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11

Panel Radiators, Accessories, and Physical Data

DiaNorm panel radiators are available in a wide selection of shapes and sizes to help designers select a panel with the necessary heat output, and place that heat output within a given building space. Several accessories are also available to simplify and speed installation. This section gives physical data on DiaNorm panel radiators and accessories that help designers build efficient systems.

DiaNorm panels are produced in state-of-the-art facilities

General Construction

All DiaNorm Radiators are made of high quality 1.25mm FePO1 Steel, and finished with a white epoxy powder coating that is baked at 400 F. All panels are built under an ISO 9002 certified procedure and meet several international quality standards.

Application Stipulations

• Because of their steel construction, DiaNorm panels should only be used in closed-loop hydronic heating systems. Use in open loop systems voids the warranty.

• DiaNorm radiators are not to be exposed to pressures above 145 psi.

• The maximum differential pressure across DiaNorm radiators (inlet to outlet connection) is 14.5 psi.

• DiaNorm radiators are not for use in steam heating systems.

• The radiator inlet connection (left), and outlet connection (right) can NOT be reversed.

Panel shapes and sizes

DiaNorm panels are available in four heights (10", 14", 20", and 24"), and in six lengths (16", 24", 36", 48", 64", and 72"). They are also available in three depths (2-5/8", 3-3/4", and 5-7/8"). **Upon special request, DiaNorm panels are available in lengths up to 118 inches and heights up to 36 inches. Contact Heatlines, Inc. for pricing, availability, and thermal ratings.**

Model 11 panels (pictured next page) are 2-5/8 inches wide and available in six lengths (16", 24", 36", 48", 64", and 72"). When a thin profile is required, model 11 panels are ideal. When installed, its outer face is only 3-5/8 inches out from the wall. Model 11 panels have a single row of convective fins. They also provide a slightly higher percentage of their heat output as radiant rather than convective heat.

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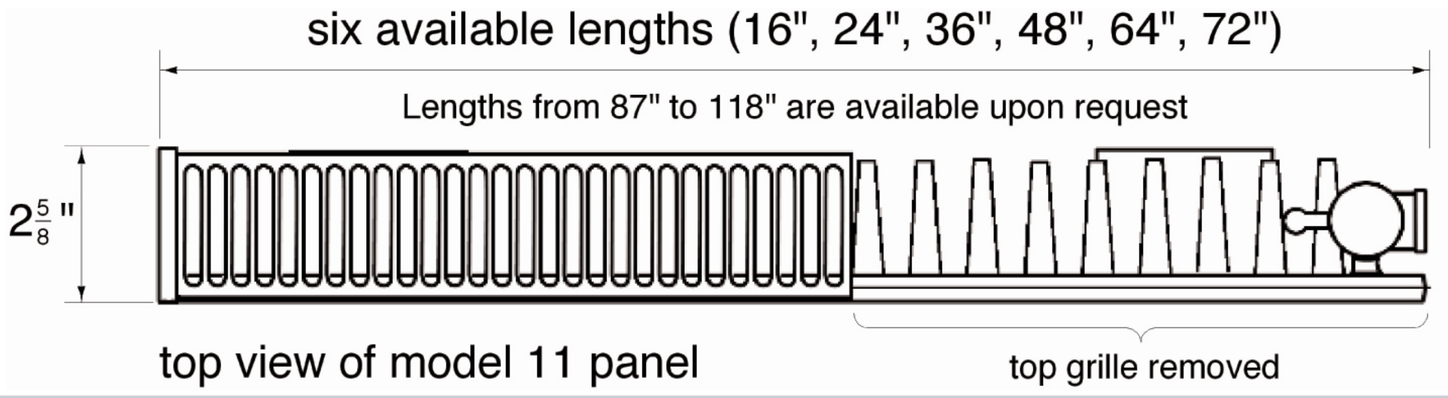
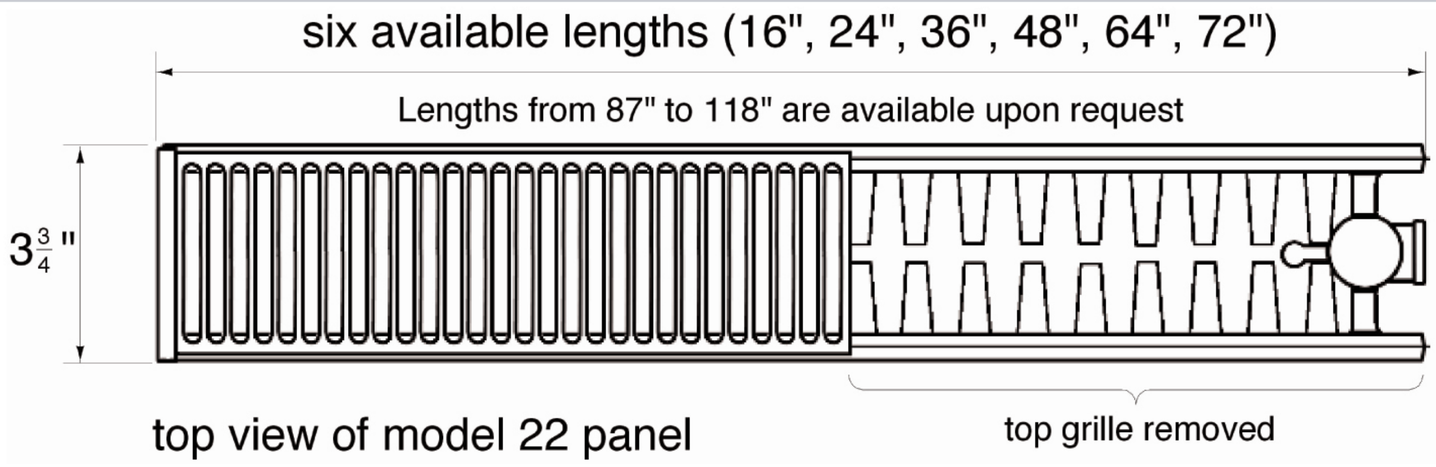
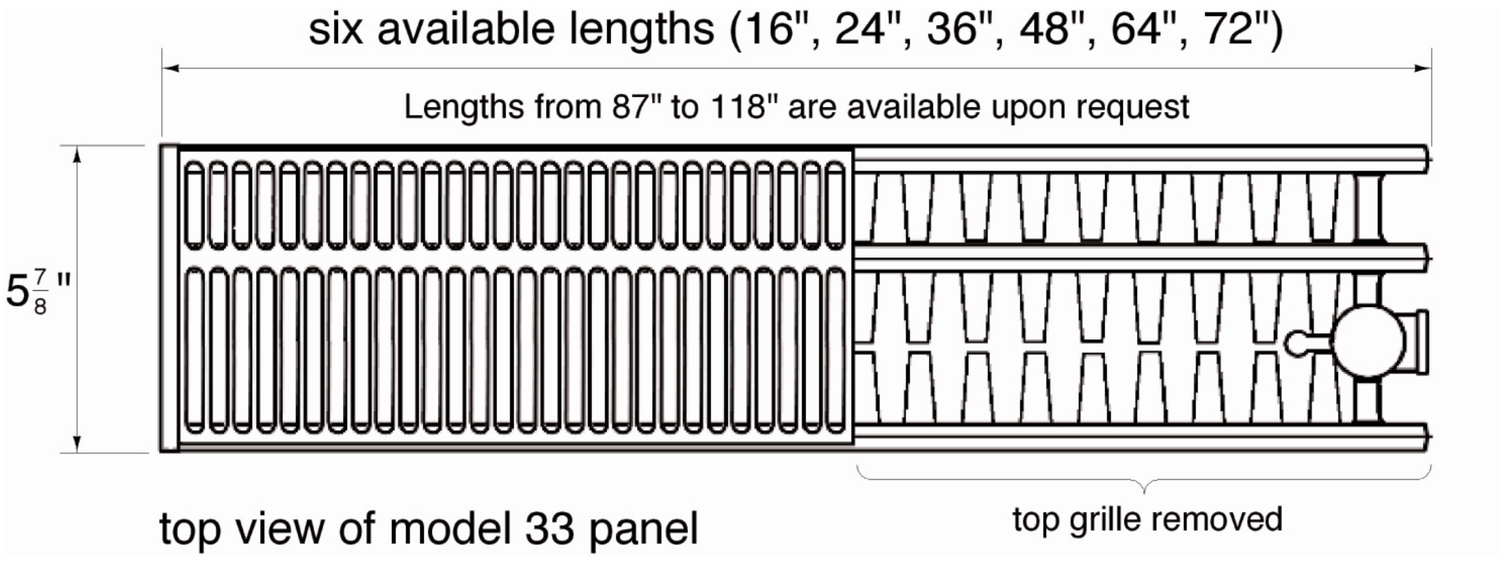




Model 22 panels are 3-3/4 inches wide and available in six lengths (16", 24", 36", 48", 64", and 72"). When space is tight and higher heat output is needed the model 22 panel is a good choice. Model 22 panels project 4-3/4 inches out from the wall surface, and have two rows of fins for higher convective heat output.

Model 33 panels are 5-7/8 inches wide and available in six lengths (16", 24", 36", 48", 64", and 72"). These panels provide the highest heat output per square foot of frontal area. Model 33 panels project 6-7/8 inches out from the wall surface, and have three rows of convective fins. They can also be floor-mounted.



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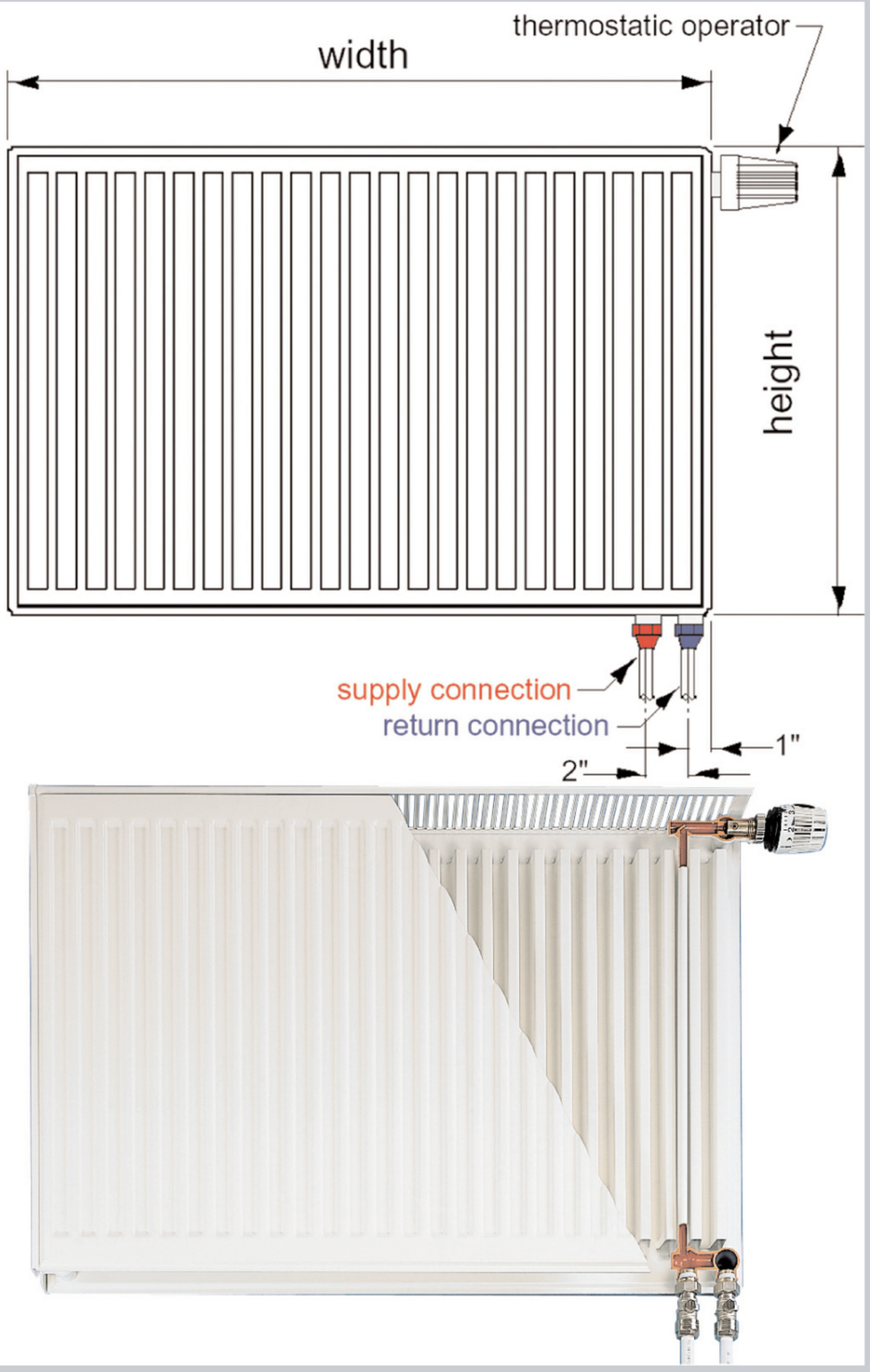
All DiaNorm radiators sold in North America have side-by-side supply and return connections at the bottom right side of the panel as shown below.



Assuming the radiator valve is partially or fully open, heated water enters the left (supply) connection and flows up through an internal riser tube to the inlet of the valve. After passing through the valve the flow continues onward to the horizontal manifold at the top of the panel. It then divides and flows downward through the vertical riser channels on the face of the panel. All flow is collected by the lower manifold and routed back to the outlet connection at the lower right of the panel.

The integral radiator valve maintains complete control of flow through the panel. The extent to which this valve can open can be manually set to limit heat output.

If a thermostatic operator is attached to the radiator valve, and the radiators are piped properly, the heat output of the panel is automatically adjusted to maintain a set comfort level in the room.

A thermostatic operator mounted on integral radiator valve

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Accessories

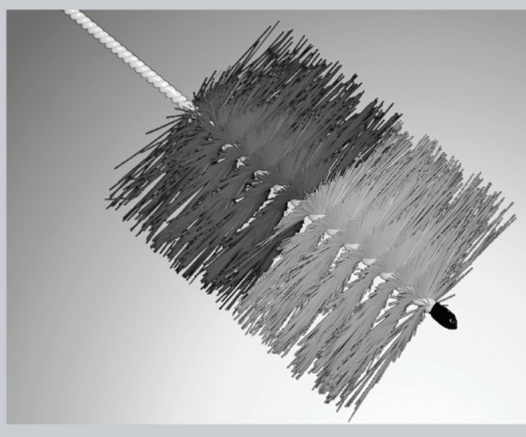
Several accessories are available for DiaNorm panel radiators.

Shelf Supports

A pair of supports can be attached to the top of the radiator to support a shelf along the length of the radiator. The depth of the shelf bracket can be adjusted to accommodate shelves between 6-3/8 and 11 inches wide (depending on the model of radiator). The bracket securely tightens into the upper portion of the panel through the top grille.

Cleaning Brush

This specially shaped brush makes it easy to thoroughly clean dust from the interior of the panel. Just push the brush down through the top grille to push dust out the bottom of the panel where it can be easily vacuumed up.



Rough-in tool

This fixture allows installers to mark the exact position of piping penetrations for model 11,22, and 33 panels. It can also be temporarily connected to the supply and return piping to allow the piping system to be pressure tested and flushed prior to installing the panel radiators. Its use is illustrated later in this section.

Mounting Options

DiaNorm panel radiators can be mounted in several ways to accommodate different room conditions.

Wall Mounting

The most common mounting method is to attach the radiator directly to a wall surface. This is easily done using DiaNorm spring-loaded mounting brackets shown below.

Note: *Panel mounting brackets must mount securely to wooden framing or masonry walls. They should never be solely supported by drywall or plaster wall finishes.*

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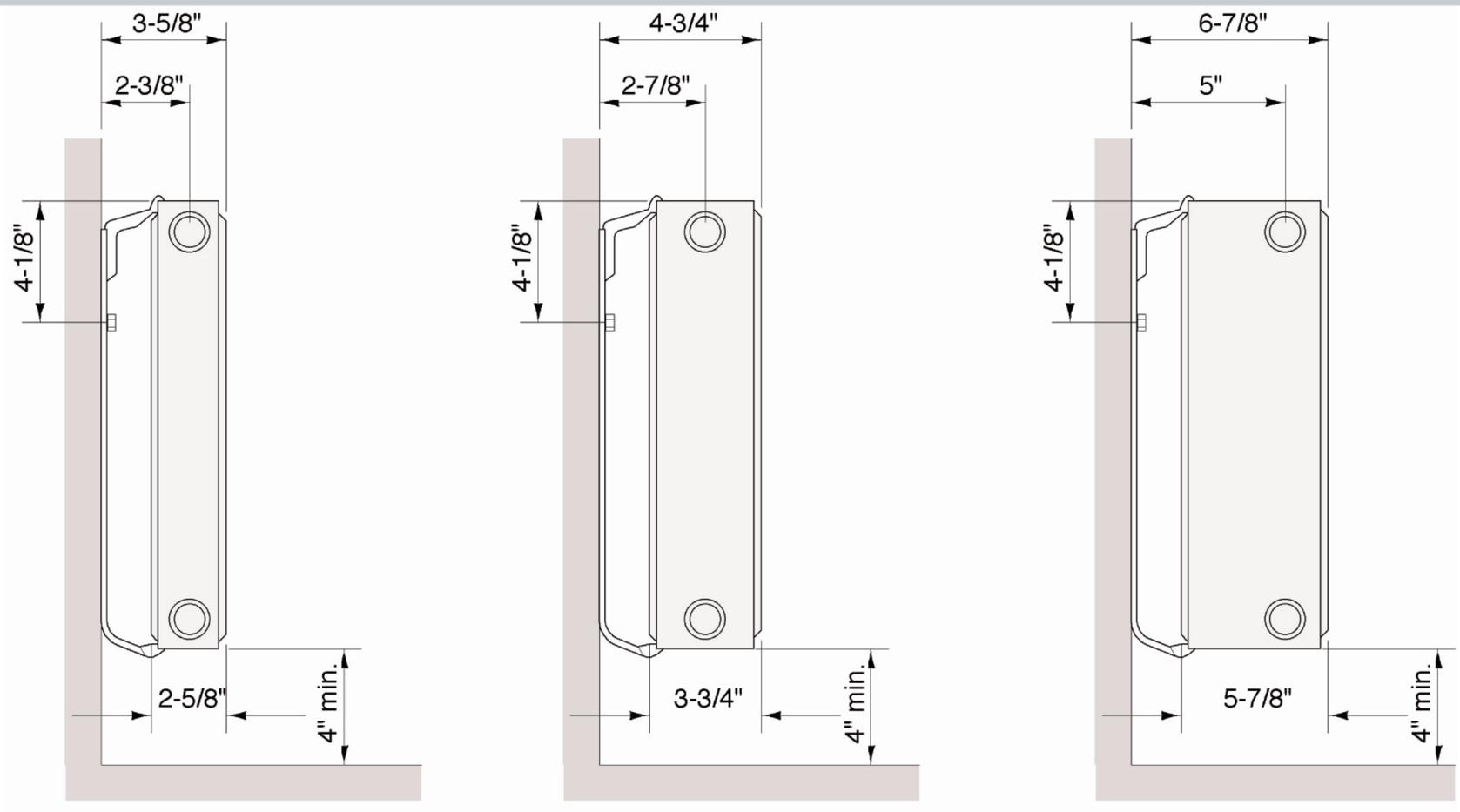
The spring-loaded mounting brackets can be attached to a radiator virtually anywhere along its length. This allows the brackets to be placed so fasteners can go directly into wooden framing. The lower portion of the bracket supports the lower edge of the panel. The upper portion of the bracket is spring loaded, and snaps securely and unobtrusively into the grille openings at the top of the panel as shown at right. The panel can be easily removed from the bracket if necessary to access the wall.

Top of spring-loaded wall bracket securely holds radiator in place. Bracket can be easily opened if panel needs to be temporarily removed from wall.

The diagram below shows the mounted dimensions for radiator types 11, 22, and 33. These dimensions are derived from metric lengths rounded to the nearest 1/8 inch. The finish wall-to-piping side port dimensions are the same as the finish wall to piping center dimensions at the bottom of the panel.

Note: Supply and return piping connections at the bottom of the radiator are spaced 2 inches center to center.



Model 11 Model 22 Model 33

NOTE: Dimension rounded to nearest 1/8"

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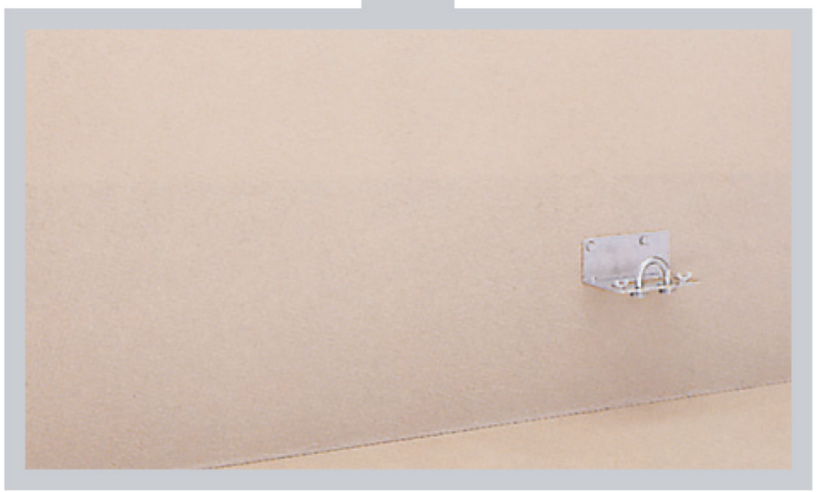
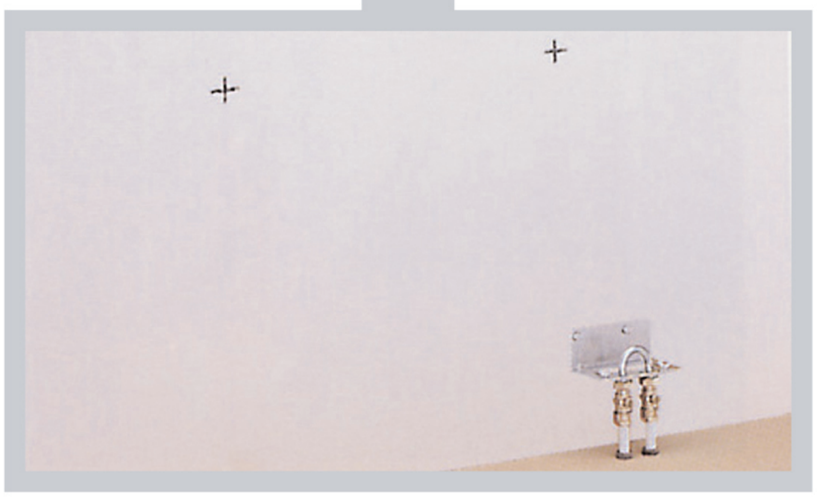
Mounting a DiaNorm Radiator to a Wall

The following sequence show how a DiaNorm radiator can be mounted to a wall using the spring-loaded mounting brackets. Piping is located and pressure tested using the rough-in bracket.

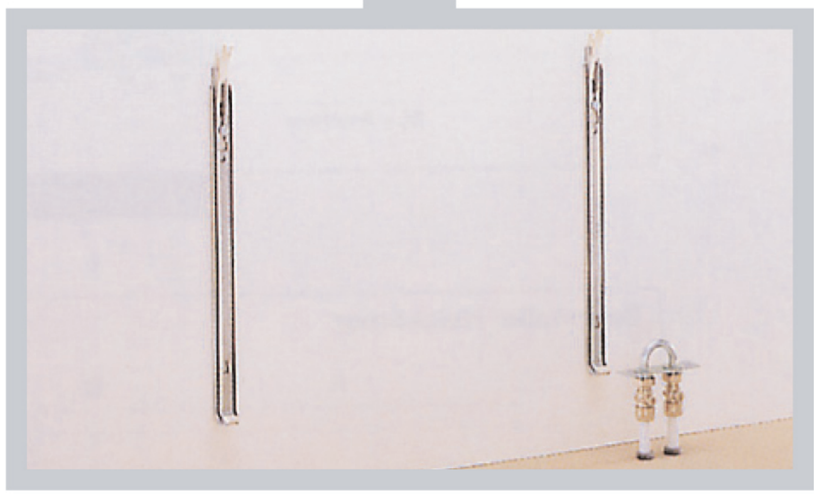
Step 1: Locate the piping riser penetrations through the floor, and mark the location for the rough-in tool on the wall. The bottom of the horizontal plate of the rough in represents the bottom of the panel radiator. Be sure the movable piping locator plate on the rough-in tool is set for the type of DiaNorm panel being mounted (e.g. model 11, 22, or 33). Mount the rough-in tool to the wall.



Step 2: Route supply and return piping to the rough-in tool. **Note: If isolation or bypass valves will be used they attach to the bottom of the rough-in tool the same way they would attach directly to the radiator connections.**



Step 3: Securely fasten the radiator mounting brackets to the wall. Remove the wall mounting plate for the rough-in tool leaving the tubing connections in place. The system piping can be pressure tested and flushed prior to mounting the panel radiator.



Step 4: Close the isolation valves and remove the piping U-bend plate. Clip the panel radiator to the wall brackets aligning the bottom connections with the upper ends of the isolation valves. Finally, connect the isolation valves to the radiator and install the PVC escutcheon plate over the tubing where it penetrates the floor.

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DiaNorm panels can also be supported above the floor using the floor pedestals shown below. These supports are especially well suited for situations where the panel is mounted adjacent to glazing that extends near the floor level.

Once installed, the lower flange and vertical arm of the pedestal can be covered with a smooth white plastic collar and escutcheon plate to provide a clean and neat appearance.

Heat Output ratings

The heat output of panel radiators is dependent on several factors. The most significant of which include:

1. **Panel dimensions**
2. **Supply water temperature**
3. **Ambient air temperature**

The following tables can be used to estimate panel heat output at reference operating conditions of 190 ºF supply water temperature, 20ºF temperature drop across panel, and 68 ºF room air temperature.

Model 11	16"long	24"long	36"long	48"long	64"long	72"long
24" high	1870	2817	4222	5630	7509	8447
20" high	1607	2421	3632	4842	6455	7260
14" high	1215	1831	2748	3662	4883	5494

Model 22	16"long	24"long	36"long	48"long	64"long	72"long
24" high	3153	4750	7127	9500	12668	14254
20" high	2733	4123	6186	8245	10994	12368
14" high	2051	3093	4638	6182	8245	9275
10" high	1491	2247	3373	4498	5995	6745

Model 33	16"long	24"long	36"long	48"long	64"long	72"long
24" high	4531	6830	10247	13664	18216	20494
20" high	3934	5937	9586	11870	15829	17807
14" high	2968	4474	6711	8948	11932	13425
10" high	2191	3304	4958	6609	8811	9913

All outputs are in Btu/hr at reference conditions: (190ºF supply water temperature, 20ºF temperature drop across panel, and 68ºF room air temperature).

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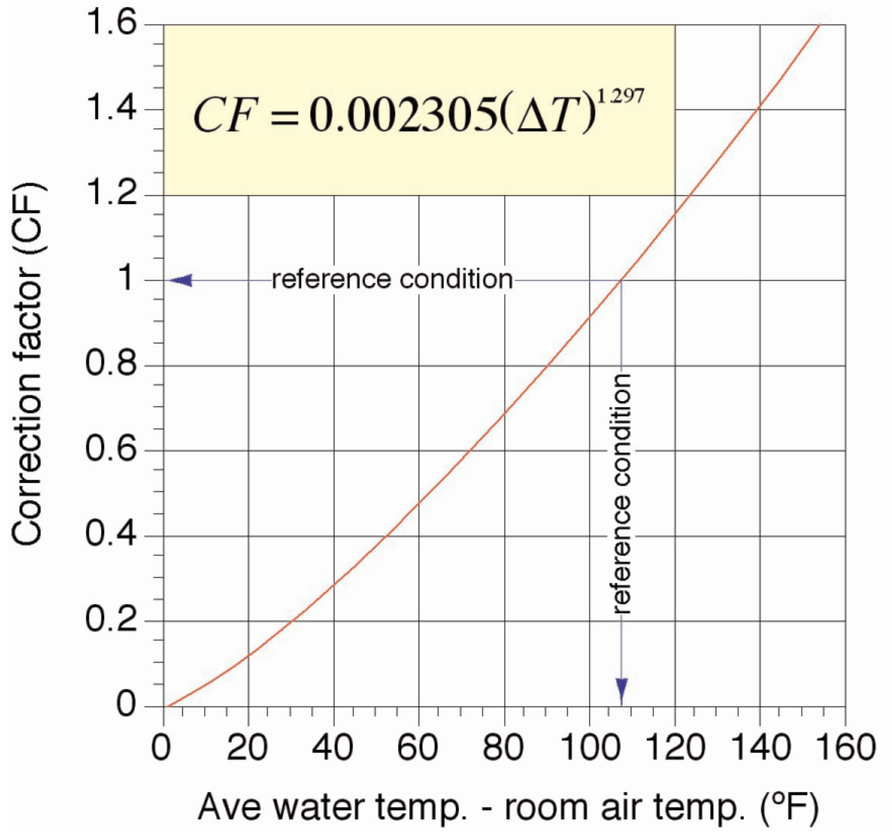
Heat outputs can be corrected for operating conditions other than the reference conditions by finding the appropriate correction factor (CF) from the graph below.



Example

Determine the heat output of a DiaNorm model 11 panel 24" high by 48" wide operated with a design supply temperature of 160ºF, a temperature drop of 20ºF in a room with 65ºF air.

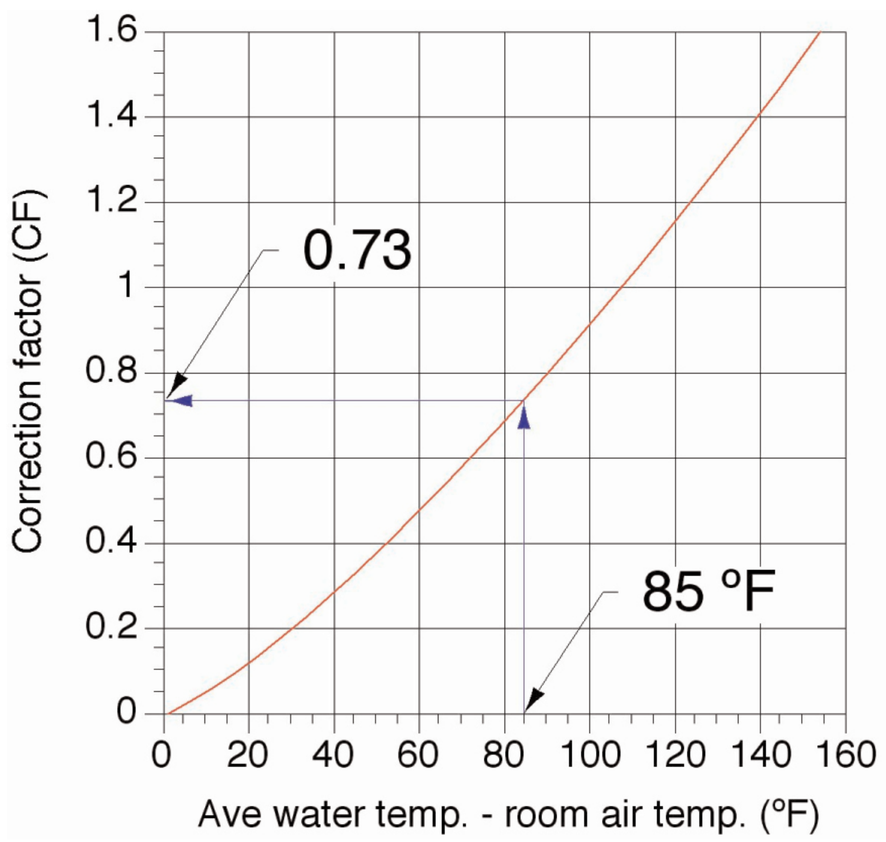
Solution

Step 1: First find the output of the panel at reference conditions (190ºF supply water temperature, 20ºF temperature drop across panel, and 68ºF room air temperature). That number is found in the model 11 heat output table (previous page): 5630 Btu/hr.

Step 2: Next, determine the *average* water temperature at the specified operating conditions by subtracting half the design temperature drop from the supply water temperature: 160 - (20/2) = 150ºF

Step 3: Find the difference between the average water temperature and the room air temperature: 150-65=85ºF

Step 4: Enter the graph at 85ºF on the horizontal axis, read up to the curve, and then over to the correction factor on the vertical axis. In this example the correction factor is 0.73



Step 5: Multiply the heat output at the reference conditions by the correction factor to get the actual heat output at the specified operating conditions: Output = 0.73x5630 = 4110 Btu/hr.

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An alternative to reading the correction factor from the graph (in step 4) is to calculate it using the formula given in the upper left corner of the graph. In this case:

$$CF = 0.002305(\Delta T)^{1.297} = 0.002305(85)^{1.297} = 0.733$$

Panel heat output increases with increasing water supply temperature. Heat output also increases at lower room air temperature. Operating the panels at relatively high temperature drops (25 to 40 ºF) slightly lowers the average water temperature in the panel for a given inlet temperature. This, in turn, slightly lowers panel heat output. However, higher temperature drops also decrease flow rate requirements and may reduce the size of the distribution piping and circulator. More importantly, lower flow rates may significantly reduce the cost of operating the circulator over the life of the system.

Head Loss of Panels

The head loss of DiaNorm panels is primarily a function of the balancing valve setting. It can be calculated using the following formula (based on water as the heating fluid):

$$H_L = a \times (f)^2$$

Where:

H_L = pressure drop through the radiator (feet of head)
f = flow rate through radiator (gpm)

The values of the constant (a) are listed in the following table based on the setting of the balancing valve:

Balancing valve setting	Value of (a)
Fully open	3.472
6	4.692
5	9.900
4	23.46
3	112.6
2	818.7
1	2918.6

If glycol antifreeze solutions are used the head loss of the panels will be higher. As a guideline, multiply the head loss using water by the following factors to estimate the head loss using glycol antifreeze solutions:

30% glycol (multiply head loss by 1.18)
50% glycol (multiply head loss by 1.34)

The pressure drop across the panels can be estimated from the head loss using the following formula:

$$\Delta P = \frac{D \times H_L}{144}$$

Where:

ΔP = pressure drop across the panel (psi)
D = density of the fluid being used (lb/ft³) (for water at 140 ºF D = 61.3 lb/ft³)
H_L = head loss through the radiator (feet of head)

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Panel volumes

The following table lists the volume of fluid in various DiaNorm panels. The numbers are in **US gallons per foot of radiator length.**

	Height = 10"	Height = 14"	Height = 20"	Height = 24"
Model 11	N/A	0.13	0.15	0.17
Model 22	0.17	0.20	0.30	0.35
Model 33	0.26	0.33	0.44	0.52