Safe and Easy Installation Guide

March 2004

Multitube® Instrument Tubing

The World Standard
Unpacking Bundle

Care should be given to removing the protective wrap that is used to pack each bundle shipped. Sometimes this packing can be as simple as a plastic shrink-wrap material or as complex as wooden slats nailed between reel flanges.

The protective plastic wrap should be removed by uncoiling it from the bundle after the bundle has been placed up on jack stands. Knives or other sharp tools should not be used when removing this wrap; otherwise, possible damage could occur to the bundle if it is accidentally sliced.

If the reel is lagged with wooden slats between the flanges, these slats should be carefully removed from the flange using a crowbar. All nails that could get stuck in the flange should be removed. If the nails are not removed, the bundle could slide up against the nails during the uncoiling process, causing damage to the product.

The bundle end is normally taped or tied down and attached to the inside of the flange. The end should be cut free. The product is now ready for uncoiling.

Uncoiling and Straightening Bundle from Reel

Removing bundled tubing from a reel requires the use of nothing more than putting the reel onto a jack stand or an A-frame lifting device. (See Figure 1.)

The bundle can either be pulled over a mandrel or special roller guides to assist with straightening the product.

Pulling Bundle Off Reel

Tube bundles should be pulled from reels that are raised off the ground and free turning. Care should be taken to avoid kinks and excessively sharp bends. When pulling around corners, pulleys or wheels should be used that have a radius of at least ten times the diameter of the Multitube product being installed.

A two-man team should be used when uncoiling the product. One man should be stationed at the reel end to stop the reel from turning when the pulling tension is stopped. The other man should be stationed at the mandrel or pulley slowly guiding the product off the reel.

The outer cover of the tubing should be protected from welding sparks, hot slap or beads during and after installation. In areas where these are a problem, the

Figure 1

An idler helps in straightening Temptube as it comes off the delivery reel.

bundle jacket should be protected with a shield or appropriate cover.

Bending Tubes

Bending of the Parker Temptube can generally be done by hand when being installed in a cable tray or existing pipe racks.

If the 3000 series Temptube is to be installed in short lengths (5 – 25 ft.) in confined conditions where tight bends are required, either of the following methods may be used.

1. The tubing can be pre-bent according to routing requirements and installed.
2. The tubing can be positioned in approximate location and bent to exact routing requirements in place.

For lengths over 25 feet, Method 2 above is suggested.

Pre-bending may be accomplished with a properly-sized mandrel, a sliding shoe cable, or a thin-wall conduit bender. When bending in position, either of the benders may be used.

Figure 2

Workperson using a thin wall conduit bender with Temptube.
Pulling

The Pulling Force

Where pulling tension is small – for small diameter cables and short, uncomplicated runs – manpower is suitable. Where pulling tension is relatively high – for large diameter cables and long, obstructed runs – a pneumatic or electrical winch is best.

Particularly when pulling into conduit, the reel of tubing should be located at the end nearest the most bends in the run. This will result in lower pulling tension than would be encountered if the opposite procedure were followed.

Station one man at the reel end to stop the reel from turning when the pulling force is topped. If pulling into conduit, a man should be available at the feed-in end to apply a suitable lubricant. For PVC jacketed types, use lubricants such as Y-ER-EAS (Electroc Compound Company, Cleveland, Ohio) (See Appendix A, Lube Pull) or Wire Lube (Ideal Industries, Inc., Sycamore, Illinois), available from electrical supply houses.

Pulling Line Connection

The pulling line should be connected to the tube assembly by means of a Kellems grip (Kellems Division of Hubbell Inc., Stonington, Connecticut). These are available at most electrical supply houses (See Appendix A.3, “Kellems Grips”).

Allowable Pulling Tensions

The table below is a guide to help in determining maximum allowable pulling tensions.

Multiply the number of tubes in the assembly by the appropriate tension figure.

<table>
<thead>
<tr>
<th>Tube Size O.D.</th>
<th>Copper Tubes</th>
<th>Aluminum Tubes</th>
<th>Plastic Tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot;</td>
<td>150</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>250</td>
<td>150</td>
<td>35</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>350</td>
<td>270</td>
<td>50</td>
</tr>
</tbody>
</table>

Approximate Allowable Pulling Tension per Tube (in pounds)

Consideration should be given to the fact that extremes of tension may tend to flatten the tubes as they round corners, etc. The larger the tube diameter, the more important this becomes. Be sure to observe the minimum bending radius of ten times the tube assembly diameter during pulling operation. After pulling in, all cables finished with armor or PVC coverings can be bent safely to a radius of six times the O.D. of the cable. Most types can be bent more sharply if necessary. For minimum bending information on any specific construction, consult the Parflex Multitube Instrument and Heat trace Tubing Product Catalog 4200-M-1 or contact the Parflex Division.

Pulleys and Rollers

For rounding corners, a pulley installed in a manner similar to Appendix A.4, “Sheaves,” is recommended. And to facilitate passing over sharp edges that might damage the cable or obstructions that would cause undue tension, rollers can be employed. Both the pulleys and rollers can be rented at many electrical supply houses.

Eliminating Excess Slack

After pulling the desired length into position, secure the leading end of the cable firmly to the terminal structure. Working toward the let-off reel, secure the tubing to the support structure at proper intervals. As slack accumulates ahead of the secured points, it should be taken up back at let-off reel. The amount of slack to leave depends upon the method of support being used and upon the tubing material.

Specific recommendations for installation are described in the following pages.

Types of Installations

Channels or Trays

Horizontal Runs

Tubing assemblies may be laid loosely in trays or on racks without securing clamps or clips. The modest amount of “snaking” that occurs is sufficient to take care of normal expansion and contraction in copper or stainless steel tubing installations. Because of the relatively high coefficient of expansion of polyethylene, additional slack must be introduced. A good rule of thumb in plastic tubing installations is to provide 1 foot of slack for every 100 feet of tubing run. This will provide for contraction where the minimum temperature goes as far as 100°F below the installation temperature.

- Crisscrossing and overlapping should be kept to a minimum for non-insulated bundles.
- Tray covers should be installed where foot traffic is likely.
- Branch tubes should not be run over the top of a channel flange or tray edge.
• Insulated products, Parker Temptube®/Temptrace™ must have a 1/2 inch minimum spacing and should never be overlapped.

The flange or edge should first be cut away and all burrs removed before branch tubes are installed. Branch tubing should be anchored within 2 feet of the connection to the main cable to ensure that no strain is placed on the tube connection fitting.

**Vertical Drops**

Suitable clips, clamps or straps should be spaced not more than 6 feet apart. Where these are in contact with Multitube® jackets, they should be at least 1/2 inch wide to provide a suitable bearing surface. Where the support points are more than 6 feet apart, a Kellems grip or split blocks should be used.

Vertical drops up to 20 feet may be anchored at the top by a Kellems grip, “U” bolt, pipe clamp or similar fitting before entering the conduit. This is done in order to prevent the cable from working back into the conduit and exerting strain on the tube connection fittings. When installing the “U” bolt, etc., special care should be taken not to crush the tubes.

**Problem Area Guidelines**

- Runs having an elevation rise should be limited to 15 ft. for every 10 psi of steam pressure (4.5M per 0.7 bar).
- Steam supply lines and condensate return lines should be one size larger than the steam tracer.
- Temptube should be kept clear of hot surfaces; e.g., boilers, heat exchangers, steam headers and high pressure steam lines.
- Abide by recommended minimum bend radii, support centers and clearance of 12” between support and a directional change.
- Use wide surface clamping devices or strap ties.
- Allow separation of Temptube in clustered runs.
- Use long sweeping bends.
- Be sure to seal all exposed ends.
- Allow sloping for self-draining.
- Consider adding drip leg and steam trap at transition from steam supply to tracer if supply runs are long.

**Conduit Installations**

**General**

Runs should be made with a minimum of fittings. Bends are preferred to elbows, particularly on smaller sizes. Conduit which carries plastic tubing or metal tubing with a PVC jacket (plastic) should not be within 24 inches of any steam pipe, space heater or other source of heat with a surface temperature above 167°F.

Conduit should not be overloaded; this greatly increases pulling tension. If the run is not straight, the sum of the cross-sectional areas of the individual Multitube cables should be not more than 25% of the inside conduit cross-sectional area.

On straight, unobstructed runs, the sum of the cross-sectional areas of the individual Multitube cable should not exceed the percentages given in the following table.

<table>
<thead>
<tr>
<th>No. of Cables</th>
<th>Percent of Conduit Cross-Sectional Area Occupied by Cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60%</td>
</tr>
<tr>
<td>2</td>
<td>40%</td>
</tr>
<tr>
<td>3 or more</td>
<td>50%</td>
</tr>
</tbody>
</table>

In order to reduce friction and, consequently, the pulling tension, a pulling compound should be applied to Multitube as it is fed into the conduit. Refer to “Pulling” section for additional details.

**Attachment to Existing Structures**

Multitube may be attached to existing walls, ceilings and other supporting structures. A few typical methods of attachment are illustrated. (See Figure 3.)

When supporting Multitube horizontally, clamps should be spaced approximately as follows: Metal tubing not to exceed 8 feet; plastic tubing every 2 to 3 feet. For outdoor installations subject to heavy ice or wind loading, closer spacing should be employed.

Start by pulling the tubing through predetermined routing. Securing the Temptube should begin at one end after the tube has been connected. Securing should continue toward the free end until it is assured that enough Temptube is available for connection.

If there is concern of boiler shutdown, placement of the product may incorporate a slope for self-draining (1/2 inch in 10 feet).

Securing should be done with hardware which has a large bearing surface area and a fixed drawdown point.
The Temptube should be secured in accordance with support center and spacing information (see Table 1). Temptube should not be secured within any directional change to allow for movement from thermal expansion and to provide flexibility to withstand water hammer.

Routing Recommendations

For optimum results, the routing of Temptube should keep the number of bends to a minimum and allow for generous sweeping bends when they are required. (See Figure 4.)

For steam supply and condensate return applications, the use of a cable tray is advantageous in that it provides for a clear, unobstructed path for the Temptube. Because this application generally is centered around a manifold system with multiple Temptube runs, the total cable tray capacity can be utilized.

When running Temptube lines adjacent to one another, allow a minimum of 1/2 inch separation between lines. Do not bundle multiple Temptube lines together.

For one or two individual runs, existing cable trays, pipe racks or structural steel can be used for Temptube.

Underground Runs Buried Directly in the Earth

In those cases where there are no suitable supporting structures or where appearance is of primary importance, it is common to bury Multitube tubing directly into the ground with a sand cushion. We recommend Multitube types AT, TAT, THW for direct burial applications.

Aerial Messenger Type Installation

Where available support structures are located quite far apart (up to 150 feet), an inexpensive and practical solution is the use of a messenger supported system. One or more Multitube tubing assemblies can be supported from the same messenger. The messenger can be installed first and the Multitube then attached by means of messenger rings. If there are no supporting structures available, wood poles can be set for the purpose.

Storage

All coils and reels of Multitube instrument tubing should be stored in a such a way as to be protected from mechanical damage. Also, care should be taken to prevent damage by corrosive chemicals. This is particularly true for interlocked armor covered types. PVC based jacketed types are highly resistant to splashing of most acids and alkalies.

Jacketed tubing will withstand extremely low temperatures in storage and after installation. However, care must be taken when the installation is being made at temperatures below -10°C (+14°F) to prevent cracking caused by rapid bending. In such cases, it is recommended that the reels of tubing be stored in a heated building for at least 24 hours immediately preceding start of installation. Installations requiring several hours can be safely carried out under these conditions.

Bundle End Protection

Temptube is a thermally insulated and jacketed tubing product and care must be taken to ensure that the thermal insulation is kept dry to preserve its insulating properties. Temptube Splice Kit SK-612, 630, 696 and End Sealant RTV-103BLK, 106RED and ESKs are all that are needed to ensure a completely sealed weather-proof system.
Tube Preparation

Whether tubing is pre-bent, or bent to exact routing in place, tube preparation is the same. First, measure approximate length (be sure there is enough) and cut off. Prepare each end as follows. Cut the jacket laterally about 3 inches from end, then cut around jacket and remove. Cut and remove insulation. When using a tubing cutter, cut off and deburr tube. Then install fitting on end of tubing.

For electrical connections, follow the instructions provided with each kit.

Branch Connections and Terminations

When practical, connections and splices should be made inside junction boxes to assure:

1. Mechanical protection to the tubing fittings (and gauges, if present).
2. An orderly arrangement of tube connections which provides for:
   a. Efficiency in making tube connections.
   b. Ease in recognition of the various tube lines.
   c. Ease in changing tube connections should future expansion or development require it.
   d. Corrosion protection.
   e. Neat appearance.

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WARNING

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Sheave to be Min. Bend radius of umbilical.

Vertical Installation  Horizontal Installation

1/4  4"–6"  12"–15"  8"  .91"  .10 lb/ft  1/2 Min.
1/8  4"–6"  12"–15"  12"  1.14"  .10 lb/ft  1/2 Min.
3/8  4"–6"  12"–15"  14"  1.345"  .10 lb/ft  1/2 Min.

Note: Use Kellems® Grip when pulling umbilical. Attach to entire bundle not the process tube.