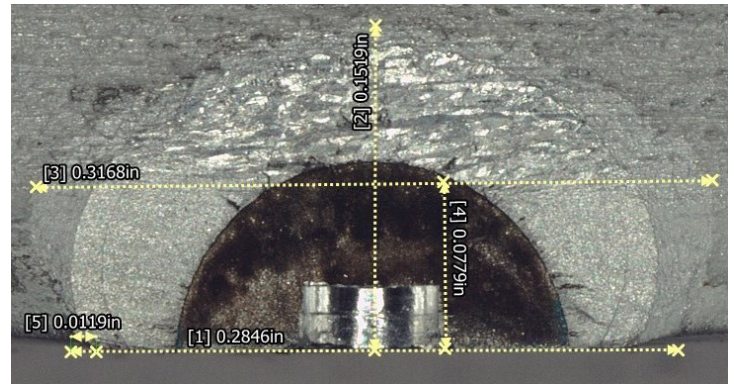


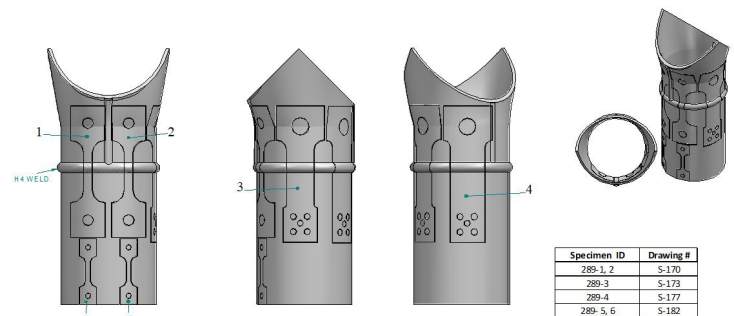
Marshall Space Flight Center

Mechanical Testing

The Materials and Processes Laboratory's Mechanical Test team conducts a wide variety of tests to characterize the behavior of materials under various conditions in various environments. This team can perform standard American Society for Testing and Materials (ASTM) test methods, in addition to nonstandard mechanical tests in air, helium, nitrogen, hydrogen, and methane from elevated temperatures to cryogenic temperatures. Engineers are available to provide guidance in test plan development and execution, specimen design, and cut-plan design. Skilled machinists on site are also available for manufacturing test samples using computer numerical controlled (CNC) and electrical discharge machining (EDM) tools. Static and dynamic material characterization can be evaluated in simulated service environments with computerized data acquisition, including digital image correlation (DIC). Custom testing of components or structural analog testing can also be designed and conducted. United States Government and industry specifications are supported for any standard test type. This facility is ISO9001 and ISO17025 compliant for mechanical testing and calibration. Consulting services are offered in all areas.



Simulated Surface Sample Fracture Surface.

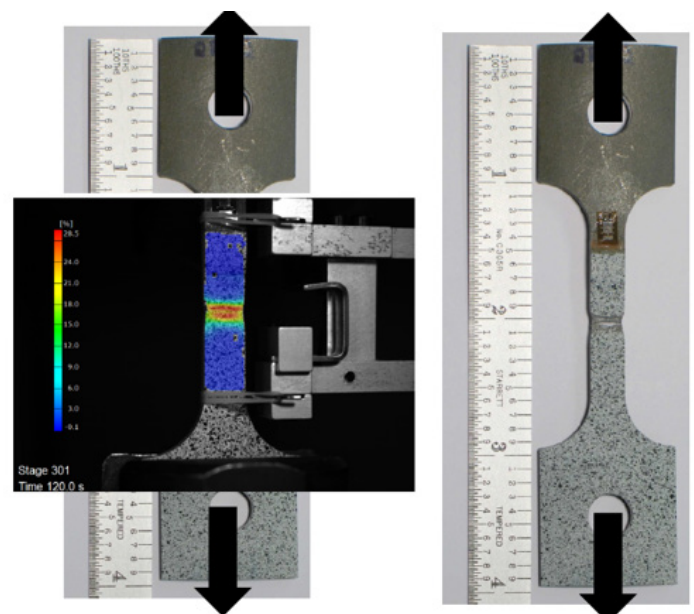


Custom Sample Design and Drawings.

Key Benefits

Mechanical Test Facility

- Over twenty-five mechanical test frames.
- Tension/compression load capability up to 265 kips.
- Torque-tension testing of threaded fasteners up to 1000 ft-pounds.
- Elevated temperature testing in air up to 1,800 °F.
- Cryogenic temperature testing capability down to -320 °F.
- Test environments include air, and gaseous or liquid nitrogen. Liquid helium (-450 °F) testing capability is under development.
- Standard test configurations include ASTM mechanical tests (e.g., tension, compression, modulus, HCF, LCF, da/dN, fracture toughness (all varieties), creep, shear, bending, and hardness).



Digital Image Correlation on Tensile Specimen.

- Non-standard coupon tests (application specific) may include simulated service tests, small scale structural component tests, analog structural component tests, and various fastener tests.
- Data acquisition methods include digital image correlation (measure surface coordinates, displacements, velocities, and strain values and rates in 3D); strain gages, LVDT, clip gages, and extensometers; multi-channel data acquisition systems at variable frequencies.

Hydrogen Test Facility

- The hydrogen test facility (HTF) can perform an extensive range of tests with procedures developed on demand.
- Twelve custom test systems are operated in ten structurally reinforced test cells.
- Tension/compression load capability up to 110 kips in liquid hydrogen.
- Variable temperature testing in high pressure gaseous nitrogen, helium, or hydrogen at temperature ranging from -200°F to $1,800^{\circ}\text{F}$.
- Cryogenic temperature testing capability at -423°F (LH2) and -320°F (LN2).
- High-pressure cryogenic permeability tests in liquid hydrogen at pressures up to 300 psi.
- Test systems capable of testing in pressurized gasses up to 10,000 psi.
- Test configurations include standard ASTM tests (HCF, LCF, da/dN, fracture toughness, tension, compression, modulus), non-standard coupon tests (application specific), simulated service tests.
- Data acquisition includes strain gages, LVDT, clip gages, extensometers; multi-channel data acquisition systems at variable data acquisition frequencies are available.



Tension Test Specimen in Liquid Hydrogen.

National Aeronautics and Space Administration

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