



A Subsidiary of THE MMR GROUP, INC.

# Massachusetts Materials Research, Inc.

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## LABORATORY TESTING SERVICES

MMR is an Employee-Owned materials laboratory specializing in cost effective, fast, reliable and friendly service. The following is a summary of our testing capabilities.

### CHEMICAL ANALYSES

- ◆ Metals & Alloys
- ◆ Ceramics & Industrial Minerals
- ◆ Slag & Deposits
- ◆ RoHS Materials
- ◆ Residues (Organic & Inorganic)
- ◆ Plastics, Polymers (Non Destructive)
- ◆ Rubbers, Elastomers (Non Destructive)
- ◆ X-ray Diffraction (XRD)
- ◆ X-ray Fluorescence (XRF)
- ◆ ICP Plasma Spectroscopy (Inductively Coupled Plasma/Atomic Emission Spectrometer)
- ◆ Combustion Analysis (Carbon and Sulfur)
- ◆ Gas Analysis (Oxygen, Nitrogen, Hydrogen)
- ◆ Ion Chromatography (Anions)
- ◆ Infrared (Fourier Transform - FTIR)
- ◆ Microscopic Infrared (Fourier Transform – FTIR)
- ◆ DSC (Differential Scanning Calorimetry) - measures melting point, glass transition
- ◆ TGA (Thermogravimetric Analysis) - measures content of plasticizer, resin, filler, etc.
- ◆ Wet Chemistry (Special Methods, Deposit Loading)

### MECHANICAL TESTING

- ◆ Tensile from -450°F to 1800°F
- ◆ Charpy Impact (ASTM & TUV)
- ◆ 3 pt and 4 pt bend
- ◆ Single, Double & Lap Shear
- ◆ Weld Procedure Qualification
- ◆ Flexural Strength
- ◆ Compression Strength
- ◆ Tube Flare and Flattening Tests
- ◆ Fasteners (Bolts & Nuts)
- ◆ In-house Machine Shop
- ◆ Specimen & Fixture Machining

### METALLOGRAPHY

- ◆ Weld & Braze Evaluation
- ◆ ASTM Corrosion Tests (A262, G48)
- ◆ Alpha Case of Titanium Alloys
- ◆ Intergranular Attack
- ◆ Alloy Depletion
- ◆ Electrical Discharge Machining Evaluation
- ◆ Field Replication
- ◆ Sample Mounting & Preparation
- ◆ Vicker's and Knoop Microhardness
- ◆ Rockwell and Brinell Hardness
- ◆ Portable Rockwell Hardness
- ◆ Shore Durometer Hardness
- ◆ Grain Size
- ◆ Inclusion Rating
- ◆ Peel Test

### FATIGUE AND SIMULATED SERVICE TESTING

- ◆ Axial Fatigue from -450°F to 1800°F
- ◆ High Cycle Fatigue
- ◆ Low Cycle Fatigue
- ◆ Bending Fatigue from -300°F to 1400°F
- ◆ Rotary Bending Fatigue from Ambient to 350°F
- ◆ Flexural Fatigue
- ◆ Plate Bending Fatigue from Ambient to 350°F
- ◆ Hydraulic Fatigue
- ◆ Torsional Fatigue to 75,000 inch lbs.
- ◆ Fastener Fatigue
- ◆ Cryogenic Mechanical
- ◆ Simulated Service Testing
- ◆ Component and Finished Product Testing
- ◆ Fracture Mechanics Testing
- ◆ Strain Gage Application and Testing
- ◆ Residual Stress Testing
- ◆ Shear Stress Testing
- ◆ Hydraulic Burst Pressure to 20,000 PSI
- ◆ Proof Load to 58,000 lb.
- ◆ Adhesive Bond Strength
- ◆ Peel Strength
- ◆ Corrosion and Stress Corrosion Testing
- ◆ Environmental Degradation of Plastics
- ◆ Salt Spray

### NON-DESTRUCTIVE TESTING

- ◆ Radiography - (Industrial X-ray)
- ◆ Magnetic Particle Inspection
- ◆ Liquid Penetrant Inspection
- ◆ Metallographic Replication

### MATERIALS ENGINEERING CONSULTING AND FAILURE ANALYSIS

- ◆ Analyze Failures for Prevention
- ◆ Determine Root Causes of Failures
- ◆ Recommend and Select Materials and Processes
- ◆ Recommend Product Improvements
- ◆ Analyze and Characterize New Products
- ◆ Provide Metallurgical Consulting
- ◆ Identify Fatigue, Corrosion, Wear, Brittle, Ductile Failures
- ◆ Identify Material Defects
- ◆ Identify Deposits, Contaminants, Corrosion Products
- ◆ Provide Detailed Microscope Analysis of Products
- ◆ Analyze Products made from Metals, Plastics, and/or Ceramics
- ◆ Provide Forensic Engineering Analysis, and Expert Witness Testimony
- ◆ Stereo Microscopy, Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDS)