Fastener Specification

Detailed **Fastener Specifications** are required in order to predict pallet performance. Pallet performance is highly dependent on the connections between components, which in turn are highly dependent on the **fastener withdrawal resistance** and **fastener shear resistance** in the connections.

PDS allows 6 different **Fastener Types**:

- Helically Threaded Nails
- Annularly Threaded Nails
- Twisted Square Wire Nails
- Plain Shank Nails
- Rectangular Wire Staples
- Round Wire Staples

Helically Threaded Nails, also called drive screws, have screw-like threads that can dramatically increase the withdrawal resistance.

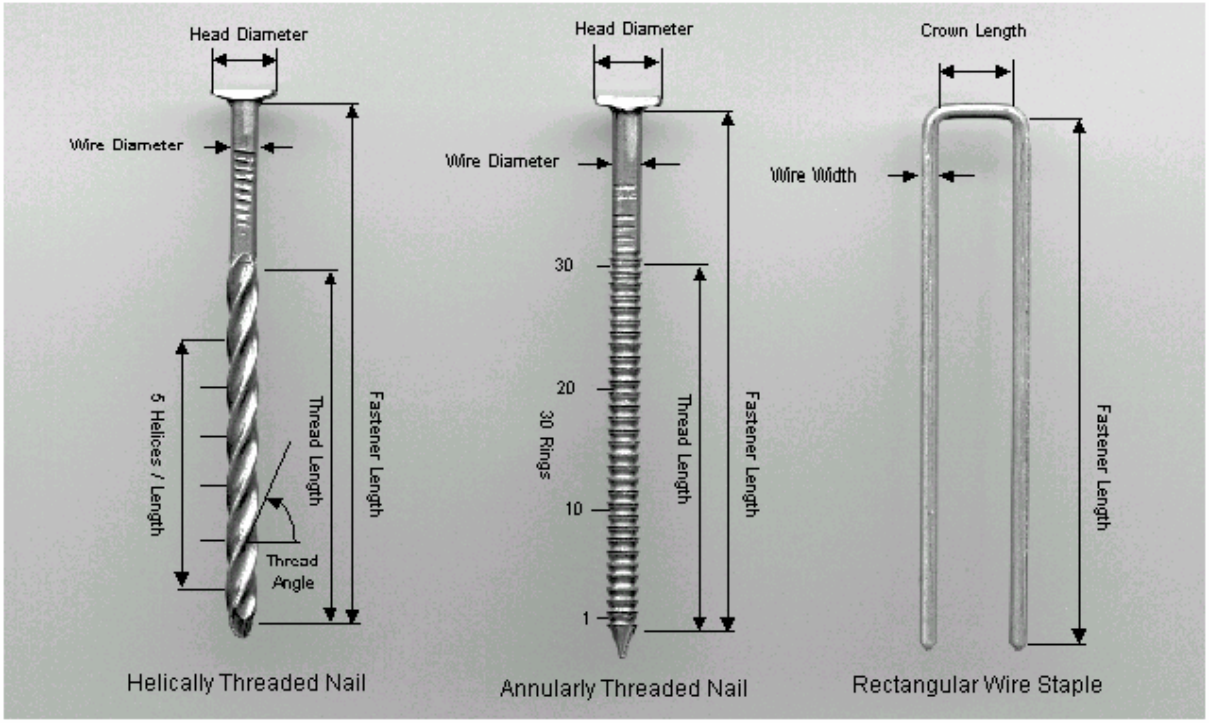
Annularly Threaded Nails, also called ring-shank nails, have annular threads (or rings) which can dramatically increase the withdrawal resistance.

Twisted Square Wire Nails are formed from square wire and are twisted to form screw-like threads.

Plain Shank Nails are formed from round wire and have no threads.

Rectangular Wire Staples are formed from flattened, or rectangular, wire.

Round Wire Staples are formed from round wire.



Fastener Length is measured along the fastener axis from beneath the nail head rim (or beneath the staple crown) up to but not including the point. This measure indicates the length of the fastener useful to shank withdrawal and shear resistance. The nail head (or staple crown) and point do not contribute.

Thread Length is measured along the fastener axis from the beginning of the thread up to but not including the point.

Thread Diameter is the maximum diameter of the threaded portion of the shank, measured perpendicular to the fastener axis.

Wire Diameter is the diameter of the undeformed shank, measured perpendicular to the fastener axis and away from the head, crown, grip marks, or thread.

Wire Width of Rectangular Wire Staples is the dimension of the wire measured parallel to the Crown Length.

Wire Thickness of Rectangular Wire Staples is the dimension of the wire measured perpendicular to the Crown Length. It is normally greater than Wire Width.

Head Diameter is the average diameter of the nail head measured perpendicular to the nail axis.

Crown Length is measured along the staple crown between the staple legs.

The number of **Helixes** for helically threaded and twisted square wire nails is an indication of the number and angle of the threads.

The number of **Helixes** can be measured by laying a ruler along the thread and parallel to the nail axis, and then counting the number of times the thread crest contacts the ruler over a convenient length (not counting the contact point at the zero mark). This gives

Helixes per inch (or Helixes per mm). Multiply this number by the **Thread Length** to get **Helixes**.

The number of **Helixes** can be calculated based on **Thread Diameter**, **Flutes**, and **Thread Angle** using the following formula:

Helixes = Flutes x Thread Length / (Tan (Π / 180 x Thread Angle) x Π x Thread Diameter)

Flutes are the between-thread depressions on Helically Threaded Nails. (The number of **Flutes** is same as the number of thread leads.)

The number of **Flutes** can be measured by marking the bottom of a flute with a felt-tip pen. This is flute #1. Twist the nail and count each flute until you're back to #1 (which was marked). Nails typically have 4 or 5 flutes, possibly 6.

Thread Angle for Helically Threaded Nails is dependent on the thread dies used by the nail manufacturer. **Thread Angle** can be calculated based on **Thread Diameter**, **Thread Length**, **Helixes**, and **Flutes**.

The number of **Rings** for Annularly Threaded Nails is the number of annular threads, or rings, along the **Thread Length**.

MIBANT Angle, measured on the Morgan Impact Bend-Angle Nail Tester, is a measure of the impact resistance of the fastener, and is related to the ductility, pliability, toughness, and brittleness of the fastener.

Two **Performance Indices** provide relative measures of the estimated fastener performance in withdrawal and shear.

The **Fastener Withdrawal Index**, or **FWI**, is a dimensionless, relative measure of the estimated performance of the fastener in withdrawal. It is useful when comparing fasteners with differing physical characteristics and dimensions. Fasteners with greater **FWI** would be expected to have greater withdrawal resistance when driven into the same wood to the same depth.

The **Fastener Shear Index**, or **FSI**, is a dimensionless, relative measure of the estimated performance of the fastener in shear. It is useful when comparing with fasteners with differing physical characteristics and dimensions. Fasteners with greater **FSI** would be expected to provide greater shear resistance when driven into the same wood to the same depth.