

| ELASTOMER PHYSICAL AND CHEMICAL PROPERTIES COMPARISON                                                                                |                         |                                       |                                           |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------|-------------------------------------------|-------------------------------|------------------------------------------|--------------------------------------|---------------------------------------|-----------------------------------------------------------------------|-------------------------------------------|----------------------------------------------|-----------------------------------------------|
| <div>RATING</div> <div>SCALE</div> <div>CODE</div>                                                                                   | 7                       | -                                     | Outstanding                               |                               |                                          |                                      |                                       | LIST OF ELASTOMERS<br>USED IN EXPANSION<br>JOINTS AND RUBBER<br>PIPES |                                           |                                              |                                               |
|                                                                                                                                      | 6                       | -                                     | Excellent                                 |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
|                                                                                                                                      | 5                       | -                                     | Very Good                                 |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
|                                                                                                                                      | 4                       | -                                     | Good                                      |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
|                                                                                                                                      | 3                       | -                                     | Fair to Good                              |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
|                                                                                                                                      | 2                       | -                                     | Fair                                      |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
|                                                                                                                                      | 1                       | -                                     | Poor to Fair                              |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
|                                                                                                                                      | 0                       | -                                     | Poor                                      |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
|                                                                                                                                      | X                       | -                                     | Contact MDC                               |                               |                                          |                                      |                                       |                                                                       |                                           |                                              |                                               |
| <div><br/>COMMON NAME CHEMICAL<br/>GROUP NAME</div> | NEOPRENE<br>Chloroprene | GUM RUBBER<br>Polyisoprene, Synthetic | NATURAL RUBBER<br>Polyisoprene, Synthetic | BUTYL<br>Isobututene-Isoprene | CHLOROBUTYL<br>Chloro-Isobutene-Isoprene | BUNA-N / NITRILE<br>Nitril-Butadiene | SBR /GRS /BUNA-S<br>Styrene-Butadiene | HYPALON<br>Chloro-Sulfonyl-Polyethylene                               | VITON / FLUOREL<br>Fluorocarbon Elastomer | EPDM<br>Ethylene-Propylene-Diene- Terpolymer | TEFLON / TFE /FEP<br>Fluoro-Ethylene-Polymers |
| ANSI /ASTM MATERIAL<br>DESIGNATION                                                                                                   | CR                      | NR                                    | IR                                        | IIR                           | CIIR                                     | NBR                                  | SBR                                   | CSM                                                                   | FKM                                       | EPR                                          | AFMU                                          |
| Ozone                                                                                                                                | 5                       | 0                                     | 0                                         | 6                             | 6                                        | 2                                    | 0                                     | 7                                                                     | 7                                         | 7                                            | 7                                             |
| Weather                                                                                                                              | 6                       | 2                                     | 2                                         | 5                             | 5                                        | 2                                    | 2                                     | 6                                                                     | 7                                         | 6                                            | 7                                             |
| Sunlight                                                                                                                             | 5                       | 0                                     | 0                                         | 5                             | 5                                        | 0                                    | 0                                     | 7                                                                     | 7                                         | 7                                            | 7                                             |
| Oxidation                                                                                                                            | 5                       | 4                                     | 4                                         | 6                             | 6                                        | 4                                    | 2                                     | 6                                                                     | 7                                         | 6                                            | 7                                             |
| Heat                                                                                                                                 | 4                       | 2                                     | 2                                         | 5                             | 5                                        | 4                                    | 3                                     | 4                                                                     | 7                                         | 6                                            | 7                                             |
| Cold                                                                                                                                 | 4                       | 5                                     | 5                                         | 4                             | 4                                        | 3                                    | 5                                     | 4                                                                     | 2                                         | 5                                            | X                                             |
| Flame                                                                                                                                | 4                       | 0                                     | 0                                         | 0                             | 0                                        | 0                                    | 0                                     | 4                                                                     | 6                                         | 0                                            | X                                             |
| Tear                                                                                                                                 | 4                       | 5                                     | 5                                         | 4                             | 4                                        | 3                                    | 3                                     | 3                                                                     | 2                                         | 4                                            | X                                             |
| Abrasion                                                                                                                             | 5                       | 7                                     | 6                                         | 4                             | 4                                        | 4                                    | 5                                     | 4                                                                     | 5                                         | 5                                            | 4                                             |
| Imermeability                                                                                                                        | 4                       | 2                                     | 2                                         | 6                             | 6                                        | 4                                    | 2                                     | 4                                                                     | 5                                         | 4                                            | X                                             |
| Dynamic                                                                                                                              | 2                       | 6                                     | 2                                         | 2                             | 2                                        | 5                                    | 4                                     | 2                                                                     | 5                                         | 5                                            | X                                             |
| Rebound-Hot                                                                                                                          | 5                       | 6                                     | 6                                         | 5                             | 5                                        | 4                                    | 4                                     | 4                                                                     | 4                                         | 6                                            | X                                             |
| Rebound-Cold                                                                                                                         | 4                       | 6                                     | 6                                         | 0                             | 0                                        | 4                                    | 4                                     | 2                                                                     | 2                                         | 6                                            | X                                             |
| Comp. Set                                                                                                                            | 2                       | 4                                     | 4                                         | 3                             | 3                                        | 5                                    | 4                                     | 2                                                                     | 6                                         | 4                                            | X                                             |
| Tensile Strength                                                                                                                     | 4                       | 6                                     | 4                                         | 4                             | 4                                        | 5                                    | 5                                     | 2                                                                     | 5                                         | 5                                            | X                                             |
| Dielectric Str.                                                                                                                      | 5                       | 6                                     | 6                                         | 5                             | 5                                        | 0                                    | 4                                     | 5                                                                     | 5                                         | 7                                            | X                                             |
| Ele. Insulation                                                                                                                      | 3                       | 5                                     | 5                                         | 5                             | 5                                        | 1                                    | 5                                     | 3                                                                     | 3                                         | 6                                            | X                                             |
| Water Absorbtion                                                                                                                     | 4                       | 5                                     | 5                                         | 5                             | 5                                        | 4                                    | 5                                     | 4                                                                     | 5                                         | 6                                            | 7                                             |
| Radiation                                                                                                                            | 5                       | 6                                     | 6                                         | 4                             | 4                                        | 5                                    | 6                                     | 5                                                                     | 5                                         | 7                                            | 3                                             |
| Swelling in Oil                                                                                                                      | 4                       | 0                                     | 0                                         | 0                             | 0                                        | 5                                    | 0                                     | 4                                                                     | 6                                         | 0                                            | 7                                             |
| Acid Diluted                                                                                                                         | 6                       | 3                                     | 3                                         | 6                             | 6                                        | 4                                    | 3                                     | 6                                                                     | 5                                         | 6                                            | 7                                             |
| Acid Concentrated                                                                                                                    | 4                       | 3                                     | 3                                         | 4                             | 4                                        | 4                                    | 3                                     | 4                                                                     | 6                                         | 4                                            | 7                                             |
| Alphatic Hydro.                                                                                                                      | 3                       | 0                                     | 0                                         | 0                             | 0                                        | 6                                    | 0                                     | 3                                                                     | 6                                         | 0                                            | 7                                             |
| Aromatic Hydro.                                                                                                                      | 2                       | 0                                     | 0                                         | 0                             | 0                                        | 4                                    | 0                                     | 2                                                                     | 6                                         | 0                                            | 7                                             |
| Oxygenated Hydro.                                                                                                                    | 1                       | 4                                     | 4                                         | 4                             | 4                                        | 0                                    | 4                                     | 1                                                                     | 0                                         | 6                                            | 7                                             |
| Lacquers                                                                                                                             | 0                       | 0                                     | 0                                         | 3                             | 3                                        | 2                                    | 0                                     | 3                                                                     | 1                                         | 3                                            | 7                                             |
| Oil & Gasoline                                                                                                                       | 4                       | 0                                     | 0                                         | 0                             | 0                                        | 5                                    | 0                                     | 4                                                                     | 6                                         | 0                                            | 7                                             |
| Alkali Diluted                                                                                                                       | 4                       | X                                     | X                                         | 4                             | 4                                        | 4                                    | 4                                     | 4                                                                     | 4                                         | 6                                            | 7                                             |
| Alkali Concentrated                                                                                                                  | 0                       | X                                     | X                                         | 4                             | 4                                        | 0                                    | 2                                     | 4                                                                     | 0                                         | 6                                            | 7                                             |
| Animal & Vegetable Oil                                                                                                               | 4                       | X                                     | X                                         | 5                             | 5                                        | 5                                    | X                                     | 4                                                                     | 6                                         | 5                                            | 7                                             |
| Chemical                                                                                                                             | 3                       | 3                                     | 3                                         | 6                             | 6                                        | 3                                    | 3                                     | 6                                                                     | 6                                         | 6                                            | 7                                             |
| Water                                                                                                                                | 4                       | 5                                     | 5                                         | 5                             | 5                                        | 4                                    | 5                                     | 5                                                                     | 5                                         | 5                                            | 7                                             |
| TEMP. LIMIT LOW (°F)                                                                                                                 | -50                     | -50                                   | -50                                       | -50                           | -50                                      | -30                                  | -50                                   | -50                                                                   | -10                                       | -50                                          | -150                                          |
| TEMP. LIMIT HIGH (°F)                                                                                                                | 230                     | 180                                   | 180                                       | 230                           | 250                                      | 230                                  | 180                                   | 230                                                                   | 400                                       | 300                                          | 450                                           |
| RADIATION RESISTANCE (r.)                                                                                                            | 6x10 <sup>7</sup>       | 1x10 <sup>8</sup>                     | 1x10 <sup>8</sup>                         | 3x10 <sup>6</sup>             | 3x10 <sup>6</sup>                        | 6x10 <sup>7</sup>                    | 8x10 <sup>7</sup>                     | 6x10 <sup>7</sup>                                                     | 1x10 <sup>5</sup>                         | 3x10 <sup>8</sup>                            | 8x10 <sup>5</sup>                             |

Nuclear radiation resistance of elastomers is expressed in exposure to Roentgen (r) units.

Source: FLUID SEALING ASSOCIATION - TECHNICAL HANDBOOK

(JMP-2010)