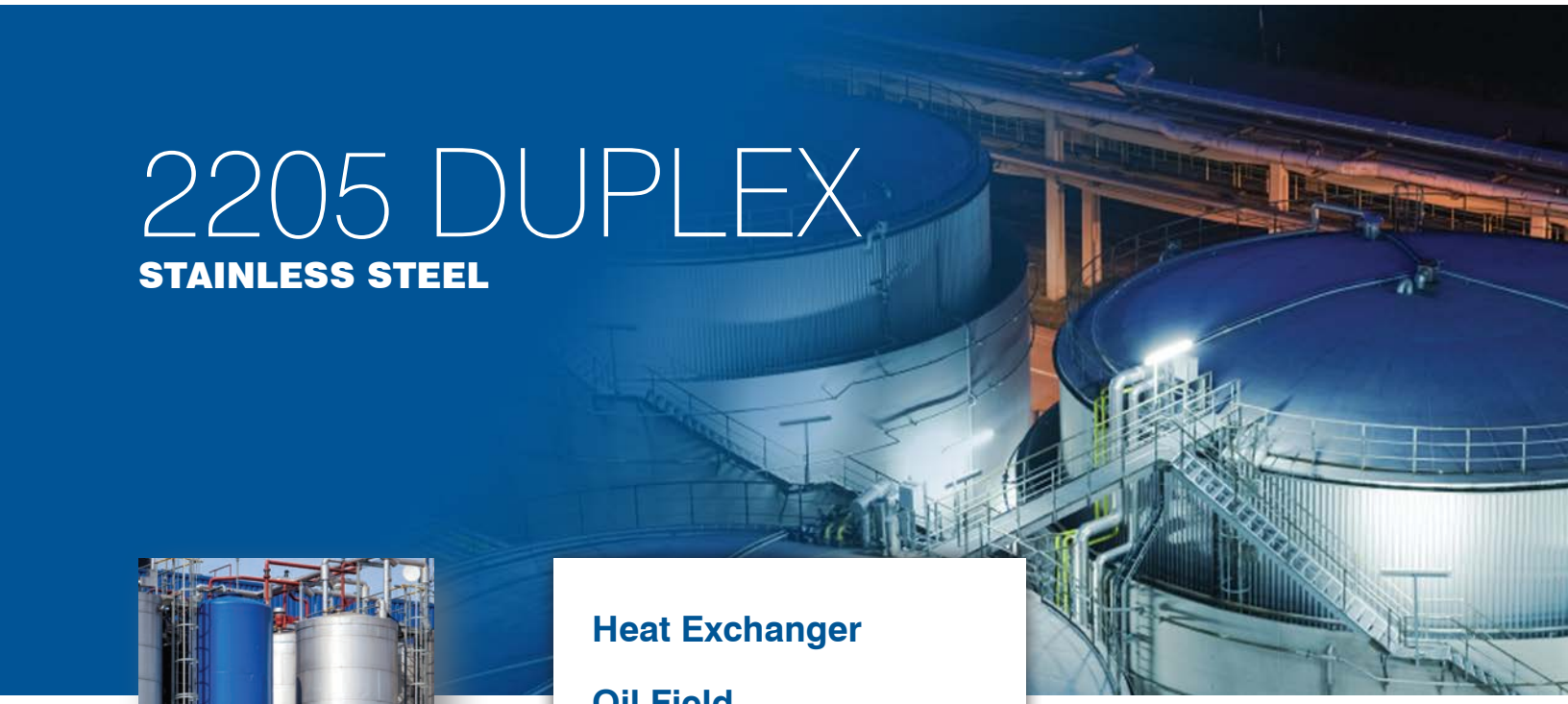
CLIFFS

2205 DUPLEX
STAINLESS STEEL



- **Heat Exchanger**
- **Oil Field**
- **Paper Production**
- **Pressure Vessel**

A combination of excellent corrosion resistance, high strength, low thermal expansion and high stress resistance makes Cleveland-Cliffs **2205 Duplex Stainless Steel** useful in a variety of applications, including: heat exchangers, pipes, pressure vessels, tanks, fans, pulp and paper production equipment, oil field equipment and press rolls.

Product Description

Cleveland-Cliffs 2205 Duplex has a mixed ferrite and austenite structure. The alloy is chemically balanced to yield a microstructure of approximately 50 – 50 ferrite to austenite ratio. It provides a valuable combination of high strength, excellent corrosion resistance, and stress-corrosion cracking resistance as well as very good pitting resistance. In addition, it is highly resistant to stress and provides a low level of thermal expansion.

Composition		(wt %)
Carbon	(C)	0.2
Manganese	(Mn)	2.00 max.
Silicon	(Si)	1.00 max.
Phosphorus	(P)	0.03 max.
Sulfur	(S)	0.02 max.
Chromium	(Cr)	22.00
Nickel	(Ni)	6.00
Molybdenum	(Mo)	3.10
Nitrogen	(N)	0.17
Iron	(Fe)	Balance

AVAILABLE FORMS

Thicknesses from 0.01 – 0.09 in. (0.25 – 2.29 mm).

Values shown in this bulletin were established in U.S. customary units. The metric equivalents may be approximate.

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Mechanical Properties

TABLE 1 – TYPICAL ROOM MECHANICAL PROPERTIES

UTS, ksi. (MPa)	0.2% YS, ksi. (MPa)	Elongation % in 2 in. (50.8 mm)	Rockwell Hardness, C
125 (862)	90 (621)	28	25

TABLE 2 – IMPACT RESISTANCE

Charpy V-Notch Impact*	
	W/A in.•lbs/in.^{2} (J/cm^2)
Longitudinal	7,486 (131)
Transverse	4,825 (84.4)

**0.06 in. (1.5 mm) thickness, -40 °F (-40 °C)*

CORROSION RESISTANCE

The general level of corrosion resistance of Cleveland-Cliffs 2205 Duplex is superior to Types 304 and 316 in most cases. Pitting resistance is also superior in comparison to Types 304 and 316. Stress-corrosion cracking resistance is superior to the austenitic grades of stainless steel.

FORMABILITY

Formability of Cleveland-Cliffs 2205 Duplex is better than that of ferritic grades, especially in heavy sections, but not quite as good as the austenitic stainless steels.

WELDABILITY

Cleveland-Cliffs 2205 Duplex can be readily welded with Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW), plasma, Shielded Metal Arc Welding (SMAW) and submerged-arc welding methods. The alloy should be welded without preheating, followed by cooling to at least 300 °F (150 °C) between each pass. A welding procedure should be developed so that a ferrite content of 30 – 55% is present in the weld fusion and heat-affected zones of the final weldment.

About Cleveland-Cliffs Inc.

Cleveland-Cliffs is the largest flat-rolled steel producer in North America. Founded in 1847 as a mine operator, Cliffs also is the largest manufacturer of iron ore pellets in North America. The Company is vertically integrated from mined raw materials and direct reduced iron to primary steelmaking and downstream finishing, stamping, tooling, and tubing. The Company serves a diverse range of markets due to its comprehensive offering of flat-rolled steel products and is the largest steel supplier to the automotive industry in North America. Headquartered in Cleveland, Ohio, Cleveland-Cliffs employs approximately 25,000 people across its mining, steel and downstream manufacturing operations in the United States and Canada.

CLIFFS

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