TSGC INC.

Tri-States Grain Conditioning, Inc.

Cable Hanging Instruction Manual

There are several types of grain storage tanks and bins. Parts of these instructions may be modified to fit the circumstances.

Care should be taken in handling the cables and leadwire; avoid crushing, cuts and knots.

Cables should be sorted according to length and put in the respective tanks before adding other hardware.

A. Locate the position for the respective cables on the bin top, making sure that cables will not be hanging in the grain stream when bins are being filled.

B. Hang cables according to the bin manufacturer's specifications.

   NOTE: Due to the many differences among steel tanks, no specific location instructions can be given.

   In most cases, the roof itself is not strong enough to support the cables. Some tanks have roof stiffeners to support the cables; some have beams or trusses; and some have special braces for hanging cables. It is up to the cable installer to determine exactly where to hang the cables so that the roof will support them. (Refer to bin manufacturer's recommendation).

C. If an eyebolt is used, tape the leadwire to the eyebolt below the bottom nut. Leave enough slack in the leadwire so that the cable may swing without pulling the splice at the top of the cable apart (see **Figures 1 and 2**).

D. Screw one nut down on the eyebolt just above where the leadwire is taped.

E. Place the eyebolt through the hole, in the beam, roof support or roof where the cable should be hung and secure with a washer and nut.

F. If the roof itself is drilled through, seal the roof, the washer, the nut and eyebolt with silicone caulk to prevent water leaks.

G. Number the leadwires on the ends with wire markers of some type so they can be identified later. See **Figure 3** for typical numbering sequence.

H. Run the leadwires to the peak of the roof in such a manner so they will not be in the grain stream or sag into the grain. On larger diameter tanks, weave or tape them to the trusses.

I. Bring leadwires through roof by installing a Meyer hub or weatherproof splice box of sufficient size for all leadwire(s). Do not bring leadwires through the roof in such a manner so they can be cut or pinched by roof, cap or anything else.

J. Coil leadwire on roof and protect from people walking on them or other hazards.

IF THE CABLES ARE NOT PROPERLY HUNG, THE BIN ROOF AND SIDEWALLS CAN BE DAMAGED BY THE PULL OF THE CABLES. YOU MUST DETERMINE THE STRUCTURAL STRENGTH OF THE BIN OR CABLE SUPPORTS SUPPLIED BY THE MANUFACTURER OR INSTALLED BY THE BIN ERECTOR TO BE SURE THAT IT IS ADEQUATE AND WILL NOT PERMIT DAMAGE TO THE ROOF OR SIDEWALLS.

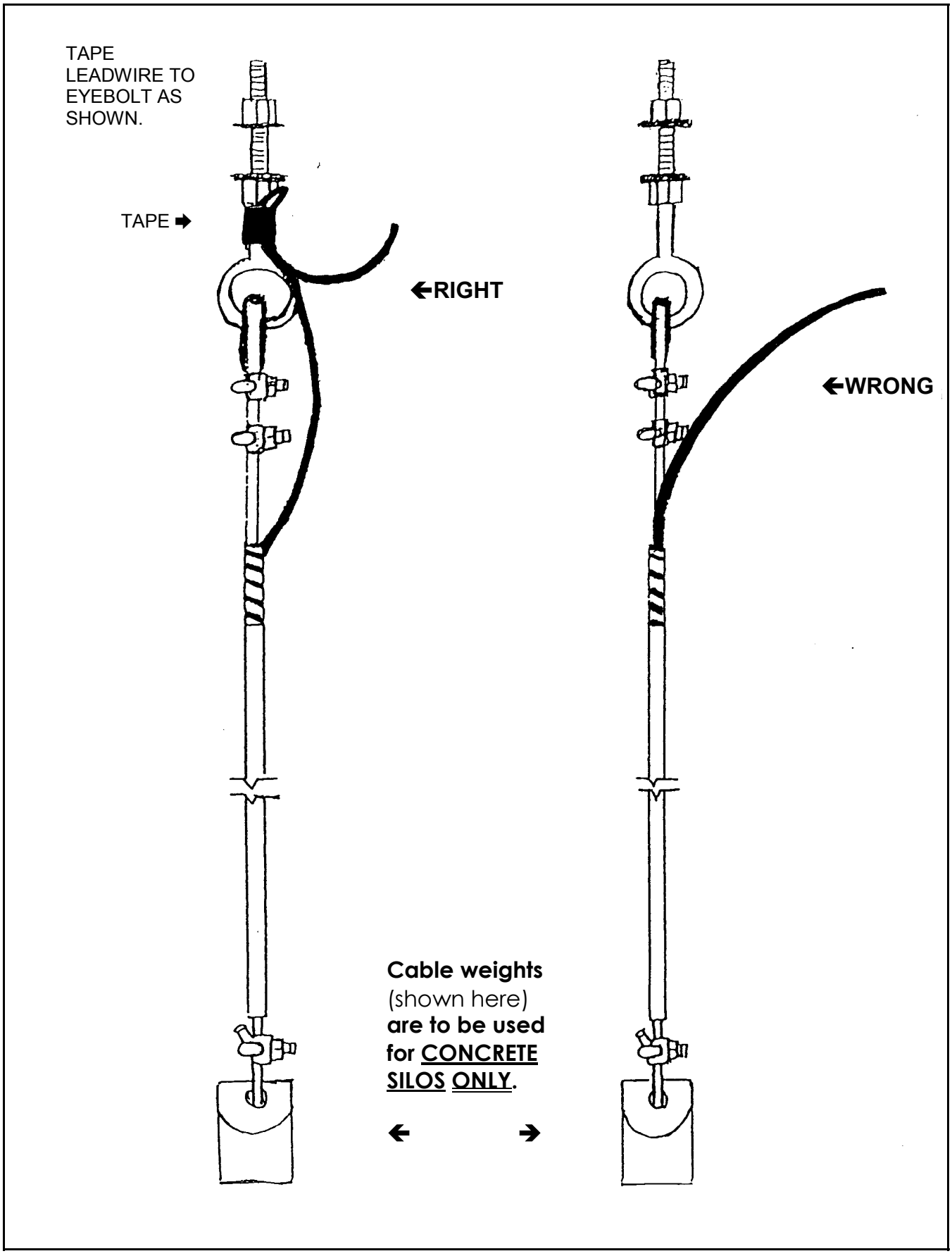

TAPE
LEADWIRE TO
EYEBOLT AS
SHOWN.
TAPE
RIGHT
WRONG
Cable weights
(shown here)
are to be used
for CONCRETE
SILOS ONLY.

FIGURE 1.

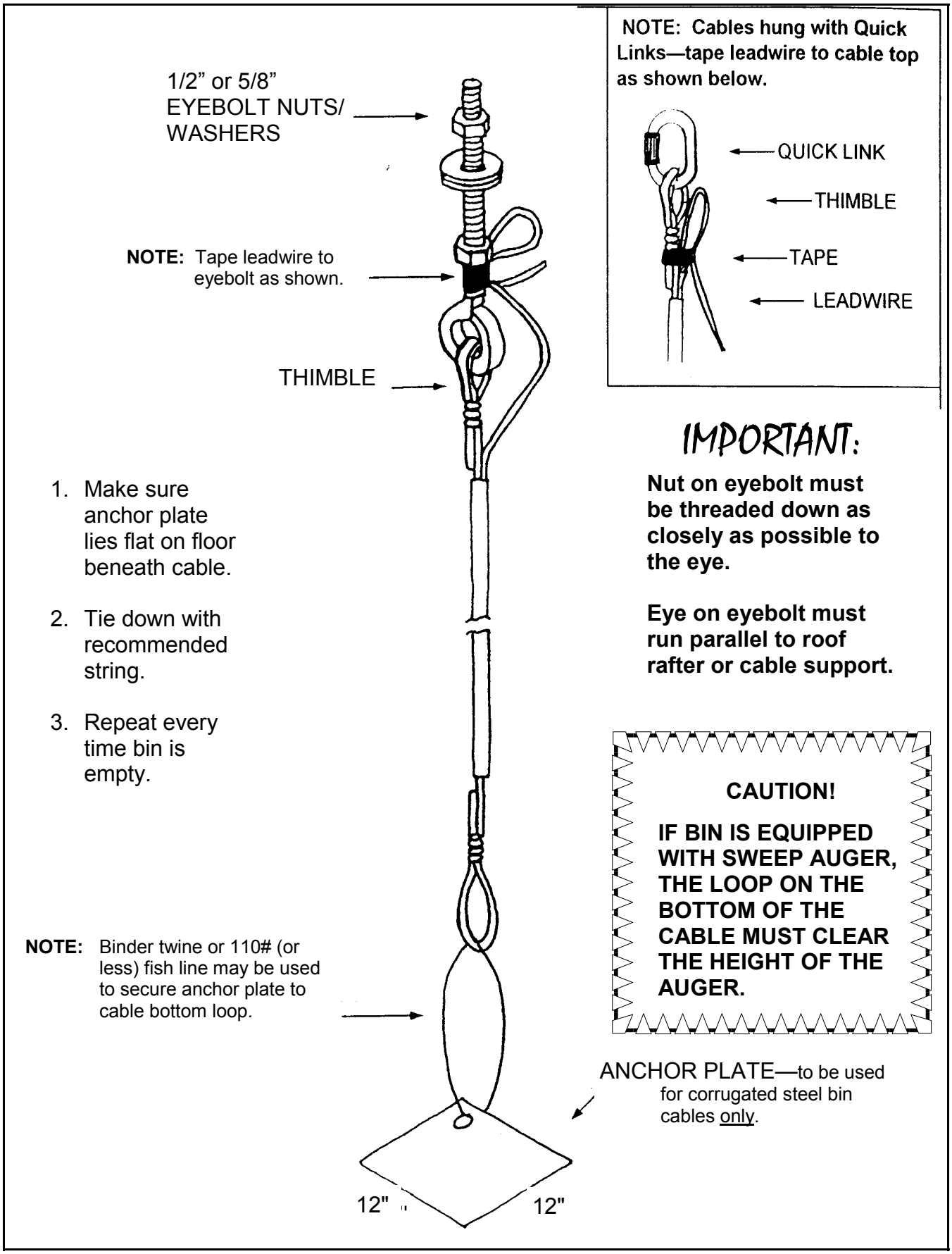

1/2" or 5/8"
EYEBOLT NUTS/
WASHERS
NOTE: Tape leadwire to eyebolt as shown.
THIMBLE
NOTE: Cables hung with Quick Links—tape leadwire to cable top as shown below.
QUICK LINK
THIMBLE
TAPE
LEADWIRE
IMPORTANT:
Nut on eyebolt must be threaded down as closely as possible to the eye.
Eye on eyebolt must run parallel to roof rafter or cable support.
1. Make sure anchor plate lies flat on floor beneath cable.
2. Tie down with recommended string.
3. Repeat every time bin is empty.
CAUTION!
IF BIN IS EQUIPPED WITH SWEEP AUGER, THE LOOP ON THE BOTTOM OF THE CABLE MUST CLEAR THE HEIGHT OF THE AUGER.
NOTE: Binder twine or 110# (or less) fish line may be used to secure anchor plate to cable bottom loop.
ANCHOR PLATE—to be used for corrugated steel bin cables only.
12"
12"

FIGURE 2.

Numbering or Identification Sequence

The numbering sequence of cables in steel tanks is standardized. The center cable or first cable clockwise from the manhole is always number 1. If more than one radius is required by the coverage pattern, the inner circle will have the smaller numbers in clockwise sequence and the lowest number of the other radii will be the first cable clockwise from the manhole. **See examples below.**

NOTE: A cable location diagram will be provided on specific bins. If so provided, please refer to the diagram for proper cable location.

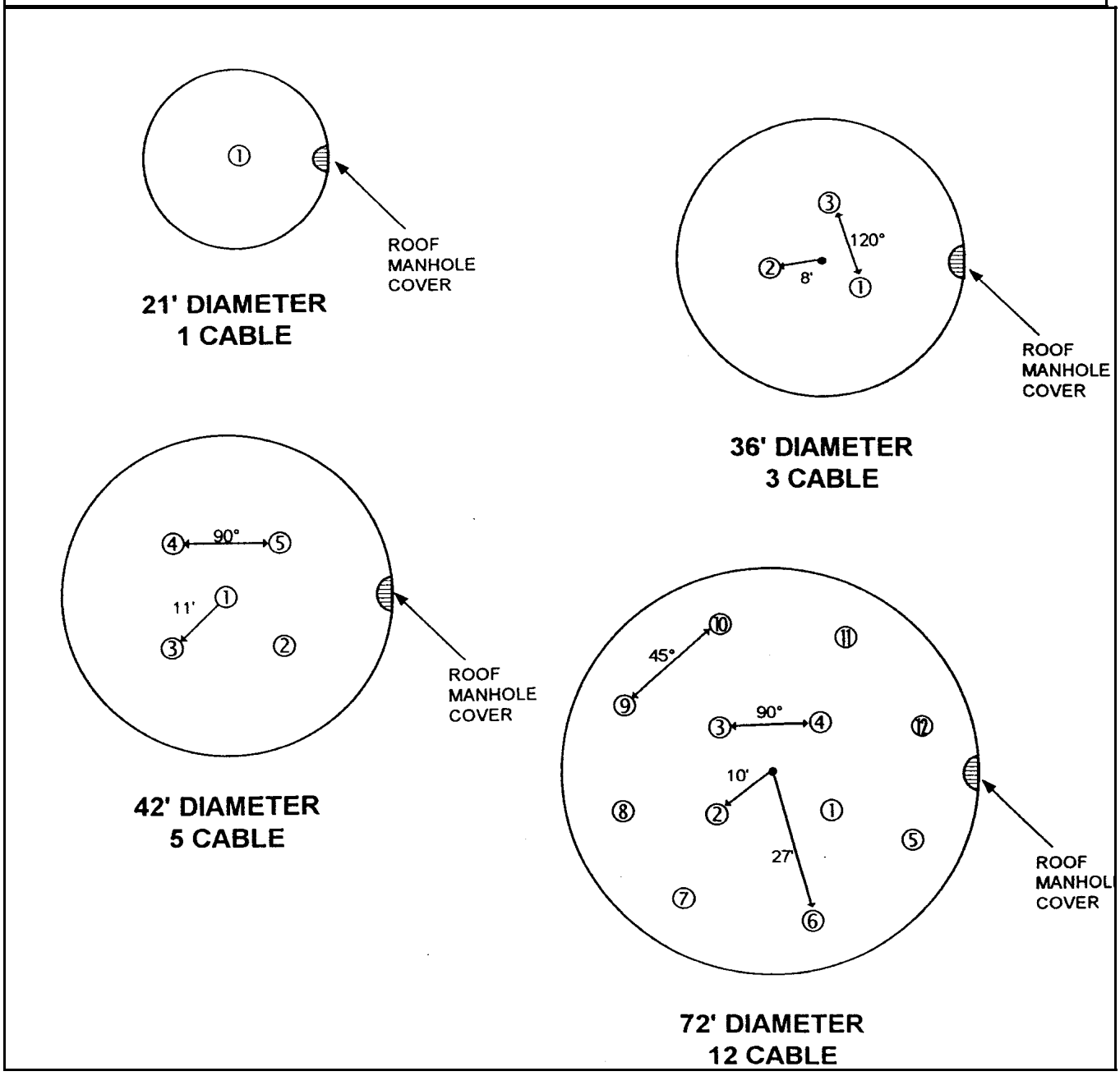


FIGURE 3.

Installing Leadwire Conduit

Conduit is used to protect wires from weather or mechanical damage.

Thinwall conduit is usually used for inside runs which will not be exposed to the weather.

Rigid conduit must be used for any outside work which will be exposed to the weather and may be required on some installations for inside runs as well.

A. Conduit size is regulated by the mass of wires being housed. The maximum should be 75% filled. Proper type and size of fittings must be used in each raceway for ease in pulling wires.

   The conduit size is determined by the maximum number of leadwires which must be run through it and the size of the leadwire. See **Table below**.

B. All conduit runs must be kept away from high-voltage wires as much as possible to prevent inductance "pick up".

   No more than two 90-degree bends or combination of bends totaling 180 degrees should be in the raceway between pull boxes.

   Requirements regarding perpendiculars, horizontals, supports, fittings, and "expansion joints" are the same as for general electrical work.

Leadwire and Conduit

CONDUIT SIZE	½"	¾"	1"	1¼"	1½"	2"
6 T/C Leadwire	9	16	27	50	70	100
12 T/C Leadwire	3	5	12	20	30	60
18 T/C Leadwire	3	5	11	18	28	46
21 T/C Leadwire	3	5	11	18	28	46

CRS Box Installation

The central reading station box (CRS box) should be located at a convenient, non-obstructed area for easy access. Normally, it is mounted on the sidewall of the tank approximately 4 feet above grade.

A. Remove the reading plug panel from the enclosure. ***See Figure 4.***
B. Drill or punch a hole in the side of the box. This is for the conduit entrance. The hole should be sized according to the size of conduit being used. To determine hole size, add 3/8" to the conduit size being used. (**Example:** 1" conduit plus 3/6" = 1-3/8" hole size)
C. Mount the box to the sidewall of the bin with 1/4" self-tapping screws or bolts.
D. Do not replace the reading plug panel until the splicing is completed.

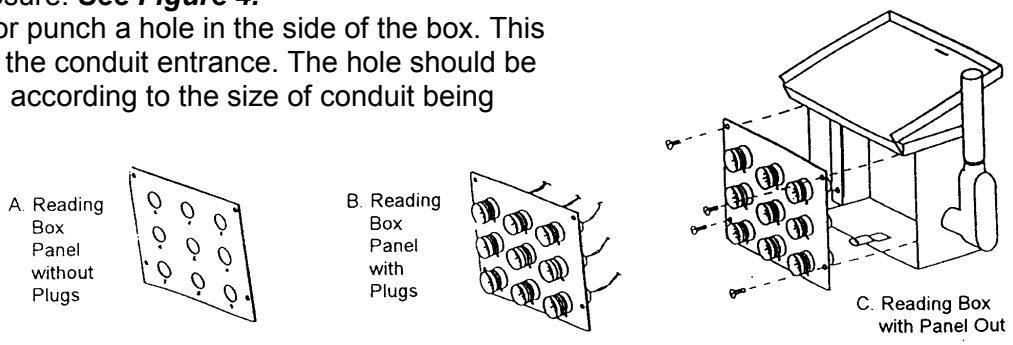


FIGURE 4.

Pulling Leadwire through Conduit

Leadwire is used to connect the cable to the reading outlet plug. It should be run in accordance with the print.

NOTE: Leadwire requires special care when handling; avoid crushing, cuts, and knots.

A. Pull leadwire from the point of exiting the tank to the CRS box.

B. Trim excess wire off on each leadwire. A length of at least 5 ft. should be left at the CRS box. (This is for splicing).

   NOTE: The wire marking tags should be moved up before trimming the leadwire.

Leadwire Composition

Figure 5 illustrates the wires in the 3 groups which make up 18TC leadwire.

In 12TC leadwire, the group with the ORANGE constantan wire is left out, leaving only the groups with the WHITE and BROWN constantan.

6TC leadwire has only one group and the constantan is WHITE.

On 21 copper conductor, 3 groups as shown are used; however, a PURPLE copper wire is added to each group.

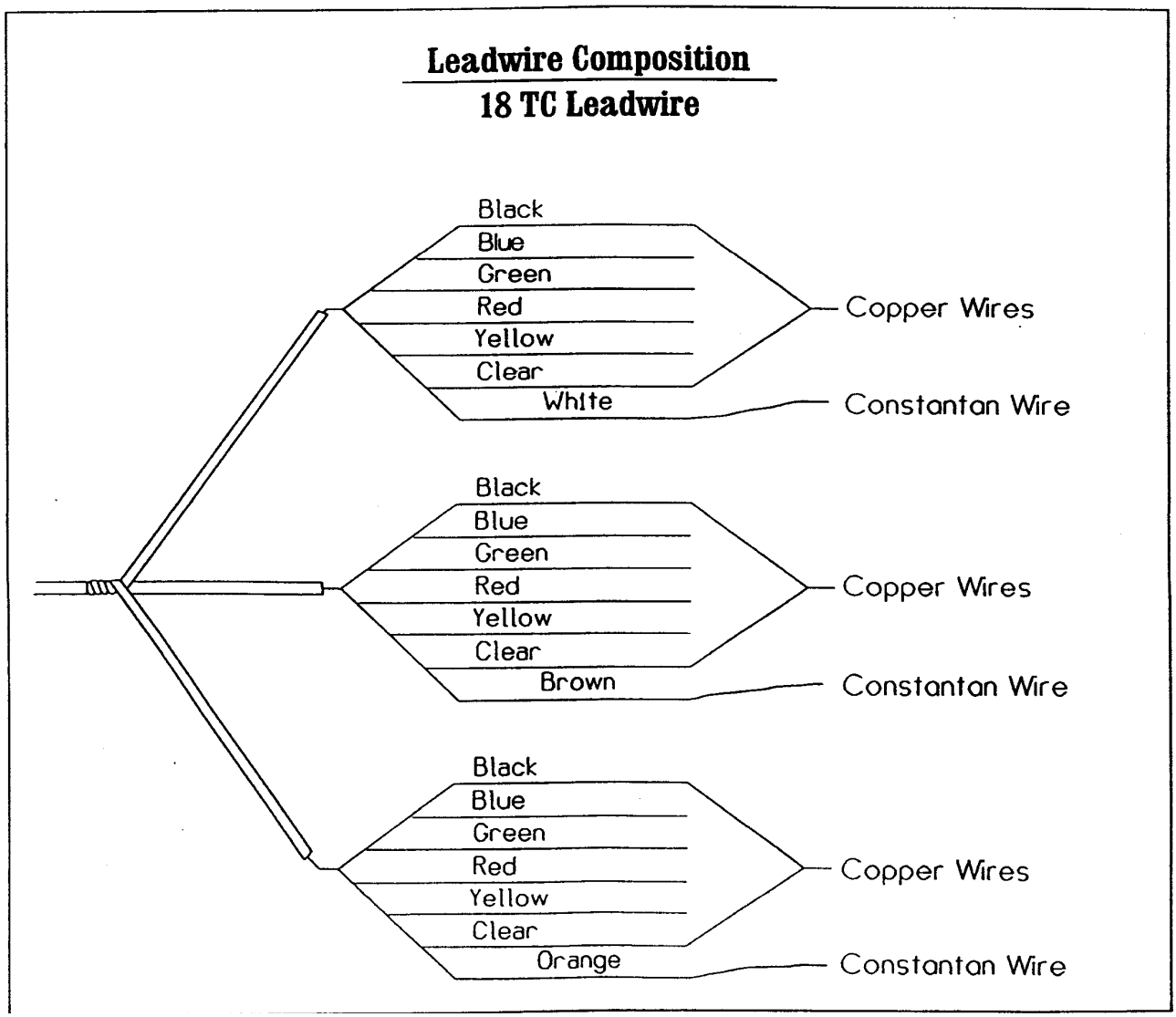


FIGURE 5.

Splicing with Compression Connectors

The wires are spliced color-to-color and group-to-group. Each pair of wires is inserted completely into the connector and crimped. They are insulated outside and grease-filled inside. The grease retards corrosion and resists water, thus making a good conductive splice. The outside of the crimp is insulated, so no further insulation is required. The splice, when completed, is then taped to help retard water and to keep the splice neat looking. The connectors can be crimped with a pair of lineman's pliers, but we prefer the crimping tool that was designed for them!

The crimping tools and connectors are available through TSGC, Inc. and can be purchased with the temperature equipment. Compression connectors are very effective in areas where elevator personnel do not want you to use a soldering iron, due to remoteness or electrical power or for other considerations.

The tools required for compression connector splicing are:

1. A pair of good diagonal cutting pliers
2. A very sharp knife
3. A pair of pliers -- long nose
4. A soldering iron

The materials required for compression connector splicing are:

1. Compression crimps
2. Good quality electrical friction tape

Detailed Steps to Be Followed in Sequence

1. Using a sharp knife, cut along the ridge on the leadwire about one inch, exposing the ripcord as shown in **Figure 6**.Do this to both pieces.
2. Pull the ripcord with the long-nose pliers, slitting the outer covering of the leadwire back to the tape. Cut off the outer covering at the point indicated in **Figure 7**. Do this to both pieces.
   NOTE: Should the ripcord break ,slit the outer covering along the top of the ripcord ridge and repeat Step 2.
3. Tape together the two pieces of leadwire about 4" from the ends with 2 or 3 turns of electrical friction tape as shown in **Figure 8**.
4. Separate the wires into their respective groups so you are splicing the WHITE group of one cable into the WHITE group of the other cable.
5. Twist the wires together, color-to-color, for each group a little so they will not separate. **Do this one group at a time so as not to get mixed up.**
6. Taking a pair of side cutters, cut off the excess wire so the wires are about 3" longer than the black outer covering.
7. Place a connector over each pair of wires and using the crimping tool, crimp the connectors tightly closed. Be sure that the crimps are seated as far on the wires as possible, and that the tool crimps the connectors fully.
   NOTE: The tool is designed so that it will not open up again until the tool has squeezed the connector to its maximum.
8. After all of the wires are crimped, tape up the splice with a good grade of electrical tape.
9. The splice is complete.

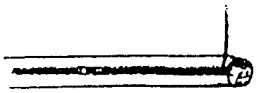


FIGURE 6.

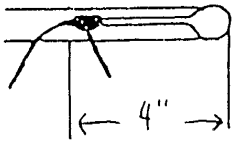


FIGURE 7.

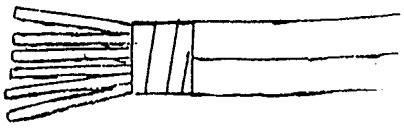


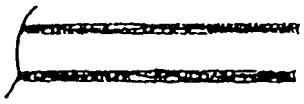
FIGURE 8.

System Checkout

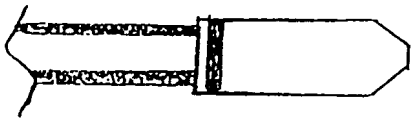
Upon completion of the installation, all thermocouples (T/Cs) should be checked.

This check is done by simply plugging your portable instrument into the plug(s) and reading through each T/C on each cable. If an open or non-functioning T/C is discovered, remove the CRS Box Panel and check the relative splice to make sure a good connection has been made. An open T/C will be designated differently depending on what type of instrument is being used.Refer to your instrument operation manual to determine its symptoms of an open T/C.

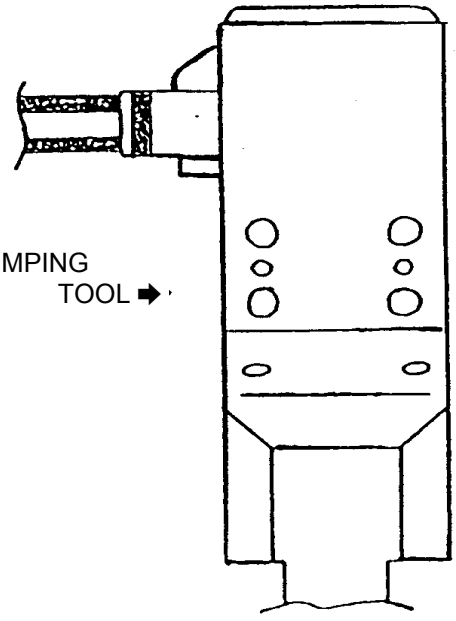
Compression Connector and Tool



WIRES SAME LENGTH



INSERT WIRES INTO CONNECTOR



CRIMPING TOOL ➡

COMPLETED CONNECTION

SQUEEZE TOOL UNTIL TOOL RELEASES. MAKE SURE WIRES STAY ALL THE WAY IN THE CONNECTOR.