MSi Testing & Engineering, Inc.
Your Source for Metallurgical Testing and Failure Analysis
1390 N. 25th Avenue
Melrose Park, IL 60160
708·343·3444
F A X·3033

ACCREDITED
CERT #0510-01

Dear Valued MSi Customer,

Thank you for your interest in MSi Testing & Engineering. MSi is the largest metallurgical engineering test lab in the Midwest. Our new 30,000 sq. ft. facility is conveniently located on the west side of Chicago in Melrose Park, Illinois.

Our engineering staff includes nine metallurgical engineers and three chemists with a broad cross section of industrial experience. Although specializing in failure analysis, we daily perform problem solving, material and processing claims, corrosion and plating investigations and many other engineering services that all rely on our extensive industrial backgrounds. (see attached brochure).

The individual laboratories within MSi provide routine testing services 24 hrs a day on three shifts to meet all of our clients critical turn-around requirements. Same day, next day and routine 2 day service are all in a days work at MSi. Routine chemical testing, tensile testing, Charpy impact testing, metallography, and hardness testing are all evaluated and released by our certifications department to all corners of the manufacturing industry every day.

MSi has been accredited by the American Association for Laboratory Accreditation (A2LA) since 1990. As a leader in laboratory accreditation and our commitment to accuracy, the equipment at MSi is calibrated at least semi-annually, which is twice the recommended ASTM interval !!

As you can see, MSi's laboratory is staffed with experienced professionals, highly skilled technicians, and equipped with leading edge technology. This combination assures fast turn-around and accurate test results. One of our engineers is always available to answer any technical questions you may have.

Please call or e-mail any of the following engineering or sales contacts below:

Sales Contacts

Larry Schlarb	Sales Manager	larry@msi-testing.com
Tamra Gorsky	Outside Sales Associate	tamra@msi-testing.com
Regina Flores	Inside Sales Support	customerservice@msi-testing.com

Engineering Contacts

Mitch Jacobs	Senior Metallurgical Engineer	mitch@msi-testing.com
Dave Hoffman	Senior Metallurgical Engineer	dave@msi-testing.com
John Fruscione	Senior Metallurgical Engineer	john@msi-testing.com

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LABORATORY PRICE LIST

(EFFECTIVE: June 2009)

CHEMICAL ANALYSIS (OES and ICP Methods) *

Minimum Sample Size:
1/2 Diameter x 1/4" Thick or 50 Grams

Spectrographic Chemical Analysis with Standard Elements: *(Includes Aluminum Base, Ductile/Gray Iron, Carbon/Alloy Steels, Stainless Steel, Nickel Base, and Tool Steel)*		$ 100.00
Nitrogen Test on Steel:		$ 80.00
Carbon & Sulfur (Leco Method):		$ 50.00
ICP (Inductively Coupled Plasma)/Wet Analysis (5 Grams min. per Sample)	Minimum Charge	$ 200.00
ICP (5 grams min. per sample) additional elements	add'l sample	$ 150.00
Titanium (Includes Hydrogen, Nitrogen, & Oxygen):		$ 160.00
Remelt Charge for Samples Less than 1/4" Diameter or 50 Grams:		$ 50.00

METALLOGRAPHIC EVALUATIONS

Case Depth, Grain Size, Plating Thickness, Heat Treatment Evaluation, or Micro Inclusion Rating:	$ 200.00
Routine Metallurgical Examination	$ 200.00
Specimen Mounting & Preparation Only for Metallurgical Examinations & Microhardness:	$ 100.00
Macrostructure Examination:	$ 85.00 - 200
Corrosion Testing: ASTM A262 Practice A:	$ 200.00
Corrosion Testing: ASTM A262 Practice B or Practice E:	$ 300.00
Photomicrographs:	$ 50.00

ENGINEERING SERVICES

Engineering Hourly Rate:	$ 200.00
EDS Plating Identification & Spectrum:	$ 100.00
SEM/EDS (Includes Semi-Quantitative Analysis), Hourly Rate:	$ 300.00
Photomacrographs, Minimum Charge:	$ 50.00

Failure Analysis and all Engineering Projects are Quoted in Writing.

MECHANICAL TESTING *

Samples Requiring Cutting:
Over 1 1/2" Diameter or Thickness - Call for Quote.

Tensile Testing Round or Flat up to 60,000 Lbs Maximum:	$ 75.00
Axial/Wedge Tensile or Proofload up to 60,000 Lbs Maximum:(up to 1/4 hr prep included, up to 1 1/2" dia.)	$ 25.00
Axial/Wedge Tensile or Proofload set up charge	$ 50.00
Tensile Testing Full Size Round or Flat up to 120,000 Lbs Maximum:	$ 125.00
Bend Testing:	$ 75.00
Charpy Impact: (Set of 3) at Room Temperature:	$ 150.00
Charpy Impact: (Set of 3) Room Temperature to -100 Degrees Fahrenheit:	$ 175.00
Charpy Impact: (Set of 3) -100 Degrees F to -321 Degrees Fahrenheit:	$ 250.00
Jominy Testing includes Heat Treat:	$ 150.00
Heat Treat Per Job Minimum:	$ 50.00
Surface Roughness:	$ 50.00
Hardness Testing (Rockwell or Superficial Including 3 Readings):	$ 50.00
Hardness Testing per Reading (Brinell, Vickers Microhardness or Knoop Microhardness):	$ 50.00

SALT SPRAY TESTING

Salt Spray testing per hour	$ 1.50
ASTM B117 with Report and Photos (Per Day):	$ 36.00
Setup Charge, Interim Inspection, photos and final report(each)	$ 25.00

ADDITIONAL LABORATORY CHARGES

Specification Review if Required or Acceptance/Rejection to Specification by an Engineer:	$ 50.00
Cutting Over Size (1 1/2" Thick Samples) Per Hr:	Call for Quote
If Same Day Service is Required, there will be a 100% Surcharge	
Pickup Charge, UPS Shipment Charge to Return Samples or Retest Processing Fee, Minimum Charge:	$ 25.00

Minimum Billing: $ 100, NET 30 DAYS, Credit Cards Accepted

* Cutting, Machining, Sample Preparation, and Testing May Be Included Depending On Sample Configuration

MSi TEST REQUEST FORM

Date: _____ P.O. No. _____

Company _____ RUSH ____ Regular ____

Requested By _____ Fax ____ E-Mail ____

Phone No. _____ Need By _____

Fax No. _____ E-Mail _____

MATERIAL INFORMATION

Size: _____ Lot No. _____

Grade _____ Part Name _____

Heat No. _____

Specification(s) _____

Accept / Reject Required ____ (Additional Charges May Apply)

Not Required ____

REQUIRED TESTING

Tensile _____

Charpy Impact _____ Temperature: _____

Mil's + % Shear: _____

Orientation: Longitudinal ____ Transverse ____

Chemistry _____ Special Directions _____

Hardness _____ Type: Brinell ____ Rockwell ____

Microstructure (describe) _____

Additional Instructions _____

_____

_____

_____

MSi

Our New Location . . .

1390 North 25th Avenue, Melrose Park, Illinois

***MSi** Testing & Engineering Inc.* is a metals testing and consulting laboratory that has been serving industry since 1985. MSi's laboratory is staffed with experienced professionals from a diverse range of industries, highly skilled technicians and occupies a fully equipped accredited new state-of-the-art facility. This combination offers unparalleled customer service, fast turnaround and accurate test results.

Services

Metallurgical - Services offered vary from routine metallography to comprehensive failure investigations. Our metallurgical testing lab is fully equipped and accredited to meet your metallurgical needs.

Chemical Analysis - Optical emission, inductively coupled plasma (ICP), and LECO combustion analysis of carbon, alloy, stainless and tool steels, cast irons, aluminum alloys, titanium and more.

Mechanical - A state-of-the-art CNC machine shop assures fast and accurate preparation of test samples. Routine services include tensile, Charpy impact, hardness and more.

Failure Analysis - Investigations vary from product claims to comprehensive failure analysis. Consulting services can include recommendations to prevent future failures and reduce costs.

Certifications - Our quality assurance program is accredited by The American Association for Laboratory Accreditation, A2LA, and has been audited by various customers. Our doors are always open to assure your confidence.

Scanning Electron Microscope

ACCREDITED
CERT #0510 01

visit our website for more information

www.msi-testing.com

dedicated customer service

focus

accurate test results

fast turnaround

MSi

MSi Advantages

- experienced staff from various industries
- communicate directly with staff engineers
  - technical questions
- fast turnaround
  - 24 hour service on all routine testing upon request
- fully equipped laboratory and machine shop
  - state of the art equipment
- A2LA accredited
- laboratory quality program accredited to ISO 17025

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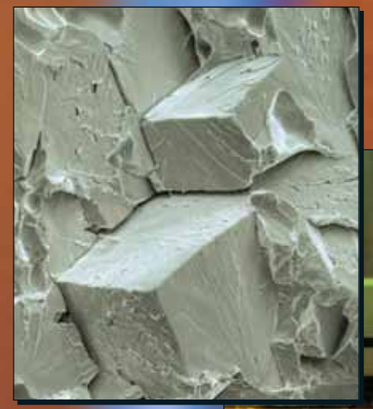
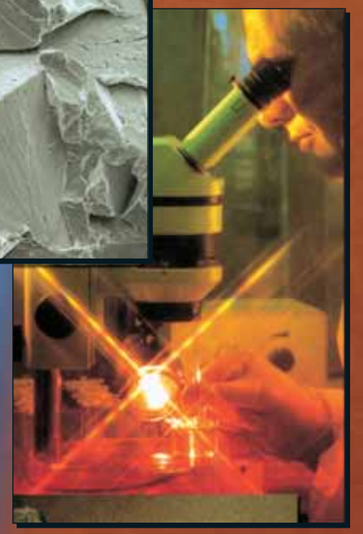




Our MSI Professional Staff

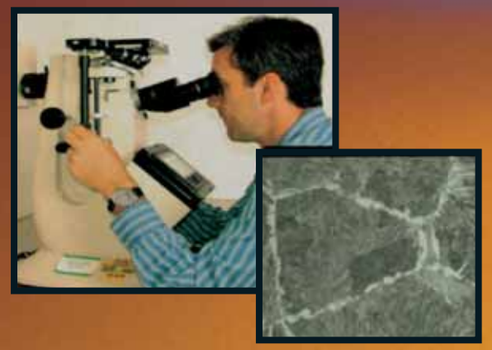
MSi

Testing & Engineering, Inc.

Metals Testing and Consulting

customer service **accurate test results** **fast turnaround**

Metallurgical



Metallurgical
- Case Depth
- Microstructure Interpretation
- Decarburization
- Microhardness Testing, Knoop and Vickers
- Heat Treatment Evaluation
- Grain Size Exam
- Inclusion Rating
- Macroetching and Evaluation
- Salt Spray
- Jominy Hardenability
- PPAP Testing
- Plating Thickness
- Digital Microphotography

Chemical

Chemical Analysis Capabilities
- Plain Carbon/Alloy Steel
- 300 & 400 Series SS
- Titanium Alloys
- Tool Steels
- Nickel Base Alloys
- Aluminum Base Alloys
- Copper Base Alloys
- Cast Irons

Techniques and Services
- Optical Emission Spectrometry
- LECO Carbon / Sulfur / Oxygen and Nitrogen
- Inductively Coupled Plasma (ICP)
- Re-Melt Furnace for Small Samples
- Alloy Verification

Mechanical

Mechanical Testing
- Tensile
- Charpy Impact (up to 700 ft-lbs)
- Hardness
  - Rockwell - Brinell
  - Knoop - Vickers
- Fastener Testing
  - -Axial Tensile - Wedge Tensile
  - Proof Load - Torque Testing
- Bend
- Weld Testing
  - Welding Procedure Qualification
  - Welder Qualification
- Surface Roughness
- * Step Bar
  - AMS 2300 - AMS 2301
  - AMS 2303 - AMS 2304

Charpy Impact (up to 700 ft-lbs)

Failure Analysis

Engineering Services
- Failure Analysis
- Product Claims
- Problem Solving and Consulting
- Third Party Testing
- Reverse Engineering
- Specification review

Electron Microscopy
- Scanning Electron Microscope (SEM)
- Energy Dispersive Spectroscopy (EDS)
- Failure Mode Classification
- Failure Origin and Source Cause ID
- Corrosion Product Analysis
- Coating and Plating ID
- Photomicrographs to 50,000X

Industries Served: Steel Manufacturing • Forging • Heat Treat • Fastener • Medical • Foundry • Transportation • Aerospace • Energy / Power • Heavy Equipment • Agriculture • Consulting

THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

MSI TESTING AND ENGINEERING, INC.

Melrose Park, IL

for technical competence in the field of

Mechanical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated January 2009*).

Presented this 10th day of February 2009.

President
For the Accreditation Council
Certificate Number 0510.01
Valid to December 31, 2010

For the tests or types of tests to which this accreditation applies,
please refer to the laboratory's Mechanical Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

MSi Testing & Engineering, Inc.
1390 N. 25th Avenue
Melrose Park, IL 60160
George Prause Phone: 708 343 3444
george@msi-testing.com

MECHANICAL

Valid To: December 31, 2010 Certificate Number: 0510.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following fastener, nut, metals testing and analysis:

Test Description	**ASTM**	**SAE**	**Other**
Metallurgical Lab			
Hardness			
Rockwell A, B, C, N, T	E18, F606, F606M	J429	
Brinell	E10		
Microhardness (Knoop & Vickers)	E384, F606, F606M		
Vickers	E92		ISO 6507-1
Jominy Hardenability	A255		
Metallographic Evaluation			
Specimen Preparation	E3		
MacroetchTesting	E381		
Microetching Metals and Alloys	E407		
Grain Size Exam	E112, E1181		
Micro-Cleanliness Rating	E45 (method A, C, D, and E)		ISO 4967 (method A and B); DIN 50602 (method K & L); JIS G 0555
Case Depth		J423	
Discontinuity Exam	A574	J122, J123	ISO 898-1
Decarburization Exam	E1077	J121, J419	
Volume Fraction by Point Count	E562	AMS 2315	
Graphite Microstructure	A247		
SEM/EDS	B748, E766, E1508		MSi Proc. 2000
Intergranular Attack in Austenitic SS (Practice A and E)	A262 (Practice A & E)		
Pitting and Crevice Corrosion	G48 (method A & B)		

*Failure analysis using the test methods listed above in accordance with Msi Procedure 5000

Test Description	**ASTM**	**SAE**	**Other**
Detrimental Intermetallic Phases in Duplex Stainless Steels	A923		
Intergranular Corrosion in Nickel Chrome Alloys	G28 (method A)		
Inclusion or Second-Phase Content by Automatic Image Analysis	E1245		
Mechanical Lab			
Tensile Testing (Axial & Wedge)	B557, E8, F606	J429, J995, J1199, J1216	EN 10002-1, EN 10002-2
Proof (Internal & External Threads)	F606	J429, J1199	
Charpy Impact Testing (Type A)	E23		ISO 148-1, -2; EN 10045-1, -2; JIS Z 2202
Bend	A370		AWS B4.0 (Part A)
Steel Cleanliness			AMS 2301, 2304; JIS G 0556
Proof Torque / Drive Torque		J78, J81	
Hydrogen Embrittlement		J78	USCAR-7
Surface Roughness			ASME B46; MSi Procedure 590
Coating Weight (Zn)	A90		
Chemical Lab			
Optical Emission Spectroscopy (OES)			
Steel	E415, A751		
Stainless Steel	E1086, A751		
Aluminum	E1251		
Titanium, Copper, Nickel	E1473		MSi Procedure 1002
Cast Iron	E1999, A751		
High Mn Steel	E2209, A751		
Combustion/Absorption Analysis Leco – C / S / N / O	E1019 E1409, E1941		
Sample Preparation by Re-melt	E1306		
Graphitic Carbon – Cast Iron	E351		
Inductively Coupled Plasma (ICP)	E1479, E2371		MSi 1006
Hexavalent Chrome			ISO 3613; GMW 3034; DX 900359
Salt Spray (fog)	B117	USCAR-1	GM 4298P; ISO 9227

*Failure analysis using the test methods listed above in accordance with Msi Procedure 5000