Instron® TechNotes Getting the most up-to-date information on materials testing

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Application Story

The Impenetrable Ship

Imagine being a sailor in 1812, and watching a war ship built of enormous size and great strength repel its attacker's cannonballs – without them penetrating the surface. This was the case with the USS Constitution, and when a sailor proclaimed, "Its sides must be made of iron!" the ship was nicknamed Old Ironsides.

Obviously, the ship's sides were not made of iron, but crafted from an exceptionally strong oak. As the oldest commissioned war ship still afloat in the world, it's of great interest to the Navy. To find out more about this type of wood and how to preserve its condition, the Navy turned to the USDA Forest Products Lab (USDAFPL), the nation's leading wood research institute.

Using Instron's 5544 to test samples from Old Ironsides, the USDAFPL found that the boat's main structural components are made of live oak, a common wood that was used in the 1700s and is found along the eastern seaboard of the US. No longer used as a common material, live oak is in a class of its own.

"This type of wood doesn't follow the normal rules of wood," said Bill Nelson, Supervisory General Engineer at USDAFPL. "It is extremely strong and doesn't decay. When we would bend it in a u-shape, it would snap back to its original form. It's also extremely dense, making it incredibly hard to cut and fashion with even the sharpest tools."

This 200^{+}-year-old ship now resides in Boston Harbor where age and weather pose a greater threat than cannonballs. Although the toughness factor of live oak makes traditional wood construction challenging, Nelson is working with his team to find ways to preserve and restore Old Ironsides.

Tech Tip

Tightening Your Wedge Grips

A common mistake many customers make to troubleshoot specimen slippage when using their mechanical wedge style tensile grips is over tightening them. Over tightening a wedge grip can damage the grip and exert unwanted load on the specimen. The mechanical design of a wedge grip works in the following way:

1. A tension force is applied to the specimen
2. This tension force causes the specimen to pull downward on the jaw faces (provided there is good bite between the jaw faces and the specimen)
3. The faces slide through the grip body along the wedge path
4. The faces then squeeze the specimen

This entire process is self-tightening – the higher the tensile load, the harder the jaw faces squeeze in on the specimen.

While over-tightening isn't an effective way to improve slippage, customers can minimize specimen slippage by improving the bite through the use of proper jaw faces and ensuring the specimen contacts at least 2/3 of the grip faces.

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You Asked - We Answered

Q: I've been testing to ASTM test standards and now I've been asked to do the ISO equivalent. What is the difference between ASTM and ISO? Can I use my existing test fixtures?

TENSILE PROPERTIES		
	ASTM D 638	**ISO 527**
Preferred Specimen Type:	Type I	Type IA
SPECIMEN DIMENSIONS (mm)		
Thickness:	3.2 ± 0.4	4 ± 0.2
Width:	13 ± 0.6	10 ± 0.2
Gauge Length:	50 ± 0.25	50 ± 0.5
Length of Narrow Section:	57 ± 0.5	80 ± 2
Grip Separation:	115 ± 0.5	115 ± 1
TEST SPEED (mm/min)		
	5, 50, 500 mm/min per the material specification or based on rupture within 0.5 - 5 minutes testing time	• 5 mm/min for brittle materials • 50 mm/min for ductile materials

A: While testing requests are still significant for ASTM evaluations, ISO is predominant in many parts of the world and many organizations are moving to ISO test procedures. There can be significant differences between the two standards, including specimen preparation, size, test conditions, fixturing and reporting. It's important that users closely read the standards. For example, an ASTM user testing plastics would follow ASTM D 638, while an ISO user would follow ISO 527 (see chart for the type of differences to expect). However, Instron systems can easily test according to both ASTM and ISO standards. Many of our test fixtures (but not all) are designed to accommodate both standards and the software can easily change settings, units, and results with a click of the mouse. If you are testing to a specific standard and have questions, contact an applications specialist who can assist you.

What do you think? Tell us!

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