

spectively. The schedules approved by the Sectional Committee are given in Tables 1 and 3 and the corresponding weights in Tables 2 and 4.

Standard-weight pipe is generally furnished with threaded ends in random lengths of 16 to 22 ft, although when ordered with plain ends, 5 per cent may be in lengths of 12 to 16 ft. Five per cent of the total number of lengths ordered may be *joints* which are two pieces coupled together. Extra-strong pipe is generally furnished with plain ends in

TABLE 2. NOMINAL WEIGHTS OF WELDED AND SEAMLESS STEEL PIPE

| NOMINAL<br>PIPE<br>SIZE<br>INCHES | SCH.<br>10<br>PLAIN<br>ENDS | SCH.<br>20<br>PLAIN<br>ENDS | SCHEDULE<br>30 |                             | SCHEDULE<br>40 |                             | SCH.<br>60<br>PLAIN<br>ENDS | SCH.<br>80<br>PLAIN<br>ENDS | SCH.<br>100<br>PLAIN<br>ENDS | SCH.<br>120<br>PLAIN<br>ENDS | SCH.<br>140<br>PLAIN<br>ENDS | SCH.<br>160<br>PLAIN<br>ENDS |
|-----------------------------------|-----------------------------|-----------------------------|----------------|-----------------------------|----------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
|                                   |                             |                             | Plain<br>Ends  | Threads<br>and<br>Couplings | Plain<br>Ends  | Threads<br>and<br>Couplings |                             |                             |                              |                              |                              |                              |
| 1/8                               |                             |                             |                |                             | 0.25*          | 0.25*                       |                             | 0.32*                       |                              |                              |                              |                              |
| 1/4                               |                             |                             |                |                             | 0.43*          | 0.43*                       |                             | 0.54*                       |                              |                              |                              |                              |
| 3/8                               |                             |                             |                |                             | 0.57*          | 0.57*                       |                             | 0.74*                       |                              |                              |                              |                              |
| 1/2                               |                             |                             |                |                             | 0.86*          | 0.86*                       |                             | 1.09*                       |                              |                              |                              | 1.31                         |
| 3/4                               |                             |                             |                |                             | 1.14*          | 1.14*                       |                             | 1.48*                       |                              |                              |                              | 1.94                         |
| 1                                 |                             |                             |                |                             | 1.68*          | 1.69*                       |                             | 2.18*                       |                              |                              |                              | 2.85                         |
| 1 1/4                             |                             |                             |                |                             | 2.28*          | 2.29*                       |                             | 3.00*                       |                              |                              |                              | 3.77                         |
| 1 1/2                             |                             |                             |                |                             | 2.72*          | 2.74*                       |                             | 3.64*                       |                              |                              |                              | 4.86                         |
| 2                                 |                             |                             |                |                             | 3.66*          | 3.68*                       |                             | 5.03*                       |                              |                              |                              | 7.45                         |
| 2 1/2                             |                             |                             |                |                             | 5.80*          | 5.82*                       |                             | 7.67*                       |                              |                              |                              | 10.0                         |
| 3                                 |                             |                             |                |                             | 7.58*          | 7.62*                       |                             | 10.3*                       |                              |                              |                              | 14.3                         |
| 3 1/2                             |                             |                             |                |                             | 9.11*          | 9.21*                       |                             | 12.5*                       |                              |                              |                              |                              |
| 4                                 |                             |                             |                |                             | 10.8*          | 10.9*                       |                             | 15.0*                       |                              | 19.0                         |                              | 22.6                         |
| 5                                 |                             |                             |                |                             | 14.7*          | 14.9*                       |                             | 20.8*                       |                              | 27.1                         |                              | 33.0                         |
| 6                                 |                             |                             |                |                             | 19.0*          | 19.2*                       |                             | 28.6*                       |                              | 36.4                         |                              | 45.3                         |
| 8                                 |                             | 22.4                        | 24.7*          | 25.0*                       | 28.6*          | 28.8*                       | 35.7                        | 43.4*                       | 50.9                         | 60.7                         | 67.8                         | 74.7                         |
| 10                                |                             | 28.1                        | 34.3*          | 35.0*                       | 40.5*          | 41.2*                       | 54.8*                       | 64.4                        | 77.0                         | 89.2                         | 105.0                        | 116.0                        |
| 12                                |                             | 33.4                        | 43.8*          | 45.0*                       | 53.6           | 55.0                        | 73.2                        | 88.6                        | 108.0                        | 126.0                        | 140.0                        | 161.0                        |
| 14 O. D.                          | 36.8                        | 45.7                        | 54.6           |                             | 63.3           |                             | 85.0                        | 107.0                       | 131.0                        | 147.0                        | 171.0                        | 190.0                        |
| 16 O. D.                          | 42.1                        | 52.3                        | 62.6           |                             | 82.8           |                             | 108.0                       | 137.0                       | 165.0                        | 193.0                        | 224.0                        | 241.0                        |
| 18 O. D.                          | 47.4                        | 59.0                        | 82.0           |                             | 105.0          |                             | 133.0                       | 171.0                       | 208.0                        | 239.0                        | 275.0                        | 304.0                        |
| 20 O. D.                          | 52.8                        | 78.6                        | 105.0          |                             | 123.0          |                             | 167.0                       | 209.0                       | 251.0                        | 297.0                        | 342.0                        | 374.0                        |
| 24 O. D.                          | 63.5                        | 94.7                        | 141.0          |                             | 171.0          |                             | 231.0                       | 297.0                       | 361.0                        | 416.0                        | 484.0                        | 536.0                        |
| 30 O. D.                          | 99.0                        | 158.0                       | 197.0          |                             |                |                             |                             |                             |                              |                              |                              |                              |

Weights are given in pounds per linear foot and are for pipe with plain ends except for sizes which are commercially available with threads and couplings for which both weights are listed.

\*The weights marked with asterisk in Schedules 30 and 40 are identical with weights for standard-weight pipe in former lists; those in Schedules 60 and 80 are identical with weights for extra-strong pipe in former lists.

The Schedule Numbers indicate approximate values of the expression  $1000 \times P/S$ .

random lengths of 12 to 22 ft, although 5 per cent may be in lengths of 6 to 12 ft.

In addition to *IPS* copper pipe, several varieties of copper tubing are in use with either flared or compression couplings or soldered joints. Dimensions of copper water tubing intended for plumbing, underground water service, fuel-oil lines, gas lines, etc., have been standardized by the U. S. Government and the *American Society for Testing Materials*. There are three standard wall-thickness schedules of copper water tubing classified in accordance with their principal uses as follows:

Class *K*—Designed for underground services and general plumbing service.

Class *L*—Designed for general plumbing purposes.

Class *M*—Designed for use with soldered fittings only.

In general, Type *K* is used where corrosion conditions are severe, and Types *L* and *M* where such conditions may be considered normal as, for instance, in heating work. Types *K* and *L* are available in both hard and

TABLE 3. DIMENSIONS OF WELDED WROUGHT-IRON PIPE

| NOMINAL<br>PIPE<br>SIZE | OUTSIDE<br>DIAMETER | NOMINAL WALL THICKNESSES FOR SCHEDULE NUMBERS |                |                |                |                |                |
|-------------------------|---------------------|-----------------------------------------------|----------------|----------------|----------------|----------------|----------------|
|                         |                     | Schedule<br>10                                | Schedule<br>20 | Schedule<br>30 | Schedule<br>40 | Schedule<br>60 | Schedule<br>80 |
| 1/8                     | 0.405               | -----                                         | -----          | -----          | 0.070*         | -----          | 0.098*         |
| 1/4                     | 0.540               | -----                                         | -----          | -----          | 0.090*         | -----          | 0.122*         |
| 3/8                     | 0.675               | -----                                         | -----          | -----          | 0.093*         | -----          | 0.129*         |
| 1/2                     | 0.840               | -----                                         | -----          | -----          | 0.111*         | -----          | 0.151*         |
| 3/4                     | 1.050               | -----                                         | -----          | -----          | 0.115*         | -----          | 0.157*         |
| 1                       | 1.315               | -----                                         | -----          | -----          | 0.136*         | -----          | 0.183*         |
| 1 1/4                   | 1.660               | -----                                         | -----          | -----          | 0.143*         | -----          | 0.195*         |
| 1 1/2                   | 1.900               | -----                                         | -----          | -----          | 0.148*         | -----          | 0.204*         |
| 2                       | 2.375               | -----                                         | -----          | -----          | 0.158*         | -----          | 0.223*         |
| 2 1/2                   | 2.875               | -----                                         | -----          | -----          | 0.208*         | -----          | 0.282*         |
| 3                       | 3.5                 | -----                                         | -----          | -----          | 0.221*         | -----          | 0.306*         |
| 3 1/2                   | 4.0                 | -----                                         | -----          | -----          | 0.231*         | -----          | 0.325*         |
| 4                       | 4.5                 | -----                                         | -----          | -----          | 0.242*         | -----          | 0.344*         |
| 5                       | 5.563               | -----                                         | -----          | -----          | 0.263*         | -----          | 0.383*         |
| 6                       | 6.625               | -----                                         | -----          | -----          | 0.286*         | -----          | 0.441*         |
| 8                       | 8.625               | -----                                         | -----          | 0.283*         | 0.329*         | -----          | 0.510*         |
| 10                      | 10.75               | -----                                         | -----          | 0.313*         | 0.372*         | 0.510*         | 0.606          |
| 12                      | 12.75               | -----                                         | -----          | 0.336*         | 0.414†         | 0.574†         | 0.702          |
| 14 O. D.                | 14.0                | 0.250                                         | 0.312          | 0.375          | 0.437          | 0.625          | 0.750          |
| 16 O. D.                | 16.0                | 0.250                                         | 0.312          | 0.375          | 0.500          | 0.687          | -----          |
| 18 O. D.                | 18.0                | 0.250                                         | 0.312          | 0.437          | 0.562          | 0.750          | -----          |
| 20 O. D.                | 20.0                | -----                                         | 0.375          | 0.500          | 0.562          | -----          | -----          |

All dimensions are given in inches.

The decimal thicknesses listed for the respective pipe sizes represent their nominal or average wall dimensions. For tolerances on wall thicknesses, see appropriate material specification.

\*Thicknesses marked with an asterisk in Schedules 30 and 40 are identical with thicknesses for standard-weight pipe in former lists; those in Schedules 60 and 80 are identical with thicknesses for extra-strong pipe in former lists.

The Schedule Numbers indicate approximate values of the expression  $1000 \times P/S$ .

†Owing to a necessary departure from the old standard-weight and extra-strong thicknesses in these two sizes, the new thicknesses are not as yet stocked by all manufacturers and jobbers. Hence, where agreeable to the purchaser and suitable for the service conditions, the old standard-weight 0.382 in. wall pipe corresponding to a 1000 P/S value of 38.7 is still available and can be substituted for the 0.414 in. wall and the old extra-strong 0.510 in. wall pipe corresponding to a 1000 P/S value of 56.3 can be substituted for the 0.574 in. wall.

soft tempers; Type *M* is available only in hard temper. Where flexibility is essential as in hidden replacement work or where as few joints as possible are desired as in fuel-oil lines, the soft temper is commonly used. New or exposed work generally employs copper pipe of a hard temper. All three classes are extensively used with soldered fittings.

Standard dimensions, weights, and diameter and wall thickness tolerances for these classes of copper tubing are given in Table 5. Copper pipe is also available with dimensions of steel pipe.

Refrigeration lines used in connection with air conditioning equipment