ASHI Reporter

July, 2016

Inspection News and Views from the American Society of Home Inspectors

Deck Stairs

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The Word A look at terms used in home inspection reports

Deck Stairs

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Once again, The Word invites you to travel into the dark realm of subjects that are sometimes misunderstood by home inspectors. The Word hopes you will find this trip informative and maybe a little entertaining.

Our subject this month is **decks.** The scariest deck demons are deck flashing and deck ledger attachments, which The Word will discuss in an upcoming column about decks. Meanwhile, there are other deck demons that are almost as scary; one of them is stairs.

Stair Safety

Inspectors should remember two important facts about stairs. The first fact is that stairs are one of the most dangerous systems we inspect. Falls involving stairs can result in serious personal injury; that is where the big money lies for attorneys. The second fact is that interior and exterior stairs share almost all of the same requirements. If anything, we should be more careful about applying current safety and structural requirements to exterior stairs because exterior stairs are subject to harsh environmental conditions that may exacerbate safety and structural problems. We should spend time inspecting all stairs, especially exterior stairs.

Inspection of stairs begins by determining if the stairs are safe for you and your client to use. Perform a

quick visual check of the stringers, including their condition, length and attachment to the deck. Check the condition of the treads. You do not want anyone on the stairs if they collapse, and you do not want anyone to trip on deteriorated treads. “Failed under test” is not a good explanation for stair-related injuries during an inspection.

Stringer Bearing on Support

Stringers usually have two bearing points. The plumb (vertical) cut usually bears on a rim joist or on a beam. The seat (horizontal) cut should, **at a minimum,** bear on a solid landing. The stringers should be supported at grade level by posts that bear on footings, but The Word does not recall ever seeing this installation detail. If there is good stringer bearing on a solid landing, The Word declares victory and moves on. Those who live in cold climates might consider being stricter about stringer footings because frost heave could move the stringers and loosen the connection at the plumb cut. Refer to **Figure 1** for a summary of stringer installation recommendations.

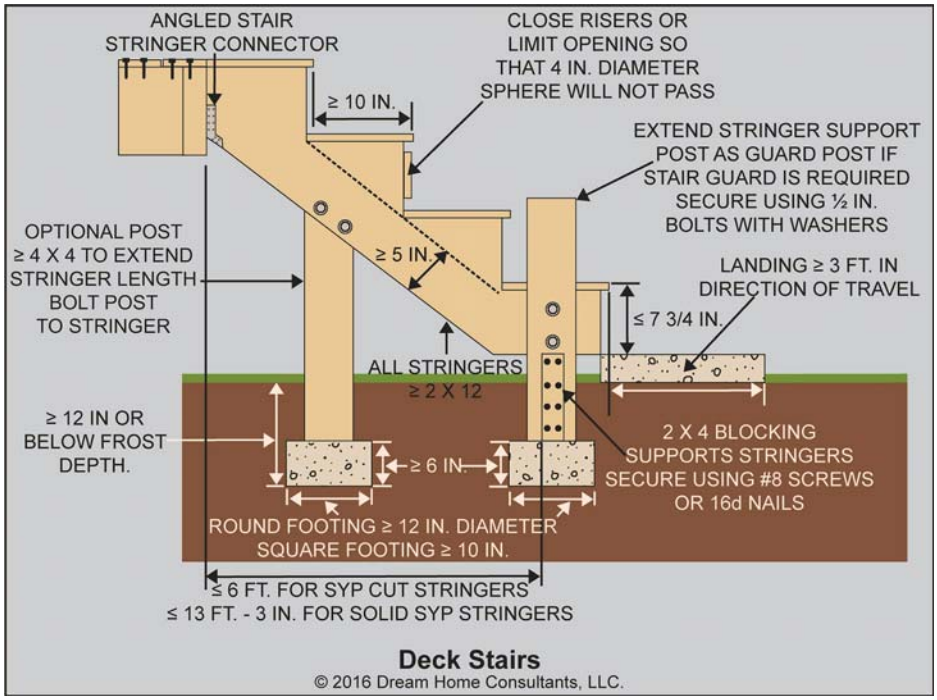

Figure 1

Stringer attachment at bearing points must help the stringer resist both vertical and lateral loads. The vertical load (gravity) pulls the stringer down from the bearing point. This is the load inspectors think about more often. The lateral (horizontal) load pulls the stringer away from the bearing point. The lateral load is often the cause of the stair collapse; the nails withdraw from the bearing point, then gravity takes over.

There are three ways to attach stringers to the rim joist or beam to resist both vertical and lateral loads: the right way, the wrong way and the wrong way that might work. The right way is uncommon. The wrong way is the norm. The wrong way that might work is the scariest because it might work or it might not.

The right way to attach the stringer plumb cut to the rim joist or beam is by using a connector, such as a

Simpson LSC or LSSU, installed according to manufacturer's instructions, including using the recommended fasteners. Connectors provide both the vertical and lateral support for the stringer. **Photo 1** shows an attempt to attach a stringer using a connector. Good try, but there are still problems. The stringer should fully bear on the connector seat. Screws are not allowed unless specifically allowed by manufacturer's instructions, and then, only manufacturer-supplied screws may be used. Deck screws and drywall screws are not allowed.

Photo 1

The wrong way to attach the stringer plumb cut to the rim joist or beam is using nails that are subject to withdrawal.

This is always wrong. Nails are subject to withdrawal unless the stringer is secured somewhere against lateral movement. If the stringers are bearing on a landing with no attachment to the landing and no other attachment that resists lateral loads, then the nails are subject to withdrawal. If the stringers are bearing on the ground, that is even worse. **Photo 2** shows a stringer that is pulling away from the rim joist after less than one year.

Photo 2

The wrong way that might work is when stringers are attached using nails that may not be subject to withdrawal. This method usually involves installing the nails at an angle through the stringer into the rim joist, a method called toe-nailing in some areas. This method sometimes involves installing the nails through the rim joist into the stringer plumb cut, a method called end-nailing in some areas. Stringer attachment using nails that are not subject to withdrawal might work if an adequate quantity of the correct nails is installed, if the nails are properly installed (there are rules about how to correctly install toe-nails), and if the wood and the nails maintain their integrity over the life of the deck. That is a lot of ifs—more than The Word is comfortable with. The Word recommends installing stringer connectors on all stringers that are nailed at the rim joist, beam or a drop header.

As we have discussed, the right way to attach a stringer is to use a connector. A properly installed connector makes stringer installation easy and can eliminate complications such as a drop header. Perhaps carpenters have not received the memo about these connectors or perhaps they like to do things the hard way. In either case, there are two common methods of positioning the stringer relative to deck flooring.

The best place to position a stringer, from a stringer attachment perspective, is to place the top tread even with the deck flooring. This allows the stringer plumb cut to fully bear on the rim joist or beam, and it provides the maximum fastening area. Carpenters do not like this method because they claim it makes installing the stair guards and handrails more difficult. A common stringer placement, therefore, is to place the top tread one riser below the deck flooring. There are two common ways to accomplish this. **Photo 3** shows one method, which is clearly a job for Obviousman. The other method is to use a drop header.

Photo 3

A drop header is a piece of lumber installed below the rim joist or beam. The stringer plumb cut bears partly on the drop header and partly on the rim joist or beam. If a drop header is used, the attachment of the drop header to the rim joist or beam is important. Attachment using nails is always wrong because the nails are subject to withdrawal over time. **Photo 4** shows a drop header secured using only nails. Proper attachment of the drop header to the rim joist or beam involves installing bolts through lumber to connect the drop header and rim joist or beam.

Photo 4

The Word is not aware of a prescriptive detail for connecting a drop header to a rim joist or beam. The following is a common detail that is accepted in some areas. Use at least two 2x4s. Install at least a ⅜-inch diameter bolt through the drop header and through the rim joist or beam. The bolts should be located as close as possible to the center of the 2x4, horizontally, so there is enough wood between the bolt and edge of the wood to resist wood splitting and shearing. 2 inches is a safe distance in this case.

Photo 5 shows a bolted drop header. The top bolt is too close to the right edge of the 2x4; if you look closely, the 2x4 is split. Otherwise, it is a decent effort at a drop header installation.

Photo 5

Assuming that the stringers are not supported at the bottom by posts and footings, the next best stringer seat cut bearing on support is to have the entire area of the seat cut below the bottom tread bearing on support. The stringer is better able to support the imposed loads with more wood on a bearing surface. At a minimum, 1. inches of the seat cut heel should bear on support. The seat cut toe should not be the only part of the stringer bearing on support. We should report configurations such as shown in **Photo 6** as significant deficiencies requiring correction. These configurations can allow the stringer to shear along the wood grain, resulting in stair collapse.

Photo 6

Stringer Construction

There are two styles of stringers. The cut stringer is by far the most common style. A cut stringer is made by cutting triangles into the stringer to obtain the risers and treads. The other, less common style is the

solid stringer. Solid stringer treads bear on manufactured brackets or on lumber fastened to the stringer. A solid stringer is stronger than a cut stringer; thus, a solid stringer may span farther without support. A cut stringer made from Southern pine may only span six feet between supports. A solid stringer may span 13 feet, 3 inches.

A stringer should be made using at least a 2x12 and the spans noted in the previous paragraph assume this. A stringer made using a 2x10 may work, but it is difficult to obtain the recommended stringer throat depth when cutting a 2x10. The throat is the area of uncut wood at the smallest point. The throat should be at least 5 inches deep. If a saw kerf extends past the riser/ tread triangle, the measurement is to the saw kerf. **Photo 7** shows a stringer throat that is way too small. Refer to **Figure 1.**

Photo 7

Risers and Treads

As we discussed earlier, deck stairs share the same requirements as interior stairs. The maximum riser height depends on local rules and on when the stairs were built. The current maximum riser height in most areas is 7. inches. The Word does not get concerned unless the riser height is more than about 8 inches. Riser height difference is more of a concern because having different heights between risers is a trip hazard. The maximum riser height difference between any two risers in a flight of stairs is ⅜ inch. The Word is strict about reporting riser height differences.

Deck stairs are more likely to have open risers than are interior stairs. Open risers that are more than 30 inches above grade should not allow a 4-inch diameter sphere to pass.

The most common deck stair tread problem that The Word sees is loose and deteriorated treads. Loose and deteriorated treads should not surprise anyone. If there is any surprise, it is that treads last as long as they do. Treads are usually nailed and even deformed shank-type nails will withdraw eventually when the cut part of the stringer deteriorates because of weather exposure (the cut is almost always not preservative-treated). Treads are installed horizontally and may be subjected to prolonged exposure to moisture. Exposure to moisture can cause wood deterioration and distortion such as cupping. Southern pine sizes 2x6 and larger can be especially prone to deterioration and cupping.

The minimum tread depth is 10 inches in most parts of the country. The easy way to achieve the 10-inch depth with deck stairs is to use two 2x6s or two 5/4x6s, which produce a tread depth of a little over 11 inches (assuming the recommended ⅛-inch space is left between the two boards). Treads that are 6 inches or less nominal depth should not span more than 18 inches between supports. Tread span is usually not an issue for the common 36-inch wide stairway with cut stringers and lumber treads.

The Bottom Line

The lesson for this column is this: Do not be the inspector who fails to report deck defects. The deck demons may haunt you if you do not find them and report them. Memo to Hestia (goddess of the home and hearth): The Word does not reside on Mt. Olympus (just at its base) and welcomes other viewpoints. Send your lightning bolts or emails to Bruce@DreamHomeConsultants.com. The thoughts contained herein are those of The Word; they are not ASHI standards or policies.

Bruce Barker is the founder and president of Dream Home Consultants, and the author of Everybody's Building Code, *written to help home inspectors understand the International Residential Code. Bruce has been building and inspecting homes since 1987. He currently serves on the ASHI Board of Directors. He is a certified Residential Combination Inspector and a licensed contractor in Arizona, Florida and North Carolina. To read more of Bruce's articles or if you need a presenter at your next chapter event, go to www.dreamhomeconsultants. com.*