



# Fasteners

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This handout is intended only as a guide and is based in part on the 2020 Minnesota State Building Code, Blaine City ordinances, and good building practice. While every attempt has been made to insure the correctness of this handout, no guarantees are made to its accuracy or completeness. Responsibility for compliance with applicable codes and ordinances falls on the owner or contractor. For specific questions regarding code requirements, refer to the applicable codes or contact your local Building Department.

ROOFING			
Asphalt Shingles	Mineral-surfaced Roll Roofing	Wood Shingles	Wood Shakes
Fasteners for asphalt shingles must be galvanized steel, stainless steel, aluminum, or copper roofing nails, minimum 12 gauge shank with a minimum 3/8" diameter head and of a length to penetrate through the roofing materials and a minimum of 3/4" inch into roof sheathing or when roof sheathing is less than 3/4" thick, the fastener shall penetrate through the sheathing.	Roll roofing must be installed in accordance with the manufacturer's installation instructions.	Fasteners for wood shingles must be corrosion-resistant with a minimum penetration of 1/2" into the sheathing. For sheathing less than 1/2" in thickness, the fastener shall extend through the sheathing. A minimum of two fasteners per shingle are required.	Fasteners for wood shakes must be corrosion-resistant with a minimum penetration of 1/2" into the sheathing. For sheathing less than 1/2" in thickness, the fastener shall extend through the sheathing. A minimum of two fasteners per shake are required.

FIBERBOARD WALL SHEATHING TO FRAMING A, B, C			
Table R602.3(1)			
Sheathing Type	Type of Fastener	Spacing of Fasteners	
		Edges (Inches)	Intermediate Supports (Inches)
1/2" regular cellulosic fiberboard sheathing	1 1/2" galvanized roofing nails; 6d common nails; staples 16 ga., 1 1/2" long	3	6
1/2" structural cellulosic fiberboard sheathing	1 1/2" galvanized roofing nails; 8d common nails; staples 16 ga., 1 1/2" long	3	6
25/32" structural cellulosic fiberboard sheathing	1 3/4" galvanized roofing nails; 8d common nails; staples 16 ga., 1 1/2" long	3	6

- All nails are smooth-common, box or deformed shanks except where otherwise stated.
- Staples are 16-gauge wire and have a minimum 7/16-inch on diameter crown width.
- Four-foot-by-8-foot or 4-foot-by-9-foot wall panels must be applied vertically.

## GYPSUM BOARD

Table R702.3.5

Thickness of Gypsum Board	Size of Fasteners to Wood Framing
3/8"	<p>Nails: 13 gage, 1 1/4" long, 19/64" head; 0.098 diameter, 1 1/4" long, annular-ringed; or 4d cooler nail, 0.080" diameter, 1 3/8" long, 7/32" head.</p> <p>Screws: Screws shall be Type S or W and penetrate into wood framing a minimum of 5/8 inch.</p>
1/2 "	<p>Nails: 13 gage, 1 3/8" long, 19/64" head; 0.098 diameter, 1 1/4" long, annular-ringed; 5d cooler nail, 0.086" diameter, 1 5/8" long, 15/64" head; or gypsum board nail, 0.086" diameter, 1 5/8" long, 9/32" head.</p> <p>Screws: Screws shall be Type S or W and penetrate into wood framing a minimum of 5/8 inch.</p>
5/8"	<p>Nails: 13 gage, 1 5/8" long, 19/64" head; 0.098 diameter, 1 3/8" long, annular-ringed; 6d cooler nail, 0.092" diameter, 1 7/8" long, 1/4" head; or gypsum board nail, 0.0915" diameter, 1 7/8" long, 19/64" head.</p> <p>Screws: Screws shall be Type S or W and penetrate into wood framing a minimum of 5/8 inch.</p>

## WOOD STRUCTURAL PANELS, SUBFLOOR, ROOF AND WALL SHEATHING, AND PARTICLEBOARD WALL SHEATHING TO FRAMING A, B, C, D

Table R602.3(1)

Sheathing Thickness	Type of Fasteners	Spacing of Fasteners	
		Edges (Inches) <sup>f</sup>	Intermediate Supports (Inches)
5/16 – 1/2	6d common nail (subfloor, wall) 8d common nail, (roof) <sup>e</sup>	6	12
19/32 – 1	8d common nail	6	12
1 1/8 – 1 1/4	10d common nail or 8d deformed nail	6	12

- a. All nails are smooth-common, box or deformed shanks except where otherwise stated.
- b. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.
- c. Four-foot-by-8-foot or 4-foot-by-9-foot wall panels must be applied vertically.
- d. Wood structural panels include plywood, OSB or composite panels.
- e. Nails for attaching wood structural panel roof sheathing to gable end wall framing must be spaced 6 inches on center.
- f. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and at all floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and at all roof plane perimeters. Blocking of roof or floor sheathing panel edges perpendicular to the framing members shall not be required except at intersection of adjacent roof planes. Floor and roof perimeters shall be supported by framing members or solid blocking.

# EXTERIOR FINISHES<sup>a, b, c, d, e</sup>

Table R703.4

SIDING MATERIAL		TYPE OF SUPPORTS FOR THE SIDING MATERIAL AND FASTENERS				
		Wood or wood structural panel sheathing	Fiberboard sheathing into stud	Gypsum sheathing into stud	Direct to studs	Number or spacing of fasteners
Horizontal Aluminum (must use aluminum fasteners)	Without Insulation	0.120" nail 1 ½" long	0.120" nail 2" long	0.120" nail 2" long	Not allowed	Same as stud spacing
	With Insulation	0.120" nail 1 ½" long	0.120" nail 2 ½" long	0.120" nail 2 ½" long	Not allowed	
Hardboard panel siding-vertical		0.092" nail, min. head diam. 0.225, nail must accommodate sheathing and penetrate framing 1.5 inches	0.092" nail, min. head diam. 0.225, nail must accommodate sheathing and penetrate framing 1.5 inches	0.092" nail, min. head diam. 0.225, nail must accommodate sheathing and penetrate framing 1.5 inches	0.092" nail, min. head diam. 0.225, nail must accommodate sheathing and penetrate framing 1.5 inches	6" panel edges, 12" intermediate supports
Hardboard lap-siding-horizontal		Minimum shank diameter of 0.099", min. head diameter of 0.240", and nail length must accommodate sheathing and penetrate framing 1 ½"	Minimum shank diameter of 0.099", min. head diameter of 0.240", and nail length must accommodate sheathing and penetrate framing 1 ½"	Minimum shank diameter of 0.099", min. head diameter of 0.240", and nail length must accommodate sheathing and penetrate framing 1 ½"	Minimum shank diameter of 0.099", min. head diameter of 0.240", and nail length must accommodate sheathing and penetrate framing 1 ½"	Same as stud spacing, 2 per stud
Steel siding		0.113 nail – 1 ¾" long, Staple – 1 ¾" long	0.113 nail – 2 ¾" long, Staple – 2 ½" long	0.113 nail – 2 ½" long, Staple – 2 ¼" long	Not allowed	Same as stud spacing
Plywood panel (exterior grade)		0.099 nail – 2" long	0.113 nail – 2 ½" long	0.099 nail – 2" long	0.099 nail – 2" long	6" on edges
Vinyl siding		0.120" nail 1 ½" long, Staple 1 ¾" long	0.120" nail 2" long, Staple 2 ½" long	0.120" nail 2" long, Staple 2 ½" long	Not allowed	Same as stud spacing
Wood rustic drop siding	Fastener penetration into stud – 1"				0.113 nail – 2 ½" long, Staple – 2" long	Face nailing up to 6" widths – 1 per bearing; 8" widths and over, 2 nails per bearing
Wood shiplap siding						
Wood bevel siding						
Wood butt tip siding						

- All applications are based on a stud spacing of 16" o.c. Where studs are spaced 24 inches, siding shall be applied to sheathing approved for that spacing.
- Nail is a general description and shall be T-headed, modified round head, or round head with smooth or deformed shanks.
- Staples must have a minimum crown width of 7/16" outside diameter and be manufactured of minimum No. 16 gauge wire.
- Nails or staples shall be aluminum, galvanized, or rust-preventative coated and shall be driven into the studs for fiberboard or gypsum backing.
- Aluminum nails must be used to attach aluminum siding.

# STRUCTURAL MEMBERS A, B, C

Table 602.3(1)

Description of Building Elements	Number and Type of Fasteners	Spacing of Fasteners
Joist to sill or girder	3-8d	---
Sole plate to joist or blocking, face nail	16d	16" o.c.
Top or sole plate to stud, end nail	2-16d	---
Stud to sole plate, toe nail	3-8d or 2-16d	---
Double studs, face nail	10d	24" o.c.
Double top plates, face nail	10d	24" o.c.
Sole plate to joist or blocking at braced wall panels	3-16d	16" o.c.
Double top plates, minimum 24 inch offset of end joints, face nail in lapped area	8-16d	---
Blocking between joists or rafters to top plate, toe nail	3-8d	---
Rim joist to top plate, toe nail	8d	6" o.c.
Top plates, laps at corners and intersections, face nail	2-10d	---
Built-up header, two pieces with 1/2 " spacer	16d	16" o.c. along each edge
Continued header, two pieces	16d	16" o.c. along each edge
Ceiling joists to plate, toe nail	3-8d	---
Continuous header to stud, toe nail	4-8d	---
Ceiling joist, laps over partitions, face nail	3-10d	---
Ceiling joist to parallel rafters, face nail	3-10d	---
Rafter to plate, toe nail	2-16	---
1" brace to each stud and plate, face nail	2-8d 2 staples, 1 3/4"	--- ---
Built-up corner studs	10d	24" o.c.
Built-up girders and beams, 2-inch lumber layers	10d	Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.
Roof rafters to ridge, valley or hip rafters: Toe nail	4-16d	---
Face nail	3-16d	---
Rafter ties to rafters, face nail	3-8d	---

- a. All nails are smooth-common, box or deformed shanks except where otherwise stated.
- b. Staples are 16-gauge wire and have a minimum 7/16-inch on diameter crown width.
- c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.

## Corrosion Resistant Nails

### Stainless Steel Nails

Approved stainless steel nails come as either Type 304 or Type 316. Stainless steel nails provide superior resistance to corrosion and are required for portions of the construction of wood foundation systems. If you are using a wood foundation system, make sure you are using the right fasteners in the right locations.

### Hot-dipped galvanized (zinc coated) steel nails

Nails are dipped in molten zinc to give each nail a thick coating of zinc. Hot dipped nails are required in wood foundation applications where stainless steel is not required and may be used in other situations which require corrosion resistant fasteners.

### Hot-tumbled galvanized (zinc coated) steel nails

Nails are galvanized by putting zinc chips into a hot, rotating barrel with the nails with the zinc then “washing” off on the nails. These nails may also be used in wood foundations where stainless steel nails are not required and may be used in other situations that require corrosion resistant fasteners.

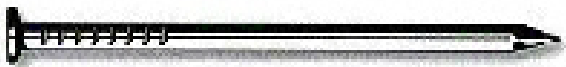
### Electro galvanized steel nails

This method of corrosion protection uses electricity to put a thin shiny coating of zinc on the nails. Electro galvanized nails may not be used in the construction of wood foundations but may be used in others areas of building construction requiring corrosion resistant fasteners.

### Mechanical galvanized steel nails

This is a cold process that hammers zinc powder on to nails to give them a galvanized coating. Mechanically galvanized nails may not be used in the construction of wood foundations but may be used in others areas of building construction requiring corrosion resistant fasteners.

## COMMON CONSTRUCTION NAILS



**Common Nails** – Common nails are the most popular nails in use today. They are the basic nail for most construction. They are usually available with flat heads and diamond points, although they are sometimes manufactured with other head and point designs. Most common nails have a cement or vinyl coating that improves their holding power. Suitable for a wide variety of purposes, common nails are used primarily for structural framing, scaffolding and general carpentry.



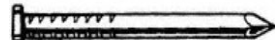
**Box Nails** – Box nails are used for light construction and rough work in soft woods. Box nails are of the same general design as common nails but are made of a smaller wire gauge. Because of their smaller diameter, they are easily driven and less likely to split wood. Most box nails have a cement or vinyl coating that improves their holding power.



**Finishing Nails** – Finishing nails are slightly smaller in diameter than common nails. Finishing nails are those made for interior trim, finish carpentry, cabinetwork, and furniture building. Their small, cupped head help to position the nail set to countersink the head of the nail below the surface of the wood.



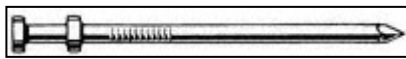
**Casing Nails** - Casing nails, with their deep, wedge-shaped heads, are used for interior trim, finish carpentry, cabinet making and furniture. They are most often used where a nail heavier than a finishing nail is required. Like finishing nails, they also have cupped heads for easier nail setting. In their corrosion resistant form, they are also used for exterior applications.



**Joist Hanger Nails** – Joist hanger nails are specially made for use with joist hangers. These nails have specific head sizes, thickness, steel and shank designs, and point configurations to insure conformity with the joist hanger manufacturers published values. When using any connector, the manufacturers published literature should be consulted to insure that the proper fastener is being used. Screws should not be substituted unless specified by the manufacturer.



**Cut Nails** – Cut nails are made from sheets of specially hardened steel in a wide range of lengths, dimensions and head designs. They are wedge-shaped with squared edges to cut through wood without splitting. Cut nails should be driven with their widest dimension parallel to the grain of the wood. The most widely used cut nail is the furring or concrete nail, for fastening wood or metal to cement, masonry or building block walls.



**Duplex Head Nails** – Duplex head nails are used for scaffolding, forms and other temporary construction. They are easy to pull, safe dismantling time, lumber and nails.



**Masonry Nails** – In addition to the cut nail, there are several other types of masonry nails. These nails are made of high carbon steel for maximum hardness to insure easiest possible penetration. They are mainly used for fastening lumber to concrete or masonry.



**Roofing Nails** – Roofing nails are designed for the application of asphalt and fiberglass shingles on new construction and reroofing jobs. Roofing nails are corrosion resistant. Their broad heads resist pulling through shingles during high winds. Nails should be long enough to penetrate  $\frac{3}{4}$  inch into the wood deck lumber or completely through plywood decking. Roofing nails also come in ring and spiral shanks for additional holding power in high-wind areas.



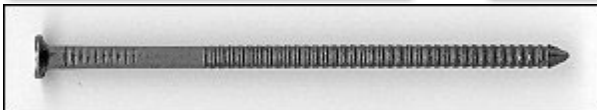
**Shingle Nails** - Shingle nails are used for the application of wood roofing products. Because of their smaller head, they should never be used for asphalt roofing applications. Shingle nails should always be corrosion resistant.



**Drywall Nails** – Drywall nails are used for the application of drywall. Their ring shank design adds additional holding power.



**Siding Nails** – Siding nails are designed for face and blind nailing differing types of manufactured siding products. Only corrosion resistant nails may be used for siding applications.



**Deformed Shank Nails** – Deformed shank nails are nails with ringed, screwed, threaded, clinched or barbed shanks to increase the withdrawal strength of the nail.



**Deck screws** – Deck screws are a popular fastener for fastening decking to framing on exterior decks because of their ease of installation and ability to resist withdrawal. Deck screws come in square drive, star drive, torx drive, and Philips head.



**Wood screws** – Wood screws are used when a fastener stronger than a nail is needed. Wood screws are tapered so as to help draw wood together as the screw is inserted. Screw heads are usually flat, oval, or round depending on the desired final appearance. Screws should penetrate 2/3 of the combined thickness of the materials being joined. Galvanized or corrosion resistant screws should be used where rust could be a problem. Lubricating screws with soap or beeswax will ease installation. A pilot hole (usually 2 sizes smaller than the shank of the screw) should always be made before driving a screw. This is especially crucial in hardwoods or when driving a screw near the end of a board. When working with screws of a larger diameter, a pilot hole of the same diameter as the shank of the screw should be drilled into the wood to a depth of 1/3 the length of the screw.





**Cabinet screws** – Cabinet screws are use for cabinet assembly and installation. They come in a variety of lengths with both Phillips and #2 square heads.



**Drywall Screws** – Drywall screws are designed for holding power and ease of penetration. While both Type S and Type W drywall screws can be used to attach drywall to wood framing, only Type S screws can be used for application of drywall to steel studs.



**Anchor bolts** – Anchor bolts are set into concrete and masonry slabs and foundations for anchoring sills and plates. Anchor bolts must be a minimum of 1/2" diameter and extend a minimum of 7 inches into masonry or concrete.



**Carriage bolts**



**Stove bolt**



**Hex bolt**



**Lag screws**

**Carriage bolts, stove bolts, hex bolts, and lag screws** – are all used in wood framing when strength beyond what can be provided with nails is required. These fasteners come in a wide variety of sizes, strengths, and finishes.