



## Sound Speeds and Pipe Size Data

**Installation Reference**



GE Infrastructure  
Sensing

## Sound Speeds and Pipe Size Data

Installation Reference  
914-004E1  
August 2004



---

## List of Tables

### Sound Speed Data

|   |    |
|---|----|
| Table 1: Sound Speeds in Solids .....                         | 1  |
| Table 2: Sound Speeds in Fluids .....                         | 3  |
| Table 3: Sound Speeds in Water at Selected Temperatures ..... | 17 |

### Pipe Size Data

|   |    |
|---|----|
| Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe ..... | 19 |
| Table 5: Cast Iron Pipe Data - Standard Classes .....                       | 22 |
| Table 6: Ductile Iron Pipe Data - Standard Classes .....                    | 23 |

## Sound Speed Data

The values in Table 1 below are reproduced with permission: shear wave values from the *American Institute of Physics Handbook*, Smithsonian Tables; longitudinal values from the *Nondestructive Testing Handbook*, 2nd edition, Volume 7, *Ultrasonic Testing*. ©1991, The American Society of Nondestructive Testing.

**Table 1: Sound Speeds in Solids**

| Material   | Sound Speed*<br>Shear Wave (25°C) |        | Sound Speed*<br>Long. Wave (25°C) |        |
|--|-----------------------------------|--------|-----------------------------------|--------|
|  | m/s                               | ft/s   | mm/μs                             | in./μs |
| Steel, 1% Carbon, hardened   | 3,150                             | 10,335 | 5.88                              | 0.2315 |
| Carbon Steel   | 3,230                             | 10,598 | 5.89                              | 0.2319 |
| Mild Steel   | 3,235                             | 10,614 | 5.89                              | 0.2319 |
| Steel, 1% Carbon   | 3,220                             | 10,565 |                                   |        |
| 302 Stainless Steel  | 3,120                             | 10,236 | 5.690                             | 0.224  |
| 303 Stainless Steel  | 3,120                             | 10,236 | 5.640                             | 0.222  |
| 304 Stainless Steel  | 3,141                             | 10,306 | 5.920                             | 0.233  |
| 304L Stainless Steel   | 3,070                             | 10,073 | 5.790                             | 0.228  |
| 316 Stainless Steel  | 3,272                             | 10,735 | 5.720                             | 0.225  |
| 347 Stainless Steel  | 3,095                             | 10,512 | 5.720                             | 0.225  |
| Aluminum   | 3,100                             | 10,171 | 6.32                              | 0.2488 |
| Aluminum (rolled)  | 3,040                             | 9,974  |                                   |        |
| Copper   | 2,260                             | 7,415  | 4.66                              | 0.1835 |
| Copper (annealed)  | 2,325                             | 7,628  |                                   |        |
| Copper (rolled)  | 2,270                             | 7,448  |                                   |        |
| CuNi (70%Cu 30%Ni)   | 2,540                             | 8,334  | 5.03                              | 0.1980 |
| CuNi (90%Cu 10%Ni)   | 2,060                             | 6,759  | 4.01                              | 0.1579 |
| Brass (Naval)  | 2,120                             | 6,923  | 4.43                              | 0.1744 |
| Gold (hard-drawn)  | 1,200                             | 3,937  | 3.24                              | 0.1276 |
| Inconel  | 3,020                             | 9,909  | 5.82                              | 0.2291 |
| Iron (electrolytic)  | 3,240                             | 10,630 | 5.90                              | 0.2323 |
| *Please note these values are to be considered nominal. Solids may be inhomogenous and anisotropic. Actual values depend on exact composition, temperature, and to a lesser extent, on pressure or stress. |                                   |        |                                   |        |

Table 1: Sound Speeds in Solids (cont.)

| Material                    | Sound Speed*<br>Shear Wave (25°C) |        | Sound Speed*<br>Long. Wave (25°C) |        |
|-----------------------------|-----------------------------------|--------|-----------------------------------|--------|
|                             | m/s                               | ft/s   | mm/μs                             | in./μs |
| Iron (Armco)                | 3,240                             | 10,630 | 5.90                              | 0.2323 |
| Ductile Iron                | 3,000                             | 9,843  |                                   |        |
| Cast Iron                   | 2,500                             | 8,203  | 4.55                              | 0.1791 |
| Monel                       | 2,720                             | 8,924  | 5.35                              | 0.2106 |
| Nickel                      | 2,960                             | 9,712  | 5.63                              | 0.2217 |
| Tin, rolled                 | 1,670                             | 5,479  | 3.32                              | 0.1307 |
| Titanium                    | 3,125                             | 10,253 | 6.10                              | 0.2402 |
| Tungsten, annealed          | 2,890                             | 9,482  | 5.18                              | 0.2039 |
| Tungsten, drawn             | 2,640                             | 8,661  |                                   |        |
| Tungsten, carbide           | 3,980                             | 13,058 |                                   |        |
| Zinc, rolled                | 2,440                             | 8,005  | 4.17                              | 0.1642 |
| Glass, Pyrex                | 3,280                             | 10,761 | 5.61                              | 0.2209 |
| Glass, heavy silicate flint | 2,380                             | 7,808  |                                   |        |
| Glass, light borate crown   | 2,840                             | 9,318  | 5.26                              | 0.2071 |
| Nylon                       | 1,150                             | 3,772  | 2.40                              | 0.0945 |
| Nylon, 6-6                  | 1,070                             | 3,510  |                                   |        |
| Polyethylene (HD)           |                                   |        | 2.31                              | 0.0909 |
| Polyethylene (LD)           | 540                               | 1,772  | 1.94                              | 0.0764 |
| PVC, CPVC                   | 1,060                             | 3,477  | 2.40                              | 0.0945 |
| Acrylic                     | 1,430                             | 4,690  | 2.73                              | 0.1075 |
| Asbestos Cement             |                                   |        | 2.20                              | 0.0866 |
| Tar Epoxy                   |                                   |        | 2.00                              | 0.0787 |
| Mortar                      |                                   |        | 2.50                              | 0.0984 |
| Rubber                      |                                   |        | 1.90                              | 0.0748 |

*\*Please note these values are to be considered nominal. Solids may be inhomogenous and anisotropic. Actual values depend on exact composition, temperature, and to a lesser extent, on pressure or stress.*

Table 2: Sound Speeds in Fluids

| Substance                     | Chemical Formula                                | All data given at 25°C (77°F) unless otherwise noted. |                  |                    |                           |                                      |                    |
|-------------------------------|---|---|------------------|--------------------|---------------------------|--------------------------------------|--------------------|
|                               |   | Specific Gravity                                      | Sound Speed      |                    | $\Delta v/^\circ\text{C}$ | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                               |   |   | m/s              | ft/s               | m/s/°C                    | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Acetic anhydride (22)         | (CH <sub>3</sub> CO) <sub>2</sub> O             | 1.082<br>(20°C)                                       | 1,180            | 3,871.4            | 2.5                       | 0.769                                | 8.274              |
| Acetic acid, anhydride (22)   | (CH <sub>3</sub> CO) <sub>2</sub> O             | 1.082<br>(20°C)                                       | 1,180            | 3,871.4            | 2.5                       | 0.769                                | 8.274              |
| Acetic acid, nitrile          | C <sub>2</sub> H <sub>3</sub> N                 | 0.783   | 1,290            | 4,232.3            | 4.1                       | 0.441                                | 4.745              |
| Acetic acid, ethyl ester (33) | C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>    | 0.901   | 1,085            | 3,559.7            | 4.4                       | 0.467                                | 5.025              |
| Acetic acid, methyl ester     | C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>    | 0.934   | 1,211            | 3,973.1            |                           | 0.407                                | 4.379              |
| Acetone                       | C <sub>3</sub> H <sub>6</sub> O                 | 0.791   | 1,174            | 3,851.7            | 4.5                       | 0.399                                | 4.293              |
| Acetonitrile                  | C <sub>2</sub> H <sub>3</sub> N                 | 0.783   | 1,290            | 4,232.3            | 4.1                       | 0.441                                | 4.745              |
| Acetylacetone                 | C <sub>6</sub> H <sub>10</sub> O <sub>2</sub>   | 0.729   | 1,399            | 4,589.9            | 3.6                       |                                      |                    |
| Acetylen dichloride           | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>   | 1.26  | 1,015            | 3,330.1            | 3.8                       | 0.400                                | 4.304              |
| Acetylene tetrabromide (47)   | C <sub>2</sub> H <sub>2</sub> Br <sub>4</sub>   | 2.966   | 1,027            | 3,369.4            |                           |                                      |                    |
| Acetylene tetrachloride (47)  | C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>   | 1.595   | 1,147            | 3,763.1            |                           | 1.156<br>(15°C)                      | 12.438<br>(59°F)   |
| Alcohol                       | C <sub>2</sub> H <sub>6</sub> O                 | 0.789   | 1,207            | 3,960              | 4.0                       | 1.396                                | 15.02              |
| Alkazene-13                   | C <sub>15</sub> H <sub>24</sub>                 | 0.86  | 1,317            | 4,320.9            | 3.9                       |                                      |                    |
| Alkazene-25                   | C <sub>10</sub> H <sub>12</sub> Cl <sub>2</sub> | 1.20  | 1,307            | 4,288.1            | 3.4                       |                                      |                    |
| 2-Amino-ethanol               | C <sub>2</sub> H <sub>7</sub> NO                | 1.018   | 1,724            | 5,656.2            | 3.4                       |                                      |                    |
| 2-Aminotolidine (46)          | C <sub>7</sub> H <sub>9</sub> N                 | 0.999<br>(20°C)                                       | 1,618            | 5,308.4            |                           | 4.394<br>(20°C)                      | 47.279<br>(68°F)   |
| 4-Aminotolidine (46)          | C <sub>7</sub> H <sub>9</sub> N                 | 0.966<br>(45°C)                                       | 1,480            | 4,855.6            |                           | 1.863<br>(50°C)                      | 20.045<br>(122°F)  |
| Ammonia (35)                  | NH <sub>3</sub>                                 | 0.771   | 1,729<br>(-33°C) | 5,672.6<br>(-27°F) | 6.68                      | 0.292<br>(-33°C)                     | 3.141<br>(-27°F)   |
| Amorphous Polyolefin          |   | 0.98  | 962.6<br>(190°C) | 3158.2<br>(374°F)  |                           | 26,600                               | 286,000            |
| t-Amyl alcohol                | C <sub>5</sub> H <sub>12</sub> O                | 0.81  | 1,204            | 3,950.1            |                           | 4.374                                | 47.064             |
| Aminobenzene (41)             | C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>   | 1.022   | 1,639            | 5,377.3            | 4.0                       | 3.63                                 | 39.058             |
| Aniline (41)                  | C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>   | 1.022   | 1,639            | 5,377.3            | 4.0                       | 3.63                                 | 39.058             |
| Argon (45)                    | Ar  | 1.400<br>(-188°C)                                     | 853<br>(-188°C)  | 2798.6<br>(-306°F) |                           |                                      |                    |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                 | Chemical Formula                               | All data given at 25°C (77°F) unless otherwise noted. |                    |                    |                                     |                                      |                    |
|---------------------------|--|---|--------------------|--------------------|-------------------------------------|--------------------------------------|--------------------|
|                           |  | Specific Gravity                                      | Sound Speed        |                    | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                           |  |   | m/s                | ft/s               |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Azine                     | C <sub>6</sub> H <sub>5</sub> N                | 0.982   | 1,415              | 4,642.4            | 4.1                                 | 0.992<br>(20°C)                      | 10.673<br>(68°F)   |
| Benzene (29, 40, 41)      | C <sub>6</sub> H <sub>6</sub>                  | 0.879   | 1,306              | 4,284.8            | 4.65                                | 0.711                                | 7.65               |
| Benzol (29, 40, 41)       | C <sub>6</sub> H <sub>6</sub>                  | 0.879   | 1,306              | 4,284.8            | 4.65                                | 0.711                                | 7.65               |
| Bromine (21)              | Br <sub>2</sub>                                | 2.928   | 889                | 2,916.7            | 3.0                                 | 0.323                                | 3.475              |
| Bromo-benzene (46)        | C <sub>6</sub> H <sub>5</sub> Br               | 1.522   | 1,170<br>(20°C)    | 3,838.6<br>(68°F)  |                                     | 0.693                                | 7.456              |
| 1-Bromo-butane (46)       | C <sub>4</sub> H <sub>9</sub> Br               | 1.276<br>(20°C)                                       | 1,019<br>(20°C)    | 3,343.2<br>(68°F)  |                                     | 0.49<br>(15°C)                       | 5.272<br>(59°F)    |
| Bromo-ethane (46)         | C <sub>2</sub> H <sub>5</sub> Br               | 1.460<br>(20°C)                                       | 900<br>(20°C)      | 2,952.8<br>(68°F)  |                                     | 0.275                                | 2.959              |
| Bromoform (46, 47)        | CHBr <sub>3</sub>                              | 2.89<br>(20°C)  | 918                | 3,011.8            | 3.1                                 | 0.654                                | 7.037              |
| n-Butane (2)              | C <sub>4</sub> H <sub>10</sub>                 | 0.601<br>(0°C)  | 1,085<br>(-5°C)    | 3,559.7<br>(23°F)  | 5.8                                 |                                      |                    |
| 2-Butanol                 | C <sub>4</sub> H <sub>10</sub> O               | 0.81  | 1,240              | 4,068.2            | 3.3                                 | 3.239                                | 34.851             |
| sec-Butylalcohol          | C <sub>4</sub> H <sub>10</sub> O               | 0.81  | 1,240              | 4,068.2            | 3.3                                 | 3.239                                | 34.851             |
| n-Butyl bromide (46)      | C <sub>4</sub> H <sub>9</sub> Br               | 1.276<br>(20°C)                                       | 1,019<br>(20°C)    | 3,343.2<br>(68°F)  |                                     | 0.49<br>(15°C)                       | 5.272<br>(59°F)    |
| n-Butyl chloride (22, 46) | C <sub>4</sub> H <sub>9</sub> Cl               | 0.887   | 1,140              | 3,740.2            | 4.57                                | 0.529<br>(15°C)                      | 5.692<br>(59°F)    |
| tert Butyl chloride       | C <sub>4</sub> H <sub>9</sub> Cl               | 0.84  | 984                | 3,228.3            | 4.2                                 | 0.646                                | 6.95               |
| Butyl oleate              | C <sub>22</sub> H <sub>42</sub> O <sub>2</sub> |   | 1,404              | 4,606.3            | 3.0                                 |                                      |                    |
| 2, 3 Butylene glycol      | C <sub>4</sub> H <sub>10</sub> O <sub>2</sub>  | 1.019   | 1,484              | 4,868.8            | 1.51                                |                                      |                    |
| Cadmium (7)               | Cd   |   | 2,237.7<br>(400°C) | 7,341.5<br>(752°F) |                                     | 1.355cp<br>(440°C)                   | 14.579<br>(824°F)  |
| Carbinol (40, 41)         | CH <sub>4</sub> O                              | 0.791<br>(20°C)                                       | 1,076              | 3,530.2            | 2.92                                | 0.695                                | 7.478              |
| Carbitol                  | C <sub>6</sub> H <sub>14</sub> O <sub>3</sub>  | 0.988   | 1,458              | 4,783.5            |                                     |                                      |                    |
| Carbon dioxide (26)       | CO <sub>2</sub>                                | 1.101<br>(-37°C)                                      | 839<br>(-37°C)     | 2,752.6<br>(-35°F) | 7.71                                | 0.137<br>(-37°C)                     | 1.474<br>(-35°F)   |
| Carbon disulphide         | CS <sub>2</sub>                                | 1.261<br>(22°C)                                       | 1,149              | 3,769.7            |                                     | 0.278                                | 2.991              |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                             | Chemical Formula                             | <i>All data given at 25°C (77°F) unless otherwise noted.</i> |                |                  |                           |                                      |                    |
|---------------------------------------|--|--|----------------|------------------|---------------------------|--------------------------------------|--------------------|
|                                       |  | Specific Gravity   | Sound Speed    |                  | $\Delta v/^\circ\text{C}$ | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                                       |  |  | m/s            | ft/s             | m/s/ $^\circ\text{C}$     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Carbon tetrachloride (33, 35, 47)     | CCl <sub>4</sub>                             | 1.595 (20°C)   | 926            | 3038.1           | 2.48                      | 0.607                                | 6.531              |
| Carbon tetrafluoride (14) (Freon 14)  | CF <sub>4</sub>                              | 1.75 (-150°C)  | 875.2 (-150°C) | 2,871.5 (-238°F) | 6.61                      |                                      |                    |
| Cetane (23)                           | C <sub>16</sub> H <sub>34</sub>              | 0.773 (20°C)   | 1,338          | 4,389.8          | 3.71                      | 4.32                                 | 46.483             |
| Chloro-benzene                        | C <sub>6</sub> H <sub>5</sub> Cl             | 1.106  | 1,273          | 4,176.5          | 3.6                       | 0.722                                | 7.768              |
| 1-Chloro-butane (22, 46)              | C <sub>4</sub> H <sub>9</sub> Cl             | 0.887  | 1,140          | 3,740.2          | 4.57                      | 0.529 (15°C)                         | 5.692 (59°F)       |
| Chloro-diFluoromethane (3) (Freon 22) | CHClF <sub>2</sub>                           | 1.491 (-69°C)  | 893.9 (-50°C)  | 2,932.7 (-58°F)  | 4.79                      |                                      |                    |
| Chloroform (47)                       | CHCl <sub>3</sub>                            | 1.489  | 979            | 3,211.9          | 3.4                       | 0.55                                 | 5.918              |
| 1-Chloro-propane (47)                 | C <sub>3</sub> H <sub>7</sub> Cl             | 0.892  | 1,058          | 3,471.1          |                           | 0.378                                | 4.067              |
| Chlorotrifluoromethane (5)            | CClF <sub>3</sub>                            |  | 724 (-82°C)    | 2,375.3 (-116°F) | 5.26                      |                                      |                    |
| Cinnamaldehyde                        | C <sub>9</sub> H <sub>8</sub> O              | 1.112  | 1,554          | 5,098.4          | 3.2                       |                                      |                    |
| Cinnamic aldehyde                     | C <sub>9</sub> H <sub>8</sub> O              | 1.112  | 1,554          | 5,098.4          | 3.2                       |                                      |                    |
| Colamine                              | C <sub>2</sub> H <sub>7</sub> NO             | 1.018  | 1,724          | 5,656.2          | 3.4                       |                                      |                    |
| o-Cresol (46)                         | C <sub>7</sub> H <sub>8</sub> O              | 1.047 (20°C)   | 1,541 (20°C)   | 5,055.8 (68°F)   |                           | 4.29 (40°C)                          | 46.16 (104°F)      |
| m-Cresol (46)                         | C <sub>7</sub> H <sub>8</sub> O              | 1.034 (20°C)   | 1,500 (20°C)   | 4,921.3 (68°F)   |                           | 5.979 (40°C)                         | 64.334 (104°F)     |
| Cyanomethane                          | C <sub>2</sub> H <sub>3</sub> N              | 0.783  | 1,290          | 4,232.3          | 4.1                       | 0.441                                | 4.745              |
| Cyclohexane (15)                      | C <sub>6</sub> H <sub>12</sub>               | 0.779 (20°C)   | 1,248          | 4,094.5          | 5.41                      | 1.31 (17°C)                          | 14.095 (63°F)      |
| Cyclohexanol                          | C <sub>6</sub> H <sub>12</sub> O             | 0.962  | 1,454          | 4,770.3          | 3.6                       | 0.071 (17°C)                         | 0.764 (63°F)       |
| Cyclohexanone                         | C <sub>6</sub> H <sub>10</sub> O             | 0.948  | 1,423          | 4,668.6          | 4.0                       |                                      |                    |
| Decane (46)                           | C <sub>10</sub> H <sub>22</sub>              | 0.730  | 1,252          | 4,107.6          |                           | 1.26 (20°C)                          | 13.55 (68°F)       |
| 1-Decene (27)                         | C <sub>10</sub> H <sub>20</sub>              | 0.746  | 1,235          | 4,051.8          | 4.0                       |                                      |                    |
| n-Decylene (27)                       | C <sub>10</sub> H <sub>20</sub>              | 0.746  | 1,235          | 4,051.8          | 4.0                       |                                      |                    |
| Diacetyl                              | C <sub>4</sub> H <sub>6</sub> O <sub>2</sub> | 0.99   | 1,236          | 4,055.1          | 4.6                       |                                      |                    |



Table 2: Sound Speeds in Fluids (cont.)

| Substance                                  | Chemical Formula  | All data given at 25°C (77°F) unless otherwise noted. |                  |                   |                                     |                                      |                    |
|--|---|---|------------------|-------------------|-------------------------------------|--------------------------------------|--------------------|
|  |   | Specific Gravity                                      | Sound Speed      |                   | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|  |   |   | m/s              | ft/s              |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Diamylamine                                | C <sub>10</sub> H <sub>23</sub> N                             |   | 1,256            | 4,120.7           | 3.9                                 |                                      |                    |
| 1,2-Dibromo-ethane (47)                    | C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub>                 | 2.18  | 995              | 3,264.4           |                                     | 0.79<br>(20°C)                       | 8.5<br>(68°F)      |
| trans-1,2-Dibromoethene (47)               | C <sub>2</sub> H <sub>2</sub> Br <sub>2</sub>                 | 2.231   | 935              | 3,067.6           |                                     |                                      |                    |
| Dibutyl phthalate                          | C <sub>8</sub> H <sub>22</sub> O <sub>4</sub>                 |   | 1,408            | 4,619.4           |                                     |                                      |                    |
| Dichloro-t-butyl alcohol                   | C <sub>4</sub> H <sub>8</sub> Cl <sub>2</sub> O               |   | 1,304            | 4,278.2           | 3.8                                 |                                      |                    |
| 2,3 Dichlorodioxane                        | C <sub>2</sub> H <sub>6</sub> Cl <sub>2</sub> O <sub>2</sub>  |   | 1,391            | 4,563.6           | 3.7                                 |                                      |                    |
| Dichlorodifluoromethane (3) (Freon 12)     | CCl <sub>2</sub> F <sub>2</sub>                               | 1.516<br>(40°C)                                       | 774.1            | 2,539.7           | 4.24                                |                                      |                    |
| 1,2 Dichloro ethane (47)                   | C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>                 | 1.253   | 1,193            | 3,914             |                                     | 0.61                                 | 6.563              |
| cis1,2-Dichloro-ethene (3, 47)             | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>                 | 1.284   | 1,061            | 3,481             |                                     |                                      |                    |
| trans1,2-Dichloro-ethene (3, 47)           | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>                 | 1.257   | 1,010            | 3,313.6           |                                     |                                      |                    |
| Dichloro-fluoromethane (3) (Freon 21)      | CHCl <sub>2</sub> F   | 1.426<br>(0°C)  | 891<br>(0°C)     | 2,923.2<br>(32°F) | 3.97                                |                                      |                    |
| 1-2-Dichlorohexafluoro-cyclobutane (47)    | C <sub>4</sub> Cl <sub>2</sub> F <sub>6</sub>                 | 1.654   | 669              | 2,194.9           |                                     |                                      |                    |
| 1-3-Dichloro-isobutane                     | C <sub>4</sub> H <sub>8</sub> Cl <sub>2</sub>                 | 1.14  | 1,220            | 4,002.6           | 3.4                                 |                                      |                    |
| Dichloro methane (3)                       | CH <sub>2</sub> Cl <sub>2</sub>                               | 1.327   | 1,070            | 3,510.5           | 3.94                                | 0.31                                 | 3.335              |
| 1,1-Dichloro-1,2,2,2 tetra fluoroethane    | CClF <sub>2</sub> -CClF <sub>2</sub>                          | 1.455   | 665.3<br>(-10°C) | 2,182.7<br>(14°F) | 3.73                                |                                      |                    |
| Diethyl ether                              | C <sub>4</sub> H <sub>10</sub> O                              | 0.713   | 985              | 3,231.6           | 4.87                                | 0.311                                | 3.346              |
| Diethylene glycol                          | C <sub>4</sub> H <sub>10</sub> O <sub>3</sub>                 | 1.116   | 1,586            | 5,203.4           | 2.4                                 |                                      |                    |
| Diethylene glycol, monoethyl ether         | C <sub>6</sub> H <sub>14</sub> O <sub>3</sub>                 | 0.988   | 1,458            | 4,783.5           |                                     |                                      |                    |
| Diethylenimide oxide                       | C <sub>4</sub> H <sub>9</sub> NO                              | 1.00  | 1,442            | 4,731             | 3.8                                 |                                      |                    |
| 1,2-bis(DiFluoramino) butane (43)          | C <sub>4</sub> H <sub>8</sub> (NF <sub>2</sub> ) <sub>2</sub> | 1.216   | 1,000            | 3,280.8           |                                     |                                      |                    |
| 1,2-bis(DiFluoramino)-2-methylpropane (43) | C <sub>4</sub> H <sub>9</sub> (NF <sub>2</sub> ) <sub>2</sub> | 1.213   | 900              | 2,952.8           |                                     |                                      |                    |
| 1,2-bis(DiFluoramino) propane (43)         | C <sub>3</sub> H <sub>6</sub> (NF <sub>2</sub> ) <sub>2</sub> | 1.265   | 960              | 3,149.6           |                                     |                                      |                    |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                          | Chemical Formula  | All data given at 25°C (77°F) unless otherwise noted. |                 |                   |                                     |                                      |                    |
|------------------------------------|---|---|-----------------|-------------------|-------------------------------------|--------------------------------------|--------------------|
|                                    |   | Specific Gravity                                      | Sound Speed     |                   | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                                    |   |   | m/s             | ft/s              |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| 2,2-bis(DiFluoramino propane (43)) | C <sub>3</sub> H <sub>6</sub> (NF <sub>2</sub> ) <sub>2</sub> | 1.254   | 890             | 2920              |                                     |                                      |                    |
| 2,2-Dihydroxydiethyl ether         | C <sub>4</sub> H <sub>10</sub> O <sub>3</sub>                 | 1.116   | 1,586           | 5,203.4           | 2.4                                 |                                      |                    |
| Dihydroxyethane                    | C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>                  | 1.113   | 1,658           | 5,439.6           | 2.1                                 |                                      |                    |
| 1,3-Dimethyl-benzene (46)          | C <sub>8</sub> H <sub>10</sub>                                | 0.868<br>(15°C)                                       | 1,343<br>(20°C) | 4,406.2<br>(68°F) |                                     | 0.749<br>(15°C)                      | 8.059<br>(59°F)    |
| 1,2-Dimethyl-benzene (29, 46)      | C <sub>8</sub> H <sub>10</sub>                                | 0.897<br>(20°C)                                       | 1,331.5         | 4,368.4           | 4.1                                 | 0.903<br>(20°C)                      | 9.716<br>(68°F)    |
| 1,4-Dimethyl-benzene (46)          | C <sub>8</sub> H <sub>10</sub>                                |   | 1,334<br>(20°C) | 4,376.6<br>(68°F) |                                     | 0.662                                | 7.123              |
| 2,2-Dimethyl-butane (29, 33)       | C <sub>6</sub> H <sub>14</sub>                                | 0.649<br>(20°C)                                       | 1,079           | 3,540             |                                     |                                      |                    |
| Dimethyl ketone                    | C <sub>3</sub> H <sub>6</sub> O                               | 0.791   | 1,174           | 3,851.7           | 4.5                                 | 0.399                                | 4.293              |
| Dimethyl pentane (47)              | C <sub>7</sub> H <sub>16</sub>                                | 0.674   | 1,063           | 3,487.5           |                                     |                                      |                    |
| Dimethyl phthalate                 | C <sub>8</sub> H <sub>10</sub> O <sub>4</sub>                 | 1.2   | 1,463           | 4,799.9           |                                     |                                      |                    |
| Diiodo-methane                     | CH <sub>2</sub> I <sub>2</sub>                                | 3.235   | 980             | 3,215.2           |                                     |                                      |                    |
| Dioxane                            | C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>                  | 1.033   | 1,376           | 4,514.4           |                                     |                                      |                    |
| Dodecane (23)                      | C <sub>12</sub> H <sub>26</sub>                               | 0.749   | 1,279           | 4,196.2           | 3.85                                | 1.80                                 | 19.368             |
| 1,2-Ethandiol                      | C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>                  | 1.113   | 1,658           | 5,439.6           | 2.1                                 |                                      |                    |
| Ethanenitrile                      | C <sub>2</sub> H <sub>3</sub> N                               | 0.783   | 1,290           | 4,232.3           |                                     | 0.441                                | 4.745              |
| Ethanoic anhydride (22)            | (CH <sub>3</sub> CO) <sub>2</sub> O                           | 1.082   | 1,180           | 3,871.4           |                                     | 0.769                                | 8.274              |
| Ethanol                            | C <sub>2</sub> H <sub>6</sub> O                               | 0.789   | 1,207           | 3,960             | 4.0                                 | 1.39                                 | 14.956             |
| Ethanol amide                      | C <sub>2</sub> H <sub>7</sub> NO                              | 1.018   | 1,724           | 5,656.2           | 3.4                                 |                                      |                    |
| Ethoxyethane                       | C <sub>4</sub> H <sub>10</sub> O                              | 0.713   | 985             | 3,231.6           | 4.87                                | 0.311                                | 3.346              |
| Ethyl acetate (33)                 | C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>                  | 0.901   | 1,085           | 3,559.7           | 4.4                                 | 0.489                                | 5.263              |
| Ethyl alcohol                      | C <sub>2</sub> H <sub>6</sub> O                               | 0.789   | 1,207           | 3,960             | 4.0                                 | 1.396                                | 15.020             |
| Ethyl benzene (46)                 | C <sub>8</sub> H <sub>10</sub>                                | 0.867<br>(20°C)                                       | 1,338<br>(20°C) | 4,389.8<br>(68°F) |                                     | 0.797<br>(17°C)                      | 8.575<br>(63°F)    |
| Ethyl Bromide (46)                 | C <sub>2</sub> H <sub>5</sub> Br                              | 1.461<br>(20°C)                                       | 900<br>(20°C)   | 2,952.8<br>(68°F) |                                     | 0.275<br>(20°C)                      | 2.959<br>(68°F)    |
| Ethyl iodide (46)                  | C <sub>2</sub> H <sub>5</sub> I                               | 1.950<br>(20°C)                                       | 876<br>(20°C)   | 2874<br>(68°F)    |                                     | 0.29                                 | 3.12               |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                         | Chemical Formula                              | All data given at 25°C (77°F) unless otherwise noted. |                 |                    |                                     |                                      |                    |
|-----------------------------------|---|---|-----------------|--------------------|-------------------------------------|--------------------------------------|--------------------|
|                                   |   | Specific Gravity                                      | Sound Speed     |                    | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                                   |   |   | m/s             | ft/s               |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Ether                             | C <sub>4</sub> H <sub>10</sub> O              | 0.713   | 985             | 3231.6             | 4.87                                | 0.311                                | 3.346              |
| Ethyl ether                       | C <sub>4</sub> H <sub>10</sub> O              | 0.713   | 985             | 3231.6             | 4.87                                | 0.311                                | 3.346              |
| Ethylene bromide (47)             | C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub> | 2.18  | 995             | 3264.4             |                                     | 0.79                                 | 8.5                |
| Ethylene chloride (47)            | C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub> | 1.253   | 1,193           | 3914               |                                     | 0.61                                 | 6.563              |
| Ethylene glycol                   | C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>  | 1.113   | 1,658           | 5439.6             | 2.1                                 | 17.208<br>(20°C)                     | 185.158<br>(68°F)  |
| d-Fenochone                       | C <sub>10</sub> H <sub>16</sub> O             | 0.947   | 1,320           | 4330.7             |                                     | 0.22                                 | 2.367              |
| d-2-Fenochanone                   | C <sub>10</sub> H <sub>16</sub> O             | 0.947   | 1,320           | 4330.7             |                                     | 0.22                                 | 2.367              |
| Fluorine                          | F   | 0.545<br>(-143°C)                                     | 403<br>(-143°C) | 1322.2<br>(-225°F) | 11.31                               |                                      |                    |
| Fluoro-benzene (46)               | C <sub>6</sub> H <sub>5</sub> F               | 1.024<br>(20°C)                                       | 1,189           | 3900.9             |                                     | 0.584<br>(20°C)                      | 6.283<br>(68°F)    |
| Formaldehyde, methyl ester        | C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>  | 0.974   | 1,127           | 3697.5             | 4.02                                |                                      |                    |
| Formamide                         | CH <sub>3</sub> NO                            | 1.134<br>(20°C)                                       | 1,622           | 5321.5             | 2.2                                 | 2.91                                 | 31.311             |
| Formic acid, amide                | CH <sub>3</sub> NO                            | 1.134<br>(20°C)                                       | 1,622           | 5321.5             |                                     | 2.91                                 | 31.311             |
| Freon R12                         |   |   | 774.2           | 2540               |                                     |                                      |                    |
| Furfural                          | C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>  | 1.157   | 1,444           | 4737.5             | 3.7                                 |                                      |                    |
| Furfuryl alcohol                  | C <sub>5</sub> H <sub>6</sub> O <sub>2</sub>  | 1.135   | 1,450           | 4757.2             | 3.4                                 |                                      |                    |
| Fural                             | C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>  | 1.157   | 1,444           | 4737.5             | 3.7                                 |                                      |                    |
| 2-Furaldehyde                     | C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>  | 1.157   | 1,444           | 4737.5             | 3.7                                 |                                      |                    |
| 2-Furancarboxaldehyde             | C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>  | 1.157   | 1,444           | 4737.5             | 3.7                                 |                                      |                    |
| 2-Furyl-Methanol                  | C <sub>5</sub> H <sub>6</sub> O <sub>2</sub>  | 1.135   | 1,450           | 4757.2             | 3.4                                 |                                      |                    |
| Gallium                           | Ga  | 6.095   | 2,870<br>(30°C) | 9416<br>(86°F)     |                                     |                                      |                    |
| Glycerin                          | C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>  | 1.26  | 1,904           | 6246.7             | 2.2                                 | 757.1                                | 8,081.836          |
| Glycerol                          | C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>  | 1.26  | 1,904           | 6246.7             | 2.2                                 | 757.1                                | 8,081.836          |
| Glycol                            | C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>  | 1.113   | 1658            | 5439.6             | 2.1                                 |                                      |                    |
| 50% Glycol / 50% H <sub>2</sub> O |   |   | 1,578           | 5,177              |                                     |                                      |                    |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                           | Chemical Formula                              | All data given at 25°C (77°F) unless otherwise noted. |                   |                     |                                     |                                      |                    |
|-------------------------------------|---|---|-------------------|---------------------|-------------------------------------|--------------------------------------|--------------------|
|                                     |   | Specific Gravity                                      | Sound Speed       |                     | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                                     |   |   | m/s               | ft/s                |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Helium (45)                         | He <sub>4</sub>                               | 0.125<br>(-269°C)                                     | 183<br>(-269°C)   | 600.4<br>(-452°F)   |                                     | 0.025                                | .269               |
| Heptane (22, 23)                    | C <sub>7</sub> H <sub>16</sub>                | 0.684<br>(20°C)                                       | 1,131             | 3,710.6             | 4.25                                | 0.598<br>(20°C)                      | 6.434<br>(68°F)    |
| n-Heptane (29, 33)                  | C <sub>7</sub> H <sub>16</sub>                | 0.684<br>(20°C)                                       | 1,180             | 3,871.3             | 4.0                                 |                                      |                    |
| Hexachloro-<br>Cyclopentadiene (47) | C <sub>5</sub> Cl <sub>6</sub>                | 1.7180  | 1,150             | 3,773               |                                     |                                      |                    |
| Hexadecane (23)                     | C <sub>16</sub> H <sub>34</sub>               | 0.773<br>(20°C)                                       | 1,338             | 4,389.8             | 3.71                                | 4.32<br>(20°C)                       | 46.483<br>(68°F)   |
| Hexalin                             | C <sub>6</sub> H <sub>12</sub> O              | 0.962   | 1,454             | 4,770.3             | 3.6                                 | 70.69<br>(17°C)                      | 760.882<br>(63°F)  |
| Hexane (16, 22, 23)                 | C <sub>6</sub> H <sub>14</sub>                | 0.659   | 1,112             | 3,648.3             | 2.71                                | 0.446                                | 4.798              |
| n-Hexane (29, 33)                   | C <sub>6</sub> H <sub>14</sub>                | 0.649<br>(20°C)                                       | 1,079             | 3,540               | 4.53                                |                                      |                    |
| 2,5-Hexanedione                     | C <sub>6</sub> H <sub>10</sub> O <sub>2</sub> | 0.729   | 1,399             | 4,589.9             | 3.6                                 |                                      |                    |
| n-Hexanol                           | C <sub>6</sub> H <sub>14</sub> O              | 0.819   | 1,300             | 4,265.1             | 3.8                                 |                                      |                    |
| Hexahydrobenzene (15)               | C <sub>6</sub> H <sub>12</sub>                | 0.779   | 1,248             | 4,094.5             | 5.41                                | 1.31<br>(17°C)                       | 14.095<br>(63°F)   |
| Hexahydrophenol                     | C <sub>6</sub> H <sub>12</sub> O              | 0.962   | 1,454             | 4,770.3             | 3.6                                 |                                      |                    |
| Hexamethylene (15)                  | C <sub>6</sub> H <sub>12</sub>                | 0.779   | 1,248             | 4,094.5             | 5.41                                | 1.31<br>(17°C)                       | 14.095<br>(63°F)   |
| Hydrogen (45)                       | H <sub>2</sub>                                | 0.071<br>(-256°C)                                     | 1,187<br>(-256°C) | 3,894.4<br>(-429°F) |                                     | 0.003<br>(-256°C)                    | 0.032<br>(-429°F)  |
| 2-Hydroxy-toluene (46)              | C <sub>7</sub> H <sub>8</sub> O               | 1.047<br>(20°C)                                       | 1,541<br>(20°C)   | 5,055.8<br>(68°F)   |                                     | 4.29<br>(40°C)                       | 46.16<br>(104°F)   |
| 3-Hydroxy-toluene (46)              | C <sub>7</sub> H <sub>8</sub> O               | 1.034<br>(20°C)                                       | 1,500<br>(20°C)   | 4,921.3<br>(68°F)   |                                     | 5.979<br>(40°C)                      | 64.334<br>(104°F)  |
| Iodo-benzene (46)                   | C <sub>6</sub> H <sub>5</sub> I               | 1.823   | 1,114<br>(20°C)   | 3,654.9<br>(68°F)   |                                     | 0.954                                |                    |
| Iodo-ethane (46)                    | C <sub>2</sub> H <sub>5</sub> I               | 1.950<br>(20°C)                                       | 876<br>(20°C)     | 2,874<br>(68°F)     |                                     | 0.29                                 | 3.12               |
| Iodo-methane                        | CH <sub>3</sub> I                             | 2.28<br>(20°C)  | 978               | 3,208.7             |                                     | 0.211                                | 2.27               |
| Isobutyl acetate (22)               | C <sub>6</sub> H <sub>12</sub> O              |   | 1,180<br>(27°C)   | 3,871.4<br>(81°F)   | 4.85                                |                                      |                    |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                | Chemical Formula                              | All data given at 25°C (77°F) unless otherwise noted. |                  |                     |                                     |                                      |                    |
|--------------------------|---|---|------------------|---------------------|-------------------------------------|--------------------------------------|--------------------|
|                          |   | Specific Gravity                                      | Sound Speed      |                     | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                          |   |   | m/s              | ft/s                |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Isobutanol               | C <sub>4</sub> H <sub>10</sub> O              | 0.81<br>(20°C)  | 1,212            | 3,976.4             |                                     |                                      |                    |
| Iso-Butane               |   |   | 1,219.8          | 4002                |                                     |                                      |                    |
| Isopentane (36)          | C <sub>5</sub> H <sub>12</sub>                | 0.62 (20°C)   | 980              | 3,215.2             | 4.8                                 | 0.34                                 | 3.658              |
| Isopropanol (46)         | C <sub>3</sub> H <sub>8</sub> O               | 0.785<br>(20°C)                                       | 1,170<br>(20°C)  | 3,838.6<br>(68°F)   |                                     | 2.718                                | 29.245             |
| Isopropyl alcohol (46)   | C <sub>3</sub> H <sub>8</sub> O               | 0.785<br>(20°C)                                       | 1,170<br>(20°C)  | 3,838.6<br>(68°F)   |                                     | 2.718                                | 29.245             |
| Kerosene                 |   | 0.81  | 1,324            | 4,343.8             | 3.6                                 |                                      |                    |
| Ketohexamethylene        | C <sub>6</sub> H <sub>10</sub> O              | 0.948   | 1,423            | 4,668.6             | 4.0                                 |                                      |                    |
| Lithium fluoride (42)    | LiF   |   | 2,485<br>(900°C) | 8,152.9<br>(1652°F) | 1.29                                |                                      |                    |
| Mercury (45)             | Hg  | 13.594  | 1,449<br>(24°C)  | 4,753.9<br>(75°F)   |                                     | 0.114                                | 1.226              |
| Mesityloxide             | C <sub>6</sub> H <sub>16</sub> O              | 0.85  | 1,310            | 4,297.9             |                                     |                                      |                    |
| Methane (25, 28, 38, 39) | CH <sub>4</sub>                               | 0.162<br>(-89°C)                                      | 405<br>(-89°C)   | 1,328.7<br>(-128°F) | 17.5                                |                                      |                    |
| Methanol (40, 41)        | CH <sub>4</sub> O                             | 0.791<br>(20°C)                                       | 1,076            | 3,530.2             | 2.92                                | 0.695                                | 7.478              |
| Methyl acetate           | C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>  | 0.934   | 1,211            | 3,973.1             |                                     | 0.407                                | 4.379              |
| o-Methylaniline (46)     | C <sub>7</sub> H <sub>9</sub> N               | 0.999<br>(20°C)                                       | 1,618            | 5,308.4             |                                     | 4.394<br>(20°C)                      | 47.279<br>(68°F)   |
| 4-Methylaniline (46)     | C <sub>7</sub> H <sub>9</sub> N               | 0.966<br>(45°C)                                       | 1,480            | 4,855.6             |                                     | 1.863<br>(50°C)                      | 20.095<br>(122°F)  |
| Methyl alcohol (40, 44)  | CH <sub>4</sub> O                             | 0.791<br>(20°C)                                       | 1,076            | 3,530.2             | 2.92                                | 0.695                                | 7.478              |
| Methyl benzene (16, 52)  | C <sub>7</sub> H <sub>8</sub>                 | 0.867   | 1,328<br>(20°C)  | 4,357<br>(68°F)     | 4.27                                | 0.644                                | 7.144              |
| 2-Methyl-butane (36)     | C <sub>5</sub> H <sub>12</sub>                | 0.62 (20°C)   | 980              | 3,215.2             |                                     | 0.34                                 | 3.658              |
| Methyl carbinol          | C <sub>2</sub> H <sub>6</sub> O               | 0.789   | 1,207            | 3,960               | 4.0                                 | 1.396                                |                    |
| Methyl-chloroform (47)   | C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub> | 1.33  | 985              | 3,231.6             |                                     | 0.902<br>(20°C)                      | 9.705<br>(68°F)    |
| Methyl-cyanide           | C <sub>2</sub> H <sub>3</sub> N               | 0.783   | 1,290            | 4,232.3             |                                     | 0.441                                | 4.745              |
| 3-Methyl cyclohexanol    | C <sub>7</sub> H <sub>14</sub> O              | 0.92  | 1,400            | 4,593.2             |                                     |                                      |                    |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                    | Chemical Formula                                | All data given at 25°C (77°F) unless otherwise noted. |                 |                     |                           |                                      |                    |
|------------------------------|---|---|-----------------|---------------------|---------------------------|--------------------------------------|--------------------|
|                              |   | Specific Gravity                                      | Sound Speed     |                     | $\Delta v/^\circ\text{C}$ | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                              |   |   | m/s             | ft/s                | m/s/°C                    | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Methylene chloride (3)       | CH <sub>2</sub> Cl <sub>2</sub>                 | 1.327   | 1,070           | 3,510.5             | 3.94                      | 0.31                                 | 3.335              |
| Methylene iodide             | CH <sub>2</sub> I <sub>2</sub>                  | 3.235   | 980             | 3,215.2             |                           |                                      |                    |
| Methyl formate (22)          | C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>    | 0.974<br>(20°C)                                       | 1,127           | 3,697.5             | 4.02                      |                                      |                    |
| Methyl iodide                | CH <sub>3</sub> I                               | 2.28 (20°C)   | 978             | 3,208.7             |                           | 0.211                                | 2.27               |
| $\alpha$ -Methyl naphthalene | C <sub>11</sub> H <sub>10</sub>                 | 1.090   | 1,510           | 4,954.1             | 3.7                       |                                      |                    |
| 2-Methylphenol (46)          | C <sub>7</sub> H <sub>8</sub> O                 | 1.047<br>(20°C)                                       | 1,541<br>(20°C) | 5,055.8<br>(68°F)   |                           | 4.29<br>(40°C)                       | 46.16<br>(104°F)   |
| 3-Methylphenol (46)          | C <sub>7</sub> H <sub>8</sub> O                 | 1.034<br>(20°C)                                       | 1,500<br>(20°C) | 4,921.3<br>(68°F)   |                           | 5.979<br>(40°C)                      | 64.334<br>(104°F)  |
| Milk, homogenized            |   |   | 1,548           | 5,080               |                           |                                      |                    |
| Morpholine                   | C <sub>4</sub> H <sub>9</sub> NO                | 1.00  | 1,442           | 4,731               | 3.8                       |                                      |                    |
| Naphtha                      |   | 0.76  | 1,225           | 4,019               |                           |                                      |                    |
| Natural Gas (37)             |   | 0.316<br>(-103°C)                                     | 753<br>(-103°C) | 2,470.5<br>(-153°F) |                           |                                      |                    |
| Neon (45)                    | Ne  | 1.207<br>(-246°C)                                     | 595<br>(-246°C) | 1,952.1<br>(-411°F) |                           |                                      |                    |
| Nitrobenzene (46)            | C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>   | 1.204<br>(20°C)                                       | 1,415<br>(20°C) | 4,642.4<br>(68°F)   |                           | 1.514                                | 16.29              |
| Nitrogen (45)                | N <sub>2</sub>                                  | 0.808<br>(-199°C)                                     | 962<br>(-199°C) | 3,156.2<br>(-326°F) |                           | 0.217<br>(-199°C)                    | 2.334<br>(-326°F)  |
| Nitromethane (43)            | CH <sub>3</sub> NO <sub>2</sub>                 | 1.135   | 1,300           | 4,265.1             | 4.0                       | 0.549                                | 5.907              |
| Nonane (23)                  | C <sub>9</sub> H <sub>20</sub>                  | 0.718<br>(20°C)                                       | 1,207           | 3,960               | 4.04                      | 0.99<br>(20°C)                       | 10.652<br>(68°F)   |
| 1-Nonene (27)                | C <sub>9</sub> H <sub>18</sub>                  | 0.736<br>(20°C)                                       | 1,207           | 3,960               | 4.0                       |                                      |                    |
| Octane (23)                  | C <sub>8</sub> H <sub>18</sub>                  | 0.703   | 1,172           | 3,845.1             | 4.14                      | 0.73                                 | 7.857              |
| n-Octane (29)                | C <sub>8</sub> H <sub>18</sub>                  | 0.704<br>(20°C)                                       | 1,212.5         | 3,978               | 3.50                      | 0.737                                | .930               |
| 1-Octene (27)                | C <sub>8</sub> H <sub>16</sub>                  | 0.723<br>(20°C)                                       | 1,175.5         | 3,856.6             | 4.10                      |                                      |                    |
| Oil of Camphor Sassafrassy   |   |   | 1,390           | 4,560.4             | 3.8                       |                                      |                    |
| Oil, Car (SAE 20a.30)        |   | 1.74  | 870             | 2,854.3             |                           | 190                                  | 2,045.093          |
| Oil, Castor                  | C <sub>11</sub> H <sub>10</sub> O <sub>10</sub> | 0.969   | 1,477           | 4,845.8             | 3.6                       | 0.670                                | 7.209              |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                     | Chemical Formula                              | All data given at 25°C (77°F) unless otherwise noted. |                 |                     |                                     |                                      |                    |
|-------------------------------|---|---|-----------------|---------------------|-------------------------------------|--------------------------------------|--------------------|
|                               |   | Specific Gravity                                      | Sound Speed     |                     | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                               |   |   | m/s             | ft/s                |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Oil, Diesel                   |   | 0.80  | 1,250           | 4,101               |                                     |                                      |                    |
| Oil, Fuel AA gravity          |   | 0.99  | 1,485           | 4,872               | 3.7                                 |                                      |                    |
| Oil (Lubricating X200)        |   |   | 1,530           | 5,019.9             |                                     |                                      |                    |
| Oil (Olive)                   |   | 0.912   | 1,431           | 4,694.9             | 2.75                                | 100                                  | 1,076.365          |
| Oil (Peanut)                  |   | 0.936   | 1,458           | 4,783.5             |                                     |                                      |                    |
| Oil (Sperm)                   |   | 0.88  | 1,440           | 4,724.4             |                                     |                                      |                    |
| Oil, 6                        |   |   | 1,509<br>(22°C) | 4,951<br>(72°F)     |                                     |                                      |                    |
| 2,2-Oxydiethanol              | C <sub>4</sub> H <sub>10</sub> O <sub>3</sub> | 1.116   | 1,586           | 5,203.4             | 2.4                                 |                                      |                    |
| Oxygen (45)                   | O <sub>2</sub>                                | 1.155<br>(-186°C)                                     | 952<br>(-186°C) | 3,123.4<br>(-303°F) |                                     | 0.173                                | 1.861              |
| Pentachloro-ethane (47)       | C <sub>2</sub> HCl <sub>5</sub>               | 1.687   | 1,082           | 3,549.9             |                                     |                                      |                    |
| Pentalin (47)                 | C <sub>2</sub> HCl <sub>5</sub>               | 1.687   | 1,082           | 3,549.9             |                                     |                                      |                    |
| Pentane (36)                  | C <sub>5</sub> H <sub>12</sub>                | 0.626<br>(20°C)                                       | 1,020           | 3,346.5             |                                     | 0.363                                | 3.905              |
| n-Pentane (47)                | C <sub>5</sub> H <sub>12</sub>                | 0.557   | 1,006           | 3,300.5             |                                     | 0.41                                 | 4.413              |
| Perchlorocyclopentadiene (47) | C <sub>5</sub> Cl <sub>6</sub>                | 1.718   | 1,150           | 3,773               |                                     |                                      |                    |
| Perchloro-ethylene (47)       | C <sub>2</sub> Cl <sub>4</sub>                | 1.632   | 1,036           | 3,399               |                                     |                                      |                    |
| Perfluoro-1-Hepten (47)       | C <sub>7</sub> F <sub>14</sub>                | 1.67  | 583             | 1,912.7             |                                     |                                      |                    |
| Perfluoro-n-Hexane (47)       | C <sub>6</sub> F <sub>14</sub>                | 1.672   | 508             | 1,666.7             |                                     |                                      |                    |
| Phene (29, 40, 41)            | C <sub>6</sub> H <sub>6</sub>                 | 0.879   | 1,306           | 4,284.8             | 4.65                                | 0.711                                | 7.65               |
| <b>b</b> -Phenyl acrolein     | C <sub>9</sub> H <sub>8</sub> O               | 1.112   | 1,554           | 5,098.4             | 3.2                                 |                                      |                    |
| Phenylamine (41)              | C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> | 1.022   | 1,639           | 5,377.3             | 4.0                                 | 3.63                                 | 39.058             |
| Phenyl bromide (46)           | C <sub>6</sub> H <sub>5</sub> Br              | 1.522   | 1,170<br>(20°C) | 3,838.6<br>(68°F)   |                                     | 0.693                                | 7.456              |
| Phenyl chloride               | C <sub>6</sub> H <sub>5</sub> Cl              | 1.106   | 1,273           | 4,176.5             | 3.6                                 | 0.722                                | 7.768              |
| Phenyl iodide (46)            | C <sub>6</sub> H <sub>5</sub> I               | 1.823   | 1,114<br>(20°C) | 3,654.9<br>(68°F)   |                                     | 0.954<br>(15°C)                      | 10.265<br>(59°F)   |
| Phenyl methane (16, 52)       | C <sub>7</sub> H <sub>8</sub>                 | 0.867<br>(20°C)                                       | 1,328<br>(20°C) | 4,357<br>(68°F)     | 4.27                                | 0.644                                | 6.929              |
| 3-Phenyl propenal             | C <sub>9</sub> H <sub>8</sub> O               | 1.112   | 1,554           | 5,098.4             | 3.2                                 |                                      |                    |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                           | Chemical Formula                              | All data given at 25°C (77°F) unless otherwise noted. |                    |                     |                           |                                      |                    |
|-------------------------------------|---|---|--------------------|---------------------|---------------------------|--------------------------------------|--------------------|
|                                     |   | Specific Gravity                                      | Sound Speed        |                     | $\Delta v/^\circ\text{C}$ | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                                     |   |   | m/s                | ft/s                | m/s/°C                    | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Phthalardione                       | C <sub>8</sub> H <sub>4</sub> O <sub>3</sub>  |   | 1,125<br>(152°C)   | 3,691<br>(306°F)    |                           |                                      |                    |
| Phthalic acid, anhydride            | C <sub>8</sub> H <sub>4</sub> O <sub>3</sub>  |   | 1,125<br>(152°C)   | 3,691<br>(306°F)    |                           |                                      |                    |
| Pthalic anhydride                   | C <sub>8</sub> H <sub>4</sub> O <sub>3</sub>  |   | 1,125<br>(152°C)   | 3,691<br>(306°F)    |                           |                                      |                    |
| Pimelic ketone                      | C <sub>6</sub> H <sub>10</sub> O              | 0.948   | 1,423              | 4,668.6             | 4.0                       |                                      |                    |
| Plexiglas, Lucite, Acrylic          |   |   | 2,651              | 8,698               |                           |                                      |                    |
| Polyterpene Resin                   |   | 0.77  | 1,099.8<br>(190°C) | 3,608.4<br>(374°F)  |                           | 39,000                               | 419,500            |
| Potassium bromide (42)              | KBr   |   | 1,169<br>(900°C)   | 3,835.3<br>(1652°F) | 0.71                      | .715cp<br>(900°C)                    | 7.693<br>(1652°F)  |
| Potassium fluoride (42)             | KF  |   | 1,792<br>(900°C)   | 5,879.3<br>(1652°F) | 1.03                      |                                      |                    |
| Potassium iodide (42)               | KI  |   | 985<br>(900°C)     | 3,231.6<br>(1652°F) | 0.64                      |                                      |                    |
| Potassium nitrate (48)              | KNO <sub>3</sub>                              | 1.859<br>(352°C)                                      | 1,740.1<br>(352°C) | 5,709<br>(666°F)    | 1.1                       | 1.19<br>(327°C)                      | 12.804<br>(621°F)  |
| Propane (2, 13)<br>(-45° to -130°C) | C <sub>3</sub> H <sub>8</sub>                 | 0.585<br>(-45°C)                                      | 1,003<br>(-45°C)   | 3,290.6<br>(-49°F)  | 5.7                       |                                      |                    |
| 1,2,3-Propanetriol                  | C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>  | 1.26  | 1,904              | 6,246.7             | 2.2                       | .000757                              |                    |
| 1-Propanol (46)                     | C <sub>3</sub> H <sub>8</sub> O               | 0.78 (20°C)   | 1,222<br>(20°C)    | 4,009.2<br>(68°F)   |                           |                                      |                    |
| 2-Propanol (46)                     | C <sub>3</sub> H <sub>8</sub> O               | 0.785<br>(20°C)                                       | 1,170<br>(20°C)    | 3,838.6<br>(68°F)   |                           | 2.718                                | 29.245             |
| 2-Propanone                         | C <sub>3</sub> H <sub>6</sub> O               | 0.791   | 1,174              | 3,851.7             | 4.5                       | 0.399                                | 4.293              |
| Propene (17, 18, 35)                | C <sub>3</sub> H <sub>6</sub>                 | 0.563<br>(-13°C)                                      | 963<br>(-13°C)     | 3,159.4<br>(9°F)    | 6.32                      |                                      |                    |
| n-Propyl acetate (22)               | C <sub>5</sub> H <sub>10</sub> O <sub>2</sub> |   | 1,280<br>(2°C)     | 4,199<br>(36°F)     | 4.63                      |                                      |                    |
| n-Propyl-alcohol                    | C <sub>3</sub> H <sub>8</sub> O               | 0.78 (20°C)   | 1,222<br>(20°C)    | 4,009.2<br>(68°F)   |                           | 2.549                                | 27.427             |
| Propylchloride (47)                 | C <sub>3</sub> H <sub>7</sub> Cl              | 0.892   | 1,058              | 3,471.1             |                           | 0.378                                | 4.067              |
| Propylene (17, 18, 35)              | C <sub>3</sub> H <sub>6</sub>                 | 0.563<br>(-13°C)                                      | 963<br>(-13°C)     | (3159.4)<br>(9°F)   | 6.32                      |                                      |                    |



Table 2: Sound Speeds in Fluids (cont.)

| Substance             | Chemical Formula                     | All data given at 25°C (77°F) unless otherwise noted. |                    |                     |                                     |                                      |                    |
|-----------------------|--------------------------------------|---|--------------------|---------------------|-------------------------------------|--------------------------------------|--------------------|
|                       |                                      | Specific Gravity                                      | Sound Speed        |                     | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|                       |                                      |   | m/s                | ft/s                |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| Pyridine              | C <sub>6</sub> H <sub>5</sub> N      | 0.982   | 1,415              | 4,642.4             | 4.1                                 | 0.992<br>(20°C)                      | 10.673<br>(68°F)   |
| Refrigerant 11 (3, 4) | CCl <sub>3</sub> F                   | 1.49  | 828.3<br>(0°C)     | 2,717.5<br>(32°F)   | 3.56                                |                                      |                    |
| Refrigerant 12 (3)    | CCl <sub>2</sub> F <sub>2</sub>      | 1.516<br>(-40°C)                                      | 774.1<br>(-40°C)   | 2,539.7<br>(-40°F)  | 4.24                                |                                      |                    |
| Refrigerant 14 (14)   | CF <sub>4</sub>                      | 1.75<br>(-150°C)                                      | 875.24<br>(-150°C) | 2,871.5<br>(-238°F) | 6.61                                |                                      |                    |
| Refrigerant 21 (3)    | CHCl <sub>2</sub> F                  | 1.426 (0°C)   | 891<br>(0°C)       | 2,923.2<br>(32°F)   | 3.97                                |                                      |                    |
| Refrigerant 22 (3)    | CHClF <sub>2</sub>                   | 1.491<br>(-69°C)                                      | 893.9<br>(50°C)    | 2,932.7<br>(122°F)  | 4.79                                |                                      |                    |
| Refrigerant 113 (3)   | CCl <sub>2</sub> F-CClF <sub>2</sub> | 1.563   | 783.7<br>(0°C)     | 2,571.2<br>(32°F)   | 3.44                                |                                      |                    |
| Refrigerant 114 (3)   | CClF <sub>2</sub> -CClF <sub>2</sub> | 1.455   | 665.3<br>(-10°C)   | 2,182.7<br>(14°F)   | 3.73                                |                                      |                    |
| Refrigerant 115 (3)   | C <sub>2</sub> ClF <sub>5</sub>      |   | 656.4<br>(-50°C)   | 2,153.5<br>(-58°F)  | 4.42                                |                                      |                    |
| Refrigerant C318 (3)  | C <sub>4</sub> F <sub>8</sub>        | 1.62<br>(-20°C)                                       | 574<br>(-10°C)     | 1,883.2<br>(14°F)   | 3.88                                |                                      |                    |
| Selenium (8)          | Se                                   |   | 1,072<br>(250°C)   | 3,517.1<br>(482°F)  | 0.68                                |                                      |                    |
| Silicone (30 cp)      |                                      | 0.993   | 990                | 3,248               |                                     | 30                                   | 322.8              |
| Sodium fluoride (42)  | NaF                                  | 0.877   | 2,082<br>(1000°C)  | 6,830.7<br>(1832°F) | 1.32                                |                                      |                    |
| Sodium nitrate (48)   | NaNO <sub>3</sub>                    | 1.884<br>(336°C)                                      | 1,763.3<br>(336°C) | 5,785.1<br>(637°F)  | 0.74                                | 1.37<br>(336°C)                      | 14.74<br>(637°F)   |
| Sodium nitrite (48)   | NaNO <sub>2</sub>                    | 1.805<br>(292°C)                                      | 1,876.8<br>(292°C) | 6,157.5<br>(558°F)  |                                     |                                      |                    |
| Solvesso #3           |                                      | 0.877   | 1,370              | 4,494.8             | 3.7                                 |                                      |                    |
| Spirit of wine        | C <sub>2</sub> H <sub>6</sub> O      | 0.789   | 1,207              | 3,960               | 4.0                                 | 1.396                                | 15.02              |
| Sulfur (7, 8, 10)     | S                                    |   | 1,177<br>(250°C)   | 3,861.5<br>(482°F)  | -1.13                               |                                      |                    |
| Sulfuric Acid (1)     | H <sub>2</sub> SO <sub>4</sub>       | 1.841   | 1,257.6            | 4,126               | 1.43                                | 11.16                                | 120.081            |
| Tellurium (7)         | Te                                   |   | 991<br>(450°C)     | 3,251.3<br>(842°F)  | 0.73                                |                                      |                    |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                              | Chemical Formula                              | All data given at 25°C (77°F) unless otherwise noted. |                 |                  |                           |                                      |                    |
|--|---|---|-----------------|------------------|---------------------------|--------------------------------------|--------------------|
|  |   | Specific Gravity                                      | Sound Speed     |                  | $\Delta v/^\circ\text{C}$ | Kinematic Viscosity $\times 10^{-6}$ |                    |
|  |   |   | m/s             | ft/s             | m/s/ $^\circ\text{C}$     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| 1,1,2,2-Tetrabromo-ethane (47)         | C <sub>2</sub> H <sub>2</sub> Br <sub>4</sub> | 2.966   | 1,027           | 3,369.4          |                           |                                      |                    |
| 1,1,2,2-Tetrachloro-ethane (67)        | C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub> | 1.595   | 1,147           | 3,763.1          |                           | 1.156 (15°C)                         | 12.438 (59°F)      |
| Tetrachloroethane (46)                 | C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub> | 1.553 (20°C)  | 1,170 (20°C)    | 3,838.6 (68°F)   |                           | 1.19                                 | 12.804             |
| Tetrachloro-ethene (47)                | C <sub>2</sub> Cl <sub>4</sub>                | 1.632   | 1,036           | 3,399            |                           |                                      |                    |
| Tetrachloro-Methane (33, 47)           | CCl <sub>4</sub>                              | 1.595 (20°C)  | 926             | 3,038.1          |                           | 0.607                                | 6.531              |
| Tetradecane (46)                       | C <sub>14</sub> H <sub>30</sub>               | 0.763 (20°C)  | 1,331 (20°C)    | 4,366.8 (68°F)   |                           | 2.86 (20°C)                          | 30.773 (68°F)      |
| Tetraethylene glycol                   | C <sub>8</sub> H <sub>18</sub> O <sub>5</sub> | 1.123   | 1,586           | 5,203.4          | 3.0                       |                                      |                    |
| Tetrafluoro-methane (14) (Freon 14)    | CF <sub>4</sub>                               | 1.75 (-150°C)   | 875.24 (-150°C) | 2,871.5 (-238°F) | 6.61                      |                                      |                    |
| Tetrahydro-1,4-isoxazine               | C <sub>4</sub> H <sub>9</sub> NO              | 1.000   | 1,442           | 4,731            | 3.8                       |                                      |                    |
| Toluene (16, 52)                       | C <sub>7</sub> H <sub>8</sub>                 | 0.867 (20°C)  | 1,328 (20°C)    | 4,357 (68°F)     | 4.27                      | 0.644                                | 6.929              |
| o-Toluidine (46)                       | C <sub>7</sub> H <sub>9</sub> N               | 0.999 (20°C)  | 1,618           | 5,308.4          |                           | 4.394 (20°C)                         | 47.279 (68°F)      |
| p-Toluidine (46)                       | C <sub>7</sub> H <sub>9</sub> N               | 0.966 (45°C)  | 1,480           | 4,855.6          |                           | 1.863 (50°C)                         | 20.053 (122°F)     |
| Toluol                                 | C <sub>7</sub> H <sub>8</sub>                 | 0.866   | 1,308           | 4,291.3          | 4.2                       | 0.58                                 | 6.24               |
| Tribromo-methane (46, 47)              | CHBr <sub>3</sub>                             | 2.89 (20°C)   | 918             | 3,011.8          |                           | 0.654                                | 7.037              |
| 1,1,1-Trichloro-ethane (47)            | C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub> | 1.33  | 985             | 3,231.6          |                           | 0.902 (20°C)                         | 9.705 (68°F)       |
| Trichloro-ethene (47)                  | C <sub>2</sub> HCl <sub>3</sub>               | 1.464   | 1,028           | 3,372.7          |                           |                                      |                    |
| Trichloro-fluoromethane (3) (Freon 11) | CCl <sub>3</sub> F                            | 1.49  | 828.3 (0°C)     | 2,717.5 (32°F)   | 3.56                      |                                      |                    |
| Trichloro-methane (47)                 | CHCl <sub>3</sub>                             | 1.489   | 979             | 3,211.9          | 3.4                       | 0.55                                 | 5.918              |
| 1,1,2-Trichloro-1,2,2-Trifluoro-Etham  | CCl <sub>2</sub> F-CClF <sub>2</sub>          | 1.563   | 783.7 (0°C)     | 2,571.2 (32°F)   |                           |                                      |                    |
| Triethyl-amine (33)                    | C <sub>6</sub> H <sub>15</sub> N              | 0.726   | 1,123           | 3,684.4          | 4.47                      |                                      |                    |
| Triethylene glycol                     | C <sub>6</sub> H <sub>14</sub> O <sub>4</sub> | 1.123   | 1,608           | 5,275.6          | 3.8                       |                                      |                    |

Table 2: Sound Speeds in Fluids (cont.)

| Substance                                    | Chemical Formula  | All data given at 25°C (77°F) unless otherwise noted. |                  |                     |                                     |                                      |                    |
|--|---|---|------------------|---------------------|-------------------------------------|--------------------------------------|--------------------|
|  |   | Specific Gravity                                      | Sound Speed      |                     | $\Delta v/^\circ\text{C}$<br>m/s/°C | Kinematic Viscosity $\times 10^{-6}$ |                    |
|  |   |   | m/s              | ft/s                |                                     | m <sup>2</sup> /s                    | ft <sup>2</sup> /s |
| 1, 1,1-Trifluoro-2-Chloro-2-Bromo-Ethane     | C <sub>2</sub> HClBrF <sub>3</sub>                            | 1.869   | 693              | 2,273.6             |                                     |                                      |                    |
| 1, 2,2-Trifluorotrichloro-ethane (Freon 113) | CCl <sub>2</sub> F-CClF <sub>2</sub>                          | 1.563   | 783.7<br>(0°C)   | 2,571.2<br>(32°F)   | 3.44                                |                                      |                    |
| d-1,3,3-Trimethylnorcamphor                  | C <sub>10</sub> H <sub>16</sub> O                             | 0.947   | 1,320            | 4,330.7             |                                     | 0.22                                 | 2.367              |
| Trinitrotoluene (43)                         | C <sub>7</sub> H <sub>5</sub> (NO <sub>2</sub> ) <sub>3</sub> | 1.64  | 1,610<br>(81°C)  | 5,282.2<br>(178°F)  |                                     |                                      |                    |
| Turpentine                                   |   | 0.88  | 1,255            | 4,117.5             |                                     | 1.4                                  | 15.064             |
| Unisis 800                                   |   | 0.87  | 1,346            | 4,416               |                                     |                                      |                    |
| Water, distilled (49, 50)                    | H <sub>2</sub> O  | 0.996   | 1,498            | 4,914.7             | -2.4                                | 1.00                                 | 10.76              |
| Water, heavy                                 | D <sup>2</sup> O  |   | 1,400            | 4,593               |                                     |                                      |                    |
| Water, sea                                   |   | 1.025   | 1,531            | 5,023               | -2.4                                | 1.00                                 | 10.76              |
| Wood Alcohol (40, 41)                        | CH <sub>4</sub> O   | 0.791<br>(20°C)                                       | 1,076            | 3,530.2             | 2.92                                | 0.695                                | 7.478              |
| Xenon (45)                                   | Xe  |   | 630<br>(-109°C)  | 2,067<br>(-164°F)   |                                     |                                      |                    |
| m-Xylene (46)                                | C <sub>8</sub> H <sub>10</sub>                                | 0.868<br>(15°C)                                       | 1,343<br>(20°C)  | 4,406.2<br>(68°F)   |                                     | 0.749<br>(15°C)                      | 8.059<br>(59°F)    |
| o-Xylene (29, 46)                            | C <sub>8</sub> H <sub>10</sub>                                | 0.897<br>(20°C)                                       | 1,331.5          | 4,368.4             | 4.1                                 | 0.903<br>(20°C)                      | 9.716<br>(68°F)    |
| p-Xylene (46)                                | C <sub>8</sub> H <sub>10</sub>                                |   | 1,334<br>(20°C)  | 4,376.6<br>(68°F)   |                                     | 0.662                                | 7.123              |
| Xylene hexafluoride                          | C <sub>8</sub> H <sub>4</sub> F <sub>6</sub>                  | 1.37  | 879              | 2,883.9             |                                     | 0.613                                | 6.595              |
| Zinc (7)                                     | Zn  |   | 3,298<br>(450°C) | 10,820.2<br>(842°F) |                                     |                                      |                    |

**Note:** For critical applications, the sources of sound speed data for pure liquids can generally be obtained from GE Infrastructure Sensing. Requests for sources must identify temperature and pressure range, and details of liquid composition.

**Sound Speeds Data**  
(cont.)

The values in Table 3 below are reproduced (with permission) from  
*American Institute of Physics Handbook*, ©McGraw-Hill Book Co.

**Table 3: Sound Speeds in Water at Selected Temperatures**

| Temperature |      | Sound Speed in Water |       | Temperature |       | Sound Speed in Water |       |
|-------------|------|----------------------|-------|-------------|-------|----------------------|-------|
| °C          | °F   | m/s                  | ft/s  | °C          | °F    | m/s                  | ft/s  |
| 0           | 32.0 | 1,402                | 4,600 |             |       |                      |       |
| 1           | 33.8 | 1,407                | 4,616 | 31          | 87.8  | 1,511                | 4,958 |
| 2           | 35.6 | 1,412                | 4,633 | 32          | 89.6  | 1,513                | 4,964 |
| 3           | 37.4 | 1,417                | 4,649 | 33          | 91.4  | 1,515                | 4,971 |
| 4           | 39.2 | 1,421                | 4,662 | 34          | 93.2  | 1,517                | 4,977 |
| 5           | 41.0 | 1,426                | 4,679 | 35          | 95.0  | 1,519                | 4,984 |
| 6           | 42.8 | 1,430                | 4,692 | 36          | 96.8  | 1,521                | 4,990 |
| 7           | 44.6 | 1,434                | 4,705 | 37          | 98.6  | 1,523                | 4,997 |
| 8           | 46.4 | 1,439                | 4,721 | 38          | 100.4 | 1,525                | 5,004 |
| 9           | 48.2 | 1,443                | 4,734 | 39          | 102.2 | 1,527                | 5,010 |
| 10          | 50.0 | 1,447                | 4,748 | 40          | 104.0 | 1,528                | 5,013 |
| 11          | 51.8 | 1,451                | 4,761 | 41          | 105.8 | 1,530                | 5,020 |
| 12          | 53.6 | 1,455                | 4,774 | 42          | 107.6 | 1,532                | 5,026 |
| 13          | 55.4 | 1,458                | 4,784 | 43          | 109.4 | 1,534                | 5,033 |
| 14          | 57.2 | 1,462                | 4,797 | 44          | 111.2 | 1,535                | 5,036 |
| 15          | 59.0 | 1,465                | 4,807 | 45          | 113.0 | 1,536                | 5,040 |
| 16          | 60.8 | 1,469                | 4,820 | 46          | 114.8 | 1,538                | 5,046 |
| 17          | 62.6 | 1,472                | 4,830 | 47          | 116.6 | 1,539                | 5,049 |
| 18          | 64.4 | 1,476                | 4,843 | 48          | 118.4 | 1,540                | 5,053 |
| 19          | 66.2 | 1,479                | 4,853 | 49          | 120.2 | 1,541                | 5,056 |
| 20          | 68.0 | 1,482                | 4,862 | 50          | 122.0 | 1,543                | 5,063 |
| 21          | 69.8 | 1,485                | 4,872 | 51          | 123.8 | 1,543                | 5,063 |
| 22          | 71.6 | 1,488                | 4,882 | 52          | 125.6 | 1,544                | 5,066 |
| 23          | 73.4 | 1,491                | 4,892 | 53          | 127.4 | 1,545                | 5,069 |
| 24          | 75.2 | 1,493                | 4,899 | 54          | 129.2 | 1,546                | 5,072 |
| 25          | 77.0 | 1,496                | 4,908 | 55          | 131.0 | 1,547                | 5,076 |
| 26          | 78.8 | 1,499                | 4,918 | 56          | 132.8 | 1,548                | 5,079 |
| 27          | 80.6 | 1,501                | 4,925 | 57          | 134.6 | 1,548                | 5,079 |
| 28          | 82.4 | 1,504                | 4,935 | 58          | 136.4 | 1,549                | 5,082 |
| 29          | 84.2 | 1,506                | 4,941 | 59          | 138.2 | 1,550                | 5,086 |
| 30          | 86.0 | 1,509                | 4,951 | 60          | 140.0 | 1,550                | 5,086 |

Table 3: Sound Speeds in Water at Selected Temperatures (cont.)

| Temperature |       | Sound Speed in Water |       | Temperature |       | Sound Speed in Water |       |
|-------------|-------|----------------------|-------|-------------|-------|----------------------|-------|
| °C          | °F    | m/s                  | ft/s  | °C          | °F    | m/s                  | ft/s  |
| 61          | 141.8 | 1,551                | 5,089 | 96          | 204.8 | 1,546                | 5,072 |
| 62          | 143.6 | 1,552                | 5,092 | 97          | 206.6 | 1,545                | 5,069 |
| 63          | 145.4 | 1,552                | 5,092 | 98          | 208.4 | 1,544                | 5,066 |
| 64          | 147.2 | 1,553                | 5,095 | 99          | 210.2 | 1,543                | 5,063 |
| 65          | 149.0 | 1,553                | 5,095 | 100         | 212.0 | 1,543                | 5,063 |
| 66          | 150.8 | 1,553                | 5,095 | 104         | 220.0 | 1,538                | 5,046 |
| 67          | 152.6 | 1,554                | 5,099 | 110         | 230.0 | 1,532                | 5,026 |
| 68          | 154.4 | 1,554                | 5,099 | 116         | 240.0 | 1,524                | 5,000 |
| 69          | 156.2 | 1,554                | 5,099 | 121         | 250.0 | 1,526                | 5,007 |
| 70          | 158.0 | 1,554                | 5,099 | 127         | 260.0 | 1,507                | 4,944 |
| 71          | 159.8 | 1,554                | 5,099 | 132         | 270.0 | 1,497                | 4,912 |
| 72          | 161.6 | 1,555                | 5,102 | 138         | 280.0 | 1,487                | 4,879 |
| 73          | 163.4 | 1,555                | 5,102 | 143         | 290.0 | 1,476                | 4,843 |
| 74          | 165.2 | 1,555                | 5,102 | 149         | 300.0 | 1,465                | 4,807 |
| 75          | 167.0 | 1,555                | 5,102 | 154         | 310.0 | 1,453                | 4,767 |
| 76          | 168.8 | 1,555                | 5,102 | 160         | 320.0 | 1,440                | 4,725 |
| 77          | 170.6 | 1,554                | 5,099 | 166         | 330.0 | 1,426                | 4,679 |
| 78          | 172.4 | 1,554                | 5,099 | 171         | 340.0 | 1,412                | 4,633 |
| 79          | 174.2 | 1,554                | 5,099 | 177         | 350.0 | 1,398                | 4,587 |
| 80          | 176.0 | 1,554                | 5,099 | 182         | 360.0 | 1,383                | 4,538 |
| 81          | 177.8 | 1,554                | 5,099 | 188         | 370.0 | 1,368                | 4,488 |
| 82          | 179.6 | 1,553                | 5,095 | 193         | 380.0 | 1,353                | 4,439 |
| 83          | 181.4 | 1,553                | 5,095 | 199         | 390.0 | 1,337                | 4,387 |
| 84          | 183.2 | 1,553                | 5,095 | 204         | 400.0 | 1,320                | 4,331 |
| 85          | 185.0 | 1,552                | 5,092 | 210         | 410.0 | 1,302                | 4,272 |
| 86          | 186.8 | 1,552                | 5,092 | 216         | 420.0 | 1,283                | 4,210 |
| 87          | 188.6 | 1,552                | 5,092 | 221         | 430.0 | 1,264                | 4,147 |
| 88          | 190.4 | 1,551                | 5,089 | 227         | 440.0 | 1,244                | 4,082 |
| 89          | 192.2 | 1,551                | 5,089 | 232         | 450.0 | 1,220                | 4,003 |
| 90          | 194.0 | 1,550                | 5,086 | 238         | 460.0 | 1,200                | 3,937 |
| 91          | 195.8 | 1,549                | 5,082 | 243         | 470.0 | 1,180                | 3,872 |
| 92          | 197.6 | 1,549                | 5,082 | 249         | 480.0 | 1,160                | 3,806 |
| 93          | 199.4 | 1,548                | 5,079 | 254         | 490.0 | 1,140                | 3,740 |
| 94          | 201.2 | 1,547                | 5,076 | 260         | 500.0 | 1,110                | 3,642 |
| 95          | 203.0 | 1,547                | 5,076 |             |       |                      |       |

## Pipe Size Data

In Table 4 below:

**A** is ANSI B 36.10 Steel pipe nominal wall thickness designation.**B** is ANSI B 36.10 Steel pipe schedule numbers.**C** is ANSI B 36.19 Stainless steel pipe schedule numbers.

Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe

| Nominal Pipe Size (in.) | Outside Diameter (in.) | Wall Thickness (in.) | A                                     | B                               | C                                  |
|-------------------------|------------------------|----------------------|---------------------------------------|---------------------------------|------------------------------------|
|                         |                        |                      | Carbon Steel<br>Wall Thickness Desig. | Carbon Steel<br>Schedule Number | Stainless Steel<br>Schedule Number |
| 1/8                     | 0.405                  | 0.049                | -                                     | -                               | 10S                                |
|                         |                        | 0.068                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.095                | XS                                    | 80                              | 80S                                |
| 1/4                     | 0.540                  | 0.065                | -                                     | -                               | 10S                                |
|                         |                        | 0.088                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.119                | XS                                    | 80                              | 80S                                |
| 3/8                     | 0.675                  | 0.065                | -                                     | -                               | 10S                                |
|                         |                        | 0.091                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.126                | XS                                    | 80                              | 80S                                |
| 1/2                     | 0.840                  | 0.065                | -                                     | -                               | 5S                                 |
|                         |                        | 0.083                | -                                     | -                               | 10S                                |
|                         |                        | 0.109                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.147                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.187                | -                                     | 160                             | -                                  |
| 3/4                     | 1.050                  | 0.065                | -                                     | -                               | 5S                                 |
|                         |                        | 0.083                | -                                     | -                               | 10S                                |
|                         |                        | 0.113                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.154                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.218                | -                                     | 160                             | -                                  |
| 1                       | 1.315                  | 0.065                | -                                     | -                               | 5S                                 |
|                         |                        | 0.109                | -                                     | -                               | 10S                                |
|                         |                        | 0.133                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.179                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.250                | -                                     | 160                             | -                                  |
| 1 1/4                   | 1.660                  | 0.065                | -                                     | -                               | 5S                                 |
|                         |                        | 0.109                | -                                     | -                               | 10S                                |
|                         |                        | 0.140                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.191                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.250                | -                                     | 160                             | -                                  |
| 1 1/2                   | 1.900                  | 0.065                | -                                     | -                               | 5S                                 |
|                         |                        | 0.109                | -                                     | -                               | 10S                                |
|                         |                        | 0.145                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.200                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.281                | -                                     | 160                             | -                                  |
|                         |                        | 0.400                | XXS                                   | -                               | -                                  |
| Nominal Pipe Size (in.) | Outside Diameter (in.) | Wall Thickness (in.) | A                                     | B                               | C                                  |
|                         |                        |                      | Carbon Steel<br>Wall Thickness Desig. | Carbon Steel<br>Schedule Number | Stainless Steel<br>Schedule Number |
| 2                       | 2.375                  | 0.065                | -                                     | -                               | 5S                                 |
|                         |                        | 0.109                | -                                     | -                               | 10S                                |
|                         |                        | 0.154                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.218                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.344                | -                                     | 160                             | -                                  |
| 2 1/2                   | 2.875                  | 0.083                | -                                     | -                               | 5S                                 |
|                         |                        | 0.120                | -                                     | -                               | 10S                                |
|                         |                        | 0.203                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.276                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.375                | -                                     | 160                             | -                                  |
| 3                       | 3.500                  | 0.083                | -                                     | -                               | 5S                                 |
|                         |                        | 0.120                | -                                     | -                               | 10S                                |
|                         |                        | 0.216                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.300                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.438                | -                                     | 160                             | -                                  |
| 3 1/2                   | 4.000                  | 0.083                | -                                     | -                               | 5S                                 |
|                         |                        | 0.120                | -                                     | -                               | 10S                                |
|                         |                        | 0.226                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.318                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.636                | XXS                                   | -                               | -                                  |
| 4                       | 4.500                  | 0.083                | -                                     | -                               | 5S                                 |
|                         |                        | 0.120                | -                                     | -                               | 10S                                |
|                         |                        | 0.237                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.337                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.438                | -                                     | 120                             | -                                  |
| 5                       | 5.536                  | 0.083                | -                                     | -                               | 5S                                 |
|                         |                        | 0.120                | -                                     | -                               | 10S                                |
|                         |                        | 0.237                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.337                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.438                | -                                     | 120                             | -                                  |
| 5                       | 5.536                  | 0.109                | -                                     | -                               | 5S                                 |
|                         |                        | 0.134                | -                                     | -                               | 10S                                |
|                         |                        | 0.258                | STD                                   | 40                              | 40S                                |
|                         |                        | 0.375                | XS                                    | 80                              | 80S                                |
|                         |                        | 0.500                | -                                     | 120                             | -                                  |
| 5                       | 5.536                  | 0.625                | -                                     | 160                             | -                                  |
|                         |                        | 0.750                | XXS                                   | -                               | -                                  |

**Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe (cont.)**

| Nominal Pipe Size (in.) | Outside Diameter (in.) | Wall Thickness (in.) | A                     | B               | C               | Nominal Pipe Size (in.) | Outside Diameter (in.) | Wall Thickness (in.) | A                     | B               | C               |     |
|-------------------------|------------------------|----------------------|-----------------------|-----------------|-----------------|-------------------------|------------------------|----------------------|-----------------------|-----------------|-----------------|-----|
|                         |                        |                      | Carbon Steel          | Carbon Steel    | Stainless Steel |                         |                        |                      | Carbon Steel          | Carbon Steel    | Stainless Steel |     |
|                         |                        |                      | Wall Thickness Desig. | Schedule Number | Schedule Number |                         |                        |                      | Wall Thickness Desig. | Schedule Number | Schedule Number |     |
| 6                       | 6.625                  | 0.109                | -                     | -               | 5S              | 14                      | 14.000                 | 0.156                | -                     | -               | 5S              |     |
|                         |                        | 0.134                | -                     | -               | 10S             |                         |                        | 0.188                | -                     | -               | 10S             |     |
|                         |                        | 0.280                | STD                   | 40              | 40S             |                         |                        | 0.250                | -                     | 10              | -               |     |
|                         |                        | 0.432                | XS                    | 80              | 80S             |                         |                        | 0.312                | -                     | 20              | -               |     |
|                         |                        | 0.562                | -                     | 120             | -               |                         |                        | 0.375                | STD                   | 30              | -               |     |
|                         |                        | 0.719                | -                     | 160             | -               |                         |                        | 0.438                | -                     | 40              | -               |     |
|                         |                        | 0.864                | XXS                   | -               | -               |                         |                        | 0.500                | XS                    | -               | -               |     |
| 8                       | 8.625                  | 0.109                | -                     | -               | 5S              |                         |                        | 0.594                | -                     | 60              | -               |     |
|                         |                        | 0.148                | -                     | -               | 10S             |                         |                        | 0.625                | XXS                   | -               | -               |     |
|                         |                        | 0.250                | -                     | 20              | -               |                         |                        | 0.750                | -                     | 80              | -               |     |
|                         |                        | 0.277                | -                     | 30              | -               |                         |                        | 0.938                | -                     | 100             | -               |     |
|                         |                        | 0.322                | STD                   | 40              | 40S             |                         |                        | 1.094                | -                     | 120             | -               |     |
|                         |                        | 0.406                | -                     | 60              | -               |                         |                        | 1.250                | -                     | 140             | -               |     |
|                         |                        | 0.500                | XS                    | 80              | 80S             |                         |                        | 1.406                | -                     | 160             | -               |     |
|                         |                        | 0.594                | -                     | 100             | -               |                         | 16                     | 16.000               | 0.165                 | -               | -               | 5S  |
|                         |                        | 0.719                | -                     | 120             | -               |                         |                        |                      | 0.188                 | -               | -               | 10S |
|                         |                        | 0.812                | -                     | 140             | -               |                         |                        |                      | 0.250                 | -               | 10              | -   |
| 0.875                   | XXS                    | -                    | -                     | 0.312           | -               |                         |                        |                      | 20                    | -               |                 |     |
| 0.906                   | -                      | 160                  | -                     | 0.375           | STD             |                         |                        |                      | 30                    | -               |                 |     |
| 10                      | 10.750                 | 0.134                | -                     | -               | 5S              |                         |                        |                      | 0.500                 | XS              | 40              | -   |
|                         |                        | 0.165                | -                     | -               | 10S             |                         |                        |                      | 0.656                 | -               | 60              | -   |
|                         |                        | 0.250                | -                     | 20              | -               | 0.844                   |                        |                      | -                     | 80              | -               |     |
|                         |                        | 0.307                | -                     | 30              | -               | 1.031                   |                        |                      | -                     | 100             | -               |     |
|                         |                        | 0.365                | STD                   | 40              | 40S             | 1.219                   |                        |                      | -                     | 120             | -               |     |
|                         |                        | 0.500                | XS                    | 60              | 80S             | 1.439                   | -                      | 140                  | -                     |                 |                 |     |
|                         |                        | 0.594                | -                     | 80              | -               | 1.594                   | -                      | 160                  | -                     |                 |                 |     |
|                         |                        | 0.719                | -                     | 100             | -               | 18                      | 18.000                 | 0.165                | -                     | -               | 5S              |     |
|                         |                        | 0.844                | -                     | 120             | -               |                         |                        | 0.188                | -                     | -               | 10S             |     |
|                         |                        | 1.000                | XXS                   | 140             | -               |                         |                        | 0.250                | -                     | 10              | -               |     |
| 12                      | 12.750                 | 0.156                | -                     | -               | 5S              |                         |                        | 0.312                | -                     | 20              | -               |     |
|                         |                        | 0.180                | -                     | -               | 10S             |                         |                        | 0.375                | STD                   | -               | -               |     |
|                         |                        | 0.250                | -                     | 20              | -               |                         |                        | 0.438                | -                     | 30              | -               |     |
|                         |                        | 0.330                | -                     | 30              | -               |                         |                        | 0.500                | XS                    | -               | -               |     |
|                         |                        | 0.375                | STD                   | -               | 40S             |                         |                        | 0.562                | -                     | 40              | -               |     |
|                         |                        | 0.406                | -                     | 40              | -               |                         |                        | 0.750                | -                     | 60              | -               |     |
|                         |                        | 0.500                | XS                    | -               | 80S             |                         |                        | 0.938                | -                     | 80              | -               |     |
|                         |                        | 0.562                | -                     | 60              | -               |                         |                        | 1.156                | -                     | 100             | -               |     |
|                         |                        | 0.688                | -                     | 80              | -               |                         |                        | 1.375                | -                     | 120             | -               |     |
|                         |                        | 0.844                | -                     | 100             | -               |                         |                        | 1.562                | -                     | 140             | -               |     |
|                         |                        | 1.000                | XXS                   | 120             | -               |                         |                        | 1.781                | -                     | 160             | -               |     |
|                         |                        | 1.125                | -                     | 140             | -               |                         |                        |                      |                       |                 |                 |     |
|                         |                        | 1.312                | -                     | 160             | -               |                         |                        |                      |                       |                 |                 |     |

**Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe (cont.)**

| Nominal Pipe Size (in.) | Outside Diameter (in.) | Wall Thickness (in.) | A                     | B               | C               | Nominal Pipe Size (in.) | Outside Diameter (in.) | Wall Thickness (in.) | A                     | B               | C               |
|-------------------------|------------------------|----------------------|-----------------------|-----------------|-----------------|-------------------------|------------------------|----------------------|-----------------------|-----------------|-----------------|
|                         |                        |                      | Carbon Steel          | Carbon Steel    | Stainless Steel |                         |                        |                      | Carbon Steel          | Carbon Steel    | Stainless Steel |
|                         |                        |                      | Wall Thickness Desig. | Schedule Number | Schedule Number |                         |                        |                      | Wall Thickness Desig. | Schedule Number | Schedule Number |
| 20                      | 20.000                 | 0.188                | -                     | -               | 5S              | 30                      | 30.000                 | 0.250                | -                     | -               | 5S              |
|                         |                        | 0.218                | -                     | -               | 10S             |                         |                        | 0.312                | -                     | 10              | 10S             |
|                         |                        | 0.250                | -                     | 10              | -               |                         |                        | 0.375                | STD                   | -               | -               |
|                         |                        | 0.375                | STD                   | 20              | -               |                         |                        | 0.500                | XS                    | 20              | -               |
|                         |                        | 0.500                | XS                    | 30              | -               |                         |                        | 0.625                | -                     | 30              | -               |
|                         |                        | 0.594                | -                     | 40              | -               |                         |                        | 0.750                | -                     | 40              | -               |
|                         |                        | 0.812                | -                     | 60              | -               |                         |                        | 32                   | 32.000                | 0.312           | -               |
|                         |                        | 1.031                | -                     | 80              | -               | 0.375                   | STD                    |                      |                       | -               | -               |
|                         |                        | 1.281                | -                     | 100             | -               | 0.500                   | XS                     |                      |                       | 20              | -               |
|                         |                        | 1.500                | -                     | 120             | -               | 0.625                   | -                      |                      |                       | 30              | -               |
|                         |                        | 1.750                | -                     | 140             | -               | 0.688                   | -                      | 40                   | -                     |                 |                 |
| 1.969                   | -                      | 160                  | -                     | 34              | 34.000          | 0.344                   | -                      | 10                   | -                     |                 |                 |
| 22                      | 22.000                 | 0.188                | -                     |                 |                 | -                       | 5S                     | 0.375                | STD                   | -               | -               |
|                         |                        | 0.218                | -                     |                 |                 | -                       | 10S                    | 0.500                | XS                    | 20              | -               |
|                         |                        | 0.250                | -                     |                 |                 | 10                      | -                      | 0.625                | -                     | 30              | -               |
|                         |                        | 0.375                | STD                   |                 |                 | 20                      | -                      | 0.688                | -                     | 40              | -               |
|                         |                        | 0.500                | XS                    | 30              | -               | 36                      | 36.000                 | 0.312                | -                     | 10              | -               |
|                         |                        | 0.875                | -                     | 60              | -               |                         |                        | 0.375                | STD                   | -               | -               |
|                         |                        | 1.125                | -                     | 80              | -               |                         |                        | 0.500                | XS                    | 20              | -               |
|                         |                        | 1.375                | -                     | 100             | -               |                         |                        | 0.625                | -                     | 30              | -               |
|                         |                        | 1.625                | -                     | 120             | -               |                         |                        | 0.750                | -                     | 40              | -               |
|                         |                        | 1.875                | -                     | 140             | -               | 42                      | 42.000                 | 0.375                | STD                   | -               | -               |
|                         |                        | 2.125                | -                     | 160             | -               |                         |                        | 0.500                | XS                    | 20              | -               |
| 24                      | 24.000                 | 0.218                | -                     | -               | 5S              |                         |                        | 0.625                | -                     | 30              | -               |
|                         |                        | 0.250                | -                     | 10              | 10S             | 0.750                   | -                      | 40                   | -                     |                 |                 |
|                         |                        | 0.375                | STD                   | 20              | -               | 48                      | 48.000                 | 0.375                | STD                   | -               | -               |
|                         |                        | 0.500                | XS                    | -               | -               |                         |                        | 0.500                | XS                    | -               | -               |
|                         |                        | 0.562                | -                     | 30              | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 0.688                | -                     | 40              | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 0.969                | -                     | 60              | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 1.219                | -                     | 80              | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 1.531                | -                     | 100             | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 1.812                | -                     | 120             | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 2.062                | -                     | 140             | -               |                         |                        |                      |                       |                 |                 |
| 2.344                   | -                      | 160                  | -                     |                 |                 |                         |                        |                      |                       |                 |                 |
| 26                      | 26.000                 | 0.312                | -                     | 10              | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 0.375                | STD                   | -               | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 0.500                | XS                    | 20              | -               |                         |                        |                      |                       |                 |                 |
| 28                      | 28.000                 | 0.312                | -                     | 10              | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 0.375                | STD                   | -               | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 0.500                | XS                    | 20              | -               |                         |                        |                      |                       |                 |                 |
|                         |                        | 0.625                | -                     | 30              | -               |                         |                        |                      |                       |                 |                 |



**Table 5: Cast Iron Pipe Data - Standard Classes**

| Nominal Pipe Size (in.) | Class A                |                      | Class B                |                      | Class C                |                      | Class D                |                      |
|-------------------------|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|
|                         | Outside Diameter (in.) | Wall Thickness (in.) | Outside Diameter (in.) | Wall Thickness (in.) | Outside Diameter (in.) | Wall Thickness (in.) | Outside Diameter (in.) | Wall Thickness (in.) |
| 3                       | 3.80                   | 0.39                 | 3.96                   | 0.42                 | 3.96                   | 0.45                 | 3.96                   | 0.48                 |
| 4                       | 4.80                   | 0.42                 | 5.00                   | 0.45                 | 5.00                   | 0.40                 | 5.00                   | 0.52                 |
| 6                       | 6.90                   | 0.44                 | 7.10                   | 0.48                 | 7.10                   | 0.51                 | 7.10                   | 0.55                 |
| 8                       | 9.05                   | 0.46                 | 9.05                   | 0.51                 | 9.30                   | 0.56                 | 9.30                   | 0.60                 |
| 10                      | 11.10                  | 0.50                 | 11.10                  | 0.57                 | 11.40                  | 0.62                 | 11.40                  | 0.68                 |
| 12                      | 13.20                  | 0.54                 | 13.20                  | 0.62                 | 13.50                  | 0.68                 | 13.50                  | 0.75                 |
| 14                      | 15.30                  | 0.57                 | 15.30                  | 0.66                 | 15.65                  | 0.74                 | 15.65                  | 0.82                 |
| 16                      | 17.40                  | 0.60                 | 17.40                  | 0.70                 | 17.80                  | 0.80                 | 17.80                  | 0.89                 |
| 18                      | 19.50                  | 0.64                 | 19.50                  | 0.75                 | 19.92                  | 0.87                 | 19.92                  | 0.96                 |
| 20                      | 21.60                  | 0.67                 | 21.60                  | 0.80                 | 22.06                  | 0.92                 | 22.06                  | 1.03                 |
| 24                      | 25.80                  | 0.76                 | 25.80                  | 0.89                 | 26.32                  | 1.05                 | 26.32                  | 1.16                 |
| 30                      | 31.74                  | 0.88                 | 32.00                  | 1.03                 | 32.40                  | 1.20                 | 32.74                  | 1.37                 |
| 32                      | 37.96                  | 0.99                 | 38.30                  | 1.15                 | 38.70                  | 1.36                 | 39.16                  | 1.58                 |
| 42                      | 44.20                  | 1.10                 | 44.50                  | 1.28                 | 45.10                  | 1.54                 | 45.58                  | 1.78                 |
| 48                      | 50.50                  | 1.26                 | 50.80                  | 1.42                 | 51.40                  | 1.71                 | 51.98                  | 1.99                 |
| 54                      | 56.66                  | 1.35                 | 57.10                  | 1.55                 | 57.80                  | 1.90                 | 58.40                  | 2.23                 |
| 60                      | 62.80                  | 1.39                 | 63.40                  | 1.67                 | 64.20                  | 2.00                 | 64.82                  | 2.38                 |
| 72                      | 75.34                  | 1.62                 | 76.00                  | 1.95                 | 76.88                  | 2.39                 |                        |                      |
| 84                      | 87.54                  | 1.72                 | 88.54                  | 2.22                 |                        |                      |                        |                      |

| Nominal Pipe Size (in.) | Class E                |                      | Class F                |                      | Class G                |                      | Class H                |                      |
|-------------------------|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|
|                         | Outside Diameter (in.) | Wall Thickness (in.) | Outside Diameter (in.) | Wall Thickness (in.) | Outside Diameter (in.) | Wall Thickness (in.) | Outside Diameter (in.) | Wall Thickness (in.) |
| 3                       |                        |                      |                        |                      |                        |                      |                        |                      |
| 4                       |                        |                      |                        |                      |                        |                      |                        |                      |
| 6                       | 7.22                   | 0.58                 | 7.22                   | 0.61                 | 7.38                   | 0.65                 | 7.38                   | 0.69                 |
| 8                       | 9.42                   | 0.66                 | 9.42                   | 0.66                 | 9.60                   | 0.75                 | 9.60                   | 0.80                 |
| 10                      | 11.60                  | 0.74                 | 11.60                  | 0.80                 | 11.84                  | 0.86                 | 11.84                  | 0.92                 |
| 12                      | 13.78                  | 0.82                 | 13.78                  | 0.89                 | 14.08                  | 0.97                 | 14.08                  | 1.04                 |
| 14                      | 15.98                  | 0.90                 | 15.98                  | 0.99                 | 16.32                  | 1.07                 | 16.32                  | 1.16                 |
| 16                      | 18.16                  | 0.90                 | 18.16                  | 1.08                 | 18.54                  | 1.18                 | 18.54                  | 1.27                 |
| 18                      | 20.34                  | 1.07                 | 20.34                  | 1.17                 | 20.78                  | 1.28                 | 20.78                  | 1.39                 |
| 20                      | 22.54                  | 1.15                 | 22.54                  | 1.27                 | 23.02                  | 1.39                 | 23.02                  | 1.51                 |
| 24                      | 26.90                  | 1.31                 | 26.90                  | 1.45                 | 27.76                  | 1.75                 | 27.76                  | 1.88                 |
| 30                      | 33.10                  | 1.55                 | 33.46                  | 1.73                 |                        |                      |                        |                      |
| 32                      | 39.60                  | 1.80                 | 40.04                  | 2.02                 |                        |                      |                        |                      |
| 42                      |                        |                      |                        |                      |                        |                      |                        |                      |
| 48                      |                        |                      |                        |                      |                        |                      |                        |                      |
| 54                      |                        |                      |                        |                      |                        |                      |                        |                      |
| 60                      |                        |                      |                        |                      |                        |                      |                        |                      |
| 72                      |                        |                      |                        |                      |                        |                      |                        |                      |
| 84                      |                        |                      |                        |                      |                        |                      |                        |                      |

Table 6: Ductile Iron Pipe Data - Standard Classes

| Nominal<br>Pipe Size<br>(in.) | Outside<br>Diameter<br>(in.) | Pipe Wall Thickness (in.) |             |             |             |             |             |             |
|-------------------------------|------------------------------|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                               |                              | Class<br>50               | Class<br>51 | Class<br>52 | Class<br>53 | Class<br>54 | Class<br>55 | Class<br>56 |
| 3                             | 3.96                         |                           | 0.25        | 0.28        | 0.31        | 0.43        | 0.37        | 0.40        |
| 4                             | 4.80                         |                           | 0.26        | 0.29        | 0.32        | 0.35        | 0.38        | 0.41        |
| 6                             | 6.90                         | 0.25                      | 0.28        | 0.31        | 0.34        | 0.37        | 0.40        | 0.43        |
| 8                             | 9.05                         | 0.27                      | 0.30        | 0.33        | 0.36        | 0.39        | 0.42        | 0.45        |
| 10                            | 11.10                        | 0.29                      | 0.32        | 0.35        | 0.38        | 0.44        | 0.47        |             |
| 12                            | 13.20                        | 0.31                      | 0.34        | 0.37        | 0.40        | 0.43        | 0.46        | 0.49        |
| 14                            | 15.30                        | 0.33                      | 0.36        | 0.39        | 0.42        | 0.45        | 0.48        | 0.51        |
| 16                            | 17.40                        | 0.34                      | 0.37        | 0.40        | 0.43        | 0.46        | 0.49        | 0.52        |
| 18                            | 19.50                        | 0.35                      | 0.38        | 0.41        | 0.44        | 0.47        | 0.50        | 0.53        |
| 20                            | 21.60                        | 0.36                      | 0.39        | 0.42        | 0.45        | 0.48        | 0.51        | 0.54        |
| 24                            | 25.80                        | 0.38                      | 0.41        | 0.44        | 0.47        | 0.50        | 0.53        | 0.56        |
| 30                            | 32.00                        |                           |             |             | 0.51        | 0.55        | 0.59        | 0.63        |
| 36                            | 38.30                        |                           |             |             | 0.58        | 0.63        | 0.68        | 0.73        |
| 42                            | 44.50                        |                           |             |             | 0.65        | 0.71        | 0.77        | 0.83        |
| 48                            | 50.80                        |                           |             |             | 0.72        | 0.79        | 0.86        | 0.93        |
| 54                            | 57.10                        |                           |             |             | 0.81        | 0.89        | 0.97        | 1.05        |



**USA**

221 Crescent St., Suite 1  
Waltham, MA 02453-3497  
Telephone: 781-899-2719  
Toll-free: 800-833-9438  
Fax: 781-894-8582  
E-mail: [panametrics@ge.com](mailto:panametrics@ge.com)  
Web: [www.gesensing.com](http://www.gesensing.com)

**Ireland**

Shannon Industrial Estate  
Shannon, County Clare  
Ireland  
Telephone: 353-61-470200  
Fax: 353-61-471359  
E-mail: [info@panametrics.ie](mailto:info@panametrics.ie)

