INSTALLER: IT IS IMPORTANT TO LIAISE WITH OTHER TRADES WHEN INSTALLING EVOLUTION RADIANT PANELS

INTRODUCTION
This booklet provides instructions to identify, handle, install and commission Dunham-Bush Evolution Style FS radiant panels. The instructions apply to panels from the standard range only. Please study the instructions carefully before commencing any installation work.

IDENTIFICATION
Refer to Diagrams 1 and 2. On larger or more complex installations, Dunham-Bush may provide a baseboard layout (BL) drawing which will show details of each panel run, dimensions and panel part numbers. If specified on the order, each panel will be marked with a unique individual stencil reference, which may also be shown on the BL drawing.

DESCRIPTION
Evolution Style FS radiant panels comprise aluminium alloy extruded planks with copper tube (carrying the hot water) mechanically located inside the extrusion to form the radiant panel. Insulation is fitted to the rear side of the panel to prevent heat loss through the back of the panel. The system is completed with end caps, cover plates and foil backed mineral wool insulation.

STANDARD RANGE OF PANELS AND SIZES
Each panel type is available as one tube (1T), two tube (2T), four tube (4T) or six tube (6T) variants and are available in nine different panel types:

- EA - standard panel
- EB - end panel
- EC - connection panel
- ED - single (stand-alone) panel
- EE - expansion panel
- EF - multi-circuit panel
- EG - dummy panel
- EH - flow connection panel
- EJ - return connection panel

Panels are available in the following nominal lengths: 600mm, 900mm, 1000mm, 1200mm, 1500mm, 1800mm, 2000mm, 2100mm, 2400mm, 2500mm, 2700mm and 3000mm

Typical panel designation:
Style FS-4T EC1200
- FS free suspended application
- 4T four tube
- EC connection panel
- 1200 nominal length 1200mm

Diagram 1: Evolution Styles FS-4T- typical panel run (1T, 2T and 6T panels similar)
Diagram 2: Typical panel arrangements; 4 tube (4T) 6 tube (6T) shown; 1 tube (1T) and 2 tube (2T) are similar
Refer to the BL (baseboard layout) drawing for project specific panel arrangement
CONSTRUCTION

Delivery
The purchaser is responsible for off-loading, and must examine the radiant panels promptly upon receipt. Any claims for damage will only be accepted if, at the time of delivery, the consignment note is endorsed with the details and counter signed by the transport driver.

Handling
Radiant panels are usually palletised so a fork-lift or similar will be required for lifting. Individual panels will be up to 3.0m long and can usually be handled by one or two persons. Panels must not be dropped or suffer impact in any circumstances. Panels can be hoisted into position using a telescopic gas-operated hoist or similar equipment, following the equipment manufacturer’s recommendations.

Storage
Radiant panels should be stored in clean, dry indoor conditions. Packaging should not be removed until the panel is required for installation (the radiant surface of each panel is covered in a protective film which should be removed when installation and commissioning is complete). Any packaging should only be removed if damage is suspected at the time of delivery.

Preparation
Evolution Style FS radiant panels are intended for horizontal installation, suspended from drop-rods or similar. It is important to liaise with other trades to co-ordinate installation. Provision must be made for proper fixings; the ceiling, soffit or structure must be suitable to accept proposed fixings such as expanding anchors, drop rods, lindaptors etc. Refer to Table 1 for panel masses.

Access is recommended for maintenance i.e. pipe connections. Builders work etc should be removable with sufficient clearance. Evolution should be free to expand during normal operation.

Warning
Some components may have sharp edges. Care must be taken when handling the product and protective gloves should be worn.

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<th>Nominal panel length (mm)</th>
<th>600</th>
<th>900</th>
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<th>1200</th>
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<th>1800</th>
<th>2000</th>
<th>2100</th>
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Table 1: Masses of Evolution Style FS radiant panels

Diagram 3: Evolution Style FS radiant panel; typical hanging arrangement with threaded drop rods; other hanging arrangements may be used.
Diagram 4: Typical section details for installation; Style FS-1T

Diagram 5: Typical section details for installation; Style FS-2T
Diagram 6: Typical section details for installation; Style FS-4T

Diagram 7: Typical section details for installation; Styles FS-6T
Diagram 8: Suspension point locations for Evolution Style FS.

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NOTES:
1. PANEL TO BE SUSPENDED VIA M6 STUDDING AND SHAKE PROOF NUTS (BY OTHERS)
2. PANEL TO BE LEVELLED TO DATUM PRIOR TO MAKING JOINTS.
3. 4 TUBE SHOWN - APPLIES TO 1,2 & 6 TUBE PANELS.
INSTALLATION

General
Refer to the baseboard layout (BL) drawing for panel arrangement. When two or more panels are to be installed in a run, then pipework is interconnected using 15mm straight couplings or expansion hoses provided.

Radiant Panels
1. Prepare suitable fixings to accept the radiant panels. Refer to Diagrams 4, 5, 6, 7 and 8 for fixing positions.
2. Suspend the panel and adjust to the appropriate level. Note that panels are best suspended by drop rods to the suspension brackets.
3. If two or more panels are to be installed in a run then clean and flux the pipe ends on both panels. Fit the slip couplings to the first panel.
4. Suspend the second panel level to the first panel and engage the pipes of both panels into the couplings.
5. Check that all panels are located correctly, level and in a straight line.
6. Centralise the slip couplings on the pipe joint, apply heat to make each joint to an accepted method (see Diagram 9).
7. Ensure that panels are interconnected correctly. EC, EH and EJ panels are positioned at the connection end (flow and return) of a panel run, whereas EB panels are positioned at the opposite end. EA and EE panels are used at intermediate positions - see Diagrams 1 and 2. ED panels are single (stand-alone) panels.
8. Refer to Pipework Connections for connecting the panels to the mains.
9. Fit the insulation to the rear of the panel with foil face uppermost or visible. Insulation can be trimmed with self-adhesive foil tape provided.

Expansion Joints
1. Expansion panels should be fitted:
   i) every 6m of straight panel run for Style FS-1T (150mm nominal width)
      Style FS-2T (300mm nominal width)
      Style FS-4T (600mm nominal width)
   ii) every panel joint of straight run for Style FS-6T (900mm nominal width).
2. Expansion hoses should be fitted in place of the slip couplings. Note that the hoses will require pre-bending prior to fitting (see Diagram 10).
3. The expansion hoses allow for differential expansion between the copper pipe and the aluminium extrusion in the panel.
4. Sufficient clearance should be allowed for overall expansion of the radiant panels, which will depend on the length of the panel run; contact Dunham-Bush for guidance.

Fitting - End Caps & Cover Plates
1. Remove protective film from radiating surface.
2. Fit end caps with self drill/tap screws and screw caps provided. End caps include knockouts which can be removed for pipe entry.
3. Fit cover plates where provided between panels using self drill/tap screws and screwcaps provided.

Pipework connections
1. Connection to the mains is made via EC, ED, EH and EJ panels.
   EC and ED panels are plain 15mm plain copper.
   EH and EJ panels are plain 15 or 22mm copper tube, specified at order stage.
   Flow and return connections are formed upwards for connection from above and are interchangeable.
2. Flexible hoses are recommended to allow for rapid installation and flexibility.
3. Local isolating and regulating valves are recommended, as well as drains, vents and strainers.
NOTES:-
1. BEFORE INSTALLING PANELS, CLEAN AND FLUX ALL TUBE ENDS.
2. SUSPEND PANEL No.1 AND LEVEL AS REQUIRED.
3. SLIDE SLIP COUPLING ONTO TUBE END OF PANEL No.1
4. SUSPEND PANEL No.2 AND LEVEL TO PANEL No.1.
5. MOVE PANELS TOGETHER.
6. ADJUST PANELS SO THAT THE DISTANCE BETWEEN THEM IS 98mm
7. CENTRALISE THE SLIP COUPLING BETWEEN THE TUBE ENDS.
8. APPLY HEAT TO JOINT AND MAKE CONNECTION USING YORKSHIRE FITTINGS APPROVED METHOD.
9. APPLY A HYDRAULIC TEST, OR EQUAL TO ALL JOINTS. MAX. TEST PRESSURE 12bar.
MAXIMUM WORKING TEMPERATURE 90°C AND WORKING PRESSURE 6bar g.

Diagram 9:  Installation detail of Evolution Styles FS - standard joint

NOTES:-
1. SUSPEND PANEL No.1 AND LEVEL AS REQUIRED.
2. FIT HOSE ON TO TUBE END OF PANEL No.2 & TIGHTEN NUTS BY HAND AS FAR POSSIBLE.
   HOLD HEXAGONAL END OF THE HOSE AND THEN TIGHTEN THE COMPRESSION NUT APPROX. 1¼ TURNS.
3. SUSPEND PANEL No.2 AND LEVEL TO PANEL No.1.
4. MOVE PANELS TOGETHER.
5. ADJUST PANELS SO THAT THE DISTANCE BETWEEN THEM IS 98mm
6. OFFER FREE END OF EACH HOSE TO TUBE END OF PANEL No.1 (THE HOSES WILL REQUIRE PRE-BENDING.)
7. TIGHTEN NUTS BY HAND AS FAR POSSIBLE, HOLD HEXAGONAL END OF THE HOSE AND THEN TIGHTEN THE
   COMPRESSION NUT APPROX. 1¼ TURNS.
8. APPLY A HYDRAULIC TEST, OR EQUAL TO ALL JOINTS. MAX. TEST PRESSURE 12bar.
MAXIMUM WORKING TEMPERATURE 90°C AND WORKING PRESSURE 6bar g.

Diagram 10:  Installation detail of Evolution Style FS - expansion joint
COMMISSIONING

1. Check the fastness of all fixings and pipe joints. Ensure that the insulation is fitted correctly and that the radiating surface is not damaged.
2. Purge the air from the system using air vents in the main (by others).
3. Hydraulically pressure test the panels and check for leaks. Refer to Table 2 for test and working pressures.
4. Balance the water flow rate through the panel to accepted practice to achieve the specified flow rate.
5. Leave this document and any layout drawings with the end-user.

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<td>Maximum cold test pressure</td>
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<tr>
<td>Maximum working pressure at 90°C</td>
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Table 2: Recommended test and working pressures

Diagram 11: Evolution Style FS-4T panel, showing flow and return connections and end cap. Insulation and mains pipework omitted for clarity.
GENERAL GUIDANCE

1. **Preparation**
   Planning and preparation of building fabric is important; it is essential to co-ordinate all installation works with other trades.

2. **Layout**
   Panel runs should be set out on a layout plan. Radiant panels should be concentrated in areas of highest heat loss i.e. around the outside perimeter of the room, particularly near windows. This will counteract disproportionately high heat losses. Single or dual circuit runs should be considered; see Water flow rates and Hydraulic Resistances below.

3. **Maximum mounting height**
   There is no maximum mounting height for Evolution. However, when mounting heights exceed 4m, the heat load should be adjusted to allow additional losses of radiant heat incident on walls and stratification of air which absorbs some heat by convection.

4. **Minimum mounting height**
   There is no minimum mounting height for Evolution. For comfort and safety, the rule-of-thumb minimum mounting height is 2.4m. Contact Dunham-Bush for further information on mounting heights and comfort conditions.

5. **Expansion**
   There should be sufficient space for Evolution radiant panels to expand during normal operation. Drop-rods or hangers should accommodate expansion movement from the panels’ overall expansion.

6. **Expansion joints**
   Expansion joints should be fitted every 6m in a straight panel run for 1T, 2T and 4T panels and every 3m (or panel joint) for 6T panels. Expansion joints (as shown in Diagram 10) are to allow differential expansion between the aluminium radiant plank and the copper pipe fitted to the panel.

7. **Panel runs**
   Refer to Diagram 2 for typical arrangements in a panel run. Dunham-Bush will prepare complete basesboard layout drawings for approval, which can be used to co-ordinate materials and installation on site.

8. **Water flow rates**
   To ensure rated heat outputs are achieved, water velocity in the tube should be such the water flow is turbulent. This maximises heat transfer from the water, through the tube and to the radiating surface. Water flow rates should also be limited to inhibit noise and erosion and high pressure drops. Water velocities should ideally be between 0.3 - 1.0m/s.

9. **Hydraulic resistances**
   Evolution utilises 15mm OD copper tube to transport hot water. To calculate the total pressure drop, determine the water flow rate:

   \[ \text{Water flow rate} = \frac{Q}{C_p \times \Delta T} \]

   - \( Q \) = total heat output from panel run (kW)
   - \( C_p \) = specific heat capacity of water (kJ/kgK); approx. 4.187 for most applications
   - \( \Delta T \) = water temperature drop (K)

   Obtain the hydraulic resistance from the graph. Note that the water flow rate should be halved if dual circuit panel runs are used (i.e. type EH and EJ panels). N.B. circuit length applies for one circuit only.

   ![Diagram 12: Hydraulic Flow Rate kg/s](image)

10. **Application**
   Evolution Style FS is designed to be freely suspended from drop-rods or similar arrangements. It can be installed at an angle but consideration must be given to draining and venting. Contact Dunham-Bush for guidance.

   **Other Applications**
   Evolution Style FS is not designed for ‘lay-in’ tile ceiling grids or plasterboard ceilings. Contact Dunham-Bush for more guidance if these applications are being considered.
Diagram 13: Evolution Style FS installed from pitched roof.
MAINTENANCE

Dunham-Bush Evolution radiant panels are essentially maintenance free, with no moving parts. Panel surfaces can be washed with mild cleaner or detergent followed by rinsing. Strong, abrasive or mechanical cleaning should not be used. If panels or accessories become damaged, they can be replaced after isolating, draining and disconnecting from pipework or adjacent panels.

SPARES/SERVICE

**PLEASE WRITE THE DETAILS OF RADIANT PANELS HERE.**

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Spare parts/service - Please contact our office, contact information shown below.

Manufacturer reserves the right to change any product specification without notice.

Dunham-Bush Ltd, Downley Road, Havant, Hants, PO9 2JD

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<th>Spare Parts and Service</th>
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