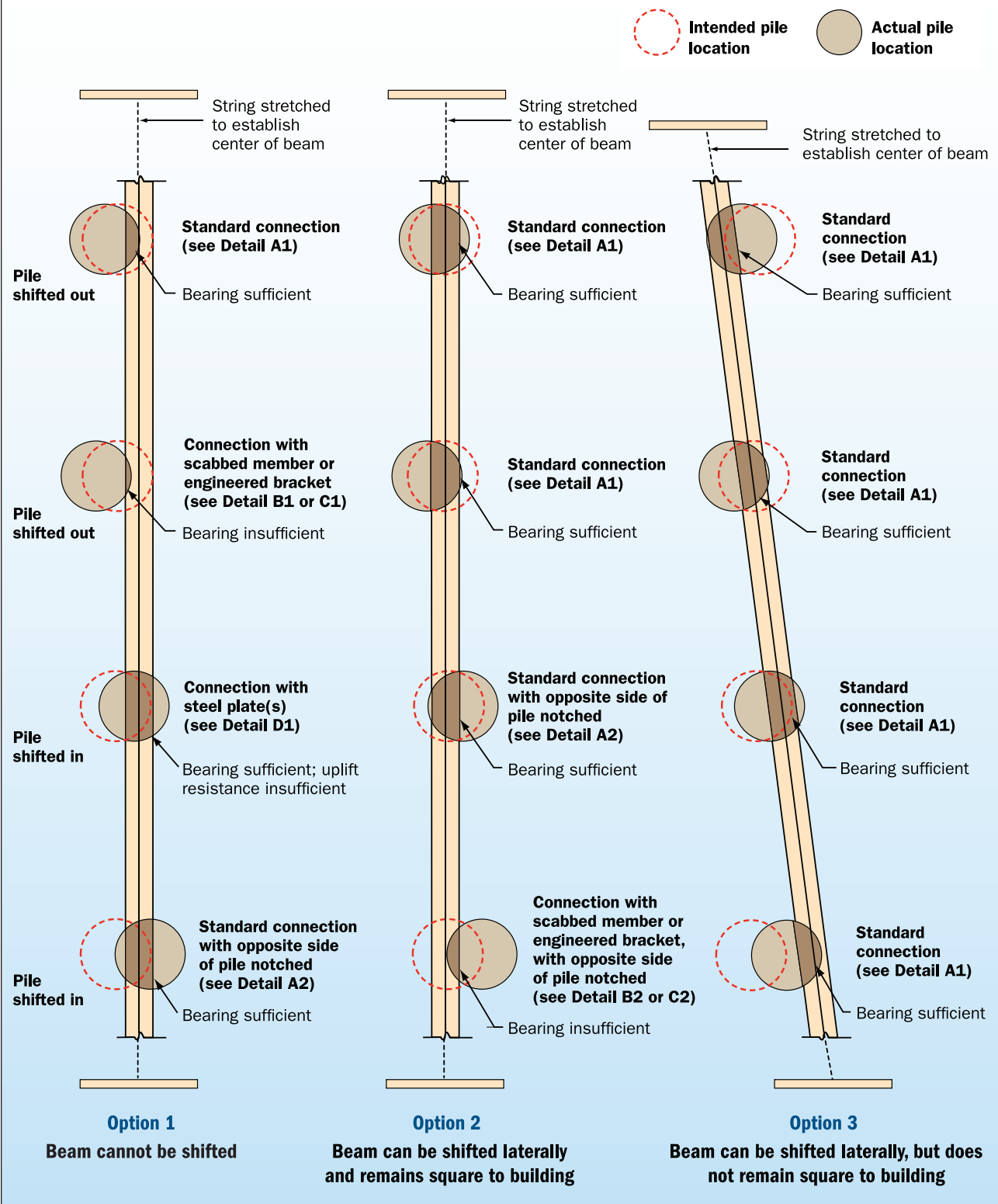
Option 2 – beam can be shifted laterally and remains square to building.

Option 3 – beam can be shifted laterally, but does not remain square to building.

Option 4 (not shown) – beam cannot be shifted, and connections shown in this fact sheet cannot be made; install and connect sister piles; an engineer must be consulted for this option.

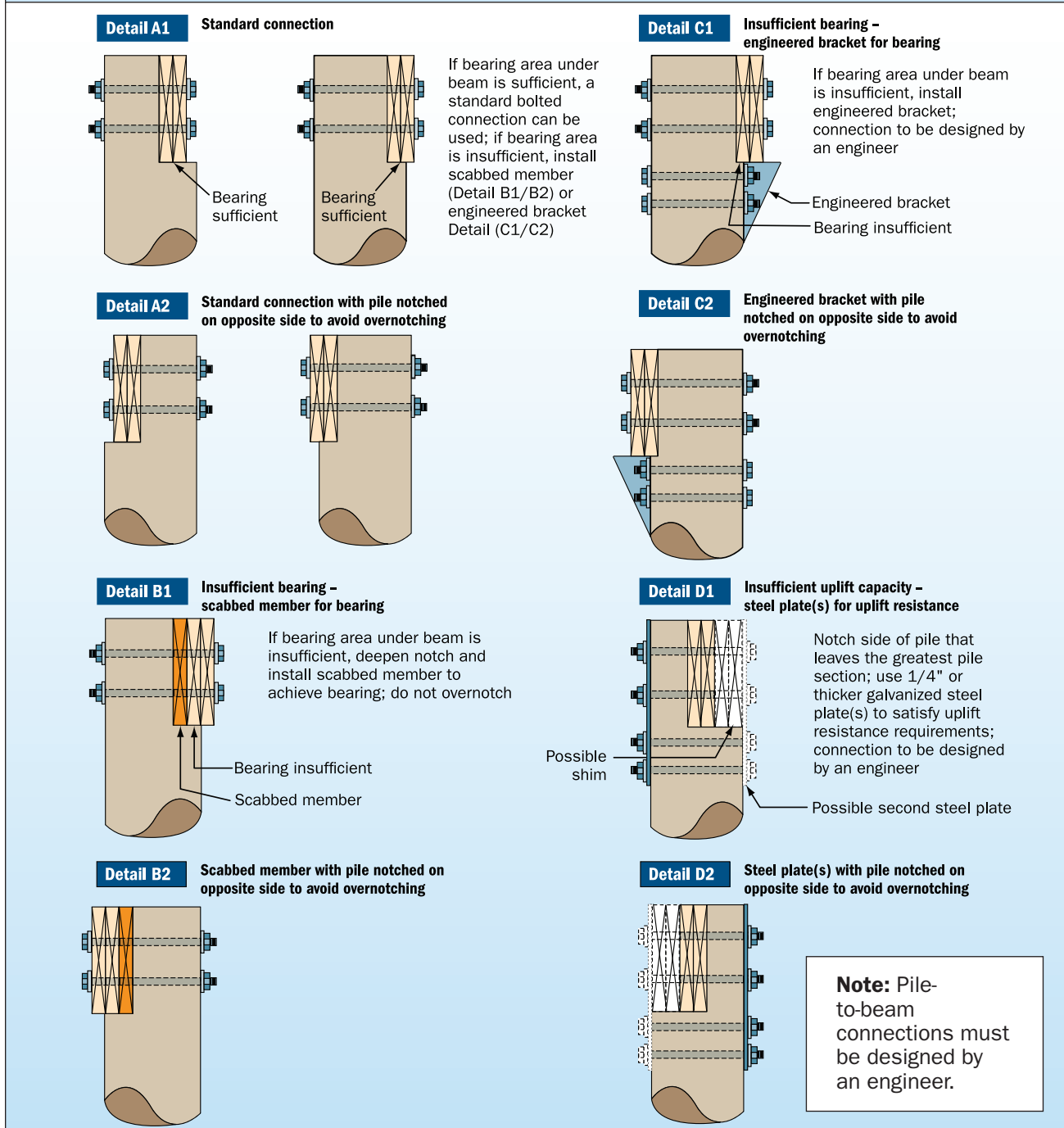
Option 5 (not shown) – beam cannot be shifted, and connections shown in this fact sheet cannot be made; remove and reinstall piles, as necessary.

Figure 3. Connection of misaligned pile.



Note: Pile-to-beam connections must be designed by an engineer.

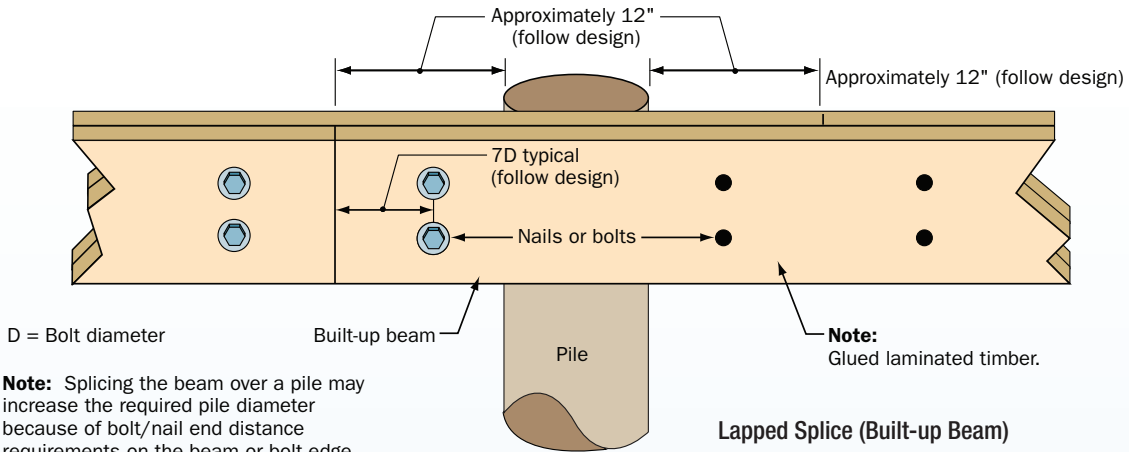
Figure 4. Connection details for misaligned piles.



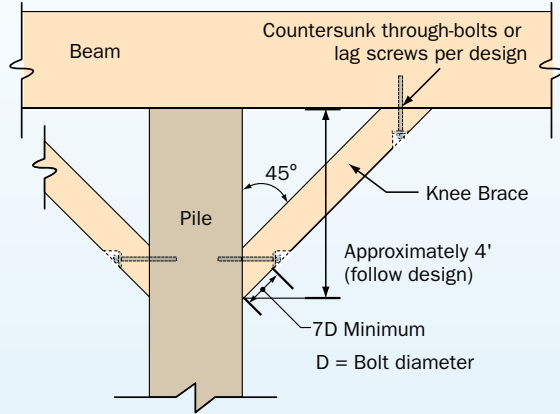
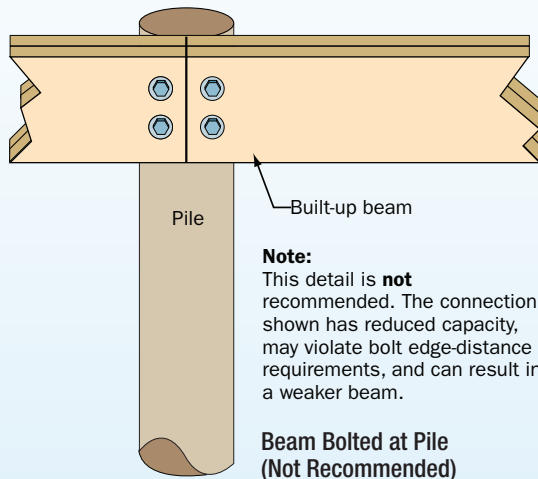
Connections to misaligned piles (see drawings on figure 3 and details above)

1. The ability to construct the pile-to-beam connections designed by the engineer is directly dependent upon the accuracy of pile installation and alignment.
2. Misaligned piles will require the contractor to modify pile-to-beam connections in the field.
3. Badly misaligned piles will require removal and reinstallation, sister piles, or special connections, all to be determined by the engineer.

Figure 5. Built-up beam connections, knee brace connections, and diagonal brace connections.

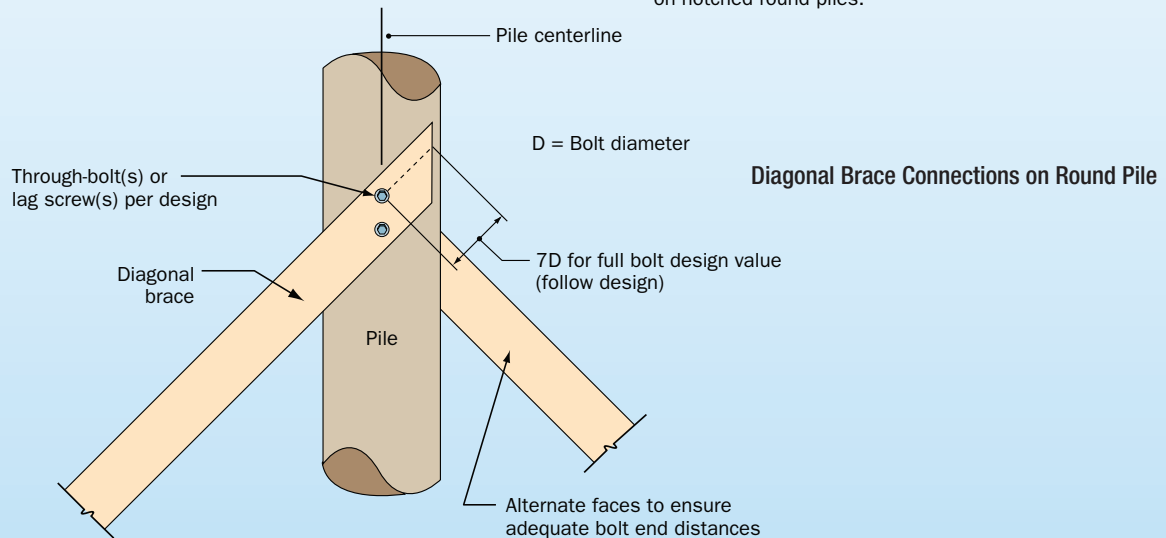


Note: Splicing the beam over a pile may increase the required pile diameter because of bolt/nail end distance requirements on the beam or bolt edge distance requirements on the pile.



Knee Brace Connection on Square Pile*

*Knee braces of this type can also be used on notched round piles.



Note: Pile-to-beam connections must be designed by an engineer.

Additional Resources

American Wood Council (AWC) (<http://www.awc.org>)

American Institute of Timber Construction (AITC) (<http://www.aitc-glulam.org>)

Developed in association with the National Association of Home Builders Research Center

