Handy & Harman of Canada, Limited
Handy & Harman du Canada, Limitée
290 CARLINGVIEW DR., REXDALE, ONTARIO M9W 5G1
Phone: (416) 675-1860 · (800) 463-1465 Fax: (416) 675-1956 · (800) 426-3907

TECHNICAL DATA SHEET

EASY-FLO

Nominal Composition:

Silver:	50.0% ± 1.0%
Copper:	15.5% ± 1.0%
Zinc:	16.5% ± 2.0%
Cadmium:	18.0% ± 1.0%
All Others:	0.15% maximum

Physical Properties:

Colour:	Light Yellow
Solidus (Melting Point):	625°C (1160°F)
Liquidus (Flow Point)	635°C (1175°F)
Specific Gravity	9.45
Density (Troy oz/cu in)	4.98
Electrical Conductivity (%IACS)	23.9
Electrical Resistivity (Microohm-cm)	7.0
Brazing Temperature Range	635°-760°C (1175°-1400°F)

Uses:

Easy-Flo is a very versatile and can be used successfully on nearly all nickel, iron and copper base alloys. In certain instances, special fluxes may be required to obtain good wetting and bonding. In brazing gray cast iron it is necessary to treat the surface prior to brazing to remove graphite, in order to assure good wetting by the brazing filler metal.

A complete list of the uses of Easy-Flo would include practically all applications for which silver brazing filler metals have been used.

Brazing Characteristics:

Easy-Flo is a eutectic type, free-flowing filler metal that, because of the narrow melting range, is less sensitive to the rate of heating and should not liquate (i.e. separate into low and high melting constituents). This high fluidity makes well-fitted joints essential and prevents “bridging” or large fillet formation. Handy Flux should be used with this filler metal.

Some base metals when brazed under high stress may crack during brazing when the stressed base metal is wetted by the brazing filler metal. This is a form of stress corrosion cracking. The low flow temperature of Easy-Flo is below the stress relaxation temperature of some nickel base alloys. The cure is to relieve the stress before the brazing alloy is applied. Higher melting brazing filler metal may be preferred since stress relief will then occur before the filler metal melts.

Properties of Brazed Joints:

The properties of a brazed joint are dependent upon the base metal, joint design, brazing technique, etc. The following information, however, should serve as a guide for estimating the results that can be achieved with Easy-Flo.

Copper: Butt joints as strong as annealed copper can be made consistently (33,000 psi tensile strength). Failure should occur in the base metal on both butt and lap joints.

Brass: Butt joints should have tensile strengths of 35,000-45,000 psi. Failure usually occurs in the brass rather than in the brazing filler metal. Brasses vary widely in composition and the presence of certain constituents may adversely affect the strength of a silver brazed joint. A high lead content in brass may result in lead evolution to the base metal/filler metal joint interface with resultant

Handy & Harman of Canada, Limited
Handy & Harman du Canada, Limitée
290 CARLINGVIEW DR., REXDALE, ONTARIO M9W 5G1
Phone: (416) 675-1860 · (800) 463-1465 Fax: (416) 675-1956 · (800) 426-3907

TECHNICAL DATA SHEET

EASY-FLO

Properties of Brazed Joints: *(continued)*

joint embrittlement. Brasses or bronzed containing aluminum will require the use of Handy Flux, Type A-1.

Steel: The tensile strength of Easy-Flo brazed joints in steel will vary considerably with the type of steel and its physical condition. Approximate values for butt joints are given in Table I below. The strength of the Armco joints is slightly higher than the unbrazed Armco because the brazing operation actually increases the strength of this base metal. Most of the Armco iron and 1020 steel specimens broke in the base metal outside the joint area. Although High Speed Steel has higher strength than 4140 steel, the strength of brazed joints is less with the former steel. This appears to be the result of poorer wetting on this grade.

The values reported are about the maximum possible under ideal conditions of fit and cleanliness. In general, increased clearances cause reduced tensile strength, Particularly in the higher strength steels.

TABLE I

	Tensile Strength of Base Metal psi	Tensile Strength of Butt Joint psi
Armco Iron (.05%C)	50,000	55,000
1020 Steel	65,000	65,000
1095 (Drill Rod)	90,000	85,000
4140 Steel	135,000	110,000
High speed Steel (18W, 4Cr, 1V)	------	90,000
Stainless Steel (18-8)		
Annealed	80,000	60,000
Cold Rolled	160,000	130,000

Shear strengths of brazed joints in various steels vary from about 20,000 to 50,000 psi depending upon joint design, materials, etc. The relationship between the shear strength of a steel and the shear strength of a brazed joint is not as pronounced as with the tensile strengths, and for design purposes it is not safe to assume brazed joint shear strengths greatly exceeding 25,000 psi. Shear tests on flange type joints indicate that fillet size exerts considerable influence on the breaking load, a large fillet being beneficial.

Tests of brazed joints show that shear in torsion are somewhat higher than direct shear. Torsion shear tests on brazed joints in steel have indicated an average value of about 40,000 psi.

The impact strength of silver brazed butt joints decreases as the strength of the steel increases. For instance, impact values for standard Charpy butt brazed test specimens of Armco iron gave average values of about 40 ft. lbs. while similar joints on 4140 steel averaged about 2 ft. lbs. This is because the softer material deforms before the joint fails and absorbs part of the impact, while hard steels do not deform and most of the effect of the impact is concentrated at the joint itself.

No broad generalizations can be made in order to establish joint strengths for all cases. An accurate evaluation, for a specific case, can only be arrived at by a test of the actual joint geometry in question. Additional test data are given in Table II for short time elevated temperature conditions.

Handy & Harman of Canada, Limited
Handy & Harman du Canada, Limitée
290 CARLINGVIEW DR., REXDALE, ONTARIO M9W 5G1
Phone: (416) 675-1860 · (800) 463-1465 Fax: (416) 675-1956 · (800) 426-3907

TECHNICAL DATA SHEET

EASY-FLO

Properties of Brazed Joints: *(continued)*

TABLE II
Strength of Easy-Flo Brazed Butt Joints at Elevated Temperatures

Test Temperature °C	Test Temperature °F	Inconel Tensile Strength psi	Elongation % in 2"	Monel Tensile Strength psi	Elongation % in 2"	18-8 Stainless Steel Tensile Strength psi	Elongation % in 2"
Room		45,000	0	70,000	7.3	101,000	0
95	200	43,000	0	60,000	5.1	----	----
150	300	45,000	0	58,000	7.3	94,000	0
205	400	----	----	----	----	76,000	0
260	500	38,000	0	48,000	3.1	49,000	0
315	600	29,000	0	----	----	30,000	0
370	700	27,000	0	31,000	0	26,000	0
425	800	14,000	0	19,000	0	12,000	0
480	900	8,000	0	13,000	0	----	----

Safety Precaution:

Easy-Flo alloy contains cadmium, and cadmium fumes are poisonous. These alloys should be used only in well-ventilated spaces with air movement such as to carry brazing fumes away from the operators face. Refer to ANSI Z49.1 entitled “Safety in Welding and Cutting”.

Corrosion Resistance:

The Easy-Flo filler metal has corrosion characteristics resembling those of the brasses. They are generally useful in applications for which copper, copper base alloys, and carbon steel are suited, and with stainless steels and nickel alloys with certain limitations.

The filler metal is unsuited for use with the strong mineral acids on any base metal, although the attached is slow enough to allow pickling in sulphuric or hydrochloric acids after brazing to clean up the part without destructive attack. Nitric acid is not recommended for use with Easy-Flo filler metals. They are also not suited for continuous use with aqueous ammonia, wet SO2, and strong chlorine bleach solutions.

The filler metal may be used in salt water, on copper, brass, Monel, nickel-silver, Inconel, and the like, to the extent that these base metals are satisfactory. Hot salt water may cause dezincification of the filler metals. In such applications, zinc free brazing filler metals such as Braze 603 or Braze 630 would be better choices.

Easy-Flo filler metal should not be used on the 400 series of stainless steels because in water (even tap water) interface corrosion occurs and the braze metal separates cleanly at the bond line. On the 300 series stainless steels Easy-Flo filler metals are usually satisfactory except for salt-water exposure, where Easy-Flo 3, Braze 505, Braze 404, Braze 403 or Braze 630 would be better choices.

In acids, other than the strong mineral acids, or in any other corrosive media whose specific effects on the filler metals are not known, the prospective use should be tested with the base metals to be joined, under the conditions of the proposed use. It is not possible to predict how various base metals may react with the filler metals under all corrosive conditions. Therefore, while the guidelines presented here are reliable to the best of our knowledge, the burden of determining suitability for any specific application rests exclusively on the user of the filler metal.

Handy & Harman of Canada, Limited
Handy & Harman du Canada, Limitée
290 CARLINGVIEW DR., REXDALE, ONTARIO M9W 5G1
Phone: (416) 675-1860 · (800) 463-1465 Fax: (416) 675-1956 · (800) 426-3907

TECHNICAL DATA SHEET

EASY-FLO

Specifications:

This alloy conforms to the following specifications:

AWS A5.8-04	BAg-1a
SAE-AMS	4770
ASME Boiler & Pressure Vessel Code, SecII-C	BAg-1a

Available Forms:

Strip, wire, powder, paste and preforms to specification. Also available as clad bimetal strip products for contact applications.

Comments:

Rev: 09/2004