Wires are the basic building blocks of a wire rope. They lay around a “center” in a specified pattern in one or more layers to form a strand. The strands lay around a core to form a wire rope.

The strands provide all the tensile strength of a fiber core rope and over 90% of the strength of a typical 6-strand wire rope with an independent wire rope core.

Characteristics like fatigue resistance and resistance to abrasion are directly affected by the design of strands.

In most strands with two or more layers of wires, inner layers support outer layers in such a manner that all wires may slide and adjust freely when the rope bends.

As a general rule, a rope that has strands made up of a few large wires will be more abrasion resistant and less fatigue resistant than a rope of the same size made up of strands with many smaller wires. The basic strand constructions are illustrated at right.
**SINGLE LAYER**  The most common example of the single layer construction is a 7 wire strand. It has a single-wire center with six wires of the same diameter around it.

**SEALE**  This construction has two layers of wires around a center with the same number of wires in each layer. All wires in each layer are the same diameter. The strand is designed so that the large outer wires rest in the valleys between the smaller inner wires. Example: 19 Seale (1-9-9) strand.

**FILLER WIRE**  This construction has two layers of uniform-size wire around a center with the inner layer having half the number of wires as the outer layer. Small filler wires, equal in number to the inner layer, are laid in valleys of the inner layer. Example: 25 Filler Wire (1-6-6f-12) strand.

**WARRINGTON**  This construction has two layers of wires around a center with one diameter of wire in the inner layer, and two diameters of wire alternating large and small in the outer layer. The larger outer-layer wires rest in the valleys, and the smaller ones on the crowns, of the inner layer. Example: 19 Warrington [1-6-(6+6)].

**COMBINED PATTERNS**  When a strand is formed in a single operation using two or more of the above constructions, it is referred to as a “combined pattern.” This example is a Seale construction in its first two layers. The third layer utilizes the Warrington construction, and the outer layer is a Seale construction. It’s described as: 49 Seale Warrington Seale [1-8-8-(8+8)-16].
STANDARD ROPE CLASSIFICATIONS
All rope of the same size, grade and core in each classification have the same minimum breaking force and weight per foot. Different constructions within each classification differ in working characteristics. Consider these features whenever you’re selecting a rope for a specific application.

<table>
<thead>
<tr>
<th>Classification*</th>
<th>Wires per strand</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 x 7</td>
<td>7 through 15</td>
</tr>
<tr>
<td>6 x 19</td>
<td>16 through 26</td>
</tr>
<tr>
<td>6 x 36</td>
<td>27 through 49</td>
</tr>
<tr>
<td>6 x 61</td>
<td>50 through 74</td>
</tr>
</tbody>
</table>

*Classifications are the same in 7 and 8 strand wire ropes

SPECIAL ROPE CONSTRUCTIONS
Unusual operating conditions often require ropes of special design to better withstand stresses or environments that would seriously impair performance of more conventional designs. Ropes that may meet these needs include the following:

> FLEX-X® A special process that creates more strand surface area on the rope to help spread contact, decrease wear, reduce drum and sheave wear and extend service life. With greater surface area and more steel per diameter than conventional ropes, Flex-X provides higher strength and better wear resistance. Its high-density strands are compacted for extra strength and resistance to abrasion, crushing and bending fatigue.

> TUF-KOTE®/PFV® A plastic impregnated wire rope proven to provide longer service life and a cleaner operation. On the inside, top-of-the-line wire rope resists the demanding pressures of your job. The polymer is applied at high pressure to force the material into the rope, serving to cushion the strands, distribute internal stresses, keep in wire rope lubricant and keep out dirt and debris. On the outside, the engineered polymer plastic is designed to provide a cleaner operation and reduces wear on sheaves and drums.

> 7-FLEX® A rope construction that offers improved resistance to bending fatigue compared to a 6-strand rope of the same diameter due to a combination of the outer wire size and the seventh strand. The use of a 26 Warrington Seale (WS) strand construction provides a good balance of operating characteristics.
> **LOADSTAR™** Already a preferred rope for container cranes, LoadStar is now providing extended service life in carriage operations and other applications where multi-sheave equipment and rigorous duty cycles induce fatigue stresses.

> **TUF-MAX®** These shovel ropes are manufactured with an enhanced coating process that makes them more resistant to external rope wear and helps extend drum and sheave life.

> **POWERMAX™** An 8-strand wire rope created to provide operating characteristics essential to drag and hoist ropes. PowerMax is more fatigue resistant than 6-strand ropes of the same diameter, plus, its greater surface area puts more steel in touch with contact surfaces reducing wear and abrasion.

> **FLATTENED (TRIANGULAR) STRAND** These ropes feature “shaped” strands formed so they will close together to achieve greater metallic area in the rope’s cross-section and greater bearing surface for contact with sheaves and drums.

> **SWAGED ROPES** These ropes offer higher strength than standard ropes of the same diameter while providing greater resistance to drum crushing, scrubbing and similar surface wear. During manufacture, the rope is swaged to produce a compact cross-section with minimum voids and greater surface area.

**ROPE CORES FORM A FOUNDATION FOR THE STRANDS**

The primary function of the rope’s core is to serve as the foundation for the strands – to keep the rope round and the strands properly positioned during operation. Your choice of core will have an effect upon the rope’s performance.

**THREE TYPES OF CORES ARE COMMONLY USED:**

1. **FIBER CORE** Polypropylene is standard, but either natural sisal (or hemp) fiber or other man-made fibers are available on special request.

2. **INDEPENDENT WIRE ROPE CORE** Literally an independent wire rope with strands and a core, called IWRC. Most wire ropes made with steel core use an IWRC.

3. **STRAND CORE** A strand made of wires. Typically, strand cores are used in utility cables only.