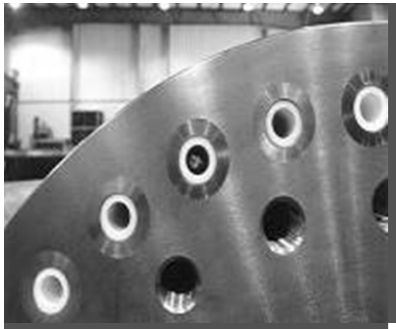
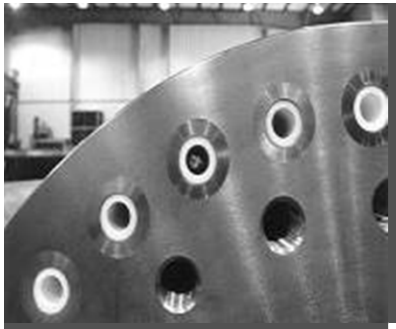


Chilled Cast Iron Rolls & Shells

SPINNAKER CORPORATION

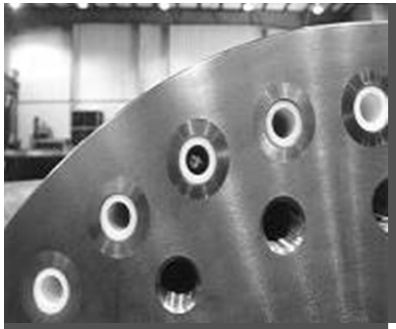
EQUIPMENT AND PROCESS SOLUTIONS



Chilled Cast Iron Characteristics

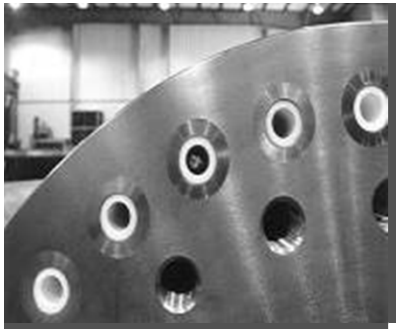
Superior Hardness:

- **Standard chilled cast iron = 550 V hardness**
- **AISI 4100 Steel = Avg. 302 V hardness**
- **Cast iron = 207 – 250 V hardness**
  - **> Hardness = > Wear & Impact Resistance = Longer Time Between Grinds + Better Roll Profile**

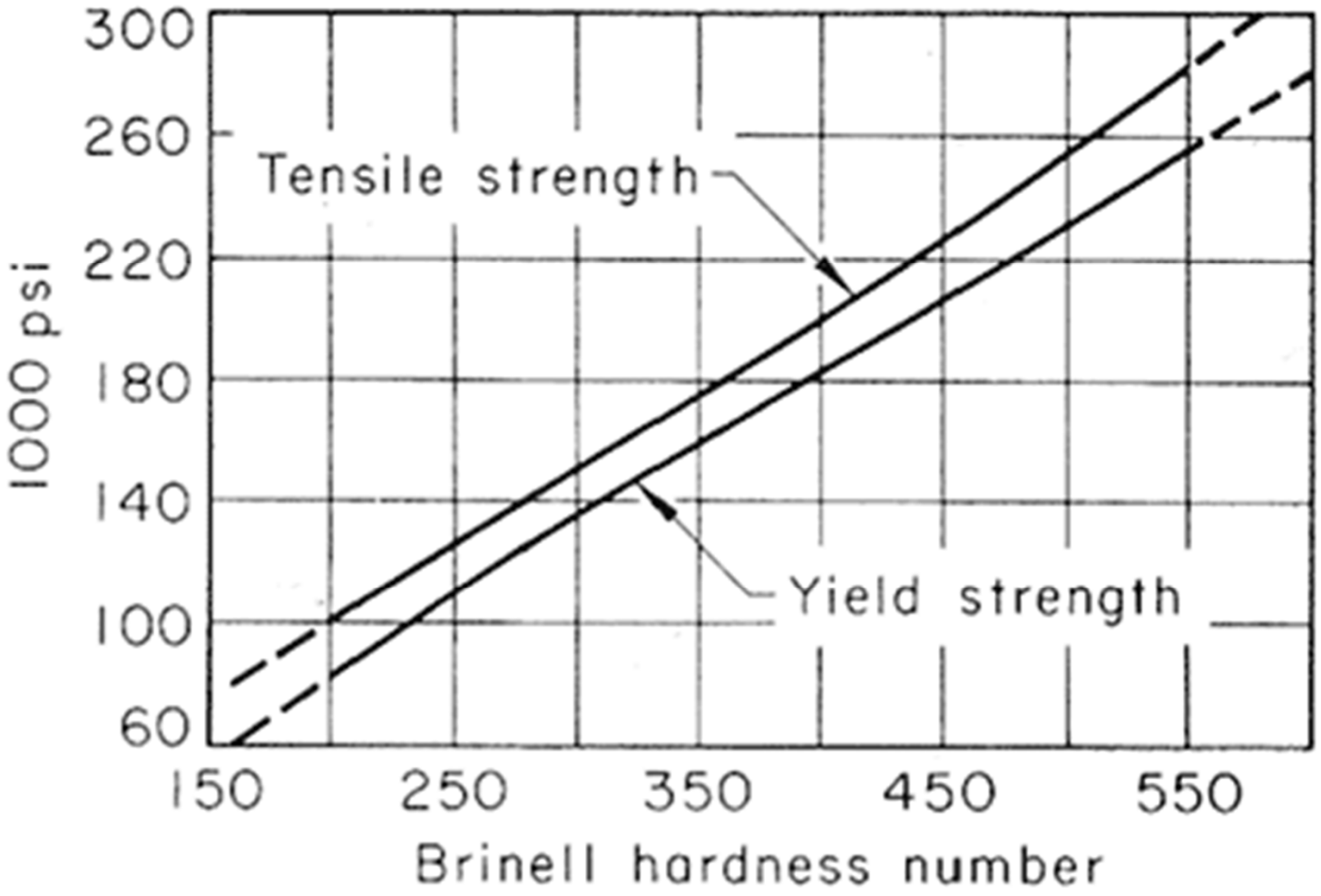


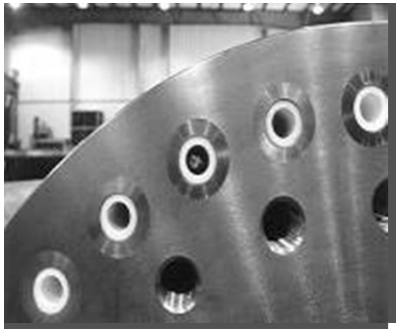
Hardness

Hardness is a measure of how resistant solid matter is to various kinds of permanent shape change when a compressive force is applied.

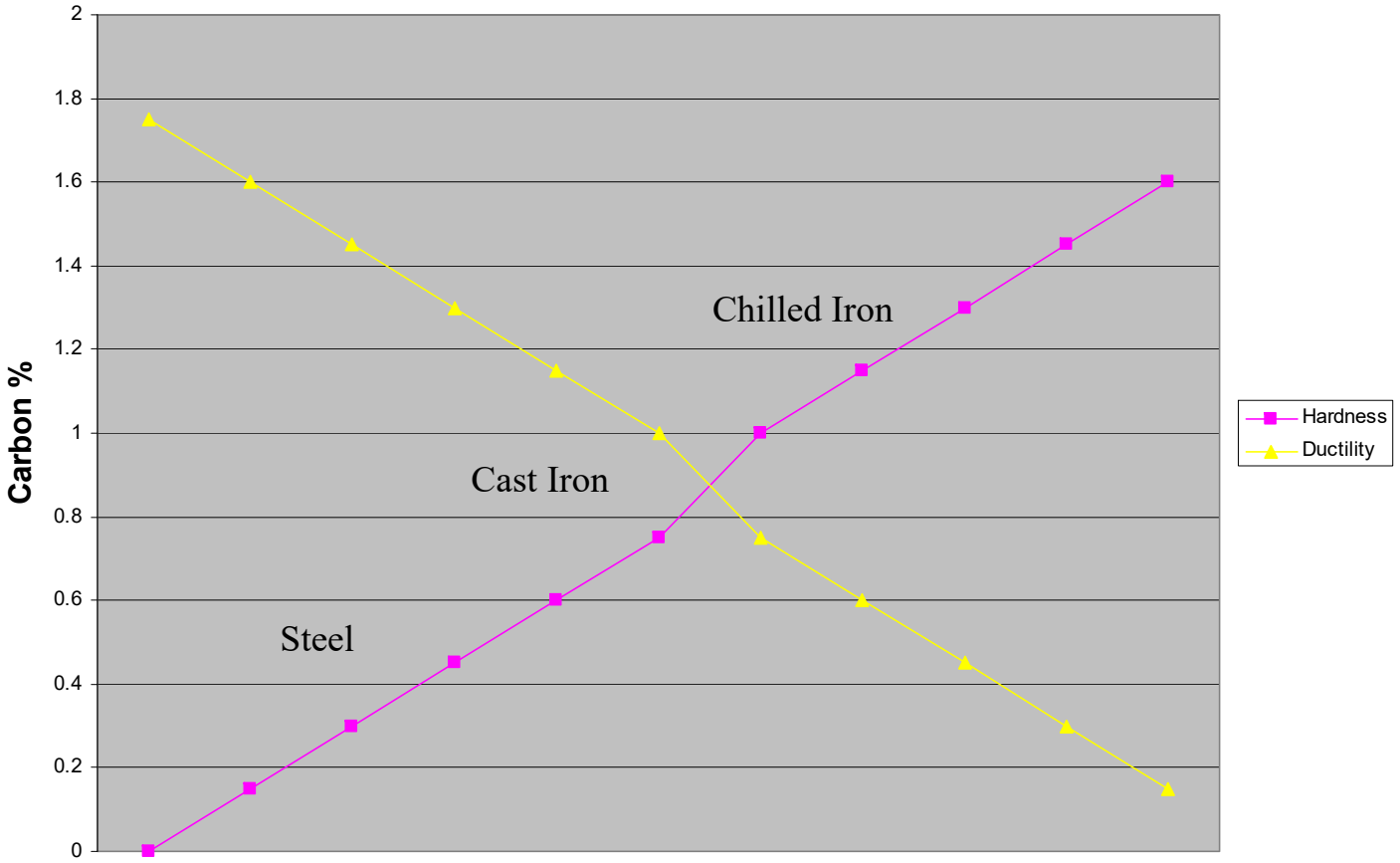


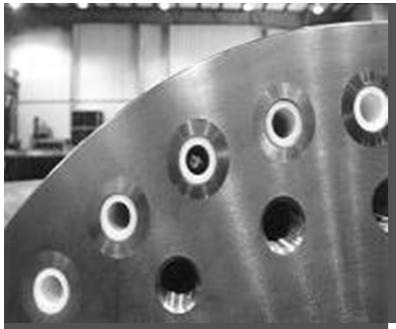
Hardness & Strength



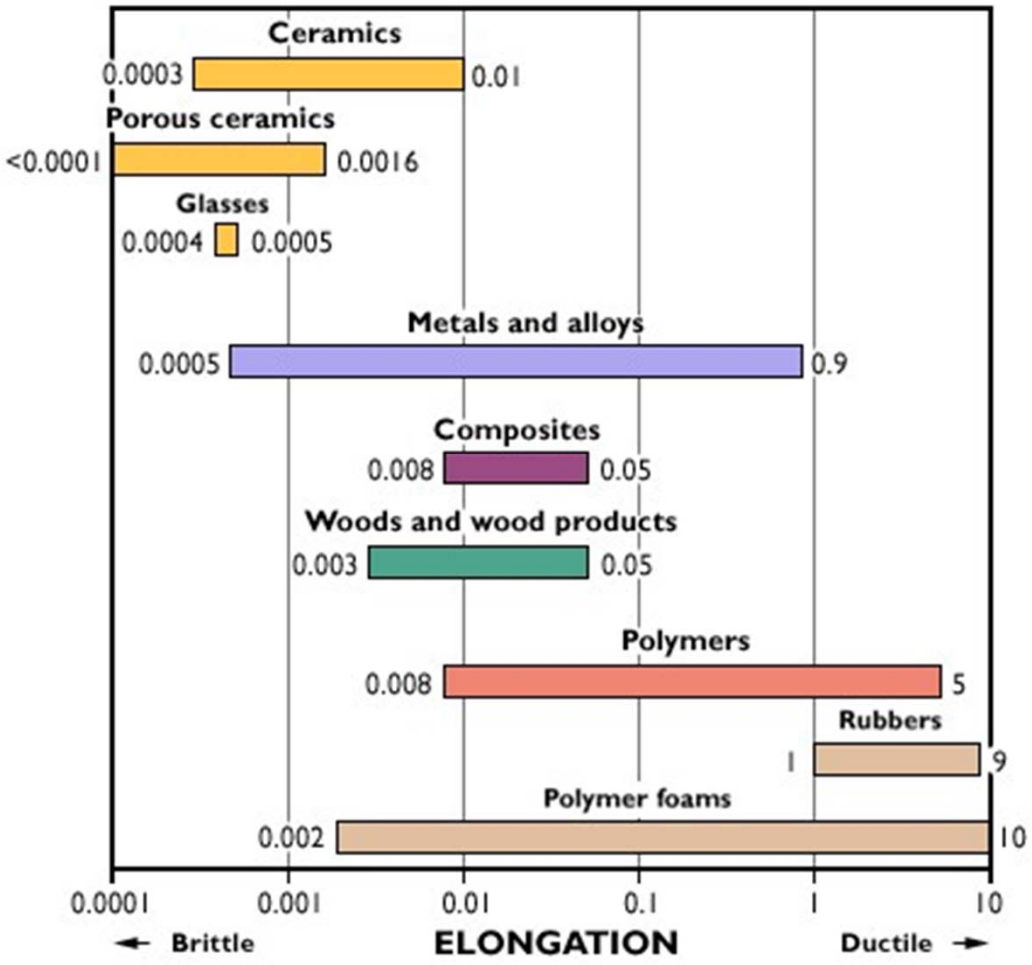


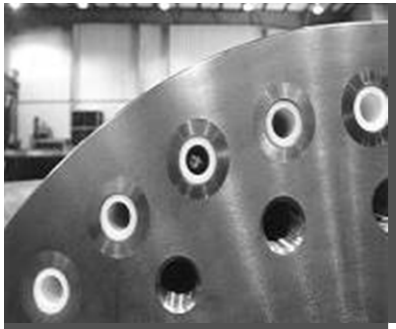
Hardness & Ductility





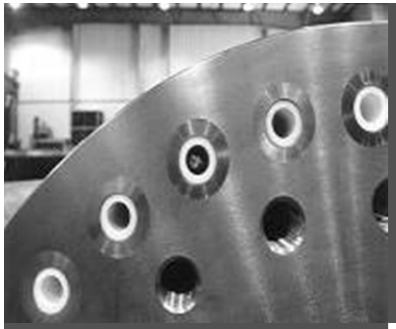
Materials Elongation





Making Chilled Iron

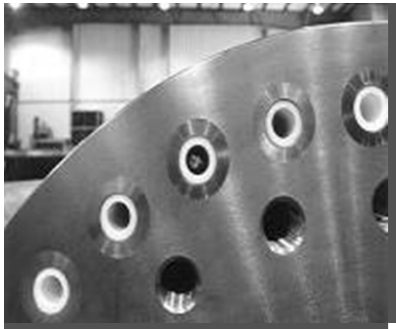
"It is difficult to cool thick castings fast enough to solidify the melt as white cast iron all the way through. However, rapid cooling can be used to solidify a shell of white cast iron, after which the remainder cools more slowly to form a core of grey cast iron. The resulting casting, called a *chilled casting*, has the benefits of a hard surface and a somewhat tougher interior. "



What is a “Chill”

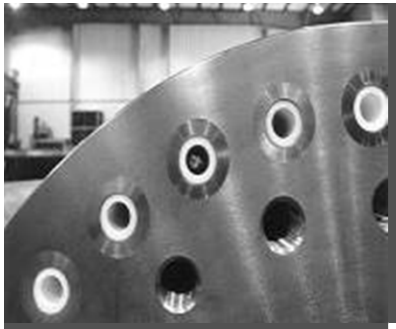
A “chill” is an object used to promote solidification in a specific portion of a metal casting mold.

External chills are masses of material that have a high heat capacity & thermal conductivity. They are placed on the outside & become part of the mold.

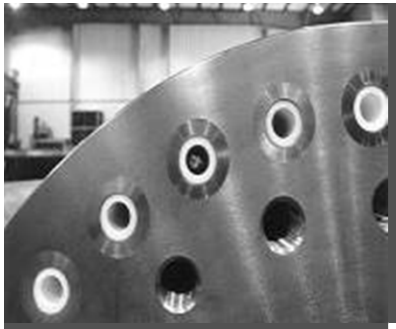


Chilled Iron Rolls

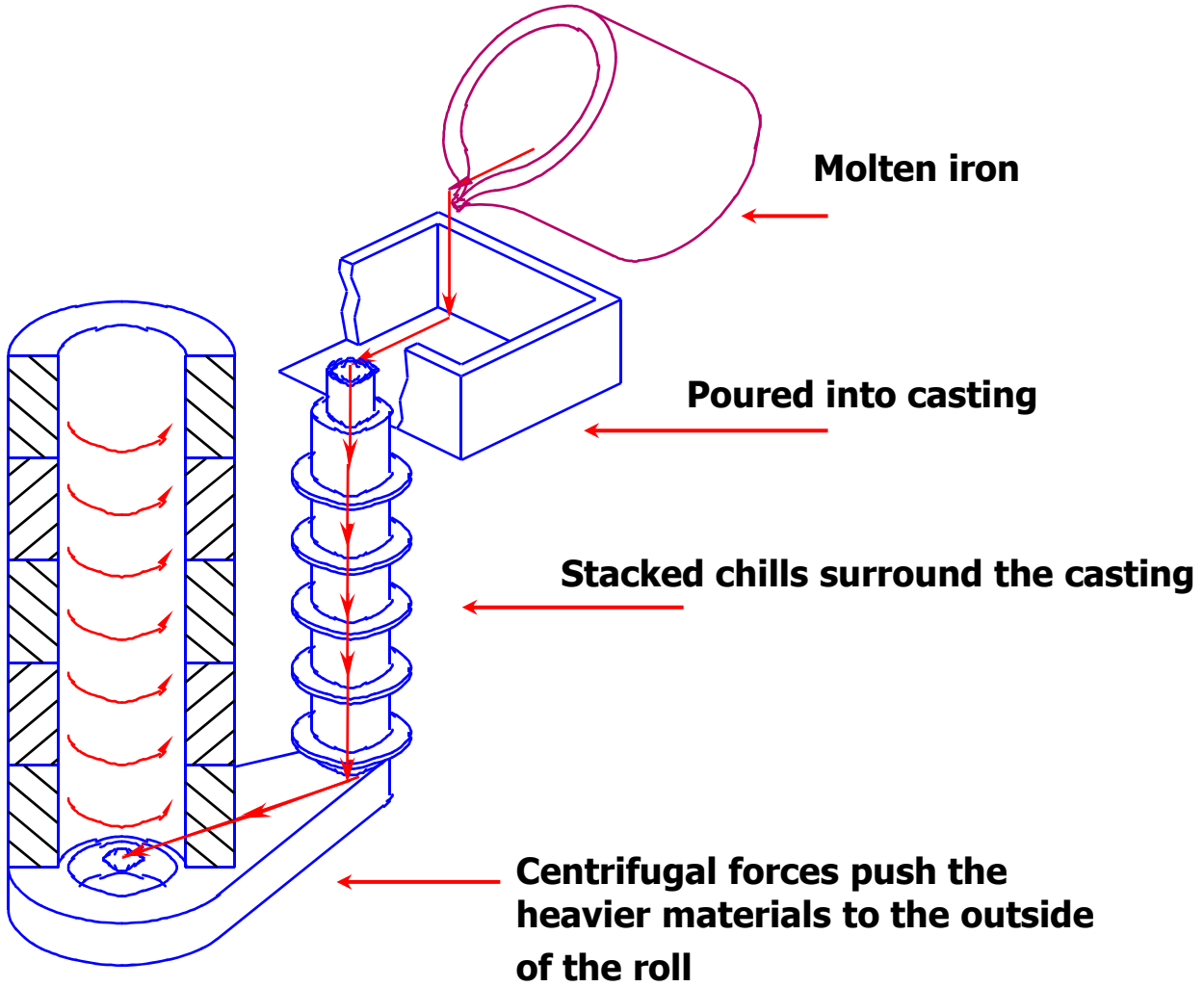
- Iron prepared in furnaces
- Poured into a pit (similar to casting a dryer)
- Chills stacked on the outside
- Centrifugal forces force high quality material to the outside, displacing impurities to the center
- Difference in solidification
  - Chilled iron on outside, grey on inside

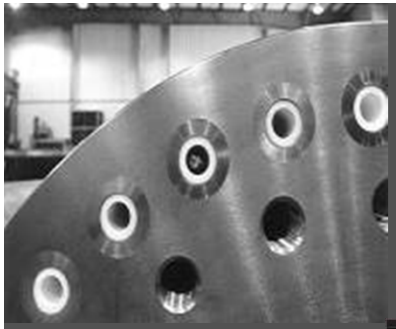


Foundry Workers Stacking Chills Preparing for a Pour



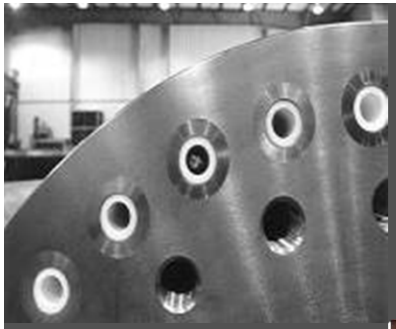
Pouring Chilled Iron Rolls

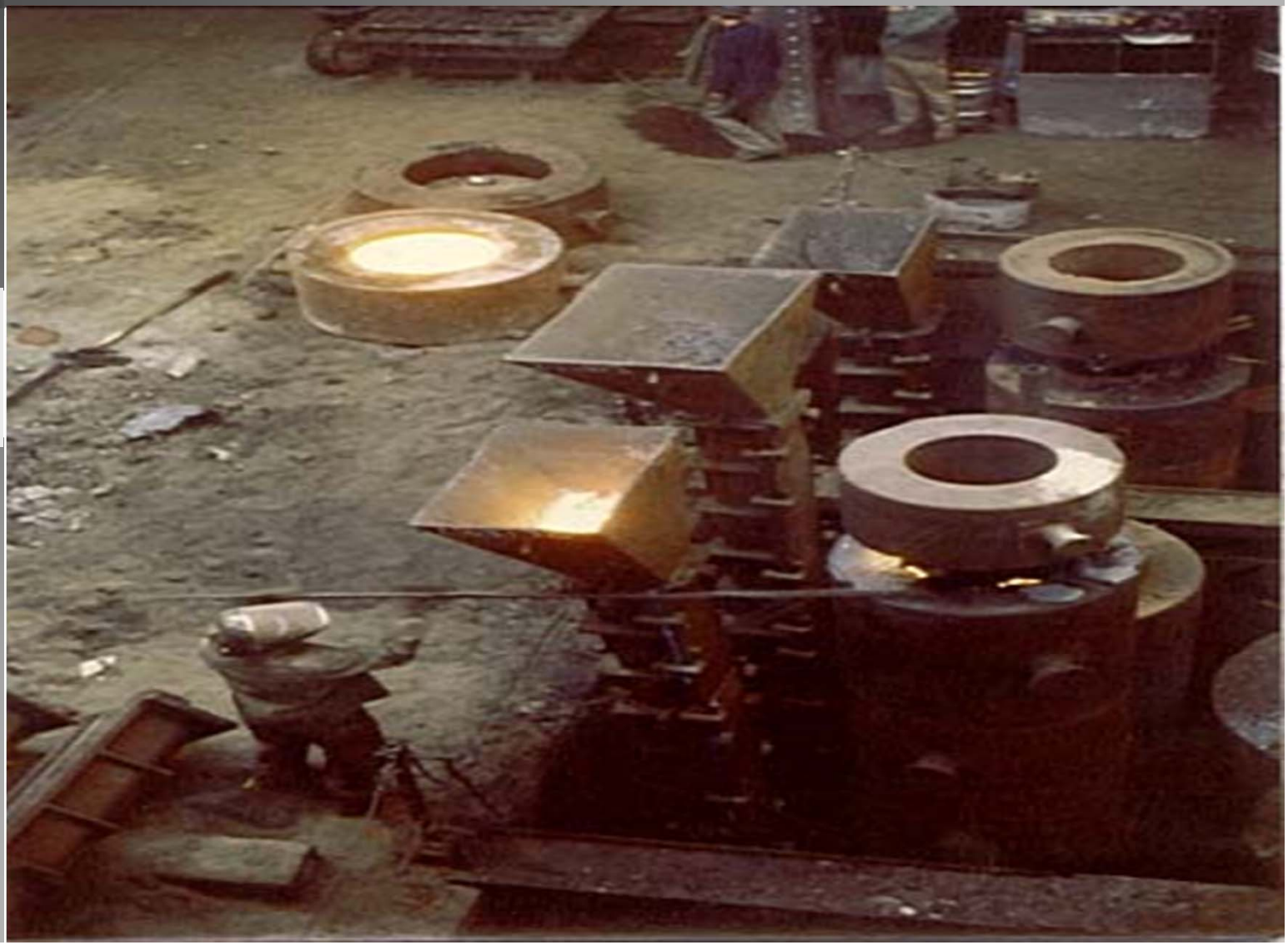




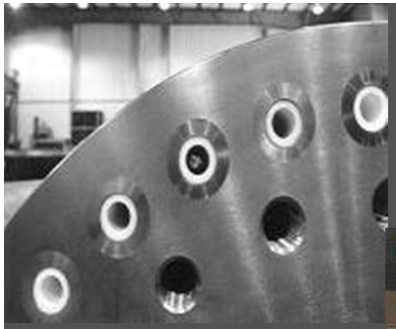
Pouring of Molten Iron

Molten Iron poured from two ladles on opposite sides

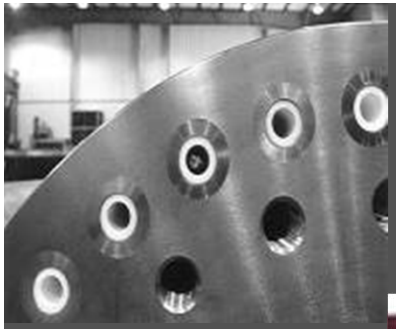




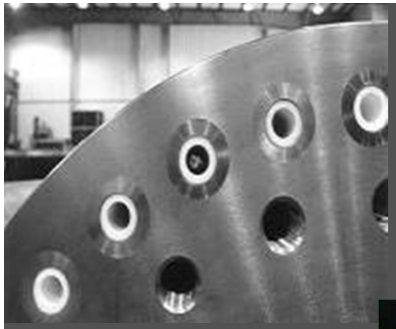
Roll Body"As-Cast"



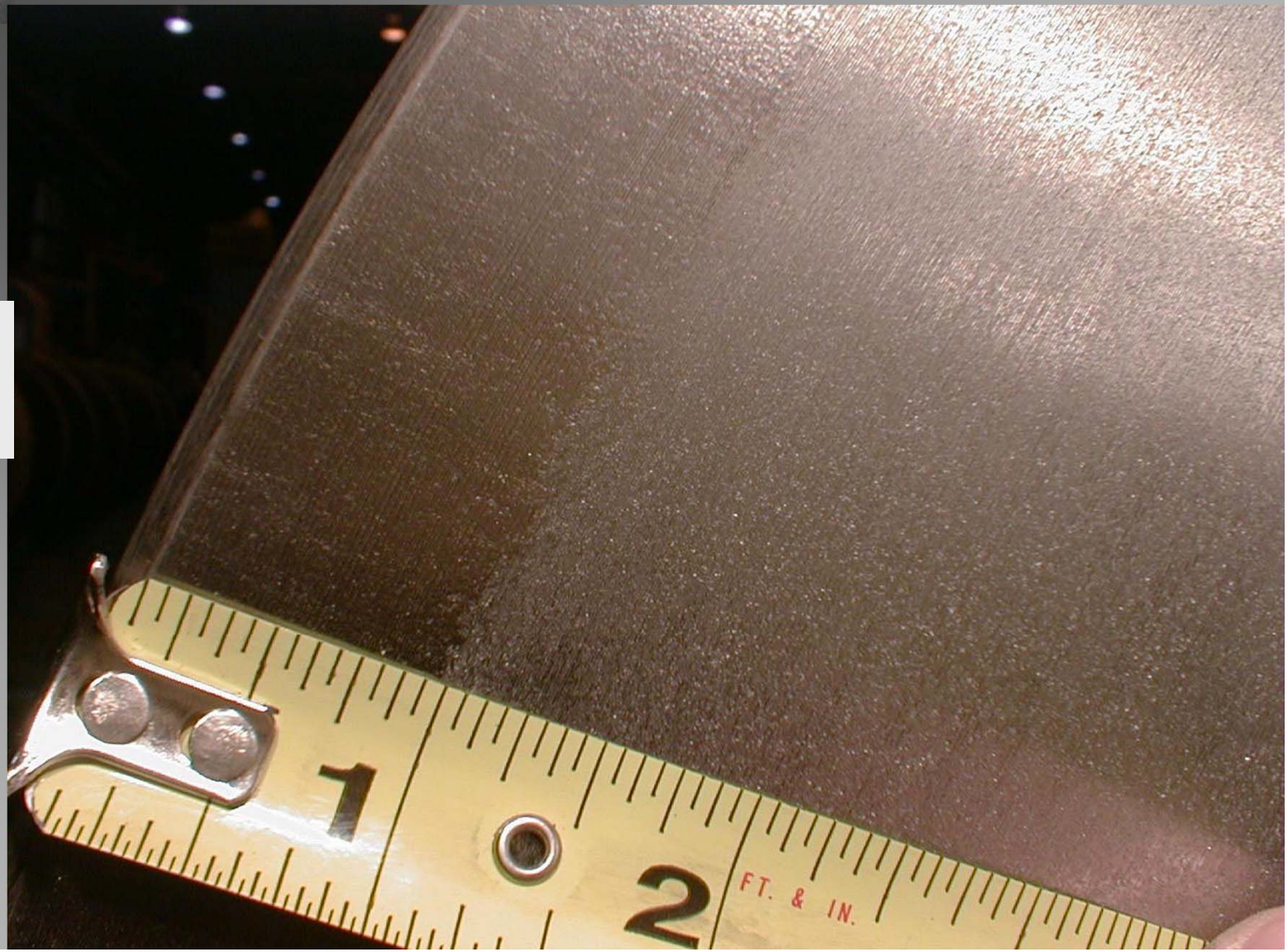
Roll is lifted from Casting Pit after one-to-two week cooling period

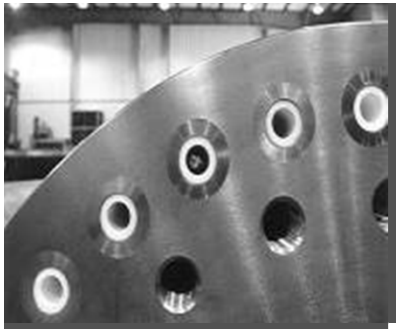


Roll Cast as a Solid Body



Chill Depth

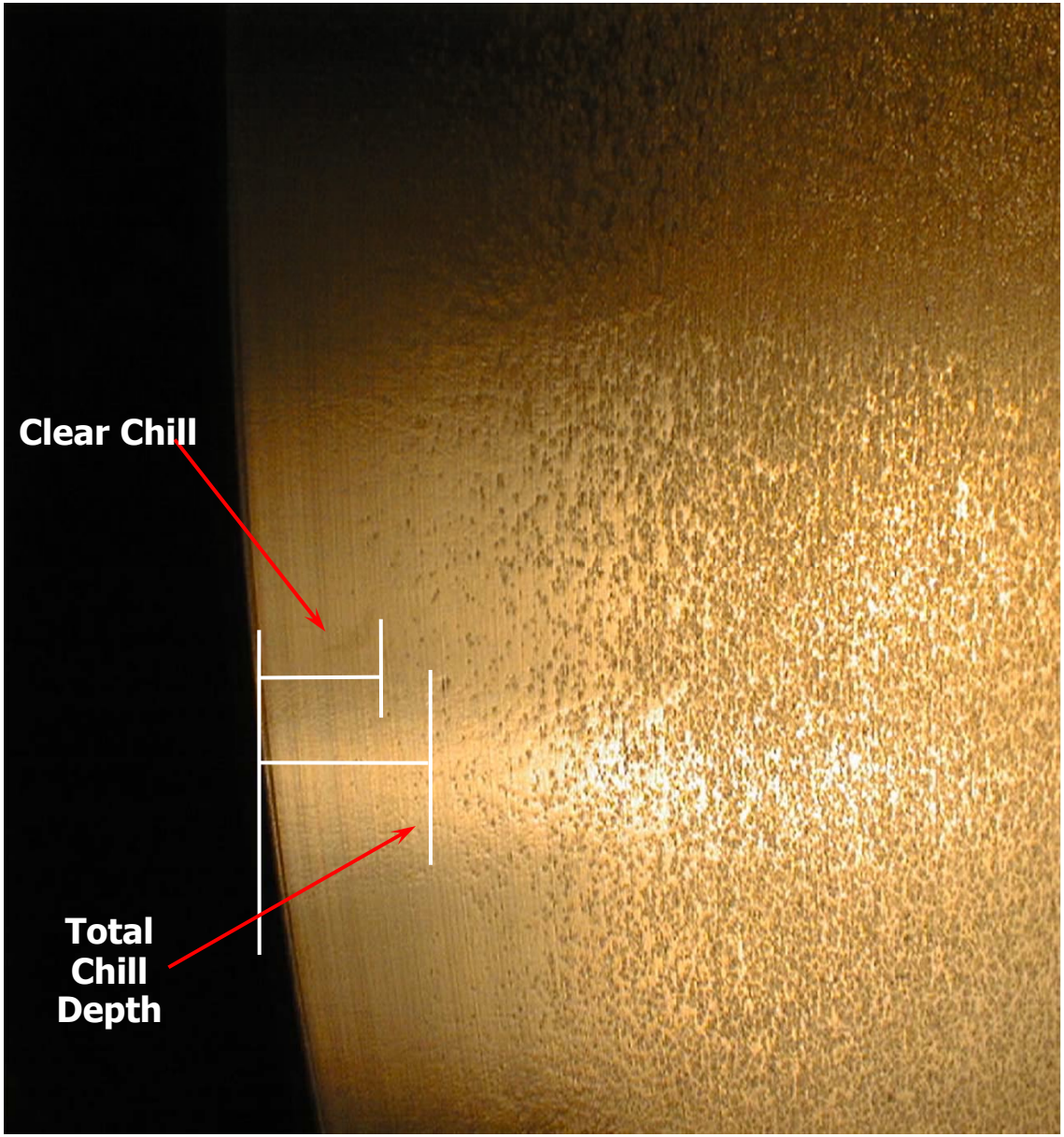




Chill Depth Chart

	NOMINAL DIAMETER			USABLE CHILL DEPTH
	From		To	
mm	150	-	300	~ 10
inches	6	-	12	~ 3/8
mm	300	-	600	~ 12
inches	12	-	24	~ 1/2
mm	600	-	1200	~ 16
inches	24	-	47	~ 5/8

Note: 2014 SHW S-roll shell had 0.63” clear chill/side.
2010 SHW Queen roll had .78” clear chill/side.


Clear Chill
Total
Chill
Depth


Grey Iron
Chill Layer
Trepan Center