

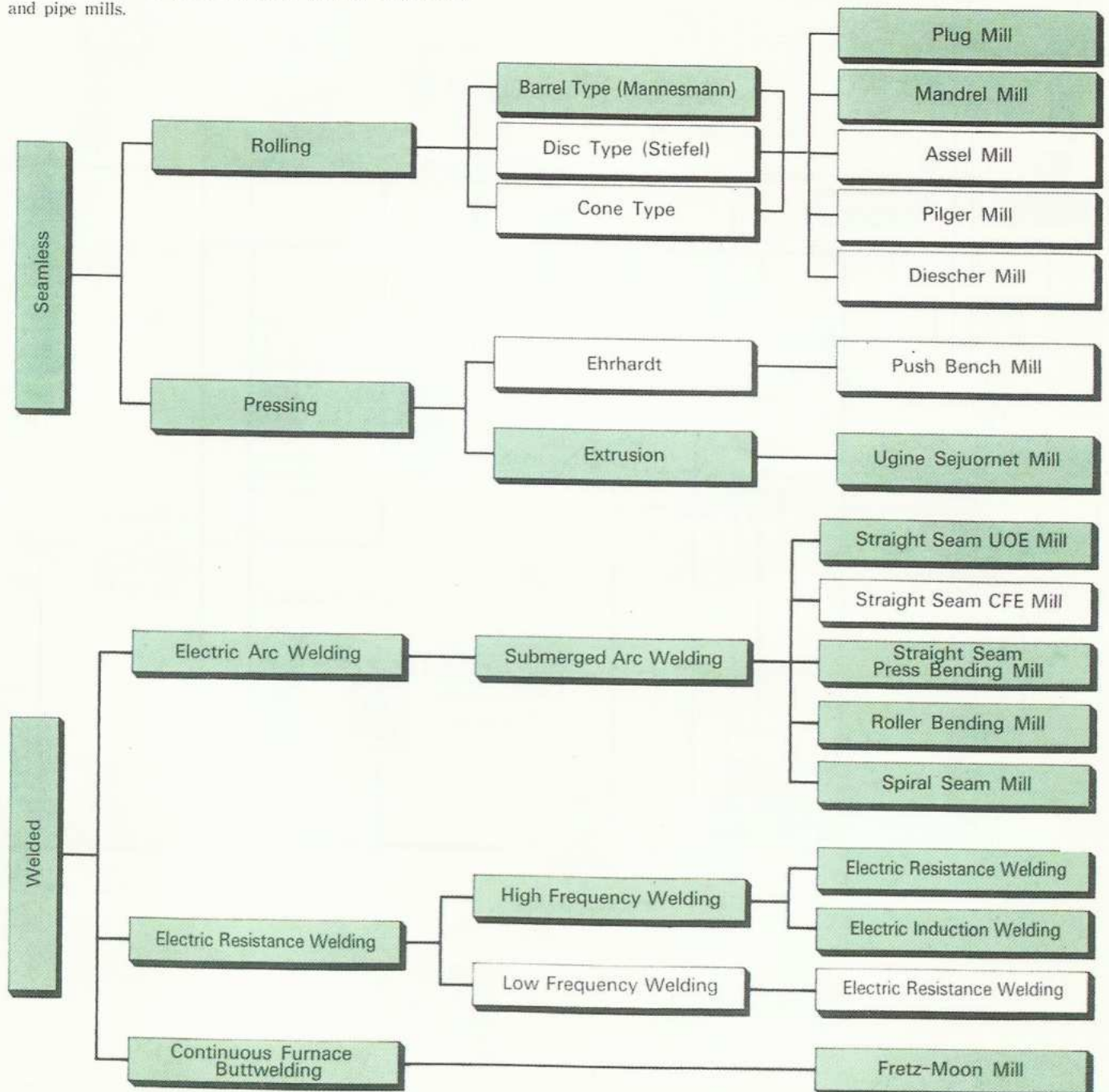


# NKK SEAMLESS PIPE AND TUBE



## Manufacture of Steel Tubular Products

Steel tubular products are manufactured by either seamless or welding processes. Those processes are further divided into several processes as shown in the following diagram. Color indicates the processes being used in NKK's tube and pipe mills.



## Mannesmann Plug Mill—Seamless, Hot Finishing

In the plug mill process, a solid round (billet) is also used. It is uniformly heated in the rotary hearth heating furnace and then pierced by a Mannesmann piercer. The pierced billet or hollow shell is roll-reduced in outside diameter and wall thickness. The rolled tube is simultaneously burnished inside and outside by a reeling machine. The reeled tube is then sized by a sizing mill to the specified dimensions. From this step the tube goes through the straightener. This process completes the hot working of the tube. The tube (referred to as a mother tube) after finishing and inspection, becomes a finished product.

### Dimension Range

Outside Diameter : 6.260~17.000 in (159.0~431.8mm)

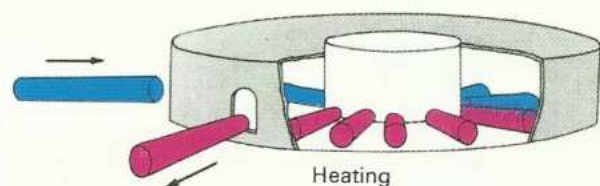
Wall Thickness : 0.217~2.559 in (5.5~65.0mm)

Maximum Length : 44ft (13,500mm)

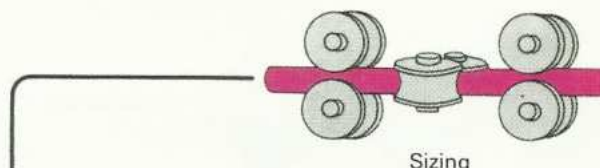


Mannesmann piercer

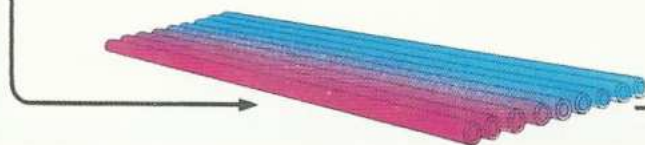
## Sequence of Plug Mill Operation



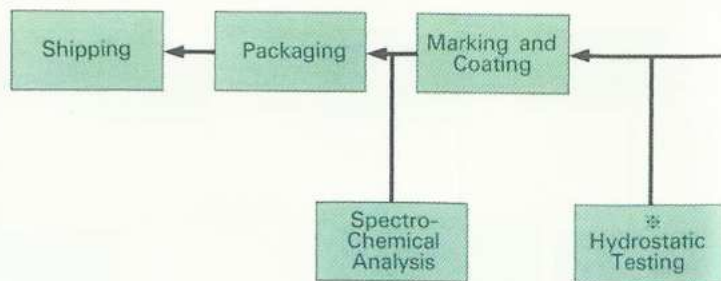
Heating



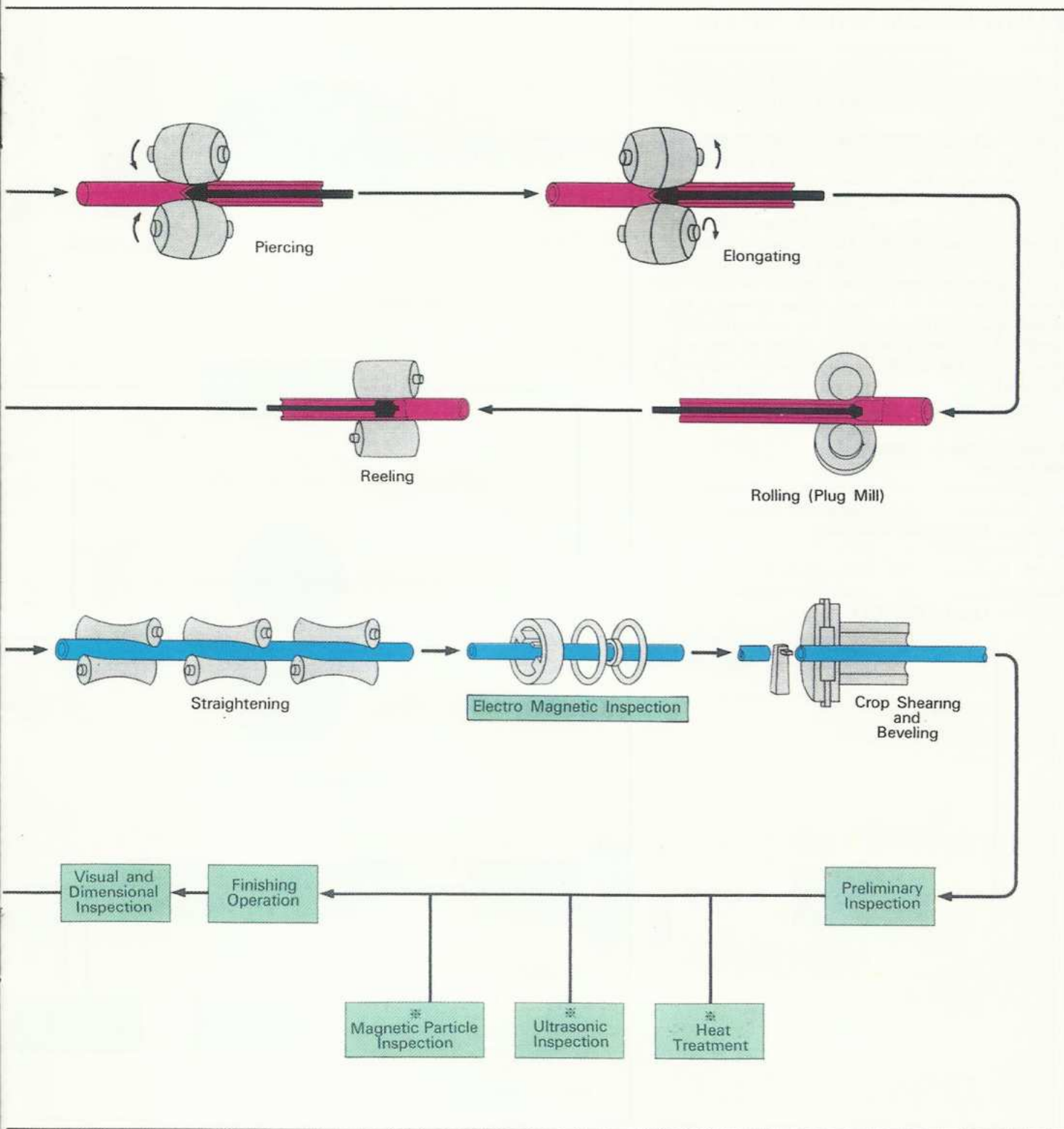
Sizing



Cooling



Note :Processes marked by an asterisk are conducted according to specification and/or customer requirements.



# Manufacturing Ranges by Processes and Dimensions

## Hot Finished Seamless Tube

| Wall Thickness   |        |                   | mm | 2.5   | 2.9   | 3.0   | 3.1   | 3.2   | 3.5   | 4.0   | 4.5   | 5.0   | 5.5   | 5.8   | 6.0   | 6.5   | 7.0   | 7.5   | 8.0   | 8.5   | 9.0   | 9.5   | 10    | 11    | 12    | 13    | 14    | 15    | 16    |
|------------------|--------|-------------------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Outside Diameter |        |                   | in | 0.098 | 0.114 | 0.118 | 0.122 | 0.126 | 0.138 | 0.157 | 0.177 | 0.197 | 0.217 | 0.228 | 0.236 | 0.256 | 0.276 | 0.295 | 0.315 | 0.335 | 0.354 | 0.374 | 0.394 | 0.433 | 0.472 | 0.512 | 0.551 | 0.591 | 0.630 |
| mm               | in     | Nominal Pipe Size |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 27.2             |        |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 34.0             |        | 1                 |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 38.1             | 1 1/2  |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 42.7             |        | 1 1/4             |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 45.0             |        |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 48.6             |        | 1 1/2             |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 50.8             | 2      |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 57.0             |        |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 60.3             | 2 3/8  |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 60.5             |        | 2                 |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 63.5             |        |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 73.0             | 2 7/8  |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 76.2             | 3      |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 76.3             |        | 2 1/2             |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 88.9             | 3 1/2  |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 89.1             |        | 3                 |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 101.6            | 4      | 3 1/2             |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 114.3            | 4 1/2  | 4                 |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 127.0            | 5      |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 139.8            | 5 1/2  | 5                 |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 153.7            | 6      |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 165.2            |        | 6                 |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 168.3            | 6 5/8  |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 177.8            | 7      |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 190.7            |        |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 193.7            | 7 5/8  |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 216.3            |        | 8                 |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 219.1            | 8 5/8  |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 232.0            |        |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 241.8            |        |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 244.5            | 9 5/8  |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 267.4            |        | 10                |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 273.0            | 10 3/4 |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 298.5            | 11 3/4 |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 318.5            |        | 12                |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 323.8            | 12 3/4 |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 339.7            | 13 3/8 |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 355.6            | 14     | 14                |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 406.4            | 16     | 16                |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 426.0            |        |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 431.8            | 17     |                   |    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

- Notes: 1. Available size range for carbon steel.  
 2. Maximum length of tube is 13,500mm(44ft). However, please consult us for particulars.  
 3. Sizes other than those shown in the table are supplied subject to negotiation.

| 17    | 18    | 19    | 20    | 21    | 22    | 23    | 24    | 25    | 26    | 27    | 28    | 29    | 30    | 31    | 32    | 33    | 34    | 35    | 36    | 37    | 38    | 39    | 40    | 42    | 44    | 46    | 48    | 50    | 55    | 60    | 65    | Outside<br>Diameter<br>mm |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------------------|
| 0.669 | 0.709 | 0.748 | 0.787 | 0.827 | 0.866 | 0.906 | 0.945 | 0.984 | 1.024 | 1.063 | 1.102 | 1.142 | 1.181 | 1.220 | 1.260 | 1.299 | 1.339 | 1.378 | 1.417 | 1.457 | 1.496 | 1.535 | 1.575 | 1.654 | 1.732 | 1.811 | 1.890 | 1.969 | 2.165 | 2.362 | 2.559 | 27.2                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 34.0                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 38.1                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 42.7                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 45.0                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 48.6                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 50.8                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 57.0                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 60.3                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 60.5                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 63.5                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 73.0                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 76.2                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 76.3                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 88.9                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 89.1                      |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 101.6                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 114.3                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 127.0                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 139.8                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 153.7                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 165.2                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 168.3                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 177.8                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 190.7                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 193.7                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 216.3                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 219.1                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 232.0                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 241.8                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 244.5                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 267.4                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 273.0                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 298.5                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 318.5                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 323.8                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 339.7                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 355.6                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 406.4                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 426.0                     |
|       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | 431.8                     |

# ASTM Std. A53 /API 5L/A-106 SEAMLESS STEEL PIPE

## Available Sizes (Dimensions and Weights) and Mill Hydraulic Test

| NPS<br>Designator | Outside Diameter |      | Wall Thickness |       | Weight<br>Class | Schedule<br>No. | Plain End |       |       | Thread & Coupling |       |       |
|-------------------|------------------|------|----------------|-------|-----------------|-----------------|-----------|-------|-------|-------------------|-------|-------|
|                   |                  |      |                |       |                 |                 | Weight    |       |       | Weight            |       |       |
|                   | in.              | mm   | in.            | mm    |                 |                 | lb/ft     | kg/ft | kg/m  | lb/ft             | kg/ft | kg/m  |
| 3/8               | 0.675            | 17.1 | 0.091          | 2.31  | STD             | 40              | 0.57      | 0.26  | 0.84  | —                 | —     | —     |
|                   |                  |      | 0.126          | 3.20  | XS              | 80              | 0.74      | 0.34  | 1.10  | —                 | —     | —     |
| 1/2               | 0.840            | 21.3 | 0.109          | 2.77  | STD             | 40              | 0.85      | 0.39  | 1.27  | 0.85              | 0.39  | 1.27  |
|                   |                  |      | 0.147          | 3.73  | XS              | 80              | 1.09      | 0.49  | 1.62  | 1.09              | 0.49  | 1.62  |
|                   |                  |      | 0.188          | 4.78  | —               | 160             | 1.31      | 0.59  | 1.95  | —                 | —     | —     |
|                   |                  |      | 0.294          | 7.47  | XXS             | —               | 1.71      | 0.78  | 2.55  | 1.72              | 0.78  | 2.54  |
| 3/4               | 1.050            | 26.7 | 0.113          | 2.87  | STD             | 40              | 1.13      | 0.51  | 1.69  | 1.13              | 0.51  | 1.69  |
|                   |                  |      | 0.154          | 3.91  | XS              | 80              | 1.47      | 0.67  | 2.20  | 1.48              | 0.67  | 2.21  |
|                   |                  |      | 0.219          | 5.66  | —               | 160             | 1.94      | 0.88  | 2.90  | —                 | —     | —     |
|                   |                  |      | 0.308          | 7.82  | XXS             | —               | 2.44      | 1.11  | 3.64  | 2.44              | 1.11  | 3.64  |
| 1                 | 1.315            | 33.4 | 0.133          | 3.38  | STD             | 40              | 1.68      | 0.76  | 2.50  | 1.68              | 0.76  | 2.50  |
|                   |                  |      | 0.179          | 4.55  | XS              | 80              | 2.17      | 0.98  | 3.24  | 2.18              | 0.99  | 3.25  |
|                   |                  |      | 0.250          | 6.35  | —               | 160             | 2.84      | 1.29  | 4.24  | —                 | —     | —     |
|                   |                  |      | 0.358          | 9.09  | XXS             | —               | 3.66      | 1.66  | 5.45  | 3.66              | 1.66  | 5.45  |
| 1 1/4             | 1.660            | 42.2 | 0.140          | 3.56  | STD             | 40              | 2.27      | 1.03  | 3.39  | 2.28              | 1.04  | 3.40  |
|                   |                  |      | 0.191          | 4.85  | XS              | 80              | 3.00      | 1.36  | 4.47  | 3.02              | 1.37  | 4.49  |
|                   |                  |      | 0.250          | 6.35  | —               | 160             | 3.76      | 1.71  | 5.61  | —                 | —     | —     |
|                   |                  |      | 0.382          | 9.70  | XXS             | —               | 5.21      | 2.36  | 7.77  | 5.22              | 2.37  | 7.76  |
| 1 1/2             | 1.900            | 48.3 | 0.145          | 3.68  | STD             | 40              | 2.72      | 1.23  | 4.05  | 2.73              | 1.24  | 4.04  |
|                   |                  |      | 0.200          | 5.08  | XS              | 80              | 3.63      | 1.65  | 5.41  | 3.66              | 1.66  | 5.39  |
|                   |                  |      | 0.281          | 7.14  | —               | 160             | 4.86      | 2.21  | 7.25  | —                 | —     | —     |
|                   |                  |      | 0.400          | 10.16 | XXS             | —               | 6.41      | 2.91  | 9.56  | 6.41              | 2.91  | 9.56  |
| 2                 | 2.375            | 60.3 | 0.154          | 3.91  | STD             | 40              | 3.65      | 1.66  | 5.44  | 3.68              | 1.67  | 5.46  |
|                   |                  |      | 0.218          | 5.54  | XS              | 80              | 5.02      | 2.28  | 7.48  | 5.07              | 2.30  | 7.55  |
|                   |                  |      | 0.344          | 8.74  | —               | 160             | 7.46      | 3.39  | 11.11 | —                 | —     | —     |
|                   |                  |      | 0.436          | 11.07 | XXS             | —               | 9.03      | 4.10  | 13.44 | 9.03              | 4.10  | 13.44 |
| 2 1/2             | 2.875            | 73.0 | 0.203          | 5.16  | STD             | 40              | 5.79      | 2.63  | 8.63  | 5.82              | 2.64  | 8.67  |
|                   |                  |      | 0.276          | 7.01  | XS              | 80              | 7.66      | 3.47  | 11.41 | 7.73              | 3.51  | 11.52 |
|                   |                  |      | 0.375          | 9.52  | —               | 160             | 10.01     | 4.54  | 14.90 | —                 | —     | —     |
|                   |                  |      | 0.552          | 14.02 | XXS             | —               | 13.70     | 6.21  | 20.39 | 13.70             | 6.22  | 20.39 |
| 3                 | 3.500            | 88.9 | 0.125          | 3.18  | —               | —               | 4.51      | 2.05  | 6.72  | —                 | —     | —     |
|                   |                  |      | 0.156          | 3.96  | —               | —               | 5.57      | 2.53  | 8.29  | —                 | —     | —     |
|                   |                  |      | 0.188          | 4.78  | —               | —               | 6.65      | 3.02  | 9.92  | —                 | —     | —     |
|                   |                  |      | 0.216          | 5.49  | STD             | 40              | 7.58      | 3.44  | 11.29 | 7.62              | 3.46  | 11.35 |
|                   |                  |      | 0.250          | 6.35  | —               | —               | 8.68      | 3.94  | 12.93 | —                 | —     | —     |
|                   |                  |      | 0.281          | 7.14  | —               | —               | 9.66      | 4.38  | 14.40 | —                 | —     | —     |
|                   |                  |      | 0.300          | 7.62  | XS              | 80              | 10.25     | 4.65  | 15.27 | 10.33             | 4.69  | 15.39 |
|                   |                  |      | 0.438          | 11.13 | —               | 160             | 14.32     | 6.50  | 21.36 | —                 | —     | —     |
|                   |                  |      | 0.600          | 15.24 | XXS             | —               | 18.58     | 8.43  | 27.68 | 18.57             | 8.43  | 27.66 |

Note : ◯ Sizes outside the above size range are on an inquiry basis.

## Pressure

| Plain End     |      |         |       |         |       | Thread and Coupling |      |         |       |         |       |
|---------------|------|---------|-------|---------|-------|---------------------|------|---------|-------|---------|-------|
| Test Pressure |      |         |       |         |       | Test Pressure       |      |         |       |         |       |
| Butt Welded   |      | Grade A |       | Grade B |       | Butt Welded         |      | Grade A |       | Grade B |       |
| psi           | kPa  | psi     | kPa   | psi     | kPa   | psi                 | kPa  | psi     | kPa   | psi     | kPa   |
| 700           | 4830 | 700     | 4830  | 700     | 4830  | —                   | —    | —       | —     | —       | —     |
| 850           | 5860 | 850     | 5860  | 850     | 5860  | —                   | —    | —       | —     | —       | —     |
| 700           | 4830 | 700     | 4830  | 700     | 4830  | 700                 | 4830 | 700     | 4830  | 700     | 4830  |
| 850           | 5860 | 850     | 5860  | 850     | 5860  | 850                 | 5860 | 850     | 5860  | 850     | 5860  |
| 900           | 6210 | 900     | 6210  | 900     | 6210  | —                   | —    | —       | —     | —       | —     |
| 1000          | 6890 | 1000    | 6890  | 1000    | 6890  | 1000                | 6890 | 1000    | 6890  | 1000    | 6890  |
| 700           | 4830 | 700     | 4830  | 700     | 4830  | 700                 | 4830 | 700     | 4830  | 700     | 4830  |
| 850           | 5860 | 850     | 5860  | 850     | 5860  | 850                 | 5860 | 850     | 5860  | 850     | 5860  |
| 950           | 6550 | 950     | 6550  | 950     | 6550  | —                   | —    | —       | —     | —       | —     |
| 1000          | 6890 | 1000    | 6890  | 1000    | 6890  | 1000                | 6890 | 1000    | 6890  | 1000    | 6890  |
| 700           | 4830 | 700     | 4830  | 700     | 4830  | 700                 | 4830 | 700     | 4830  | 700     | 4830  |
| 850           | 5860 | 850     | 5860  | 850     | 5860  | 850                 | 5860 | 850     | 5860  | 850     | 5860  |
| 950           | 6550 | 950     | 6550  | 950     | 6550  | —                   | —    | —       | —     | —       | —     |
| 1000          | 6890 | 1000    | 6890  | 1000    | 6890  | 1000                | 6890 | 1000    | 6890  | 1000    | 6890  |
| 1000          | 6890 | 1200    | 8270  | 1300    | 8960  | 1000                | 6890 | 1000    | 6890  | 1100    | 7580  |
| 1300          | 8960 | 1800    | 12410 | 1900    | 13100 | 1300                | 8960 | 1500    | 10340 | 1600    | 11030 |
| 1350          | 9310 | 1900    | 13100 | 2000    | 13790 | —                   | —    | —       | —     | —       | —     |
| 1400          | 9650 | 2200    | 15170 | 2300    | 15860 | 1400                | 9650 | 1800    | 12410 | 1900    | 13100 |
| 1000          | 6890 | 1200    | 8270  | 1300    | 8960  | 1000                | 6890 | 1000    | 6890  | 1100    | 7580  |
| 1300          | 8960 | 1800    | 12410 | 1900    | 13100 | 1300                | 8960 | 1500    | 10340 | 1600    | 11030 |
| 1350          | 9310 | 1950    | 13440 | 2050    | 14130 | —                   | —    | —       | —     | —       | —     |
| 1400          | 9650 | 2200    | 15170 | 2300    | 15860 | 1400                | 9650 | 1800    | 12410 | 1900    | 13100 |
| 1000          | 6890 | 2300    | 15860 | 2500    | 17240 | 1000                | 6890 | 2300    | 15860 | 2500    | 17240 |
| 1300          | 8960 | 2500    | 17240 | 2500    | 17240 | 1300                | 8960 | 2500    | 17240 | 2500    | 17240 |
| 1400          | 9650 | 2500    | 17240 | 2500    | 17240 | —                   | —    | —       | —     | —       | —     |
| 1400          | 9650 | 2500    | 17240 | 2500    | 17240 | 1400                | 9650 | 2500    | 17240 | 2500    | 17240 |
| 1000          | 6890 | 2500    | 17240 | 2500    | 17240 | 1000                | 6890 | 2500    | 17240 | 2500    | 17240 |
| 1300          | 8960 | 2500    | 17240 | 2500    | 17240 | 1300                | 8960 | 2500    | 17240 | 2500    | 17240 |
| 1400          | 9650 | 2500    | 17240 | 2500    | 17240 | —                   | —    | —       | —     | —       | —     |
| 1400          | 9650 | 2500    | 17240 | 2500    | 17240 | 1400                | 9650 | 2500    | 17240 | 2500    | 17240 |
| 800           | 5520 | 1290    | 8890  | 1500    | 1030  | —                   | —    | —       | —     | —       | —     |
| 1000          | 6890 | 1600    | 11030 | 1870    | 12890 | —                   | —    | —       | —     | —       | —     |
| 1000          | 6890 | 1930    | 13310 | 2280    | 15580 | —                   | —    | —       | —     | —       | —     |
| 1000          | 6890 | 2220    | 15310 | 2500    | 17240 | 1000                | 6890 | 2200    | 15170 | 2500    | 17240 |
| 1300          | 8960 | 2500    | 17240 | 2500    | 17240 | —                   | —    | —       | —     | —       | —     |
| 1300          | 8960 | 2500    | 17240 | 2500    | 17240 | —                   | —    | —       | —     | —       | —     |
| 1300          | 8960 | 2500    | 17240 | 2500    | 17240 | 1300                | 8960 | 2500    | 17240 | 2500    | 17240 |
| —             | —    | 2500    | 17240 | 2500    | 17240 | —                   | —    | —       | —     | —       | —     |
| —             | —    | 2500    | 17240 | 2500    | 17240 | —                   | —    | 2500    | 17240 | 2500    | 17240 |

# ASTM Std. A53 /API 5L/A-106 SEAMLESS STEEL PIPE

## Available Sizes (Dimensions and Weights) and Mill Hydraulic Test

| NPS<br>Designator | Outside Diameter |       | Wall Thickness |       | Weight<br>Class | Schedule<br>No. | Plain End |       |       | Thread & Coupling |       |       |
|-------------------|------------------|-------|----------------|-------|-----------------|-----------------|-----------|-------|-------|-------------------|-------|-------|
|                   | In.              | mm    | In.            | mm    |                 |                 | Weight    |       |       | Weight            |       |       |
|                   |                  |       |                |       |                 |                 | lb/ft     | kg/ft | kg/m  | lb/ft             | kg/ft | kg/m  |
| 3½                | 4.000            | 101.6 | 0.125          | 3.18  | —               | —               | 5.17      | 2.35  | 7.72  | —                 | —     | —     |
|                   |                  |       | 0.156          | 3.96  | —               | —               | 6.40      | 2.90  | 9.53  | —                 | —     | —     |
|                   |                  |       | 0.188          | 4.78  | —               | —               | 7.65      | 3.47  | 11.41 | —                 | —     | —     |
|                   |                  |       | 0.226          | 5.74  | STD             | 40              | 9.11      | 4.13  | 13.57 | 9.20              | 4.18  | 13.71 |
|                   |                  |       | 0.250          | 6.35  | —               | —               | 10.01     | 4.54  | 14.92 | —                 | —     | —     |
|                   |                  |       | 0.281          | 7.14  | —               | —               | 11.16     | 5.06  | 16.63 | —                 | —     | —     |
|                   |                  |       | 0.318          | 8.08  | XS              | 80              | 12.51     | 5.67  | 18.63 | 12.63             | 5.73  | 18.82 |
| 4                 | 4.500            | 114.3 | 0.125          | 3.18  | —               | —               | 5.84      | 2.65  | 8.71  | —                 | —     | —     |
|                   |                  |       | 0.156          | 3.96  | —               | —               | 7.24      | 3.28  | 10.78 | —                 | —     | —     |
|                   |                  |       | 0.188          | 4.78  | —               | —               | 8.66      | 3.98  | 12.91 | —                 | —     | —     |
|                   |                  |       | 0.219          | 5.56  | —               | —               | 10.01     | 4.54  | 14.81 | —                 | —     | —     |
|                   |                  |       | 0.237          | 6.02  | STD             | 40              | 10.79     | 4.89  | 16.07 | 10.89             | 4.94  | 16.23 |
|                   |                  |       | 0.250          | 6.35  | —               | —               | 11.35     | 5.15  | 16.90 | —                 | —     | —     |
|                   |                  |       | 0.281          | 7.14  | —               | —               | 12.66     | 5.74  | 18.87 | —                 | —     | —     |
|                   |                  |       | 0.312          | 7.92  | —               | —               | 13.98     | 6.33  | 20.78 | —                 | —     | —     |
|                   |                  |       | 0.337          | 8.56  | XS              | 80              | 14.98     | 6.79  | 22.32 | 15.17             | 6.89  | 22.60 |
|                   |                  |       | 0.438          | 11.13 | —               | 120             | 19.00     | 8.62  | 28.32 | —                 | —     | —     |
|                   |                  |       | 0.531          | 13.49 | —               | 160             | 22.51     | 10.21 | 33.54 | —                 | —     | —     |
| 0.674             | 17.12            | XXS   | —              | 27.54 | 12.49           | 41.03           | 27.58     | 12.52 | 41.09 |                   |       |       |
| 5                 | 5.563            | 141.3 | 0.156          | 3.96  | —               | —               | 9.01      | 4.09  | 13.41 | —                 | —     | —     |
|                   |                  |       | 0.188          | 4.78  | —               | —               | 10.79     | 4.89  | 16.09 | —                 | —     | —     |
|                   |                  |       | 0.219          | 5.56  | —               | —               | 12.50     | 5.67  | 18.61 | —                 | —     | —     |
|                   |                  |       | 0.250          | 6.35  | STD             | 40              | 14.62     | 6.43  | 21.77 | 14.81             | 6.72  | 22.07 |
|                   |                  |       | 0.281          | 7.14  | —               | —               | 15.85     | 7.19  | 23.62 | —                 | —     | —     |
|                   |                  |       | 0.312          | 7.92  | —               | —               | 17.50     | 7.94  | 26.05 | —                 | —     | —     |
|                   |                  |       | 0.344          | 8.74  | —               | —               | 19.17     | 8.70  | 28.57 | —                 | —     | —     |
|                   |                  |       | 0.375          | 9.52  | XS              | 80              | 20.78     | 9.43  | 30.94 | 21.09             | 9.57  | 31.42 |
|                   |                  |       | 0.500          | 12.70 | —               | 120             | 27.04     | 12.27 | 40.28 | —                 | —     | —     |
|                   |                  |       | 0.625          | 15.88 | —               | 160             | 32.96     | 14.95 | 49.11 | —                 | —     | —     |
|                   |                  |       | 0.750          | 19.05 | XXS             | —               | 38.55     | 17.49 | 57.43 | —                 | —     | —     |
| 6                 | 6.625            | 168.3 | 0.188          | 4.78  | —               | —               | 12.92     | 5.86  | 19.27 | —                 | —     | —     |
|                   |                  |       | 0.219          | 5.56  | —               | —               | 14.98     | 6.79  | 22.31 | —                 | —     | —     |
|                   |                  |       | 0.250          | 6.35  | —               | —               | 17.02     | 7.72  | 25.36 | —                 | —     | —     |
|                   |                  |       | 0.280          | 7.11  | STD             | 40              | 18.37     | 8.60  | 28.26 | 19.18             | 8.71  | 28.58 |
|                   |                  |       | 0.312          | 7.92  | —               | —               | 21.04     | 9.54  | 31.32 | —                 | —     | —     |
|                   |                  |       | 0.344          | 8.74  | —               | —               | 23.08     | 10.47 | 34.39 | —                 | —     | —     |
|                   |                  |       | 0.375          | 9.52  | —               | —               | 25.03     | 11.35 | 37.28 | —                 | —     | —     |
|                   |                  |       | 0.432          | 10.97 | XS              | 80              | 28.57     | 12.96 | 42.56 | 28.89             | 13.12 | 43.05 |
|                   |                  |       | 0.562          | 14.27 | —               | 120             | 38.39     | 18.62 | 64.20 | —                 | —     | —     |
|                   |                  |       | 0.719          | 18.26 | —               | 160             | 45.35     | 20.57 | 67.56 | —                 | —     | —     |
|                   |                  |       | 0.864          | 21.95 | XXS             | —               | 53.18     | 24.11 | 79.22 | —                 | —     | —     |

Note : ○ Sizes outside the above size range are on an inquiry basis.

## Pressure

| Plain End     |       |         |       |         |       | Thread and Coupling |       |         |       |         |       |
|---------------|-------|---------|-------|---------|-------|---------------------|-------|---------|-------|---------|-------|
| Test Pressure |       |         |       |         |       | Test Pressure       |       |         |       |         |       |
| Butt Welded   |       | Grade A |       | Grade B |       | Butt Welded         |       | Grade A |       | Grade B |       |
| psi           | kPa   | psi     | kPa   | psi     | kPa   | psi                 | kPa   | psi     | kPa   | psi     | kPa   |
| 800           | 5520  | 1120    | 7720  | 1310    | 9030  | —                   | —     | —       | —     | —       | —     |
| 1000          | 6890  | 1400    | 9650  | 1640    | 11310 | —                   | —     | —       | —     | —       | —     |
| 1200          | 8270  | 1690    | 11650 | 1970    | 13580 | —                   | —     | —       | —     | —       | —     |
| 1200          | 8270  | 2030    | 14000 | 2370    | 16340 | 1200                | 8270  | 2000    | 13790 | 2400    | 16550 |
| 1300          | 8960  | 2250    | 15510 | 2500    | 17240 | —                   | —     | —       | —     | —       | —     |
| 1500          | 10340 | 2500    | 17240 | 2500    | 17240 | —                   | —     | —       | —     | —       | —     |
| 1700          | 11720 | 2800    | 19310 | 2800    | 19310 | 1700                | 11720 | 2800    | 19310 | 2800    | 19310 |
| 800           | 5520  | 1000    | 6890  | 1170    | 8070  | —                   | —     | —       | —     | —       | —     |
| 1000          | 6890  | 1250    | 8620  | 1460    | 10070 | —                   | —     | —       | —     | —       | —     |
| 1200          | 8270  | 1500    | 10340 | 1750    | 12070 | —                   | —     | —       | —     | —       | —     |
| 1200          | 8270  | 1750    | 12070 | 2040    | 14070 | —                   | —     | —       | —     | —       | —     |
| 1200          | 8270  | 1900    | 13100 | 2210    | 15240 | 1200                | 8270  | 1900    | 13100 | 2200    | 15170 |
| 1300          | 8960  | 2000    | 13790 | 2330    | 16060 | —                   | —     | —       | —     | —       | —     |
| 1400          | 9650  | 2250    | 15110 | 2620    | 18060 | —                   | —     | —       | —     | —       | —     |
| 1600          | 11030 | 2500    | 17240 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |
| 1700          | 11720 | 2700    | 18620 | 2800    | 19310 | 1700                | 11720 | 2700    | 18620 | 2800    | 19310 |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | 2800    | 19310 | 2800    | 19310 |
| —             | —     | 1010    | 6960  | 1180    | 8140  | —                   | —     | —       | —     | —       | —     |
| —             | —     | 1220    | 8410  | 1420    | 9790  | —                   | —     | —       | —     | —       | —     |
| 1000          | 6890  | 1420    | 9790  | 1650    | 11380 | —                   | —     | —       | —     | —       | —     |
| 1200          | 8270  | 1670    | 11510 | 1950    | 13440 | 1200                | 8270  | 1700    | 11720 | 1900    | 13100 |
| 1200          | 8270  | 1820    | 12550 | 2120    | 14620 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2020    | 13930 | 2360    | 16270 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2230    | 15380 | 2600    | 17930 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2430    | 16750 | 2800    | 19310 | —                   | —     | 2400    | 16550 | 2800    | 19310 |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 1020    | 7030  | 1190    | 8200  | —                   | —     | —       | —     | —       | —     |
| —             | —     | 1190    | 8200  | 1390    | 9580  | —                   | —     | —       | —     | —       | —     |
| —             | —     | 1360    | 9380  | 1580    | 10890 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 1520    | 10480 | 1780    | 12270 | —                   | —     | 1500    | 10340 | 1800    | 12410 |
| —             | —     | 1700    | 11720 | 1980    | 13650 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 1870    | 12890 | 2180    | 15030 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2040    | 14070 | 2380    | 16410 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2350    | 16200 | 2740    | 18890 | —                   | —     | 2300    | 15860 | 2700    | 18620 |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |
| —             | —     | 2800    | 19310 | 2800    | 19310 | —                   | —     | —       | —     | —       | —     |

# ASTM Std. A53 /API 5L/A-106 SEAMLESS STEEL PIPE

Available Sizes (Dimensions and Weights) and Mill Hydraulic Test

| NPS Designator | Outside Diameter |       | Wall Thickness |       | Weight Class | Schedule No. | Weight |       |        |
|----------------|------------------|-------|----------------|-------|--------------|--------------|--------|-------|--------|
|                | in.              | mm    | in.            | mm    |              |              | lb/ft  | kg/ft | kg/m   |
| 8              | 8.625            | 219.1 | 0.188          | 4.78  | —            | —            | 16.94  | 7.69  | 25.26  |
|                |                  |       | 0.203          | 5.16  | —            | —            | 18.26  | 8.29  | 27.22  |
|                |                  |       | 0.219          | 5.56  | —            | —            | 19.66  | 8.93  | 29.28  |
|                |                  |       | 0.250          | 6.35  | —            | 20           | 22.36  | 10.15 | 33.31  |
|                |                  |       | 0.277          | 7.04  | —            | 30           | 24.70  | 11.21 | 36.31  |
|                |                  |       | 0.312          | 7.92  | —            | —            | 27.70  | 12.58 | 41.24  |
|                |                  |       | 0.322          | 8.18  | STD          | 40           | 28.55  | 12.96 | 42.55  |
|                |                  |       | 0.344          | 8.74  | —            | —            | 30.42  | 13.81 | 45.34  |
|                |                  |       | 0.375          | 9.52  | —            | —            | 33.04  | 15.00 | 49.20  |
|                |                  |       | 0.406          | 10.31 | —            | 60           | 35.64  | 16.18 | 53.08  |
|                |                  |       | 0.438          | 11.13 | —            | —            | 38.30  | 17.39 | 57.08  |
|                |                  |       | 0.500          | 12.70 | XS           | 80           | 43.39  | 19.70 | 64.64  |
|                |                  |       | 0.594          | 15.09 | —            | 100          | 50.95  | 23.13 | 75.92  |
|                |                  |       | 0.719          | 18.26 | —            | 120          | 60.71  | 27.56 | 90.44  |
|                |                  |       | 0.812          | 20.62 | —            | 140          | 67.76  | 30.76 | 100.92 |
|                |                  |       | 0.875          | 22.22 | XXS          | —            | 72.42  | 32.88 | 107.88 |
|                |                  |       | 0.908          | 23.01 | —            | 160          | 74.69  | 33.91 | 111.27 |
| 10             | 10.750           | 273.0 | 0.188          | 4.78  | —            | —            | 21.21  | 9.83  | 31.82  |
|                |                  |       | 0.203          | 5.16  | —            | —            | 22.87  | 10.38 | 34.08  |
|                |                  |       | 0.219          | 5.56  | —            | —            | 24.63  | 11.18 | 36.67  |
|                |                  |       | 0.250          | 6.35  | —            | 20           | 28.04  | 12.73 | 41.75  |
|                |                  |       | 0.279          | 7.09  | —            | —            | 31.20  | 14.16 | 46.49  |
|                |                  |       | 0.307          | 7.80  | —            | 30           | 34.24  | 15.54 | 51.01  |
|                |                  |       | 0.344          | 8.74  | —            | —            | 38.23  | 17.36 | 56.96  |
|                |                  |       | 0.385          | 9.27  | STD          | 40           | 40.48  | 18.38 | 60.29  |
|                |                  |       | 0.438          | 11.13 | —            | —            | 48.19  | 21.86 | 71.87  |
|                |                  |       | 0.500          | 12.70 | XS           | 80           | 54.74  | 24.85 | 81.52  |
|                |                  |       | 0.594          | 15.09 | —            | 80           | 64.43  | 29.25 | 95.97  |
|                |                  |       | 0.719          | 18.26 | —            | 100          | 77.03  | 34.97 | 114.70 |
|                |                  |       | 0.844          | 21.44 | —            | 120          | 89.29  | 40.54 | 133.00 |
|                |                  |       | 1.000          | 25.40 | XXS          | 140          | 104.13 | 47.28 | 155.09 |
|                |                  |       | 1.125          | 28.57 | —            | 160          | 115.65 | 52.51 | 172.21 |
| 12             | 12.750           | 323.8 | 0.203          | 5.16  | —            | —            | 27.20  | 12.35 | 40.55  |
|                |                  |       | 0.219          | 5.56  | —            | —            | 29.31  | 13.31 | 43.63  |
|                |                  |       | 0.250          | 6.35  | —            | 20           | 33.38  | 15.15 | 49.71  |
|                |                  |       | 0.281          | 7.14  | —            | —            | 37.42  | 16.99 | 55.75  |
|                |                  |       | 0.312          | 7.92  | —            | —            | 41.46  | 18.82 | 61.89  |
|                |                  |       | 0.330          | 8.38  | —            | 30           | 43.77  | 19.87 | 65.18  |
|                |                  |       | 0.344          | 8.74  | —            | —            | 45.58  | 20.69 | 67.90  |
|                |                  |       | 0.375          | 9.52  | STD          | —            | 49.56  | 22.50 | 73.78  |
|                |                  |       | 0.406          | 10.31 | —            | 40           | 53.52  | 24.30 | 79.70  |
|                |                  |       | 0.438          | 11.13 | —            | —            | 57.59  | 26.15 | 85.82  |
|                |                  |       | 0.500          | 12.70 | XS           | —            | 65.42  | 29.70 | 97.43  |
|                |                  |       | 0.582          | 14.27 | —            | 60           | 73.15  | 33.21 | 108.92 |
|                |                  |       | 0.688          | 17.48 | —            | 80           | 88.63  | 40.24 | 132.04 |
|                |                  |       | 0.844          | 21.44 | —            | 100          | 107.32 | 48.72 | 159.86 |
|                |                  |       | 1.000          | 25.40 | XXS          | 120          | 125.49 | 56.97 | 186.91 |
|                |                  |       | 1.125          | 28.57 | —            | 140          | 139.68 | 63.41 | 208.00 |
|                |                  |       | 1.312          | 33.32 | —            | 160          | 160.27 | 72.76 | 238.68 |
| 14             | 14.000           | 355.6 | 0.210          | 5.33  | —            | —            | 30.93  | 14.04 | 46.04  |
|                |                  |       | 0.219          | 5.56  | —            | —            | 32.23  | 14.63 | 47.99  |
|                |                  |       | 0.250          | 6.35  | —            | 10           | 36.71  | 16.67 | 54.69  |
|                |                  |       | 0.281          | 7.14  | —            | —            | 41.17  | 18.69 | 61.35  |
|                |                  |       | 0.312          | 7.92  | —            | 20           | 45.61  | 20.71 | 67.90  |
|                |                  |       | 0.344          | 8.74  | —            | —            | 50.17  | 22.78 | 74.76  |
|                |                  |       | 0.375          | 9.52  | STD          | 30           | 54.87  | 24.77 | 81.25  |
|                |                  |       | 0.438          | 11.13 | —            | 40           | 63.44  | 28.80 | 94.55  |
|                |                  |       | 0.469          | 11.91 | —            | —            | 67.78  | 30.77 | 100.94 |
|                |                  |       | 0.500          | 12.70 | XS           | —            | 72.09  | 32.73 | 107.39 |
|                |                  |       | 0.594          | 15.09 | —            | 60           | 85.05  | 38.61 | 126.71 |
|                |                  |       | 0.750          | 19.05 | —            | 80           | 106.13 | 48.18 | 158.10 |
|                |                  |       | 0.938          | 23.83 | —            | 100          | 130.85 | 57.41 | 194.96 |
|                |                  |       | 1.094          | 27.79 | —            | 120          | 150.79 | 68.46 | 224.65 |
|                |                  |       | 1.250          | 31.75 | —            | 140          | 170.22 | 77.28 | 253.66 |
|                |                  |       | 1.406          | 35.71 | —            | 160          | 189.11 | 85.86 | 281.70 |
| 16             | 16.000           | 406.4 | 0.219          | 5.56  | —            | —            | 36.91  | 16.76 | 54.96  |
|                |                  |       | 0.250          | 6.35  | —            | 10           | 42.05  | 19.09 | 62.64  |
|                |                  |       | 0.281          | 7.14  | —            | —            | 47.17  | 21.42 | 70.30  |
|                |                  |       | 0.312          | 7.92  | —            | 20           | 52.27  | 23.73 | 77.83  |
|                |                  |       | 0.344          | 8.74  | —            | —            | 57.52  | 26.11 | 85.71  |

## Pressure

| Test Pressure |       |         |       |
|---------------|-------|---------|-------|
| Grade A       |       | Grade B |       |
| psi           | kPa   | psi     | kPa   |
| 780           | 5380  | 920     | 6340  |
| 850           | 5860  | 1000    | 6890  |
| 910           | 6270  | 1070    | 7380  |
| 1040          | 7170  | 1220    | 8410  |
| 1160          | 7800  | 1350    | 9310  |
| 1300          | 8960  | 1520    | 10480 |
| 1340          | 9240  | 1570    | 10820 |
| 1440          | 9930  | 1680    | 11580 |
| 1570          | 10820 | 1830    | 12620 |
| 1700          | 11720 | 2000    | 13790 |
| 1830          | 12620 | 2130    | 14690 |
| 2090          | 14410 | 2430    | 16750 |
| 2500          | 17240 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
|               |       |         |       |
| 630           | 4340  | 730     | 5030  |
| 680           | 4680  | 800     | 5520  |
| 730           | 5030  | 860     | 5930  |
| 840           | 5790  | 980     | 6760  |
| 930           | 6410  | 1090    | 7520  |
| 1030          | 7100  | 1200    | 8270  |
| 1150          | 7930  | 1340    | 9240  |
| 1220          | 8410  | 1430    | 9860  |
| 1470          | 10140 | 1710    | 11790 |
| 1670          | 11510 | 1950    | 13440 |
| 1990          | 13720 | 2320    | 16000 |
| 2410          | 16620 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
|               |       |         |       |
| 570           | 3930  | 670     | 4620  |
| 620           | 4270  | 720     | 4960  |
| 710           | 4900  | 820     | 5650  |
| 790           | 5450  | 930     | 6410  |
| 880           | 6070  | 1030    | 7100  |
| 930           | 6410  | 1090    | 7520  |
| 970           | 6690  | 1130    | 7790  |
| 1060          | 7310  | 1240    | 8550  |
| 1150          | 7930  | 1340    | 9240  |
| 1240          | 8550  | 1440    | 9930  |
| 1410          | 9720  | 1650    | 11380 |
| 1590          | 10960 | 1850    | 12760 |
| 1940          | 13380 | 2270    | 15650 |
| 2390          | 16480 | 2780    | 19170 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
|               |       |         |       |
| 540           | 3720  | 630     | 4340  |
| 560           | 3880  | 660     | 4550  |
| 640           | 4410  | 750     | 5170  |
| 720           | 4960  | 840     | 5790  |
| 800           | 5520  | 940     | 6480  |
| 860           | 6070  | 1030    | 7100  |
| 960           | 6620  | 1120    | 7720  |
| 1130          | 7790  | 1310    | 9030  |
| 1210          | 8340  | 1410    | 9720  |
| 1290          | 8890  | 1500    | 10340 |
| 1530          | 10550 | 1790    | 12340 |
| 1930          | 13310 | 2250    | 15510 |
| 2410          | 16620 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
|               |       |         |       |
| 490           | 3380  | 570     | 3930  |
| 560           | 3860  | 660     | 4550  |
| 630           | 4340  | 740     | 5100  |
| 700           | 4830  | 820     | 5650  |
| 770           | 5310  | 900     | 6210  |

Note:

○ Sizes outside the above size range are on an inquiry basis.

# ASTM Std. A53 /API 5L/A-106 SEAMLESS STEEL PIPE

Available Sizes (Dimensions and Weights) and Mill Hydraulic Test

| NPS Designator | Outside Diameter |       | Wall Thickness |       | Weight Class | Schedule No. | Weight |        |        |
|----------------|------------------|-------|----------------|-------|--------------|--------------|--------|--------|--------|
|                | in.              | mm    | in.            | mm    |              |              | lb/ft  | kg/ft  | kg/m   |
| 16             | 16.000           | 406.4 | 0.375          | 9.52  | STD          | 30           | 62.58  | 28.41  | 93.17  |
|                |                  |       | 0.438          | 11.13 | —            | —            | 72.80  | 33.05  | 108.49 |
|                |                  |       | 0.469          | 11.91 | —            | —            | 77.79  | 35.32  | 115.86 |
|                |                  |       | 0.500          | 12.70 | XS           | 40           | 82.77  | 37.58  | 123.30 |
|                |                  |       | 0.656          | 16.66 | —            | 60           | 107.50 | 48.81  | 160.12 |
|                |                  |       | 0.844          | 21.44 | —            | 80           | 136.62 | 62.03  | 203.53 |
|                |                  |       | 1.031          | 26.19 | —            | 100          | 164.82 | 74.83  | 245.56 |
|                |                  |       | 1.219          | 30.96 | —            | 120          | 192.43 | 87.36  | 286.64 |
|                |                  |       | 1.438          | 36.53 | —            | 140          | 223.64 | 101.53 | 333.19 |
|                |                  |       | 1.594          | 40.49 | —            | 160          | 245.25 | 111.34 | 365.35 |
|                |                  |       |                |       |              |              |        |        |        |
| 18             | 18.000           | 457.2 | 0.250          | 6.35  | —            | 10           | 47.39  | 21.52  | 70.60  |
|                |                  |       | 0.281          | 7.14  | —            | —            | 53.18  | 24.14  | 79.24  |
|                |                  |       | 0.312          | 7.92  | —            | 20           | 58.94  | 26.76  | 87.75  |
|                |                  |       | 0.344          | 8.74  | —            | —            | 64.87  | 29.44  | 96.66  |
|                |                  |       | 0.375          | 9.52  | STD          | —            | 70.59  | 32.05  | 105.10 |
|                |                  |       | 0.406          | 10.31 | —            | —            | 76.29  | 34.64  | 113.62 |
|                |                  |       | 0.438          | 11.13 | —            | 30           | 82.15  | 37.30  | 122.43 |
|                |                  |       | 0.469          | 11.91 | —            | —            | 87.81  | 39.87  | 130.78 |
|                |                  |       | 0.500          | 12.70 | XS           | —            | 93.45  | 42.43  | 139.20 |
|                |                  |       | 0.562          | 14.27 | —            | 40           | 104.67 | 47.52  | 155.87 |
|                |                  |       | 0.750          | 19.05 | —            | 60           | 138.17 | 62.73  | 205.83 |
|                |                  |       | 0.938          | 23.83 | —            | 80           | 170.92 | 77.60  | 254.67 |
|                |                  |       | 1.156          | 29.36 | —            | 100          | 207.96 | 94.41  | 309.76 |
|                |                  |       | 1.375          | 34.92 | —            | 120          | 244.14 | 110.84 | 363.64 |
|                |                  |       | 1.562          | 39.67 | —            | 140          | 274.22 | 124.50 | 408.45 |
|                |                  |       | 1.781          | 45.24 | —            | 160          | 308.50 | 140.06 | 459.59 |
|                |                  |       |                |       |              |              |        |        |        |
| 20             | 20.000           | 508.0 | 0.250          | 6.35  | —            | 10           | 52.73  | 23.94  | 78.55  |
|                |                  |       | 0.281          | 7.14  | —            | —            | 59.18  | 26.87  | 88.19  |
|                |                  |       | 0.312          | 7.92  | —            | —            | 65.60  | 29.78  | 97.67  |
|                |                  |       | 0.344          | 8.74  | —            | —            | 72.21  | 32.78  | 107.60 |
|                |                  |       | 0.375          | 9.52  | STD          | 20           | 78.60  | 35.68  | 117.02 |
|                |                  |       | 0.406          | 10.31 | —            | —            | 84.96  | 38.57  | 126.53 |
|                |                  |       | 0.438          | 11.13 | —            | —            | 91.51  | 41.55  | 136.37 |
|                |                  |       | 0.469          | 11.91 | —            | —            | 97.83  | 44.41  | 145.70 |
|                |                  |       | 0.500          | 12.70 | XS           | 30           | 104.13 | 47.28  | 155.12 |
|                |                  |       | 0.594          | 15.09 | —            | 40           | 123.11 | 55.89  | 183.42 |
|                |                  |       | 0.812          | 20.62 | —            | 60           | 166.40 | 75.55  | 247.83 |
|                |                  |       | 1.031          | 26.19 | —            | 80           | 208.87 | 94.83  | 311.17 |
|                |                  |       | 1.281          | 32.54 | —            | 100          | 256.10 | 116.27 | 381.53 |
|                |                  |       | 1.500          | 38.10 | —            | 120          | 296.37 | 134.55 | 441.49 |
|                |                  |       | 1.750          | 44.45 | —            | 140          | 341.10 | 154.88 | 508.11 |
|                |                  |       | 1.969          | 50.01 | —            | 160          | 379.10 | 172.11 | 564.81 |
|                |                  |       |                |       |              |              |        |        |        |
| 24             | 24.000           | 609.6 | 0.250          | 6.35  | —            | 10           | 63.41  | 28.79  | 94.46  |
|                |                  |       | 0.281          | 7.14  | —            | —            | 71.18  | 32.32  | 106.08 |
|                |                  |       | 0.312          | 7.92  | —            | —            | 78.93  | 35.83  | 117.51 |
|                |                  |       | 0.344          | 8.74  | —            | —            | 86.91  | 39.46  | 129.50 |
|                |                  |       | 0.375          | 9.52  | STD          | 20           | 94.62  | 42.96  | 140.88 |
|                |                  |       | 0.406          | 10.31 | —            | —            | 102.31 | 46.45  | 152.37 |
|                |                  |       | 0.438          | 11.13 | —            | —            | 110.22 | 50.04  | 164.26 |
|                |                  |       | 0.469          | 11.91 | —            | —            | 117.86 | 53.51  | 175.54 |
|                |                  |       | 0.500          | 12.70 | XS           | —            | 125.49 | 56.97  | 186.94 |
|                |                  |       | 0.562          | 14.27 | —            | 30           | 140.68 | 63.87  | 209.50 |
|                |                  |       | 0.688          | 17.48 | —            | 40           | 171.29 | 77.77  | 255.24 |
|                |                  |       | 0.938          | 23.83 | —            | —            | 231.03 | 104.89 | 344.23 |
|                |                  |       | 0.969          | 24.61 | —            | 60           | 238.85 | 108.44 | 365.02 |
|                |                  |       | 1.219          | 30.96 | —            | 80           | 298.58 | 134.65 | 441.78 |
|                |                  |       | 1.531          | 38.89 | —            | 100          | 367.39 | 166.80 | 547.33 |
|                |                  |       | 1.812          | 46.02 | —            | 120          | 429.39 | 194.94 | 639.58 |
|                |                  |       | 2.062          | 52.37 | —            | 140          | 483.12 | 219.34 | 719.63 |
|                |                  |       | 2.344          | 59.54 | —            | 160          | 542.14 | 246.13 | 807.63 |
|                |                  |       |                |       |              |              |        |        |        |
| 26             | 26.000           | 660.4 | 0.250          | 6.35  | —            | —            | 68.75  | 31.21  | 102.42 |
|                |                  |       | 0.281          | 7.14  | —            | —            | 77.18  | 35.04  | 115.02 |
|                |                  |       | 0.312          | 7.92  | —            | 10           | 85.60  | 38.86  | 127.43 |
|                |                  |       | 0.344          | 8.74  | —            | —            | 94.26  | 42.79  | 140.45 |
|                |                  |       | 0.375          | 9.52  | STD          | —            | 102.63 | 46.59  | 152.80 |
|                |                  |       | 0.406          | 10.31 | —            | —            | 110.98 | 50.38  | 165.28 |
|                |                  |       | 0.438          | 11.13 | —            | —            | 119.67 | 54.28  | 178.20 |
|                |                  |       | 0.469          | 11.91 | —            | —            | 127.89 | 58.08  | 190.46 |
|                |                  |       | 0.500          | 12.70 | XS           | 20           | 136.17 | 61.82  | 202.85 |
|                |                  |       | 0.562          | 14.27 | —            | —            | 152.68 | 69.32  | 227.37 |
|                |                  |       |                |       |              |              |        |        |        |

## Pressure

| Test Pressure |       |         |       |
|---------------|-------|---------|-------|
| Grade A       |       | Grade B |       |
| psi           | kPa   | psi     | kPa   |
| 840           | 5790  | 980     | 6760  |
| 990           | 6830  | 1150    | 7930  |
| 1060          | 7310  | 1230    | 8480  |
| 1120          | 7720  | 1310    | 9030  |
| 1480          | 10200 | 1720    | 11860 |
| 1900          | 13100 | 2220    | 15310 |
| 2320          | 16000 | 2710    | 18680 |
| 2740          | 18890 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
|               |       |         |       |
| 500           | 3450  | 580     | 4000  |
| 560           | 3860  | 660     | 4550  |
| 620           | 4270  | 730     | 5030  |
| 690           | 4760  | 800     | 5520  |
| 750           | 5170  | 880     | 6070  |
| 810           | 5580  | 950     | 6550  |
| 880           | 6070  | 1020    | 7030  |
| 940           | 6480  | 1090    | 7520  |
| 1000          | 6890  | 1170    | 8070  |
| 1120          | 7720  | 1310    | 9030  |
| 1500          | 10340 | 1750    | 12070 |
| 1880          | 12960 | 2190    | 15100 |
| 2310          | 15930 | 2700    | 18620 |
| 2750          | 18960 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
|               |       |         |       |
| 450           | 3100  | 520     | 3590  |
| 510           | 3520  | 590     | 4070  |
| 560           | 3860  | 660     | 4550  |
| 620           | 4270  | 720     | 4960  |
| 680           | 4690  | 790     | 5450  |
| 730           | 5030  | 850     | 5860  |
| 790           | 5450  | 920     | 6340  |
| 850           | 5860  | 950     | 6550  |
| 900           | 6210  | 1050    | 7240  |
| 1170          | 8070  | 1250    | 8620  |
| 1460          | 10070 | 1710    | 11790 |
| 1860          | 12820 | 2170    | 14960 |
| 2310          | 15930 | 2690    | 18550 |
| 2700          | 18620 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
|               |       |         |       |
| 380           | 2620  | 440     | 3030  |
| 420           | 2800  | 490     | 3380  |
| 470           | 3240  | 550     | 3790  |
| 520           | 3590  | 600     | 4140  |
| 560           | 3860  | 660     | 4550  |
| 610           | 4210  | 710     | 4900  |
| 660           | 4550  | 770     | 5310  |
| 700           | 4830  | 820     | 5650  |
| 750           | 5170  | 880     | 6070  |
| 840           | 5790  | 980     | 6760  |
| 1030          | 7100  | 1200    | 8270  |
| 1410          | 9720  | 1840    | 11310 |
| 1450          | 10000 | 1700    | 11720 |
| 1830          | 12620 | 2130    | 14690 |
| 2300          | 15860 | 2680    | 18480 |
| 2720          | 18750 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
| 2800          | 19310 | 2800    | 19310 |
|               |       |         |       |
| 350           | 2410  | 400     | 2760  |
| 390           | 2690  | 450     | 3100  |
| 430           | 2960  | 500     | 3450  |
| 480           | 3310  | 560     | 3860  |
| 520           | 3590  | 610     | 4210  |
| 560           | 3860  | 660     | 4550  |
| 610           | 4210  | 710     | 4900  |
| 650           | 4480  | 760     | 5240  |
| 690           | 4760  | 810     | 5580  |
| 780           | 5380  | 910     | 6270  |

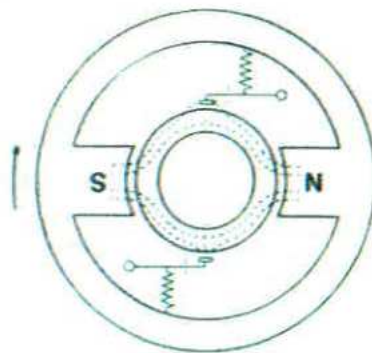
**Note:**

- Indicates availability subject to prior consultation.
- Sizes outside the above size range are on an inquiry basis.

## Inspection and Test

### Magnetic Leakage Flux Inspection ROTOMAT

The ROTOMAT HS tests non-destructively in accordance with the magnetic constant field leakage flux method. As they pass through the transmitter system, tubes are magnetized by two magnetization coils lying opposite each other. Also displaced by 180°, two test heads with the test probe systems are located between the pole shoes which guide the magnetic field. The magnetization coils and test heads rotate around the tube as it moves through the transmitter system, the test probes continuously scan the tube surface helically. The leakage flux caused at flaw locations is picked up by the test probes and passed on to the testing electronics equipment for evaluation.

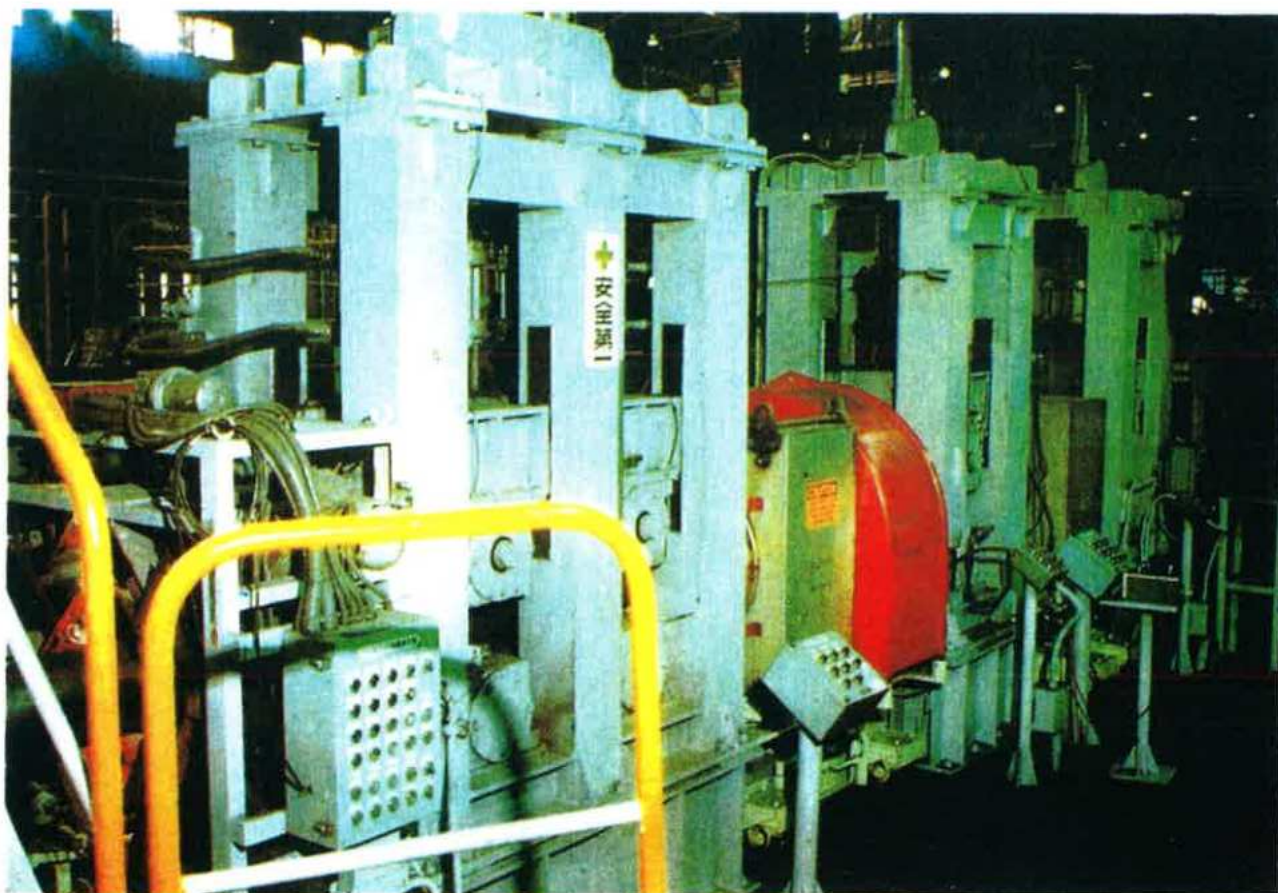
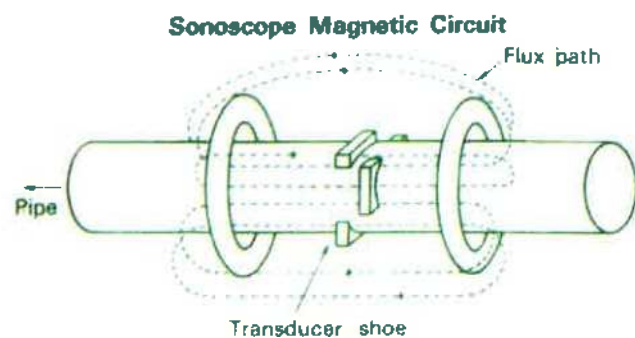
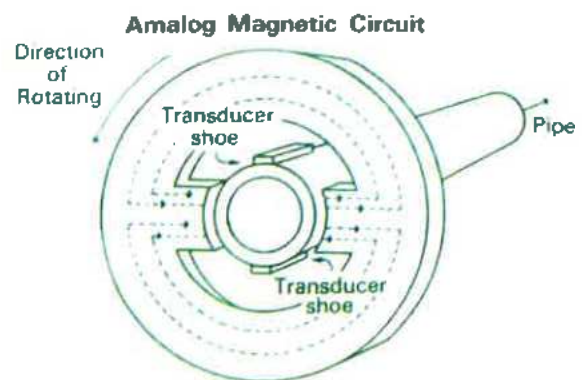


## Electromagnetic Inspection Analog Sonoscope

NKK's plug mill is equipped with an Analog-Sonoscope, electromagnetic inspection unit.

The Analog-Sonoscope pipe inspection system detects defects using flux leakage induced by electromagnetic induction in the search coil.

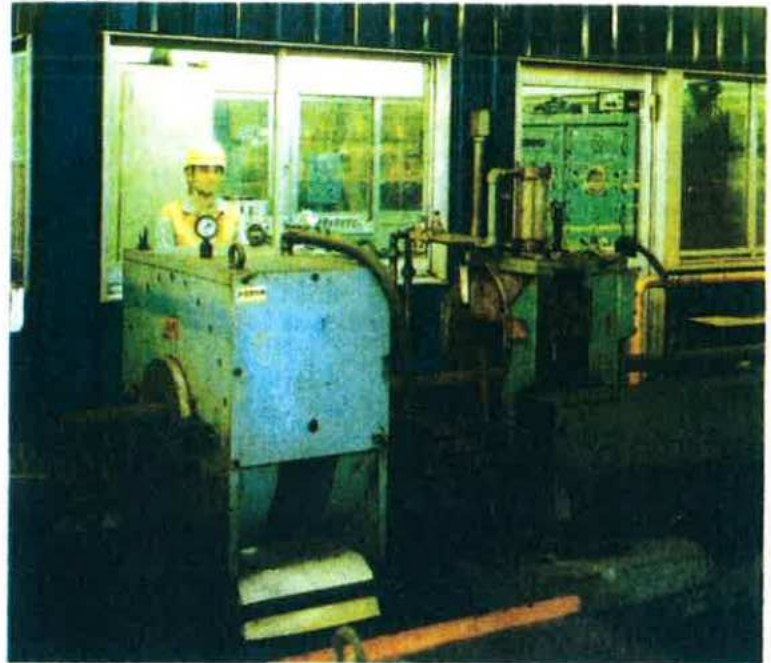
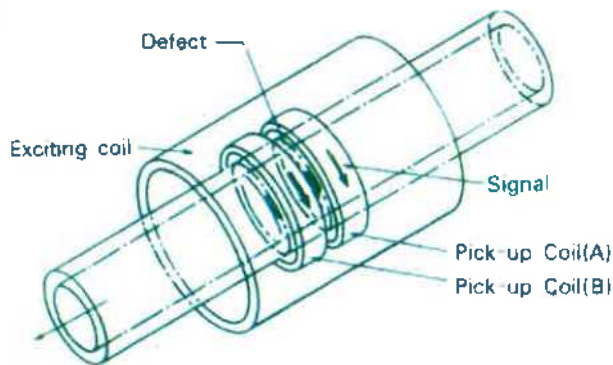
Analog magnetic circuits detect longitudinal defects in both the inside and outside surfaces. Sonoscope magnetic circuits detect circumferential defects.



## Eddy Current Inspection

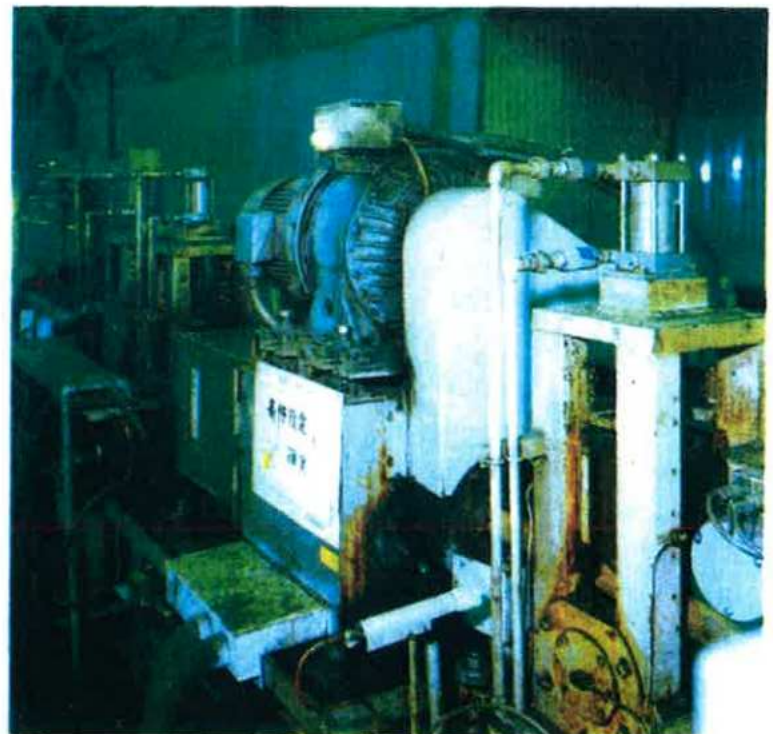
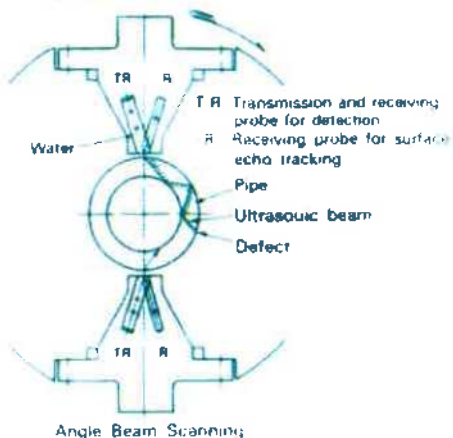
A test coil assembly forcibly generates a strong eddy current in the tube section under test. the presence of flaws disturbs the eddy current and is sensed by a detecting coil.

The apparatus is equipped with an automatic warning, marking and recording systems.



## Rotary probe Ultrasonic Inspection

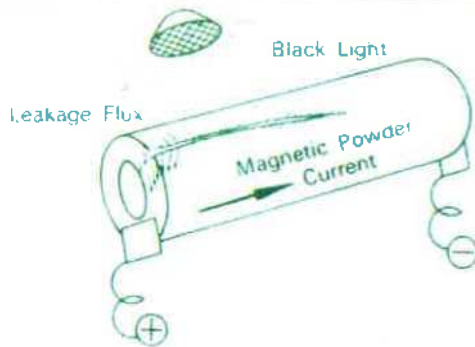
Ultramodern rotating rotor type automated ultrasonic testing system using the pulse reflection method was installed. This system enables high-accuracy and high-efficiency inspection of axial defects and circumferential defects on the inner and outer surfaces of seamless tube and in the tube wall. By use of the staight-beam probe provided in the same rotating probe device, wall thickness checking and lamination inspection can be made continuously. As a series of these NDT systems is highly efficient and highly accurate, it holds an extremely important position among quality assurance systems.



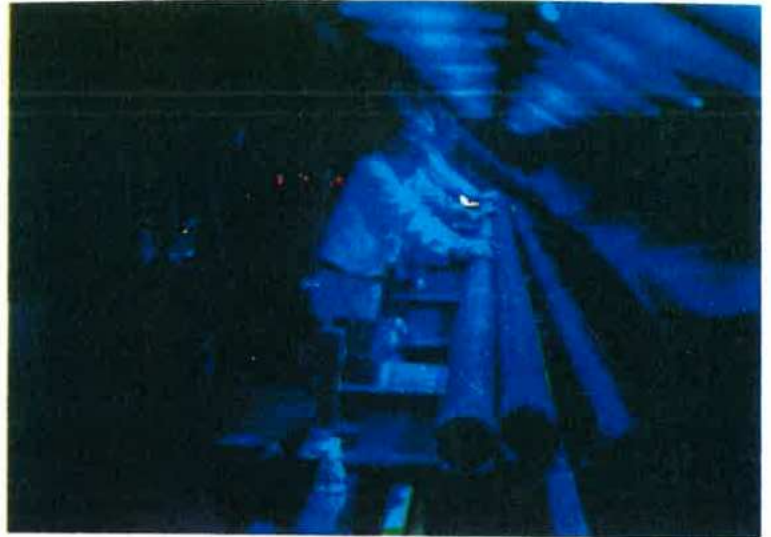
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## Magnetic Particle Inspection

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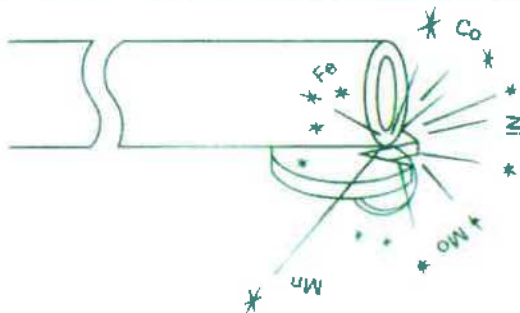
The tube is magnetized and provided with magnetic particles (mostly fluorescent magnetic particles). The presence of flaws creates a magnetic flux which shows changes in fluorescent brilliance under black light. The change is detected visually.



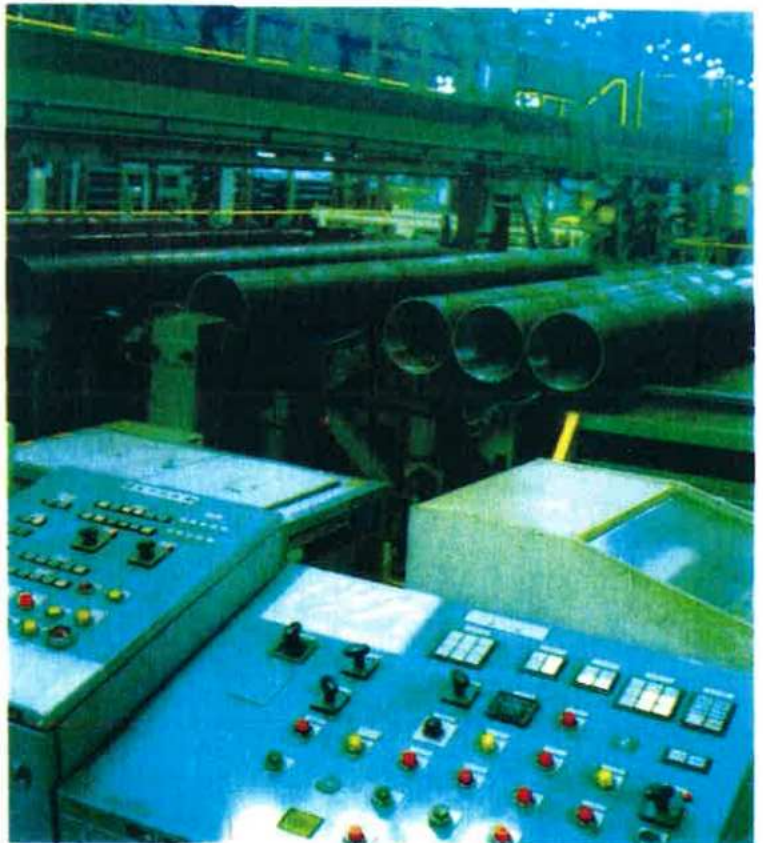
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## Spectro-Chemical Analysis

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The tube is subjected to arc discharge. Sparks created by this method have their own spectrums according to the metal elements. Such spectrums are analysed to determine the chemical composition of the tube, quantitatively and qualitatively.



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## Hydrostatic Test

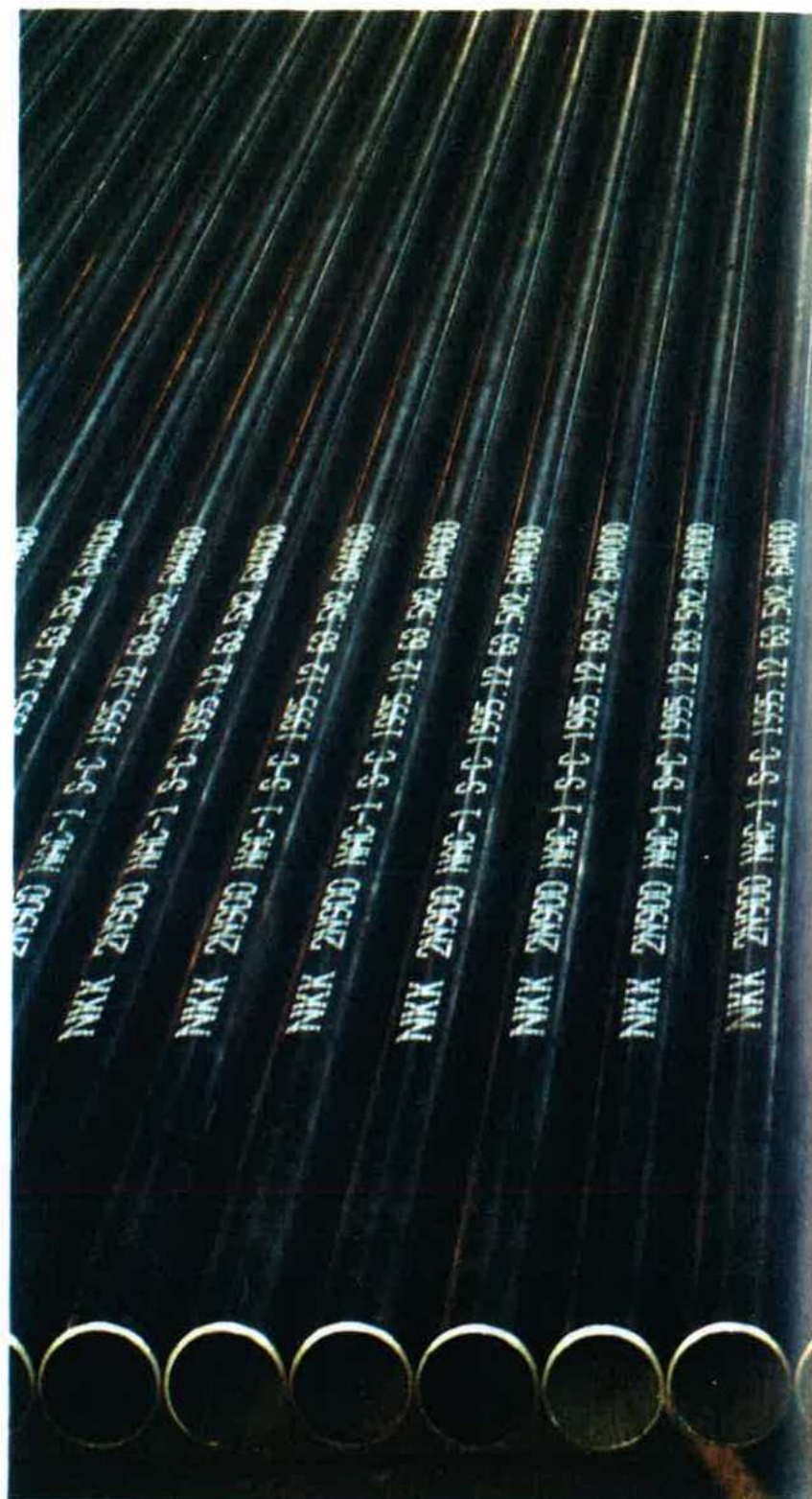
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Each length of tube is subjected to hydrostatic test.

## Information Required with Enquiries & Orders

It is desired that the following information be included in enquiries and orders.

1. Type of tube and applicable specification
2. Dimensions (Nominal or outside diameter, wall thickness, length. In case of requirements other than those stipulated in internationally recognized specifications, dimensional tolerances.)
3. Quantity (total length or number of tubes and total weight)
4. Intended end use and service conditions in detail.
5. Manufacturing method (hot finished seamless, cold finished seamless or electric induction welded)
6. Tube end finish (plain, threaded, beveled or upset)
7. Inspection (mill inspection or third party's inspection)
8. Shipping destination
9. Other information including marking, coating and packaging.



[illegible]

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