CLIFFS

ALUMINIZED TYPE 1 STEEL

- Vehicle Exhaust
- Residential Furnace
- Electric Vehicle Components
- Dryer Vents
- Commercial Baking
- Heat Shields

ALUMINIZED TYPE 1 STEEL is continuously hot-dip coated on both sides with an aluminum (Al)/silicon (Si) coating. The hot-dip process, pioneered by Cleveland-Cliffs, provides a tight, metallurgical bond between the steel and the coating. This results in a material with the strength of steel, plus the corrosion protection of aluminum and the synergistic heat protection of an aluminum/silicon alloy.

ALUMINIZED TYPE 1 STEEL

Product Features

CORROSION RESISTANCE

Aluminized Steel Type 1 has superior performance compared to zinc-coated materials for resistance to atmospheric and salt spray corrosion.

FORMABILITY

Aluminized Steel Type 1 can be used to produce parts containing simple bends to parts with deep drawing requirements.

HIGH REFLECTIVITY

Aluminized Steel Type 1 has excellent heat reflectivity during exposures to temperatures below 800 °F (427 °C), reflecting up to 80% of the radiant heat that impinges upon it.

HIGH TEMPERATURE PROPERTIES

Aluminized Steel Type 1 is an excellent heat-resistant material effective up to 1250 °F (677 °C). For applications above 800 °F (427 °C), where alloying of the coating is a concern, Cleveland-Cliffs' DQHT grade has been specially formulated to resist alloying at temperatures up to 1000 °F (538 °C).

Coating Characteristics

Aluminized Type 1 (T1) coating contains approximately 91 % aluminum and 9% silicon that is metallurgically bonded to the steel substrate. The hot-dip coating process assures a tightly adherent, uniform coating on both sides of the product. A schematic of the coating cross-section is shown in Figure 1.

Aluminized Steel Type 1 is supplied in coating weights ranging from T1 13 (0.13 oz./ft^2) to T1 60 (0.60 oz./ft^2), as shown in Table 1. Most common are T1 25 and T1 40. Lighter coating weights (T1 13 or T1 25) are recommended for severe forming applications. For coating weights not listed, contact your Cleveland-Cliffs Steel sales representative.

Surface Protection and Lubrication

To prevent staining in transit and storage, it is recommended that Aluminized Steel Type 1 be supplied with a rust-preventative protective oil. In some cases, a pre-applied press forming lubricant can be supplied. A dry film (acrylic/polymer) lubricant can also be supplied by further processing Aluminized Steel Type 1 through a coil coating facility. These specialty organic coatings are easily removed with a mild alkaline cleaner.

To further enhance protection against storage stain, a chemical surface treatment (chrome-free) can be applied to Aluminized Steel Type 1. This treatment is not recommended if the final product will be painted unless the appropriate pretreatments are performed.

Formability and Mechanical Properties

The formability of all steel products is a result of the interaction of many variables. These variables include: the mechanical properties of the steel, the forming system (tooling) used to manufacture parts and the lubrication used during forming. Of these three, Cleveland-Cliffs can directly affect the mechanical properties of the steel. Tight control over chemical composition, hot rolling parameters, amount of cold reduction, in-line annealing time and temperature, and the amount of additional processing allows the production of high quality Aluminized Steel Type 1 to meet customers' requirements.

COMMERCIAL STEEL (CS)

Commercial Steel Type B (CS Type B) and Forming Steel Type B (FS Type B) should be used for moderate forming or bending applications. These products are produced from continuously cast slabs, and unless otherwise specified, have a carbon content of 0.02 - 0.15%C and 0.02 - 0.10%C respectively. To prevent the occurrence of fluting or stretcher strains during forming or processing, both products must be ordered as EXTRASMOOTH. These products are subject to aging and the temper rolling effect is temporary.

DEEP DRAWING STEEL (DDS)

For more stringent forming applications, Deep Drawing Steel should be ordered. DDS has a controlled carbon content less than 0.06%C. Interstitial Free (I-F) steel may be supplied at the manufacturer's discretion unless low carbon is specifically requested at the time of purchase.

EXTRA DEEP DRAWING STEEL (DDS)

Extra Deep Drawing Steel or Extra Deep Drawing Steel Plus (EDDS+) should be ordered for the most demanding forming applications. These steels, also known as Interstitial Free (I-F) steel, are produced from vacuum degassed less than 0.01 0%C, stabilized grades. EDDS+ has the lowest carbon content available and has been specially formulated to be Cleveland-Cliffs' most ductile product.

For high strength or structural applications, Aluminized Steel Type 1 is also available in yield strengths up to 50 ksi. (340 MPa). Aluminized Steel Type 1 can also be specified as Drawing Quality High Temperature (DQHT) for applications where alloying of the coating can be a concern. Cleveland-Cliffs' DQHT grade has been specially formulated to resist alloying at temperatures up to 1000°F (538 °C). This product is subject to aging. Materials should be processed within 45 days of aging.

ULTRALUME® PRESS HARDENABLE AND PRESS QUENCHED STEELS (PHS & PQS)

ULTRLAUME Press Hardenable and Press Quenched Steels are available for hot forming applications. This material is used in hot stamping applications to achieve various final ultimate tensile strengths. Refer to Cliffs' ULTRALUME brochure for details.

STAINLESS STEEL

An Aluminized Type 1 ferritic (409/439) Stainless Steel is also available. Typical mechanical properties are shown in Tables 2 and 3, page 5.

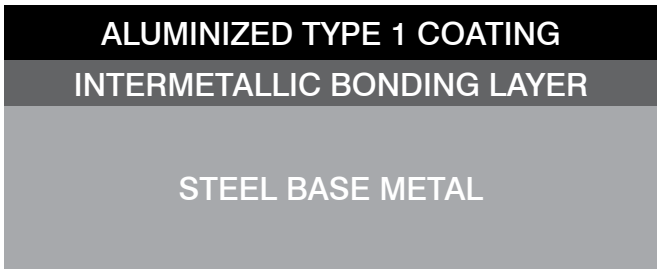
Product Description

TABLE 1 – COATING WEIGHT

Coating Designation	Coating Weight Min.		App. Ctg. Thickness per side (Mils)
	oz./ft.^{2}	g/m^2	
T1 13	0.13	40	0.25
T1 25	0.25	76	0.50
T1 26	0.26	80	0.50
T1 40	0.40	122	0.80
T1 50	0.50	152	1.00
T1 60	0.60	183	1.20

Coating Weight is the total of both sides and is determined according to ASTM A463. 1 oz./ft^2 Coating = 0.00398 in. (0.101 mm) coating thickness total both sides.

FIGURE 1 – COATING CROSS SECTION



Layers not shown to scale.

PAINTABILITY

For best results, Aluminized Steel Type 1 should be cleaned with a mild alkaline cleaner to remove dirt and oil, followed by phosphating with a zinc phosphate. Chromium and aluminum oxides also give good results as a pretreatment on coil coating lines. Mild abrasion prior to pretreating may also be used to enhance mechanical bonding of the paint.

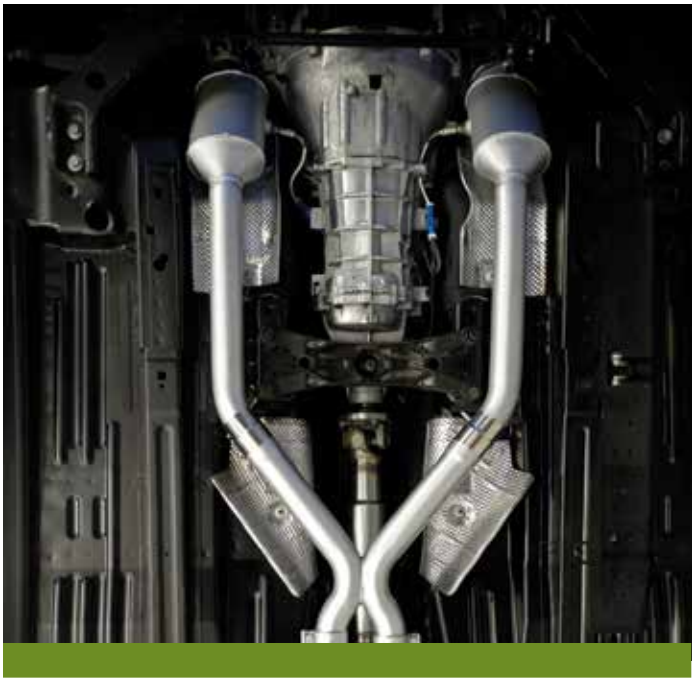
WELDABILITY

A variety of welding processes can be used to join Aluminized Steel Type 1, provided that welding procedures are adapted to the special properties of the material.

Resistance spot and projection welding processes are especially suited for Aluminized Steel. High frequency resistance welding and various arc welding processes are also compatible with Aluminized Steel. For assistance concerning your particular welding parameters, contact your Cleveland-Cliffs sales representative.

SPECIFICATIONS

Aluminized Steel Type 1 conforms to ASTM A463. For other specifications, please contact your Cleveland-Cliffs sales representative.



ALUMINIZED TYPE 1 STEEL

TABLE 2 – TYPICAL MECHANICAL PROPERTIES – STANDARD GRADES

Quality Designation	Description	YS		UTS		Elong. %	n-Value	r_m
		ksi.	MPa	ksi.	MPa			
Commercial Steel (CS Type B)	May be moderately formed. A specimen cut in any direction can be bent flat on itself without cracking.	44	303	55	380	33	–	–
Forming Steel (FS Type B)		39	269	53	365	36	0.20	1.5
Deep Drawing Steel (DOS) Low Carbon	May be used in drawing applications.	33	228	50	345	37	0.18	1.3
Deep Drawing Steel (DOS) Ultra-Low Carbon		24	166	45	310	39	0.20	1.4
Extra Deep Drawing Steel (EDDS)	Interstitial Free (1-F) steels are made by adding titanium and/or niobium to the molten Extra Deep Drawing Steel Plus steel and vacuum degassing and offer excellent drawability.	23	160	45	310	40	0.21	1.5
Extra Deep Drawing Steel Plus (EDDS+)		22	150	45	310	41	0.22	1.6
ULTRALUME PHS	Prior to hot forming	52	360	84	580	23	–	–

Typical properties produced by Cleveland-Cliffs for these grades.

Commercial Steel, Deep Drawing Steel, and Extra Deep Drawing Steel are designations described in the ASTM Specification A463 "Steel sheet, Aluminum Coated by the Hot Dip Process."

Each of these steel sheet designations is associated with unique requirements for chemical composition and with nonmandatory, typical mechanical properties.

TABLE 3 – PHYSICAL PROPERTIES – HIGHER STRENGTH GRADES

Quality Designation	Description	Min. Yield Strength		Min Tensile Strength		Min. Total Elongation %
		ksi	MPa	ksi	MPa	
Structural Steel (SS)	Grade 40	40	280	55	380	16
High-Strength Low Alloy (HSLAS)	Grade 50	50	340	60	415	20
	Grade 60	60	420	70	480	18

For additional quality designations, please contact your Cleveland-Cliffs sales representative.

TABLE 4 – ENGINEERING PROPERTIES

Young's Modulus of Elasticity	200 x 10^3 MPa at 20 °C
Density	7.87 g/cm^3 at 20 °C
Coefficient of Thermal Expansion	Low-Carbon/HSLAS: 12.4 μm/m/°C in 20 - 100 °C range I-F Steel: 12.9 μm/m/°C in 20 - 100 °C range
Thermal Conductivity	Low-Carbon/HSLAS: 89 W/m°C at 20 °C I-F Steel: 93 W/m°C at 20 °C
Specific Heat	481 J/kg/°C in 50 - 100 °C range
Electrical Resistivity	0.142 $\mu\Omega \cdot$m at 20 °C

ALUMINIZED TYPE 1 STEEL

OUTSIDE PROCESSING

Tension leveling, re-squaring, slitting, coil coating and cut-to-length are available from Cleveland-Cliffs via arrangements with outside processors.

TECHNICAL ASSISTANCE

Cleveland-Cliffs technical representatives can provide you with more detailed information concerning this product. They also are available to assist you in reviewing any welding, forming, painting or other material selection issues.

MILL LIMITS

Aluminized Steel Type 1 is available in thickness ranging from 0.017-0.140 in. (0.43-3.56 mm) and widths up to 60 in. (1524 mm), depending on dimensions and product quality. For sizes outside of these limits, please ask your Cleveland-Cliffs sales representative.

The standard coil inner diameter is 24 in. (609 mm).

About Cleveland-Cliffs Inc.

Cleveland-Cliffs is a leading North America-based steel producer with focus on value-added sheet products, particularly for the automotive industry. The Company is vertically integrated from the mining of iron ore, production of pellets and direct reduced iron, and processing of ferrous scrap through primary steelmaking and downstream finishing, stamping, tooling, and tubing. The Company is headquartered in Cleveland, Ohio with mining, steel and downstream manufacturing operations located across the United States and in Canada. For more information, visit www.clevelandcliffs.com.

CLEVELAND-CLIFFS INC.
200 Public Square
Suite 3300
Cleveland, OH 44114-2315
844.STEEL99 | 844.783.3599
clevelandcliffs.com

All information in this brochure is for the purpose of information only. Cleveland-Cliffs reserves the right to change its product range at any time without prior notice.

©2025 Cleveland-Cliffs Inc. All Rights Reserved.

March 2025