LABORATORY TESTING INC.

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LAB NEWS

History of Charpy Impact Testing

The origin of some common mechanical testing that we perform today can be traced back to research and discoveries from the 1800s. In that era there was an International Association for Testing Materials that would meet every 2-3 years in various cities around the world. By 1913 it had 2,682 members including such famous names as Brinell (hardness test), Martens (martensite), Heyn (grain size), Bauschinger, Le Chatelier and Charpy (impact test).

Georges Augustin Albert Charpy, a Frenchman, was born in 1865 and graduated from the École Polytechnique in 1887 with an engineering degree majoring in marine artillery. He went on to become a metallurgical engineer and later a professor. Charpy became interested in measuring the impact properties of steel because of the many premature failures of armament, steam boilers and steam engines in that era. He presented a paper to the Association in 1901 on the results of a test for impact resistance of steel using the aid of a pendulum. Charpy also found that the use of a notch in the test specimen was crucial in increasing the sensitivity and reproducibility of the measurement. His name became associated with the Charpy Impact Test for notch toughness because he spent years thoroughly investigating the parameters of the test.

Georges Charpy

This impact test shows the relationship of ductile to brittle transition in absorbed energy at a series of temperatures. Since iron and all other body-centered cubic metals undergo a transition from ductile behavior at higher temperatures to brittle behavior at lower temperatures, this test is required today for a number of important steel products including steel hull plate for ships, nuclear plant pressure vessels, forgings for electric power plant generator rotors, etc.

Pendulum ready to swing toward test specimen

The test is performed using several machined bar specimens 1cm x 1cm x 5.5cm with a 2mm deep notch at the middle of a specified flat surface - usually a “V” notch. The specimens are tested at a series of specified temperatures (e.g. -20ºC, -10ºC, 0ºC, +10ºC, +20ºC). Once a specimen reaches the precise temperature, it is quickly placed into a special holder with the notch

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We're Here for You

Sales/Customer Service Team

Seated from left: Tom Phillips & Dave Keller, Customer Service Reps; Mark Tierney, Technical Sales Specialist; Kathy Dickert, Customer Service Rep; Rick Heist, Sales Manager. Standing: Brandon McVaugh, Customer Service Supervisor

The Sales/ Customer Service Team at LTI is here for you to provide quotes, expedite orders, and answer your questions.

Guidelines to Expedite Service

If you're looking for prompt responses and timely turnaround, you can help ensure your expectations are met. We've created easy customer Guidelines for Best Service covering RFQs, Purchase Orders, Credit Terms, Sample Sizes, Order Shipments and Value-added Services. They're all available on our website for quick reference at *www.labtesting.com/resources.php* under the heading Guidelines or from our Sales/Customer Service Reps. Following the Guidelines will help ensure that we have all of the information and items needed to process your requests as soon as they are received.

Responding to You is a Priority

Our goal is to respond to each inquiry within 1 business day. We won't always have all of the information you need, but we will provide a status update. Sometimes we need to go to one of our technical experts in the testing, machining or calibration departments for input, which may require a bit more time.

Many Ways to Reach Us

We are available between 8:00 AM and 5:00 PM Monday through Friday by phone, e-mail or fax. You'll find our contact information online at *www.labtesting.com/contact.php*.

If you prefer to do things at your own convenience and pace, you may find many of the answers you need on our website. Navigate using the white tabs, but don't forget the links at the top of the page too.

Use our website forms to Get a Fast Quote or Request Literature. Check the status of your orders and view certifications online with *lti live update,* our Free password-secured web portal designed specifically for our customers. It's easy to sign up; just contact Sales/Customer Service.

Accreditation Updates

A2LA Expanded for Calibration

Laboratory Testing Inc. has expanded its accreditation for Calibration Services with the American Association for Laboratory Accreditation (A2LA). Since A2LA accreditation was first granted for calibration in August 2001, the scope has grown to include the calibration of a wide range of standards, gages, measuring tools, torque wrenches, force measurement, and field calibration services. The most recent additions include calibration of Length Standards to 60 inches, Tapered Thread Rings, Tapered Thread Plugs, and Rules to 78 inches.

Nadcap Renewal & Policy Change

PRI/Nadcap accreditation for Materials Testing was recently renewed through October 31, 2011. The following have been added to our scope of accreditation:

- Metallographic Evaluation of Fusion Welds and Welder/Welding Operator Qualifications
- ICP Mass Spectroscopy (ICP-MS)

PRI/Nadcap has decided that accreditation certificates will no longer have numbers or expiration dates, and will no longer be reissued following future reaccreditation audits. Nadcap is providing expiration dates and current scopes at www.eAuditNet.com.

To view our information, Log in to www.eAuditNet.com or Register for free access. Under Resources, choose Online QML or ISO/IEC 17025 QML. Type Laboratory Testing Inc. for Supplier Name and click the Search button. Click on our company name for complete details.

If you have any questions, please contact eAuditNetSupport@sae.org.

Machining Specimens for Destructive Testing

Destructive testing is performed to evaluate physical characteristics of materials, such as strength, ductility, hardness and composition, and to determine susceptibility to corrosion. The information is most often used in material selection or failure analysis. This testing is performed on samples of material known as specimens or coupons that are prepared by machining to exacting dimensions and other precise requirements.

The Process

The four main processes performed in the production of test specimens are sawing, milling, turning and grinding. Although sawing is the starting point for all specimens, one or more of the other three processes may be performed during the preparation of specific types of specimens.

Sawing:

Specimens are rough cut to length by sawing from a specific location on the sample material or part, as stated in a required specification or dictated in a drawing provided with the order. During this step, the material is cut into a workable size, which is generally close in size to the final specimen. If welds are involved, parts may be etched to identify position of the center line or heat-affected zone.

Turning:

Turning is performed on a lathe by rotating a part against a stationary cutting tool to center and turn in diameter. This is a required step for all round specimens including tensile, stress rupture, gleeble, jominy, rotating beam and fatigues, since rough-cut specimens are usually square in shape. In addition to further refining specimen dimensions, the turning process reduces the gage length and threads the ends when required by fixturing on test machines.

Milling:

Milling is the process of cutting away material by feeding a work piece past a rotating cutter with multiple teeth. The machined surface may be flat, angular, or curved and can be milled to any combination of shapes. Specimens such as flat tensile, stress rupture, and hardness samples are precision machined by this process. Also, side, face and root bend specimens for weld qualifications and certain corrosion specimens are milled. Milling is also used to further refine charpy specimens for the next step, grinding.

Grinding:

Grinding is the finish step for many types of specimens including charpy, hardness, compact tension and macro specimens used in metallurgical examinations. During grinding, a rotating abrasive wheel smooths the surface to give the material a refined look or to attain the desired finish. When required, this process can be used to create a high-quality surface finish to 32 Ra (roughness average) or better.

Machining at LTI

The Machine Shop at LTI prepares all types of test specimens to required ASTM specifications and customer requirements for mechanical and corrosion testing. Our machinists also rough cut and grind metallography specimens, prepare chips for ICP analysis and perform electrical discharge machining (EDM). Most specimens are machined from metals, including metal matrix composites, hardened steels and nickel-base alloys, using the latest CNC turning, milling and grinding machines.

All machining is PRI/Nadcap accredited and LTI is on the NIST Qualified Manufacturers List for Charpy V-notch Impact verification specimens. Traceability of sample material and specimens is insured from receipt inspection through the final process.

LTI specimen machining is a time-saving convenience for testing customers. These services also are available to companies that perform testing inhouse. Refer to our Sample Size Guidelines at *www.labtesting.com/resources.php* when ordering.

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History of Charpy Impact Testing

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oriented vertically and toward the origin of impact. The specimen is struck by a "tup" attached to a swinging pendulum of specific design and weight. The specimen breaks at its notched cross-section upon impact, and the upward swing of the pendulum is used to determine the amount of energy absorbed (notch toughness) in the process.

It is still a question if Charpy and others knew about the ductile to brittle transition that occurs with temperature in steel during these early years of impact tests. As far as it is known, all of Charpy's tests were conducted at room temperature or above. If the ductile to brittle transition was well known in the early 20th century, the steel plates manufactured in 1910 by the steelworks of David Colville in Scotland and used for the RMS Titanic could have been tested at sub-zero temperatures to reveal the brittle behavior that resulted upon impact of the hull plate with an immense iceberg at the icy North Atlantic ocean temperature of -2ºC that fateful night of April 14, 1912. Ignorance of the ductile to brittle transition in steel was again evident in the numerous Liberty ships that literally fractured in half during WW II. The over-stressed steel welds (no post-weld heat treatment) became brittle at icy water temperatures and catastrophic crack propagation took place even when the ships were at dock.

It is interesting to note that the Charpy Impact Test was not issued as a standard test method by ASTM until 1933. It is described in ASTM E23 "Notched Bar Impact Testing of Metallic Materials".

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Contact LTI

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Holiday Closings

LTI will be closed for the following upcoming holidays:

Memorial Day - Mon. May 31
Independence Day - Mon. July 5
Labor Day - Mon. Sept. 6

Please contact us in advance, if you will have rush orders near a holiday!