



**The following presentation was
made to RICOWI in 2017 and has
been updated in 2023**

Part 1



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This information has been provided by
ISANTA – International Staple, Nail & Tool Association
ISANTA members are industry leaders in power fastening tools
and fasteners.

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Nails 101



If you are involved in building design, construction or inspection you have no doubt been involved with nails. But what do you really know about a nail?

This presentation will cover some of the basic aspects of nails, applications and some of the terminology you may have experienced in the industry.



What is a nail?

By definition – a straight, slender fastener, usually pointed and headed; typically 6 inches or less in length; designed to be driven; to hold two or more pieces together or to act as support.



Most nails made today are formed from wire

Nails consist of 3 basic components



The Head



The Shank



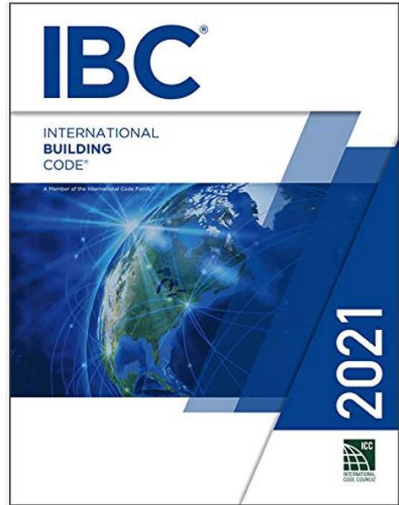
The Point



**Before getting into the
specifics regarding nails
let's explore where they
are referenced in the various**

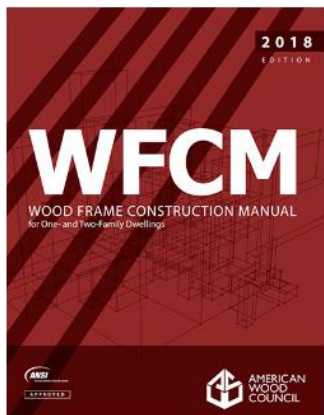
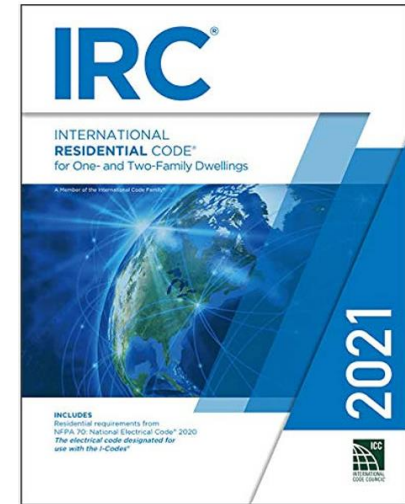
Codes and Standards

There are various standards and codes that reference nails and staples.
Among the more prominent are:

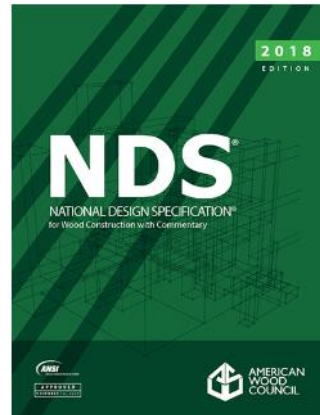


Designation: F1667/F1667M – 21a

Standard Specification for
Driven Fasteners: Nails, Spikes, and Staples¹

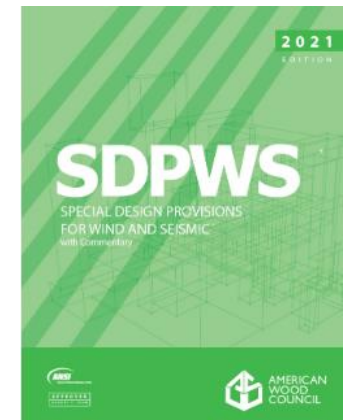


American Wood Council's Wood Frame Construction Design Manual for One-and Two Family Dwellings



American Wood Council's National Design Specification

American Wood Council's Special Design Provisions for Wind and Seismic



ASTM F1667 provides specifications regarding such subjects as:



Designation: F1667 - 15

Standard Specification for
Driven Fasteners: Nails, Spikes, and Staples¹

-terminology

-dimensions and tolerances for
nail heads
nail shanks

-materials of fabrication
steel
stainless steel
copper
etc.

-coatings

hot dip galvanized
electrogalvanized
coated
etc.

-mechanical properties

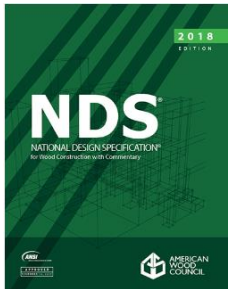
bending yield strength
ductility

-packaging requirements & labeling



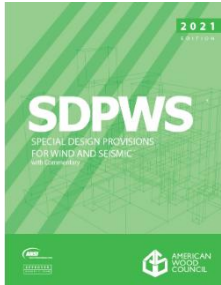
The NDS provides industry specifications including but not limited to

- Terminology for use of fasteners (e.g. edge distance, spacing, etc.)
 - Reference nail withdrawal values
 - Reference lateral design values
 - Adjustments for Reference Design Values





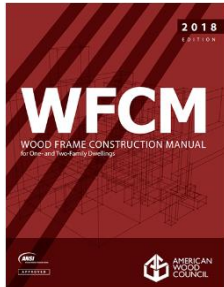
SDPWS provides industry specifications including but not limited to



- Design and construction requirements for diaphragms (roofs and floor) and shear walls
 - Shear capacities for diaphragms
 - Shear capacities for shear walls




The WFCM provides industry specifications including but not limited to



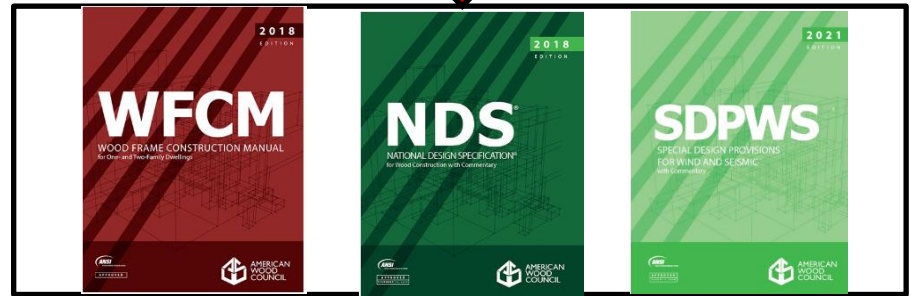
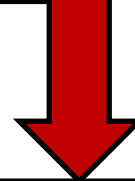
- Reference to material standards and definitions
 - Engineering Design for
 - ❖ Connections
 - ❖ Floor Systems
 - ❖ Wall System
 - ❖ Roof System
 - Prescriptive Design for
 - ❖ Connections
 - ❖ Floor Systems
 - ❖ Wall System
 - ❖ Roof System

Code & Standard Relationship

 Designation: F1667/F1667M - 21a

Standard Specification for
Driven Fasteners: Nails, Spikes, and Staples¹

F1667 Fasteners Referenced



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Referenced



Fasteners Referenced



Code & Standard References

The list is long and prominent
Within the 2021 IBC

Chapter 15 Roof Assemblies and Rooftop
Structures “nails” are mentioned 37 times.

Chapter 23 Wood
“nails” are mentioned over 186 times
“staples” are mentioned 91 times

Within the 2021 IRC

there are 371 references to nails
71 references to staples



Nails 101.a

Components of a Nail

The Nail Head



Full Round



Offset Round



D-Head



Notched Head

photos courtesy of Falcon Fasteners

Typical head configurations used in construction and in particular with power tools.

There are other types such as finish, brad, umbrella, washered, etc.



The Nail Head



Full Round



Offset Round



D-Head



Notched Head

Driven by a hammer or specific power tools (nailers)

These styles are intended for use in power tools (nailers) and are collated to maximize the number of nail per pack and use in the particular type of tool for the job



Nail Construction

The head is formed in the tooling when the end of the wire is struck with a device appropriately named a “hammer” which causes the material to cold flow into the cavity of the tooling, forming the head.

It should be noted that there are limitations in forming the head.

The material will only consistently flow so far.

And the applied force to form a head is limited or else premature tool wear takes place.



Typical Nail Shanks



Smooth



Ring



Screw



Barbed



Smooth Shank Nails

Smooth shanks are the result of forming round wire into a nail.

A feature to note on the shank is the gripper marks below the nail head.

The wire is firmly gripped to hold in place during the forming of the nail creating this feature on the shank.

Gripper marks are not a “performance” enhancing feature of a nail.



Nail Construction

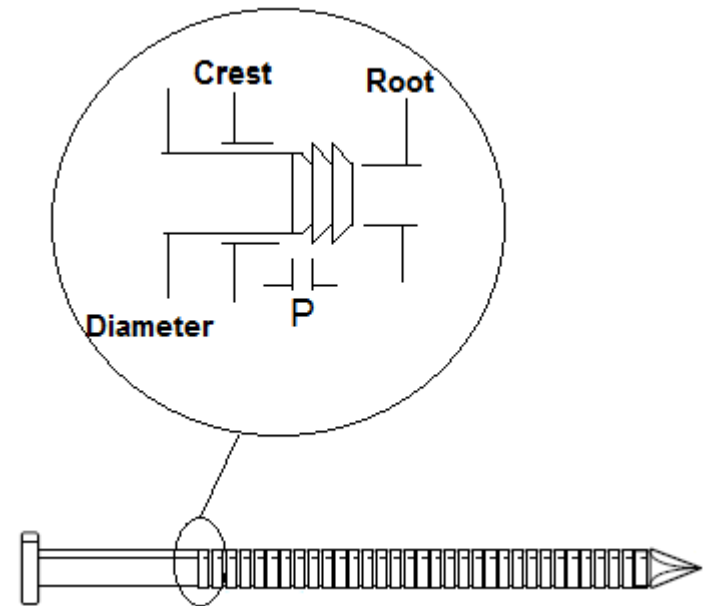
Ring Shank Nails are created by special machinery and tooling that deform the smooth shank after the nail is formed.



The material of the shank is compressed and rolled. This forms the root diameter. The design of the tool then allows the material compressed into the root to flow out to form the crest diameter.

The difference between the nominal shank diameter and the crest diameter is referred to as ring growth.

The spacing between the rings (P) is the pitch and is referenced as rings per inch (rpi).

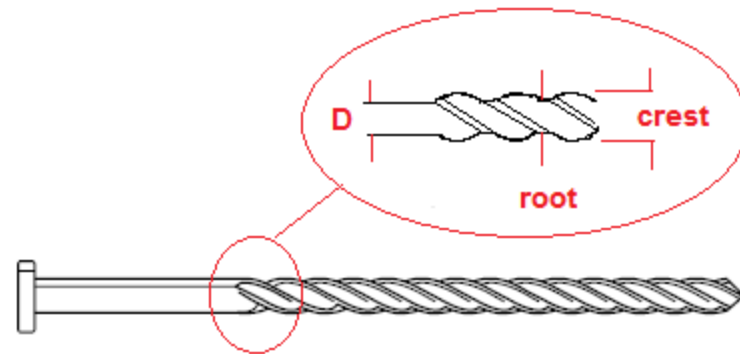


Nail Construction

Screw Shank Nails (sometimes known as twist shanks) are created by compressing and twisting.



Like the ring shank nail, there will be growth on the crest of the twist as material is moved out of the root area.



Typical Nail Points



Diamond

A diamond point is a 4-sided taper. In high quality nails, each of the 4 tapers are equal and free from burrs and defects. The tip of the point may be blunted or flattened.



Needle

A needle point is a conical shaped point that comes to a sharp tip.



Blunt or No

A blunt point, flat or no point is one that is flattened at the tip.



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