

METHOD STATEMENT

FOR INSTALLATION OF

VRF – SYSTEM



(Variable Refrigerant Flow)

Method Statement for the Installation of VRF System

1. Introduction

The fixing of all air conditioning equipment, installation of all refrigerant pipework, insulation work, drain pipe work and full commissioning shall be performed by a specialist VRF installer who is authorized to install DAIKIN equipment. In the course of installation contractor will apply the best practice methodology in carrying out its duties and will strictly adhere to the following:

1.1 Retain the responsibility to advice of any aspects which, based upon experience, would appear to be inappropriate and/or likely to lead to operational problems.

1.2 Health & Safety at Work Act 1974, and all other relevant attendant legislation, particularly the management of Health & Safety at Work Regulations 1992, Personal Protective Equipment at Work Regulation 1992 and the Construction, Design and Management (CDM) Regulation 1994.

1.3 Ensure that all personnel are in possession of the appropriate personal protective equipment to comply with the Personal Protective Equipment Regulations 1992.

1.4 Ensure that all personnel are fully competent in the work they are tasked to perform and any claim to stated qualifications are valid.

1.5 Ensure that all personnel are instructed to comply with the prevailing site rules.

1.6 Must use calibrated and regularly checked tools. Electrical tools will be calibrated and checked annual.

1.7 Upon completion of the works ensure that all debris is removed and the site is left clean and tidy to the satisfaction of the Client.

2. Refrigeration Pipework

Supply and installation of all interconnecting refrigerant pipe work will be carried out. Air Conditioning design and installation instructions and

standards will be followed holistically. All pipe work must be suitable for R410A/R407c as applicable. Longest possible lengths of copper pipe should be utilized to minimize joints on site. Furthermore all of the following points should be adhered to.

2.1 All copper pipes up to 1 1/8" (28 mm) outside diameter (O/D) shall be fabricated from refrigerant quality tube to BS EN 12449:1999. Tube shall be fully annealed up to 7/8" (22 mm) outside diameter (O/D) only. Tube shall be delivered to site internally degreased and shall be stored in clean dry conditions with ends sealed until required for installation.

2.2 All due consideration and allowances shall be taken to keep pipe work clean and dry during the installation works, ensuring that all pipe work unfinished ends are capped off at all times.

2.3 The number of joints bends and sets are to be kept to a minimum. Butt joints will not be accepted; properly swaged joints must be formed. Bends and sets are to be machine pulled to an approved radius where possible.

2.4 Flared joints must only be used when connecting to the manufacturer equipment.

2.5 Pipe work to be properly fixed and supported using a recognized industry approved support system.

2.6 Brazing shall be carried out in accordance with British Refrigeration Association Specification for Brazing and BS 14324:2004. Brazing rods shall be cadmium free and conform to BS EN 1044:1999. At all times, when brazing, a small amount of dry nitrogen must be purged through the pipe to prevent oxidation and scaling internally. Any component susceptible to heat during the brazing process that may be damaged must be protected. Soft solder shall never be used for jointing of refrigeration pipe work.

2.6.1 All completed R410A systems will be strength and leak tested with dry nitrogen as per itemized below and BS EN 378. If the system is found to be leak free, the final pressure readings for both strength and leak testing are to be witnessed by either the main contractor, the consultant or end-user and recorded in the test result Log Book.

21 bar, Strength test for a period of time that is acceptable to show any signs of deformation to the pipe work.

21 bar for final leak test for minimum 24 hours. Pressure testing signage will be clearly visible on site during testing periods.

2.6.2 All completed R410A systems will be leak tested with dry nitrogen as below and BS EN 378. If the system is found to be leak free, the final pressure readings for leak testing are to be witnessed and entered into the log Book

- 1) 3.0 bar (N2) Minimum of 3 minutes.
- 2) 15.0 bar (N2) Minimum of 3 minutes.
- 3) 21.0 bar (N2) Minimum 24 hours.

2.7 On completion of strength/leak testing an evacuation is to be carried out to 2mm Hg (2Torr). This will eliminate the risk of any moisture being present within the pipe work installation. It is recommended that a triple evacuation process be carried out as below and this should then be followed by a pressure rise test.

6 Steps Evacuation

- 1) Evacuate the system to 10 Torr from both service valves. System manifold gauges “must not” be used to measure a vacuum. A Torr gauge must be used at all times.
- 2) Break the vacuum with OFN (N2) into “suction” service valve to 1 bar.
- 3) Evacuate to 5 torr from “discharge valve”.
- 4) Repeat step 2.
- 5) Evacuate to lowest pressure vacuum pump will achieve (2 torr for 1 hour minimum).
- 6) Pressure rise test to be carried out for a minimum of 30 minutes.

3. Drain Pipe work

A condensate line shall be installed to each fan coil unit. This shall be installed and insulated as per the standard specification. Minimum size of condensate pipes to be 15mm plastic and insulated. Condensate shall be pumped from each fan coil, drains to run 1:80 minimum falls.

3.1 Pipe work will be adequately supported in such a manner as to permit free movement due to expansion and contraction.

3.2 Pipe work should be graded to fall throughout, run to waste, and should be accessible for cleaning.

3.3 On completion, a leak and function test must be carried out.

3.4 Gravity drains will be installed whenever possible.

4. Electrical Work

The contractor shall include for the design and installation (unless otherwise specified), including connecting all items of mechanical equipment. The Contractor shall provide and install all wiring, cables, conduit, trunking, cable trays, termination points, local means of isolation, control wiring etc., to mechanical plant items to ensure that all items of equipment and controls fully function in accordance with manufacturers' recommendations and the current IEE Wiring Regulations, CIBSE Codes of Practice, British Standards and UK Building Regulations.

4.1 All electrical cables used for power distribution will comply with the latest Edition IEE Regulations. All cables used for data/control must be greater than 1.25 mm 2-core screened.

4.2 Appropriate glands will be fitted to each item of equipment in accordance with environmental conditions.

4.3 The whole installation will be in full accordance with the IEE Wiring Regulations in every respect with particular attention to clipping, earthing of equipment, grounding off, final connections and isolating.

4.4 Earth bonds on refrigeration, cold water and drainage pipe work to be applied throughout.

4.5 Equi-potential bonding between exposed conductive parts and extraneous conductive parts at the same potential, to be applied throughout.

4.6 On completion the installation should be tested in accordance with the requirements of Inspection and testing section of the IEE Wiring Regulations. Inspection shall include physical check that all equipment has been securely fixed and that all electrical connections are mechanically sound.

4.7 Where necessary, to prevent damage to components of equipment, the equipment shall be disconnected for the duration of the relevant tests.

4.8 Heat resisting cable should be used in all locations where wiring is subjected to ambient temperatures in excess of 40°C (104°F).

4.9 A suitable means of isolating the electricity supply shall be fitted adjacent to and within reach and sight of the equipment with over current protections.

4.10 When running interconnecting control wiring it is essential to avoid the risk of electronic control signals being corrupted. Care should therefore be taken to avoid running control cables too close to power cables.

5. Insulation

Thermal insulating material used within any building shall, when tested in accordance with BS 476-4:1970, be classified as non-combustible also free from substances which in the event of a fire would generate appreciable quantities of smoke or toxic fumes. Insulating materials should be of Class “O” rating as defined by the Building Regulations.

5.1 Thermal insulation will be fitted to all the pipe work installations detailed herein. All materials used will be ‘non-combustible’ Class “O”. All insulation materials, adhesives and finishes, will be suitable in all respects for continuous use without degradation throughout the range of operating temperatures and within the environment indicated.

5.2 The materials and method of installation will comply with all relevant British Standards Codes of Practice.

5.3 The material will consist of flexible CFC free, elastomeric black foam with a closed cell structure. The outer surface of the foam will be an inherent vapour barrier.

5.4 In all cases where pipes pass through fire compartment walls, fire resistant and non-flammable insulation/foam will be packed between the pipe sleeve and the pipe. All insulation will be supplied at the thickness specified in relevant HVAC standards.

7. Pre-commissioning

The following items must be checked prior to any systems being switched on.

7.1 A marked up scale site drawing showing all VRF units and refrigeration pipe work, address settings (for units and remote controllers and BC branch connections) and model/serial numbers must be produced.

7.2 City Multi Indoor Units, BC Boxes, Outdoor Units addressing and screened wiring (greater than 1.25mm) as per the VRF specification (refer to data book).

7.3 All control wiring and remote controllers must be complete and connected but final connection to TB3 & TB7 left disconnected.

7.4 Before the Power Supply to Outdoor Unit is turned on, the mains wiring must be checked phase to neutral, neutral to earth. Once this is complete the mains isolator can be switched on to allow the crankcase heater to warm up the oil (minimum 24 hours).

7.5 All power supply wiring to Indoor Units (and BC controllers if R2 system) must be complete, tested and left switched on at Indoor Unit isolators.

7.6 All Indoor Units must be clearly marked with marker pen or similar indication and label indicating address and branch controller connection (R2 only) and model/serial number.

7.7 Pressure test and evacuation of system refrigerant pipe work must be completed as per section 2.6.1, 2.6.2 & 2.7.

7.8 Condensate pipe work must be completed and tested.

7.9 Total lengths of liquid line pipe work installed, must be confirmed by installation Engineers and marked on drawings for additional refrigerant charge calculation.

7.10 Sufficient supply of refrigerant R410A in dumpy cylinders must be on site adjacent to the Outdoor Units ready for use.

7.11 Now charge refrigerant into pipe work based upon the additional refrigerant charge calculation.

7.12 Outdoor Unit service valves must now be opened.

8. Commissioning

8.1 Connect Monitor Tool and check system connect information is correct i.e. Outdoor Unit, BC port, Indoor Unit and Remote controller addresses.

8.2 Start up the system and run each Indoor Unit one by one in cooling mode to confirm correct operation superheat and pipe temperatures.

8.3 Then change over all Indoor Units to heating mode and check operation, sub-cooling and pipe temperatures.

8.4 Set up and configure all controllers/time clocks/G50 centralized controllers.

8.5 Check operation of all accessories interlocks i.e. time clocks, centralized controllers etc.

8.6 Carry out airflow and static pressure drops on any units connected to ductwork.

8.7 Check operation of all condensate pumps if fitted.

8.8 Monitor operation for at least 1 hour. Observe and record all data.

8.9 Complete Commissioning Log Book via paper forms provided or via (handheld device).

VRF System sample piping diagram..

