TECHNICAL BULLETIN
JOINTING METHODS FOR RACHP PIPEWORK

1 OBJECTIVE

The objective of this technical bulletin is to inform members of the various methods currently available in the light commercial and domestic RACHP sector for joining the various different pipe materials currently available on the market and approved for use by manufacturers. Large commercial systems using steel pipework are covered in other publications.

PLEASE NOTE This technical bulletin is not designed to endorse or approve one or more products or methods above any other but seeks to impartially provide information for Refcom and BESA Members to aid them in deciding which pipe material or joining method to use for different applications. Compatibility with materials and specific refrigerants should be checked before use as many new refrigerants are entering the marketplace and there may be issues with oils and/or refrigerant gases. At the time of publishing there are no known issues with refrigerant compatibility and any of the jointing/material methods outlined below. This technical bulletin should be seen as a fluid document that may be amended frequently through time as new technologies, materials and methods become available.

2 MATERIALS IN USE

2.1 COPPER

This is still the most common material used in light commercial and residential refrigeration, air conditioning and split or multi-split/VRF style heat pump units. It is essential that copper tubing used for this purpose is of refrigeration quality, kept free of moisture or contaminant ingress, and of sufficient wall thickness for the purpose and gas in use. Copper has a high scrap metal value and has been known to be stolen from sites and even from working systems resulting in total loss of refrigerant. Copper is suitable for all jointing methods outlined in the next section.

2.2 ALUMINIUM

As concerns about theft and of availability of copper in the long term have increased, there has been an increase in the use of aluminium tubing. Aluminium has an insignificant scrap metal value rendering it virtually worthless to thieves. It is also very lightweight compared to copper and relatively pliable at room temperature and is, therefore, very easy to work with.

Aluminium is not suitable for all jointing methods outlined in the next section. Particular attention needs to be given where brazing/welding takes place as the melting point of aluminium is significantly lower than copper and normal brazing equipment will simply melt the tube. A soft solder propane flame should be used for brazing aluminium tubing.

2.3 DUAL COPPER/ALUMINIUM

Concerns about long term structural integrity of aluminium tubing led to the availability of dual tubing which comprises of 1/3 copper and 2/3 aluminium. The inner core is copper for the strength and integrity, while the outer sheath is aluminium to create the impression the whole pipe is aluminium and, therefore, of no value to thieves as well as having a significant effect on the weight of a coil of tubing.

As with the aluminium tubing, particular care should be taken when brazing this tube. A propane soft solder flame should be used to braze dual material tubing.

2.4 CAUTION

Particular care should be given when jointing dual tubing or if there are instances of different pipe materials used in a pipe run as there is the potential for galvanic corrosion where two materials of different galvanic potential come into contact with a common fluid flowing between them. Galvanic corrosion will compromise the integrity of the tubing over time and cause significant leak potential. Earth bonding between the different materials can overcome this potential but, where possible, you should always ensure the same pipe material is used throughout the length of its run.

3 JOINTING METHODS

3.1 BRAZING

Brazing is using heat to apply a copper/zinc alloy filler to join two materials together. In RACHP terms it is used to describe the process where tubing is joined together or where tubing components in a refrigeration circuit such as compressors, heat exchangers, valves, etc. are installed permanently into the circuit. It is considered a permanent joint and, where all joints in a system are made in this way, will render the equipment to be classified as "hermetically sealed" in relation to regulatory requirements such as the F gas regulation.

Tubing will first be swaged out by expanding one end to allow the other tube to slip inside prior to applying the heat and solder fill. Alternatively a proprietary coupling should be used. This allows tubing alterations such as the insertion of tee joints, bends, or changes to pipe dimensions.

Where brazing is carried out to join copper to copper, or copper to brass, it is absolutely essential that oxygen free (or "dry") nitrogen is purged through the pipes during the process to prevent the copper or brass from oxidizing. Oxidisation will create a buildup of flaking oxides inside the tubing that will be scoured by the refrigerant oil once the system starts up, flushing the debris through the system and potentially blocking valves, microbore or capillary lines, compressor valve plates and blocking filters.

3.2 MECHANICAL JOINTS

1 FLARING - Flaring is the method of gradually expanding out the end of the tubing using a proprietary refrigeration flaring tool and coupling with a flare nut. These joints are considered temporary as they are demountable using two spanners only. As such, they allow flexibility of use and can be re-used after de-coupling, but they are also easily demountable by copper thieves potentially resulting in total loss of refrigerant.

Flare joints have been highlighted as being a particularly high potential leakage point as the constant expansion and contraction of the tubing at the joint during the normal operation of the system may loosen the nut over time and create a leak point. The joint should be made using a torque wrench set to the manufacturer's recommended torque setting to avoid over tightening the flare joint and weakening the integrity of the joint.

2 ZOOMLOCK - This is a permanent joint made by using a proprietary compression tool that creates a circular crimp around the circumference of the pipe and fitting. It uses a nitrile rubber seal inside the proprietary fitting to make the joint leak free. The fittings are suitable for jointing copper to copper.

3 REFLOK - This is a permanent joint made by a proprietary tool that compresses the fitting onto the tubing. It relies on a specific tube insert (type dependent on tube type) and a proprietary sealant oil spread around the circumference of the tube before slipping into the fitting and compressing Suitable for proprietary Reflok aluminium to aluminium or aluminium to copper stub jointing only. Other brands of aluminium tubing should not be used.

4 VULKAN LOKRING - Suitable for copper to copper, copper to steel, and/or copper/steel to brass connections using proprietary fittings and inserts. The method jointing is similar to that of the Reflok system and again requires the use of a proprietary tool, fittings and oil sealant. The joint requires a tube insert specific to the type of tube being used. The joint is permanent and is made secure by compressing the fitting parts together.

4 PRESSURE AND LEAK TESTING

Upon completion of the circuit and prior to any refrigerant being transferred into the system, all joints should be inspected and tested for strength and tightness in accordance with BS EN378-2:2008 prior to evacuation/ dehydration in accordance with manufacturer's instructions and recommendations.