

# Forged Steel Roll Specifications

**GRADE: 3CR**



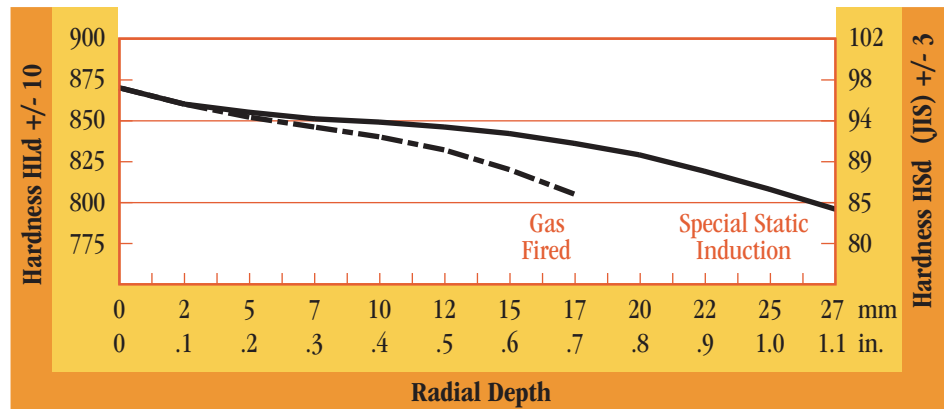
## DESCRIPTION

This medium alloy, small diameter (<20", 500 mm), work roll material is used in both ferrous and nonferrous cold mill applications. This 3% chromium alloy can be melted using either the electric arc furnace, vacuum degassed, bottom poured or ESR (electroslag remelt) ingot process. The depth of hardness profile is controlled by the specified hardening method. These methods include gas fired furnace and special static induction.

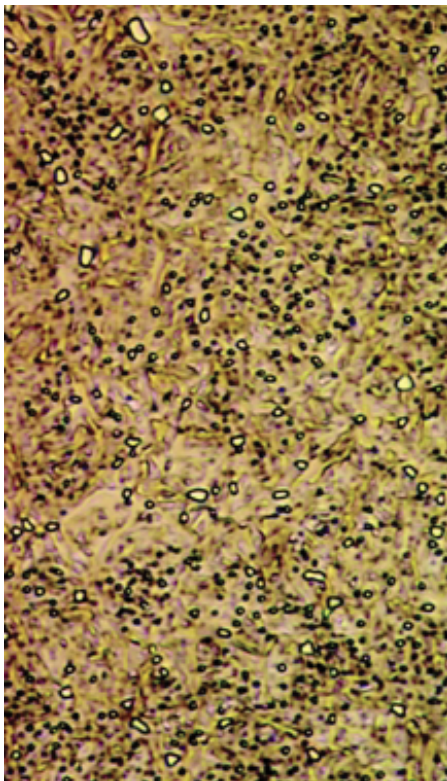
## AIM CHEMISTRY (WT%)

| C   | Mn  | P        | S        | Si  | Cr   | Mo  | V   |
|-----|-----|----------|----------|-----|------|-----|-----|
| .81 | .27 | .015 max | .012 max | .30 | 3.12 | .19 | .06 |

## DEPTH OF HARDNESS



## MICROSTRUCTURE



**1500X**

## HEAT TREATMENT CAPABILITY

Decrease from Initial Surface Hardness (Radial Depth)

| Hardening Method          | 20/30 HLd<br>4/6 HSd (JIS) | 40/50 HLd<br>8/10 HSd (JIS) |
|---------------------------|----------------------------|-----------------------------|
| Gas Fired                 | 0.30" (8 mm)               | 0.50" (13 mm)               |
| Special Static Induction* | 0.60" (15 mm)              | 0.80" (20 mm)               |

\*Cryogenic treatment utilized in this method.

## TYPICAL CARBIDE ANALYSIS

| Carbide Type     | Carbide Hardness (HV) | Surface Area (%) | Average Diameter (μ) | Carbide Density (Carbide/mm <sup>2</sup> ) |
|------------------|-----------------------|------------------|----------------------|--|
| M <sub>3</sub> C | 850-1100              | 7 - 8            | 0.7                  | 2.4 x 10 <sup>-5</sup>                     |