

Case Studies in Steel

Design of a steel pipe to pump
concrete

Background

- Duraflow products Inc. is a local Vancouver, BC company
- Manufactures steel pipe for pumping concrete
- 15 foot pipe, single wall, OD–5.5 inch, ID-4 inches, wall thickness $\frac{3}{4}$ inch

Pipe application

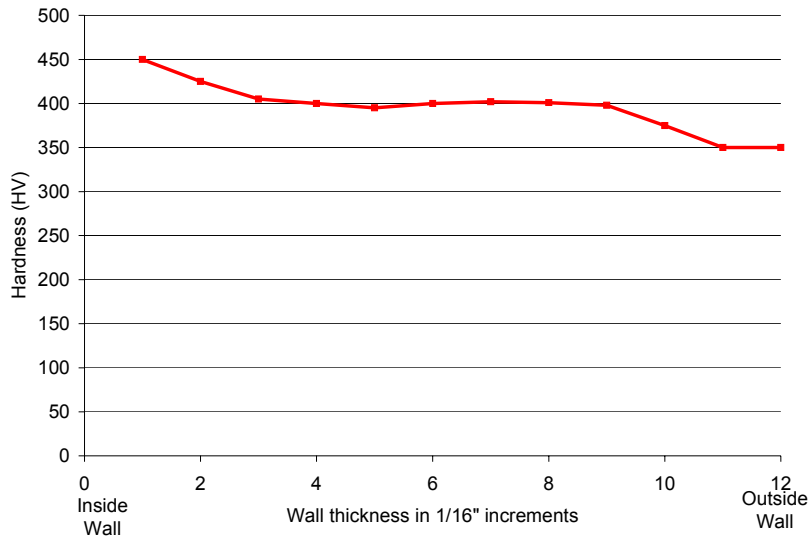


Material

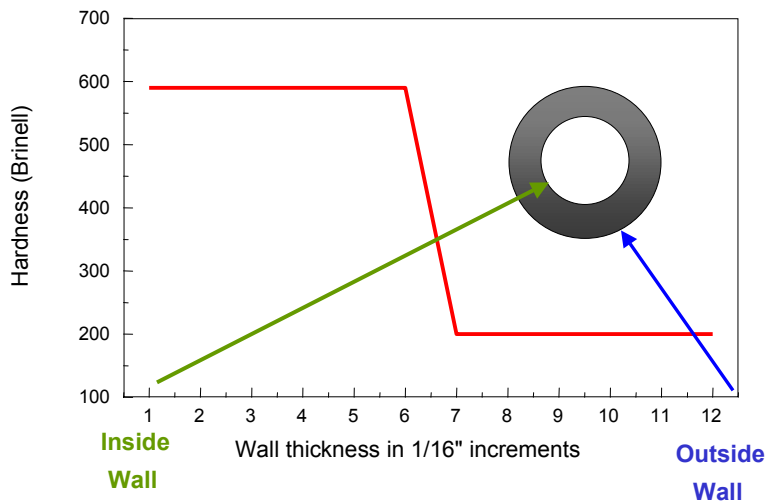
- AISI 1030 – supplied by Prudential steel

Grade	Wt% C	Wt% Si	Wt% Mn	Wt% P	Wt% S
1030	0.30	0.20	0.70	0.02	0.02

Hardness profile (measured)



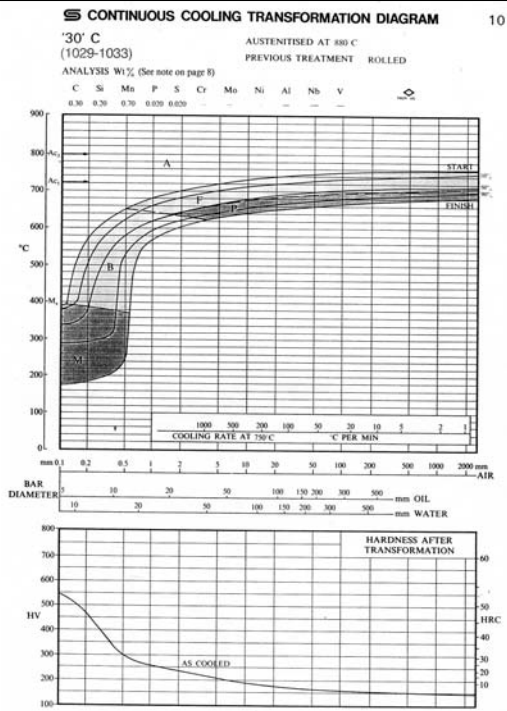
Desired hardness profile



Material

- Proposed change to AISI 1330 (supplied by Lone Star)

Grade	Wt% C	Wt% Si	Wt% Mn	Wt% P	Wt% S
1030	0.30	0.20	0.70	0.02	0.02
1330	0.30	0.15	1.80	0.02	0.02



CCT 1030

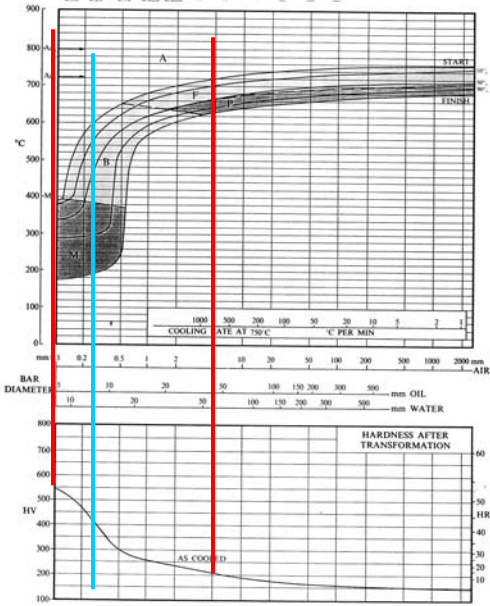
CONTINUOUS COOLING TRANSFORMATION DIAGRAM

10

'30' C (1029-1033) AUSTENITISED AT 830 C PREVIOUS TREATMENT ROLLED

ANALYSIS Wt% (See note on page 8)

C	Si	Mn	P	S	Cr	Mo	Ni	Al	Nb	V
0.30	0.20	0.70	0.020	0.020	-	-	-	-	-	-



CCT 1030

Cooling rates (desired):

OD: 80,000 °C/min
ID: 800 °C/min

Cooling rates (actual):

OD/ID: 20,000 °C/min

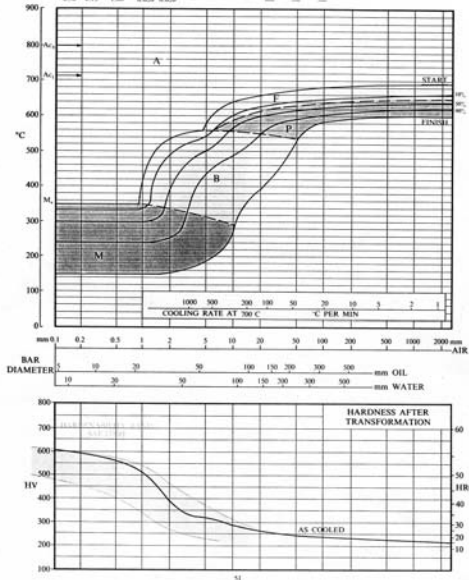
CONTINUOUS COOLING TRANSFORMATION DIAGRAM

31

1 1/2 Mn (1330) AUSTENITISED AT 860 C PREVIOUS TREATMENT ROLLED

ANALYSIS Wt% (See note on page 8)

C	Si	Mn	P	S	Cr	Mo	Ni	Al	Nb	V
0.30	0.15	1.80	0.020	0.020	-	-	-	-	-	-



CCT 1330

CONTINUOUS COOLING TRANSFORMATION DIAGRAM

31

1 1/2 Mn

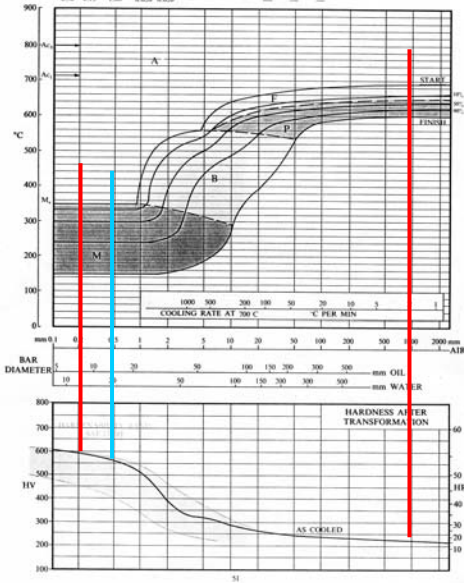
(1330)

AUSTENITISED AT 860 °C

PREVIOUS TREATMENT ROLLED

ANALYSIS Wt% (See note on page 8)

C	Si	Mn	P	S	Cr	Mo	Ni	Al	Nb	V
0.30	0.13	1.80	0.030	0.030						



CCT 1330

Cooling rates:

OD: 40,000°C/min

ID: 1-2°C/min

20,000°C/min

Proposed heat treatment

- Only heat inside to above A3
- Flame hardened on the inside
- Water quench on the outside

