

OPERATION AND MAINTENANCE INSTRUCTIONS MANUAL

LINEAR EXTRUDED HEATING PANELS

INTERCONNECTING THE COPPER TUBING

All tubing on Sun-el extruded panels use a .625 " O.D. (Nom. 5/8") copper tube. Standard size fittings readily work with the Sun-El Panel.

The ends of tubing on the panel should be lifted at approximately a 45° angle for attachment of expansion loops or U-bend.

When interconnecting panels end to end in longer zones use the Sun-El 360 degree expansion loops, the expansion loops have expanded ends that are pre-sized to fit the tubing on the panels. If not using the expansion loops you may use standard couplings and same size copper tubing.

Return bends 180 degree. 6" on center with expanded ends pre-sized to fit panel tubing are also available.

The return bends, and if possible the interconnects, should be installed while panel is on bench and care should be given not to crimp the tubing.

SOLDERING AND BRAZING COPPER TUBE

Soldering and Brazing with capillary solder joint fittings are the most common systems for joining copper tube. The American Welding Society defines soldering as a joining process which takes place below 840 degrees and brazing as a similar process which occurs above 840 degrees.

The basic theory and technique of soldering and brazing are the same for all diameters... the variables are: the amount of time, heat and filler metal required to complete a designed joint. A good joint is the product of a well trained craftsman who knows and respects the materials and methods he uses.

BASIC STEPS IN JOINING PROCESS**Measuring:**

Measuring the length of the tube must be accurate. If the tube is too short it will not reach all the way into the socket of the fitting and a proper joint cannot be made.

Cutting:

Cutting tube can be accomplished in a number of different ways to produce a satisfactory, square-end cut. The tube can be cut with a disc type cutter, a hacksaw, abrasive wheels or stationary and portable handsaws. Care must be taken that the tube is not deformed while being cut. Regardless of the cutting method used, the cut must be square with the run of the tube so that it will seal properly in the fitting socket.

Reaming:

Most methods of cutting leave a small burr on the end of the tube. Unless these rough edges are removed, erosion-corrosion may occur due to local turbulence and increased velocities in the tube. Tools used to ream tube ends include the reaming blade on the tube cutter half-round or round files, a pocket knife, or a suitable deburring tool. With annealed tube, care must be taken not to get the tube end out-of-round by applying too much pressure. Both the inside and the outside of the tube may require removal of the burr. A properly reamed piece of tube will provide a smooth surface for better flow.

Cleaning:

Cleaning is quickly and easily done. The removal of oxides and surface soil is crucial if filler metal is to flow properly. Oxides, surface soil and oil can interfere with the strength of the joint and this may result in the joint's failure. Mechanical cleaning is a simple operation. The end of the tube should be cleaned using sand cloth or nylon abrasive pads for a distance only slightly more than the depth of the fitting socket. The socket of the fitting should also be cleaned using sand cloth, abrasive pads or properly sized fitting brushes. The same precautions, as when reaming the tube, should be observed.

Copper is a soft metal: if too much material is removed, a loose fit will result and interfere with satisfactory capillary action in making the joint. The capillary space between tube and fitting is approximately .004-in. Solder or brazing filler metal can fill this gap by capillary action. This spacing is critical for the filler metal to flow into the gap and form a strong joint. Chemical cleaning may be utilized, providing the tube and fittings are thoroughly rinsed, according to the manufacturer's recommendations furnished with the cleaner. This will help neutralize any acidic conditions that may exist. The surfaces, once cleaned, should not be touched with bare hands or oily gloves. Skin oils, lubricating oils and grease impair solder flow and wetting.

TEMPERATURE RANGES**Apply Flux:**

A non-aggressive soldering flux is recommended. Stir the flux before use. A good flux will dissolve and remove traces of residual oxides from the surfaces to be joined, protect the surfaces from re-oxidation during heating and promote the wetting of the surfaces by the solder. A thin, even coating of flux should be applied with a brush to both tube and fitting. Avoid the use of fingers to apply flux. Chemicals in the flux can be harmful if carried to the eyes or open cuts.

Types of Solder:

There are a variety of solders available that will produce sound, leak-tight joints. Solders that are used for piping applications contain tin and varying amounts of antimony, copper, lead or silver. Choice of solder will depend upon application and local codes. For portable water systems, solders which do not contain lead are the best choice.

Assembly:

After both surfaces are properly fluxed, they should be assembled by placing the fitting on the tube, making sure that the tube seats against the base of the fitting socket. A slight twisting motion is suggested to ensure even coverage by the flux. Remove the excess flux with a rag. Due to the heat that is required during soldering and brazing, only cotton rags should be used. Complete all prepared joints within a single work day. Care must be taken to assure that the tube and fittings are properly supported with a reasonable, uniform capillary space around the entire circumference of the joint. Uniformity of capillary space will ensure good filler metal penetration if the guidelines of successful joint making are followed. Excessive joint clearance can cause the filler metal to crack under stress or vibration.

Heating:

Because of the open flame and high temperatures required for soldering and the flammability of the gases used, safety precautions must be observed. The heat is generally applied by use of an air/fuel torch. These torches can use acetylene or a variety of LP gases. Electric resistance pliers can also be used. Heating should begin with the flame perpendicular to the tube. This preheat will conduct the initial heat into the socket for even distribution of heat inside and out. The proper amount of preheating time depends upon the size of the joint-experience. The flames should now be moved onto the fitting. Move the flame from the fitting socket onto the tube a distance equal to the fitting socket. Touch the solder to the joint. If the solder does not melt, remove it and continue the heating process. Be careful not to overheat or direct the flame into the fitting cup. This action can cause the flux to burn and destroy its effectiveness. When the melting temperature has been reached, heat may be applied to the base of the cup to aid capillary action in drawing the solder into the cup.

Applying Soldering:

When the tube is in a horizontal position, start applying the solder slightly off-center of the bottom of the joint. Proceed across the bottom of the fitting and up to the top-center position. Return to the point of beginning. Overlap the starting point and then proceed upon the uncompleted side to the top, again, overlapping the solder. Melted solder will be drawn into the joint by capillary action regardless if the solder is being fed upward, downward or horizontally.

Cooling and Cleaning:

After the joint has been completed, natural cooling is best. Shock cooling may cause unnecessary stresses on the joint and may result in eventual failure. Clean off any remaining flux with a wet rag.

START UP

Each zone of panels should be pressure tested for leaks per specifications. All system piping should be thoroughly cleaned, flushed, drained and refilled before the radiant panels are connected into the system. When the boiler is in operation and the circulators are on set control valves to full flow position. Flow in excess of 0.5 G.P.M is required to push the air out of the panel. Gradually bring the system to design temperature. The actual temperature drop through the panel will only be achieved when building is under design heating load. Balance the radiant ceiling system during a winter day when full flow can be realized. After balancing, return the control valves to automatic operation.

WASHING

Step 1: Ordinary matter such as dust and loose dirt should be removed prior to washing by using either a vacuum or soft brush. Be sure all grooves of the panel are free of these matters.

Step 2: Ordinary industrial cleaners such as a mild detergent may be used to wash the panels. A second sponge and frequent changing of the rinse water help to avoid streaking.

CAUTION: ALWAYS DO CLEANING MAINTENANCE WHEN THERMOSTATS ARE TURNED OFF AND PANELS ARE AT ROOM TEMPERATURE. THIS WILL AVOID DRYING AND STREAKING OF CLEANERS USED.

CAUTION: DO NOT USE ABRASIVE CLEANERS ON THE PAINTED SURFACE. DO NOT USE EXCESSIVE AMOUNTS OF WATER. AVOID SLOSHING AS IT MAY GET INTO THE JOINTS AND CAUSE DISCOLORATION.

PAINTING

Sun-El panels are painted in standard white color with a two coat powder coat system. Color matching or special colors may be provided in a baked acrylic enamel. Extreme care should be taken when handling the finished side of the panel so as not to soil or scratch the finish. Touch up paint for standard white finish can be obtained by contacting the Sun-El .

CAUTION: IT IS ALSO RECOMMENDED THAT THE SURFACE OF THE PANEL BE AT ROOM TEMPERATURE, SO THAT THE AREA OF TOUCH UP WILL DRY AT NORMAL ROOM TEMPERATURE. ACCELERATED DRYING DUE TO HIGH PANEL TEMPERATURE MAY CAUSE AN UNEVEN SURFACE.