

**COLORADO METALLURGICAL SERVICES**  
**10605 East 25<sup>th</sup> Ave.**  
**Aurora, CO 80010**  
**PHONE (303) 780-9800 FAX (303) 780-9402**

**PRICE SCHEDULE**

CHEMICAL ANALYSIS	-1-
MECHANICAL TESTING	-2-
FAILURE ANALYSIS, METALLURGY/METALLOGRAPHY	-3-
SECTIONING/MACHINING/SAMPLE PREP	-4-
PLATING AND CORROSION TESTS	-5-
WELD CERTIFICATION/MISCELLANEOUS SERVICES	-6-

Minimum charge for any service is \$25.00.

Prices effective June 1, 2001, subject to change without notice.

Terms: C.O.D. without prior credit, NET 30 with credit approval.

It is our policy to complete routine jobs in 3 -5 working days. If expedited services are required, an expediting surcharge will apply.

Local pickup services are available on orders of \$100.00 or more. Customer is responsible for sample return postage/shipping charges.

# CHEMICAL ANALYSIS

## SPECTROGRAPHIC ANALYSIS 1.2

<b>ALLOY BASE</b>	<b>PRICE EACH</b>	<b>CODE</b>
ALUMINUM	35.00	COESAL
COBALT	55.00	COESCO
COPPER	55.00	COESCU
NICKEL, SUPERALLOYS	55.00	COESNI
CAST (WHITE) IRON	45.00	COESLA
IRON (STEEL, STAINLESS, TOOL STEEL)	45.00	COESSS
TITANIUM	55.00	COESTI
SINGLE ELEMENTS	30.00	COESSE
IDENTIFICATION CHARGE	30.00	COESID
SAMPLE PREPARATION <sup>2</sup>	15.00	CSPREP
SAMPLE MELTDOWN	25.00	

## INDUCTIVELY COUPLED PLASMA ANALYSIS (ICP)3

<b>SAMPLE</b>	<b>PRICE EACH</b>	<b>CODE</b>
BRAZE ALLOY POWDERS	125.00	CPOWDR
METAL ALLOYS	125.00	CICPMA
SOLDERALLOYS	125.00	CSOLDR
SINGLE ELEMENTS	55.00 dissolution + 25.00 per element	CICP1

## GAS ANALYSIS3

<b>ELEMENT</b>	<b>PRICE EACH</b>	<b>CODE</b>
HYDROGEN	60.00	CGASH
NITROGEN	45.00	CGASN
OXYGEN	45.00	CGASO
ALL THREE GASES (H, N, O)	120.00	CGASA3

## COMBUSTION ANALYSIS4

<b>ELEMENT</b>	<b>PRICE EACH</b>	<b>CODE</b>
CARBON	55.00	CCOMC
SULFUR	55.00	CCOMS

### NOTES:

(1) Does not include analysis for interstitial gases Hydrogen, Nitrogen, Oxygen, or yttrium, where required by the specification.

(2) Samples submitted for spectrographic analysis should be approximately one inch across, flat, and homogenous. Smaller samples such as wire, powder, chips, etc., or larger samples, may be analyzed at extra cost for sample meltdown or sectioning.

(3) Wet analysis, inductively coupled plasma analysis (ICP), combustion analysis, or x-ray analysis may be required due to sample size, accuracy, composition, or specification requirements, at extra cost. Lead, Tin, Zinc, Magnesium, some Copper Alloys, and some single elements are analyzed by wet analysis, ICP, combustion, or x-ray.

(4) Drillings, chips, and fillings submitted for Carbon or Sulfur analysis must be clean, oil and dirt free.

## MECHANICAL TESTING

TEST	PRICE EACH	CODE
FLARING/FLATTENING (TUBING)	20.00	PFLARE
BEND (INCLUDES VISUAL EXAM)	20.00	PBENDT
FILLET BEND	sheet to .125" 25.00 Plate over .125" 25.00	
COMPRESSION	20.00	PCOMDF
PEEL	25.00	PPEEL
NICK BREAK	20.00	
HARDNESS (BRINELL, ROCKWELL, SUPERFICIAL)	15.00	PHB/PHR/PHSR
HARDNESS (SHORE A OR D)	25.00	PHARD
HARDNESS TRAVERSE	20.00	
CHARPY IMPACT ( MACHINING, TEST, MAGNETIC MATERIALS) <sup>1</sup>	+5.00 per additional indent to 0°F 105.00 to -90°F 120.00 to -320°F 150.00	PCHLA
CHARPY IMPACT ( MACHINING, TEST, NON-MAGNETIC MATERIALS) <sup>1</sup>	to 0°F 230.00 to -90°F 230.00 to -320°F 230.00	PCHNI
CHARPY IMPACT (PRE-MACHINED SAMPLES SUBMITTED BY CUSTOMER)	to 0°F 15.00 to -90°F 25.00 to -320°F 35.00	
TENSILE TEST PER ASTM E-8 <sup>1,2</sup>	to 60K 15.00 to 110K 25.00 to 150K 30.00	PTEN60
TENSILE (SUBSIZE) <sup>1,2</sup>	30.00	
TENSILE (PREMACHINED SAMPLES SUBMITTED BY CUSTOMER)	20.00	PPULL
TENSILE, TUBING, OR WIRE	20.00	PTENTU
TENSILE, REDUCED TEMP, TO -110° F	60.00	
PROOF LOADS	25.00 setup +5.00 each	PPRFSU
SHEAR (DOUBLE OR SINGLE - DOES NOT INCLUDE TEST FIXTURE, IF REQUIRED)	25.00 setup + 10.00 each	
IN-LAB SERVICES, TECHNICIAN, AND EQUIPMENT	75.00 per hour	
OUTSIDE LAB SERVICE	125.00 per hour + travel expenses	
FULL SIZE FASTENERIBOLT TESTING	to 1 inch dia. 20.00	
FASTENERIBOLT TESTING (INCLUDES SECTIONING, MACHINING OF TEST SAMPLE, AND TENSILE TEST)	to 2 inch dia. 60.00	
FASTENERIBOLT TESTING (INCLUDES SECTIONING, MACHINING, AND TENSILE TEST)	to 3 inch dia. 90.00	
WEDGE TEST, BOLTS, AND FASTENERS	1 inch dia. or less 25.00	

**NOTES:**

(1) If not specified by customer, direction of rolling or grain flow may be determined at extra cost. Sectioning cost still apply.

(2) Tensile test includes yield at .2% offset or .5% extension under load, ultimate tensile strength, elongation, and reduction of area where applicable. Tensile test specimens require machining to ASTM-E-8 at extra cost (refer to page 4)

## METALLURGICAL SERVICES

TEST	PRICE EACH	CODE
CASE DEPTH (VISUAL)	30.00	
CASE DEPTH (MICROHARDNESS) <sup>1</sup>	40.00	MCASEM
	+2.00 per indentation	
COATING WEIGHT	40.00	MCOTWT
EXFOLIATION (ALUMINUM)	40.00	MEXFOL
GRAIN FLOW (MACRO OR MICRO) <sup>1</sup>	45.00	MGRFLO
GRAIN SIZE (VISUAL COMPARISON METHOD) <sup>1</sup>	40.00	MGRSIZ
INCLUSION RATING (VISUAL COMPARISON METHOD) <sup>1</sup>	40.00	MINCRT
INTERGRANULAR CORROSION TEST <sup>1</sup>	40.00	MIGCT
MACRO SAMPLE PREPARATION AND EXAMINATION	40.00 minimum	MEXAM
MICROSTRUCTURAL EXAMINATION <sup>1</sup>	40.00 minimum	MEXAM
MICROHARDNESS (KNOOP) <sup>1</sup>	40.00	MMHKSU
	+2.00 per indentation	
MACROHARDNESS (VICKERS) <sup>1</sup>	30.00	MMHVSU
	+8.00 per indentation	
MOUNT, POLISH, ETCH (SPECIMEN PREPARATION)	50.00	MAUTO
PHOTOMICROGRAPH, PHOTOMACROGRAPH (digital)	5.00	MPHMAC
HIGH QUALITY PRINT	20.00	
PLATING/COATING THICKNESS <sup>1</sup>	40.00	MTHICK
DENSITY	50.00	
ELECTROLESS NICKEL PLATE (WHERE REQUIRED FOR MICRO EDGE RETENTION)	25.00	
SECTIONING	60.00 per hour	MSECT
FAILURE ANALYSIS/MET ALLURGICAL REPORTS <sup>2</sup>	(Price Upon Application)	
SCANNING ELECTRON MICROSCOPY	200.00 per hour	

### NOTES:

(1) Mount, polish, etch required

(2) Conducting various tests, using investigative procedures, conducting metallurgical investigations, evaluating data, analysis, consultation, examinations, research, reverse engineering, measurements, preparing written text, report preparation, etc. may be necessary processes and may be included in creating a metallurgical report or failure analysis reports. These procedures are billed at a rate of 70.00 per hour.



## PLATING & CORROSION TESTS

### HYDROGEN EMBRITTLEMENT [ASTM-F-519]

#### PRICE EACH

#### CODES

NOTCHED TEST BARS (MACHINED TO ASTM-F-519)	25.00	PHETMB
200 HOUR TEST (PER SPECIMEN)4 BARS	160.00	PHET20
PASSIVATION HIGH HUMIDITY	Price Upon Application	
SALT SPRAY B-117	Price Upon Required Duration	CSSMIN
HYDROGEN PICK UP [2 EACH REQUIRED]	50.00	

#### PRACTICE: ASTM A-262<sup>1</sup>

A. OXALIC ACID: MOUNT & POLISH, ETCH & EXAM MICROSTRUCTURES - STEP, DUAL, DITCH, ISOLATED FERRITE, END GRAIN PITTING, INTERDENDRITIC DITCHING.	90.00	
B. FERRIC SULFATE/H <sup>2</sup> SO <sup>4</sup> 120 HOUR 5 BOILING PERIODS FINISHED SAMPLE MASS NEEDED 5-20 GRAMS	250.00	
C. HNO <sup>3</sup> - 240/96 HOURS 2 5 BOILING PERIODS FINISHED SAMPLE MASS NEEDED - 100 GRAMS		
D. HNO <sub>3</sub> - HFI 70°C 4/2 BOILING PERIODS FINISHED SAMPLE MASS NEEDED 5-20 GRAMS [2 EACH]	150.00	
E. CU-CUSO <sup>4</sup> /H <sup>2</sup> SO <sup>4</sup> 16% 24 HOUR EXPOSURE + 180° BEND TEST	150.00	
F. CU/CUSO <sup>4</sup> 50% H <sup>2</sup> SO <sup>4</sup> 120 HOUR FINISHED SAMPLE MASS NEEDED 2/5 GRAMS	220.00	

#### PRACTICE: ASTM-G-28<sup>1</sup>

METHOD A INCLUDES SECTION/TEST/EVALUATION	95.00	
METHOD B INCLUDES FERRIC CHLORIDE 24 HOUR, SECTION/MACHINE/TEST/ EVALUATE CREVICE CORROSION	195.00	

#### PRACTICE: ASTM G-48<sup>1</sup>

METHOD 1 FERRIC CHLORIDE	55.00	
24 HOUR VISUAL PLUS SETUP	50.00	
METHOD 2 FERRIC CHLORIDE 72 HOUR/CREVICE	Priced Upon Application and/or Duration	

#### CORROSION TESTING ADDITIONAL CHARGES

SAMPLE PREP ARATION <sup>2</sup>	30.00-50.00	
HEAT TREAT/SENSITIZE [AS REQUIRED/MINIMUM CHARGE OF 2 HOURS]	30.00 Per Hour	

NOTE:

(1) Prices include hazardous material disposal fees and setup charges

(2) Sectioning & Machining Additional

## WELD CERTIFICATION

Weld Certifications: A WS D1.1 thru D1.6

\* ASME Sections II, VIII and IX, NACE, AWS, AASHTO, API, Railroad, as well as Military & Federal specifications, certifications quoted separately dependent on materials, configuration requirements and sample size.

1595A Macros (8 samples) 120.00 (lot)

WELD CERTIFICATION PER MIL-STD-2219/1595A1MIL-W-8611A18604-A 175.00  
 (By specification according to Type, Procedure, or Performance)

\*MIL-W-6858 Per Quote, by Class  
 Visual Exam of Weld [Requires Macro Prep] 30.00

### MISCELLANEOUS SERVICES

TEST	PRICE	CODES
COATING IMPACT TEST	15.00	
DENSITY	50.00	
FERRITE SCOPE	20.00(MIN.)	
ELECTRICAL CONDUCTIVITY	20.00 (MIN.)	
HEAT TREATING (TO 1800° F)		
RAMP UP, AT TEMP, COOL DOWN)	30.00 Per Hour	
JOMINY END QUENCH-HARDENABILITY	175.00	
OVEN CERTIFICATION - PER AMS-H-6088		
(MACHINE AND TEST NINE TENSILES, CORROSION TEST, SAMPLE PREP, MICRO EXAM, AND REPORT)	265.00	POVEN
OVEN CERTIFICATION - PER AMS-H-6875		
(MACHINE, TENSILE TEST, CORROSION TEST, SAMPLE PREP, MICRO EXAM, AND REPORT)	140.00	
TABER ABRASION	35.00 Per Panel	CTABER
WET TAPE ADHESION TEST	25.00	CTAPE

\*NOTE: Qualification to BAC 5962 (Boeing) requires radiographic inspection in addition to the above tests, at additional cost. Some materials may be radiographic inspected depending upon specification. Refer to the specification for information.

