

Handbook on Steel Bars, Wires, Tubes, Pipes, S.S. Sheets Production with Ferrous Metal Casting & Processing

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Format: paperback

Code: NI260

Pages: 408

Price: Rs.1775US\$ 150

Publisher: NIIR PROJECT CONSULTANCY SERVICES

Usually ships within **5** days

Ferrous materials have made a major contribution to the development of modern technology; they span a tremendous range of properties and applications. Reflecting the industrial practices, the information provided here offers easy access to reliable processes involved in the manufacturing of Steel products like Steel Bars, Wires, Tubes, Pipes, Sheets etc that proves to be the backbone of construction and automobile industries booming worldwide.

The work closes the gap in the treatment of steel and cast iron. Each chapter takes into account the gradual transitions between the two types of ferrous materials. It demonstrates that ferrous metal and steel are versatile and customizable materials which will continue to play a key role in the future and also covers the operations performed on ferrous metals for converting them into a commodity.

The book provides a full characterization of steel, including structure, chemical composition, classifications, physical properties, production practices of different steel products, processing of ferrous metals and so on. It will prove to be a layman's guide for the entrepreneurs who are willing to invest in the ventures related to Iron and Steel Industries, as it contains information related to processing of ferrous metals and production practices followed in Steel products manufacturing units. The text discusses the importance and objectives of processes and material used for the production of disposable products. Many examples have been provided to illustrate the concepts discussed.

The topics covered in the book are: Casting of Ferrous Metals, Heat Treatment of Ferrous Metals, Stamping Process of Ferrous Metals, Forming Process of Ferrous Metals, Machining Process of Ferrous Metals, Joining Process of Ferrous Metals, Production of Stainless Steel Wire, Production and Fabrication of Steel Bars, Steel Tube & Pipe, Stainless Steel Sheet and Different Grades of Stainless Steel.

1. CASTING OF FERROUS METALS

Casting Methods

Sand Casting

Shell-mold Casting

Expendable-Pattern Casting (Lost foam Process)

Plaster-Mold Casting

Ceramic Mold Casting

Investment Casting (Lost Wax Process)

Vacuum Casting

Permanent Mold Casting

Die Casting
Centrifugal Casting

Casting Design and Quality
Corners, Angles and Section Thickness
Drafts and Tapers

Shrinkage
Parting Line

2. HEAT TREATMENT OF FERROUS METALS

Heat Treating Theory

Stages of Heat Treatment

Heating Stage

Soaking Stage

Cooling Stage

Heat Colors for Steel

Types of Heat Treatment

Annealing

Ferrous Metal

Nonferrous Metal

Normalizing

Hardening

Case Hardening

Carburizing

Cyaniding

Nitriding

Flame Hardening

Stationary Method

Circular Band Progressive Method

Straight Line Progressive Method

Spiral Band Progressive Method

Circular Band Spinning Method

Tempering

Quenching Media

Liquid Quenching

Water

Brine

Oil

Caustic Soda

Warning

Dry Quenching

Air

Solids

3. STAMPING PROCESS OF FERROUS METALS

Compound Die

Progressive Die

Stripper Designs

Fixed Stripper

Urethane Stripper

Spring Stripper

Stamping Terminology - Punch Operation

Perforating

Punch Stagger

Blanking

Piercing

Perforate and Shave

Piloting

Perforate and Extrude

Notching

Lancing

Coining

Embossing

Projection

Shear Angles

For More Information...

4. FORMING PROCESS OF FERROUS METALS

Rolling

Hot and Cold Rolling

Cold Rolling

Processes

Roll bending

Roll forming

Flat Rolling

Foil Rolling

Ring Rolling

Controlled Rolling

Mills

Rolling Mills

Tandem Mill

Defects

Shape

Profile

Roll Deflection

Draft

Surface Defects

Lap

Mill-shearing

Rolled-in scale

Scabs

Seams

Extrusion Process

Process

Hot Extrusion

Hot extrusion temperature for various metals

Cold Extrusion

Warm Extrusion

Equipment

Forming Internal Cavities

Indirect Extrusion

Hydrostatic Extrusion

Drives

Extrusion Defects

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Metal

Advantages and disadvantages

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Hot Working and Cold Working

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Open-die Drop Forging
Impression-die Drop Forging
Design of impression-die forgings and tooling
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Upset Forging
Automatic Hot Forging
Roll Forging
Net-shape and Near-net-shape Forging
Cost Implications
Induction Forging
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Bending Process
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Coining
Three-Point Bending
Folding
Wiping
Rotary Bending
Roll Bending
Elastomer Bending
Joggling
Calculations
Bend Allowance
Bend Deduction
K-factor
Material Considerations
Advantages
Shearing Process
Nature of Cut Edges
Equipment Characteristics
Operation
Maintaining Quality
Design Considerations

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Chuck the Workpiece
Adjusting the Tool Bit
Cutting Speeds
Setting Speed and Feed
Turning with Hand Feed
Turning with Power Feed
Measuring the Diameter
Turning a Shoulder
Grinding
Processes
Surface Grinding
Cylindrical Grinding

Creep-Feed Grinding
Centerless Grinding
A Schematic of ELID Grinding
Grinding Wheel
Lubrication
The Workpiece
Workholding Methods
Workpiece Materials
Workpiece Geometry
Effects on Workpiece Materials
Threading
Subtractive Methods
Thread Cutting
Taps and Dies
Single-Point Threading
Thread Milling
Thrilling
Thread Grinding
Thread Lapping
Thread Casting and Molding
Additive Methods
Combinations of subtractive, additive, deformative, or transformative methods
Drilling Operations
Purpose
Uses
Characteristics
Care of Drilling Machines
Lubrication
Special Care
Types of Drilling Machines
Hand-Feed
Power-Feed
Safety Precautions
Drilling Machine Safety
Tools and Equipment
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Special Drills
Sharpening Twist Drills
Precheck
Drill Point
Clearance Angle
Rake Angle
Drill Grinding Machines
Single Wheel Fixture
Double Wheel Swing Arm
Other Types of Cutters
Countersinks
Counterbores
Combined Countersink and Center Drill
Reamers
Boring Tools
Field Expedient Cutters
Tap and Die Work

Drill Holding Devices
Geared Drill Chucks
Drill Sockets and Drill Sleeves
Drill Drifts
Work Holding and Drilling Devices
Machine Table Vises
Step Blocks
Clamps
V-Blocks
Angle Plates
T-Slot Bolts
Jigs
Drilling Support Device
Cutting Fluids
Laying Out and Mounting Work
Laying Out Work
Laying Out Hole Centers
Center-Punching the Layout
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Mounting Workpieces
Vise Mounting
Table or Base Mounting
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The Drilling Process
Selecting the Drill
Installing the Drill
Selecting Drill Speed
Selecting Drill Feed
Aligning and Starting Holes
Starting Holes with Center Drill
Drawing a Drill Back on Center
Drilling
Drilling Deep Holes
Drilling a Pilot Hole
Drilling Thin Material
Using a Depth Stop
Checking the Depth of Drilled Holes
Drilling Round Stock
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Special Operations on Drilling Machines
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Countersink Alignment
Procedures for Countersinking
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Counterboring
Spot Facing
Tapping
Tapping Large Holes
Tapping Small Holes
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Machine Reamer

Reaming Operations

Boring

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Riviting

Solid Rivets

Types

Semi-Tubular Rivets

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Flush Rivet

Friction-Lock Rivet

Self-Pierce Rivets

Sizes

Installing rivets on M3 tank hull

Detail of a 1941 riveted ship hull, with the rivets clearly visible

Joint Analysis

Solid & Semi Tubular Rivets

Welding

Introduction to Welding Processes

Details of Welding Processes

Gas Welding

Flame Characteristics

Fusion arc Welding

Shielded Metal arc Welding

Submerged arc welding (SAW)

Flux cored arc welding (FCAW)

Gas shielded arc Welding

MIG and TIG

MIG welding (gas metal arc welding)

Pulsed MIG welding

Hot Wire MIG

Plasma MIG

TIG welding

Pulsed TIG Welding

Hot Wire TIG

Spot TIG

Electrical Method

Electric Resistance Welding

Electro-Slag Welding (ESW)

Induction Pressure Welding

Energy Method

Electron Beam Welding (EBW)

Laser Beam Welding

Plasma Welding

Special methods

Explosive Welding (EW)

Friction Welding

Radial Friction Welding of Pipes

Diffusion Bonding

Selection of Welding Process

Classification of Electrodes

Electrode Coating

Classification of Electrodes

Selection of Electrodes

Weld Joint Considerations

General Procedure

Type of Welded Joints

General

Groove-welds

Various types of groove welds

Fillet Welded Joint

Comparison of Joints

Welding Symbols

7. PRODUCTION OF STAINLESS STEEL WIRE

Melting Process

Billet Production

Production of Spring Wire

Conclusion

Wire Drawing

Process

Mechanical Properties

8. PRODUCTION OF STEEL BARS

Hot Rolled Bars

Cold Twisted Deformed Bars

Tmt Bars

Mild Steel Bars (as per IS: 432, part-I -1982)

Deformed Steel Bars (as per IS: 1786-1985)

Various Grades of Mild Steel Bars

Physical Requirement

Steel Bars for RCC Work

General Precautions for Steel Bars in Reinforcement

Weight of Different Steel Bars

Stainless Steel Bar-Round

Product Stocking and Processing Service Program

Bar Grade Datasheets

Bright Mild Steel Bar

Types of Cold Finished Bars

Grade Datasheets

Stainless and Engineering Steel Bar and Wire Product Specifications

Stainless Steel Bar

Stainless Steel Hollow Bar

Stainless Steel Wire

Welding wire

Carbon Bar Steel Products

Carbon and Alloy Steel Hollow Bar

Low Alloy Steel Bar

Production Flow

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Continuous Pickling Line

Cold Rolling

Annealing

Skin Pass

Warehousing

9. PRODUCTION OF STEEL TUBE AND PIPE

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Seamless Tube and Pipe

Pierce and Pilger Rolling Process

Plug Rolling Process

Continuous Mandrel Rolling Process

Push Bench Process

Pierce and Draw Process

Tube Extrusion Process

Cross Rolling Processes

Assel Rolling Process

Diescher Rolling Process

Downstream Tube Cold Forming

Cold Drawing

Cold Pilgering

Welded Tube and Pipe

Pressure Welding Processes

Fretz-Moon Process

Electric Resistance Welding

DC Processes

Low-Frequency Process

High-Frequency Processes

High-Frequency Induction Welding Process

High-Frequency Conduction Welding Process

Fusion Welding Processes

Submerged-Arc Welding Process

Gas-Shielded Arc Welding Processes

The Production of Longitudinally Welded Pipe (U-ing/O-ing process)

Spiral Pipe Production

Spiral Pipe Production in Integrated Forming and SAW Welding Lines

Spiral Pipe Production with Separate Forming and SAW Welding Lines

10. MANUFACTURING OF STAINLESS STEEL SHEET

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Manufacturing Process

Heat Treatment

Descaling

Cutting

Finishing

Manufacturing at the Fabricator or End User

Bending Process of Steel Sheet

The Air Bending Process

Recommended Inside Bend Radius

Flange Dimensions

Channels

Distortion Near Bends

Flat Layouts

Theoretical Sheet Metal Thickness Gauges

11. GRADES OF STAINLESS STEEL

A Brief Overview of Stainless Steel

Austenitic Grades

Straight Grades

“L” Grades

“H” Grades

Type 304

Type 316

Type 317

Type 317L

Type 317LM
Type 317LMN
Type 321, Type 347
Martensitic Grades
Type 410
Type 410S
Type 414
Type 416
Type 420
Type 431
Type 440
Ferritic Grades
Type 430
Type 405
Type 409
Type 434
Type 436
Type 442
Type 446
Duplex Grades
Precipitation Hardening Grades
Superalloy Grades

About NIIR

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Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

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Our Detailed Project report aims at providing all the critical data required by any entrepreneur vying to venture into Project. While expanding a current business or while venturing into new

business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line.

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Sun, 25 Jan 2026 22:48:17 +0000