

STEEL BASICS

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Learning made Simple, Visual, and Interactive

This course is designed to provide learners with an introduction to the basic equipment and terminology associated with modern steelmaking shops.

Credit Hours **1**

Learning Objectives

- Recall the primary types of steel.
- Recognize the basic forms in which steel is manufactured.
- Retain the processing steps required in the manufacturing of steel products.
- Differentiate between the important mechanical property tests applied to steel.
- Determine the difference in the primary methods used for assigning steel grades.

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I. Steel Related Processes

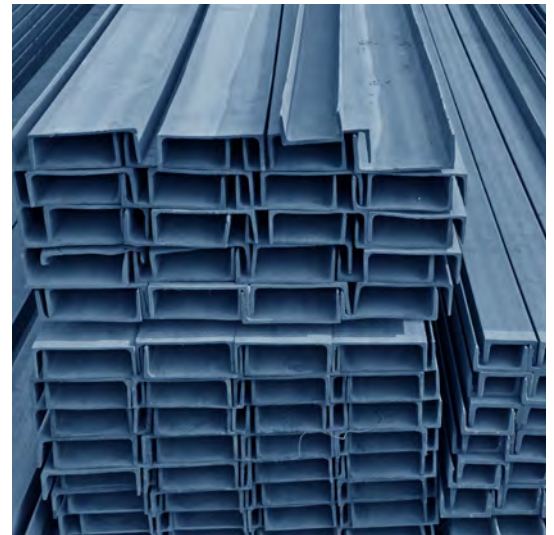
- Chemical Composition
- Steel Production Processes
- Steel Metalworking Processes
- Post Processing Steps
- Types and Forms of Steel

II. Steel Properties

- Tensile Testing
- Hardness, Impact, and Hardenability Testing
- Additional Mechanical Properties
- Grain Size and Microcleanliness
- Steel Grading Systems

III. Steel Certificate Interpretation

- Customer Order
- Chemical Composition
- Mechanical Properties
- Additional Test Results
- Macro Etch Test
- Microcleanliness Rating
- Hardenability



STEEL METALWORKING PROCESSES

What are the most prominent steel metalworking processes?

Steel metalworking processes are responsible for forming the desired steel shapes or fabricating various shapes and components. Hot forming, cold forming, and warm forming are the most prominent types of metalworking processes used in forming steel. Metalworking in the absence of the steel also delivers products with increased strength and longevity. Common metalworking processes include rolling, forging, shearing, and drawing.

Warm Forming
Warm Forming = Simple Shapes
Hot Forming = More Complex Shapes

POST PROCESSING STEPS

Nomenclature

Post processing refers to the final operations for steel and any of the physical metalworking operations that are performed after the steel has been formed. The cooling rate of the metal is an important parameter.

Typically, the faster the cooling rate, the less the metal will expand before the steel becomes as it cools. A slower cooling rate impacts a higher and more ductile steel structure.

Other metalworking facilities may perform secondary operations in-house. Operation of shearing, rolling, grinding, and turning are required to achieve part requirements.

However, steel parts and products are often shipped out for final machining operations to meet final product-related machine shop requirements.

Steel may also be heat treated to improve various properties. Some heat treating...

STEEL GRADING SYSTEMS

Customer Order

Product: Hot Rolled Bars
Heat Number: 1234 Grade: AISI 1040 Weight: 40 tons Production Run: 24.0 to 1
Product Dimensions: 2.3650" diameter 220" Min 240" Max length
Product Description: Hot rolled steel alloy bar - first grain!

Element	Chemical Composition (Weight %)								ASTM E235			
	C	Mn	Si	P	S	Al	Cr	Cu	Mg	Nb	V	N
Min. Specification	0.30	0.75	0.15	-	-	-	0.02	0.05	0.15	-	0.002	0.008
Max. Specification	0.45	1.00	0.35	0.025	0.025	0.05	1.10	0.20	0.25	0.25	0.02	0.012
Heat Chemistry	0.41	0.84	0.30	0.011	0.007	0.02	1.03	0.18	0.18	0.12	0.004	0.0060