HYDRONIC DESIGN SOLUTIONS

APPLIED HYDRONIC EXPERTISE



TECHNICAL OVERVIEW

History of Perimeter Radiation

Hydronic Design Solutions

Manufacturers' Representatives

Hydronic Design Solutions

OUR EXPERTISE

Applied Hydronic Expertise

Providing comprehensive engineering representation and specialized heating solutions:

- **Perimeter Heating & Radiators**
  Perimeter heating and architectural radiators
- **Electric Heat & Steam**
  Electric heat and steam components
- **Hydronic Controls**
  Advanced hydronic system controls

SALES REPRESENTATIVES

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HDS Manufacturers & Products

Vulcan Radiator Corp.
Fin-tube radiators, unit heaters, cabinet unit heaters, convectors and electric fin-tube heat.

Runtal Radiators
Flat-panel, electric decorative, vertical and steam radiators. Chrome valves and accessories.

Heatrex
Electric and fin-tube heat, unit and cabinet heaters, duct coils, explosion-proof and high-dust process heaters, oil immersion and flange heaters.

Tunstall
Thermostatic and float-style steam traps. Rebuild kits for most manufacturers.

Macon Controls
Thermostatic control valves with non-electric operators, low-profile 24V control valves and steam radiator valves.

Why perimeter radiation

01 ac_unit

Heat Loss Offset

Offsets heat loss at exterior walls, windows and doors.

02 air

Downdraft & Comfort Control

Helps control cold downdrafts and supports comfort near glazing.

03 whats hot

Primary Heating System

Can serve as the primary heating system for a space.

04 place

Strategic Equipment Placement

Perimeter space is limited, so equipment placement matters.

05 tune

Hydronic Balancing

Hydronic balancing supports the intended distribution of heat.

Convection and radiant heat

01

Convection

Convection transfers heat through moving air. Natural convection uses buoyancy. Fans provide forced convection.

02

Radiant Heat

Radiant exchange occurs between surfaces at different temperatures and can reduce the body’s heat loss to cold surroundings.

03

Combined Heat

Many perimeter products combine both mechanisms.

I Finned tube

01 HEAT TRANSFER

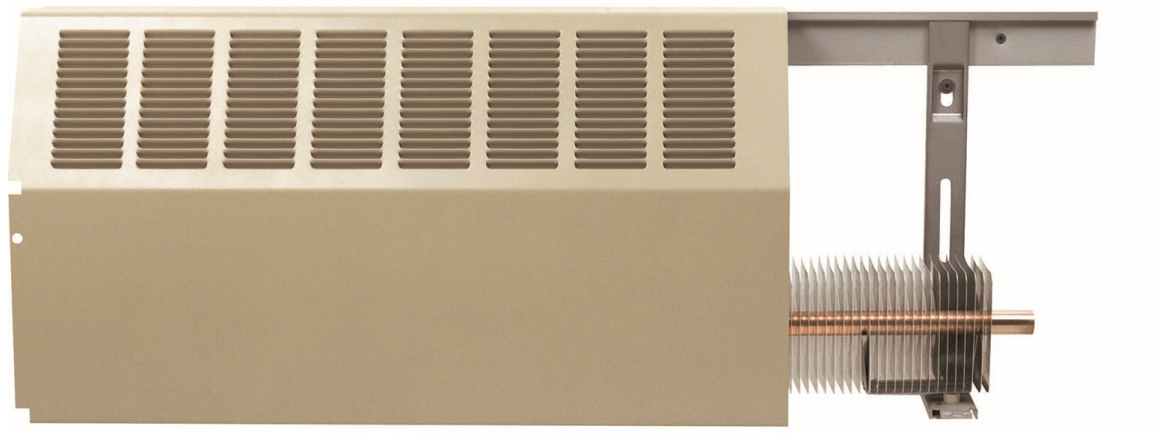
Hot water heats the tube. Heat conducts into the fins and then transfers to room air through natural convection.

02 MATERIALS & CONSTRUCTION

Copper tube is mechanically expanded into aluminum fins.

03 ARCHITECTURAL ENCLOSURE

An enclosure protects the element and shapes its architectural appearance.



Architectural finned-tube enclosures

01 CORE PRINCIPLE

The heat-transfer principle stays the same while the enclosure changes.

02 DESIGN & APPLICATION

Architectural grilles and extruded aluminum tops can suit office and public-space interiors.



Custom perimeter enclosures

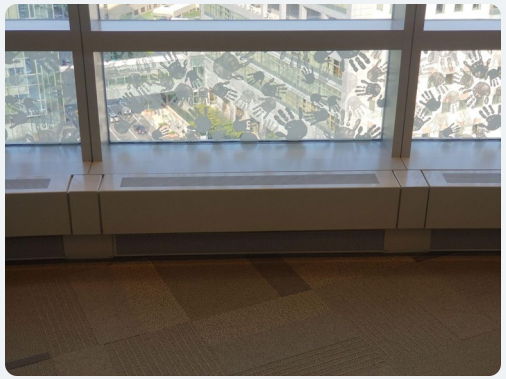
01 ARCHITECTURAL APPLICATION

Enclosures can respond to a specific architectural application.



02 DESIGN COORDINATION

Coordinate the intended appearance with element space, piping, access and the required heating output.



Vulcan enclosure families

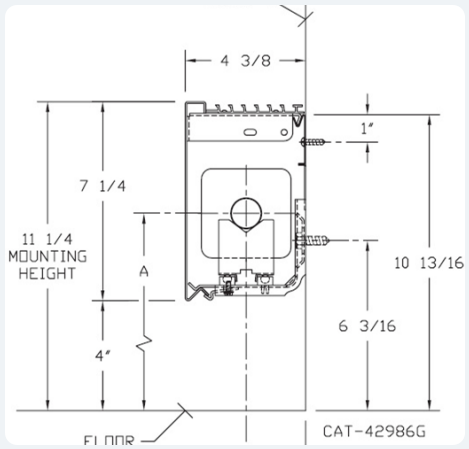
LINOVECTOR II
Integral die-stamped louvers and multiple styles.

CLASSIC
Architectural design with slip-jointed or wiped-edge construction.

DURA-VANE II
Slip-jointed enclosures and overlapping accessories.

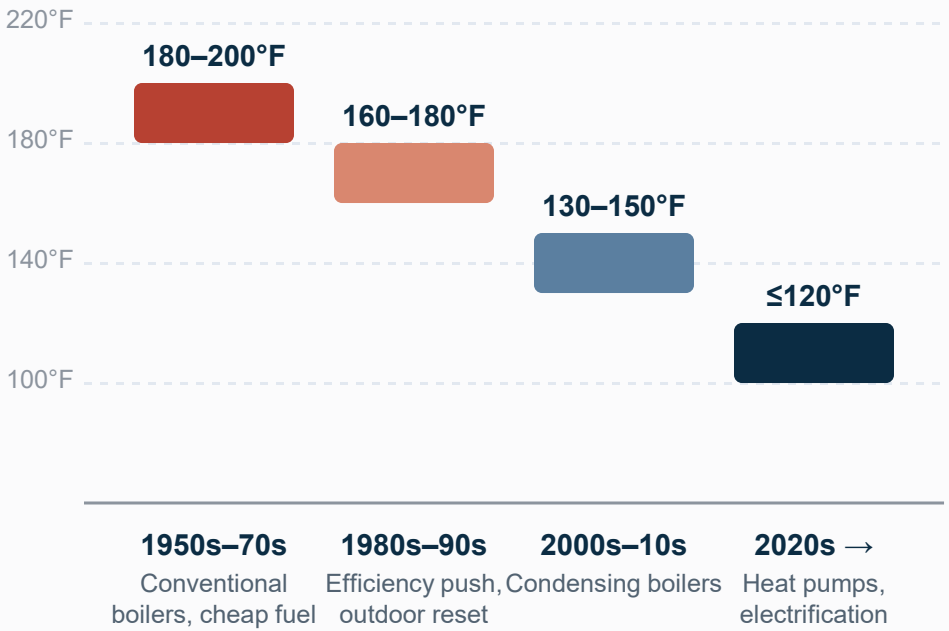
VANGUARD
Security enclosures with sloped or flat tops.







Design water temperatures keep falling



hist ory

High Temperature Legacy

Fin-tube baseboard was rated and sized when fuel was economical and boilers ran at 180°F or higher.

ther most at

Modern Low-Temp Requirement

Condensing boilers need cool return water, and air-to-water heat pumps top out around 120–130°F.

tren ding_ up

The Output Gap & Solution

Fin tube in place was never sized for low temps. Fan-assisted fin tube adds up to 2.28× output to new or existing runs.

Approximate typical design supply water temperatures by era; individual systems vary. Sources: J. Siegenthaler and D. Holohan (PM Engineer), U.S. DOE condensing boiler field study, Green Building Advisor.

Low water temperatures cut fin-tube output sharply

Average water temperature	Output vs. 215°F rating
215°F	100%
180°F	69%
150°F	45%
120°F	**26%**
100°F	15%

At 120°F average water, standard fin-tube delivers about a quarter of its 215°F rating.

Lower water temperatures have forced perimeter units to be larger, increasing capital costs.

LT Series elements, fan assist and trench units recover output at low water temperatures.

Source: Vulcan VFAS-1, LT Series element correction factors for average water temperature, 65°F entering air.

Finned tube for lower water temperatures

01 SYSTEM COMPATIBILITY

Vulcan LT Series supports designs using condensing boilers or ground water heat pumps.

02 EXTENDED TEMPERATURES

Published ratings extend to 100°F average water temperature.

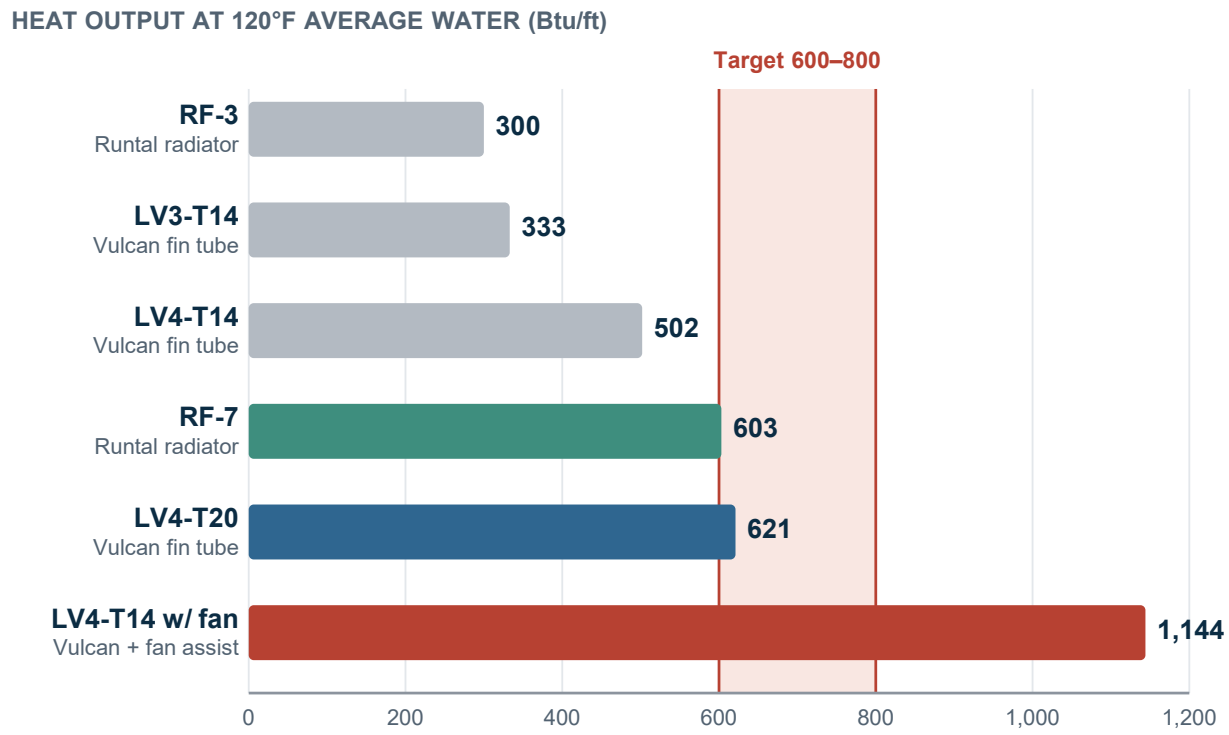
03 MULTI-TIER FLEXIBILITY

Linovector II and Classic styles accommodate additional tiers of elements.

04 FAN ASSIST

Fan assist adds up to 2.28× output (depth 3 and 4 enclosures, high fan speed).

Meeting 600–800 Btu/ft at 120°F water



warning

Standard Fin Tube Falls Short

Standard LV3-T14 and LV4-T14 fin tube give 330–500 Btu/ft at 120°F water, short of the 600–800 most perimeter loads need.

check_circle

Higher Capacity Models Reach Target

Stepping up to the LV4-T20 (621) or a Runtal RF-7 (603) successfully reaches the target.

toys

Fan Assist Delivers High Output

Adding fan assist to the LV4-T14 takes it to 1,144 Btu/ft, so fans can run at lower speeds and still easily meet the load.

Source: HDS water temperature comparison from Vulcan and Runtal published ratings. Fan assist = LV4-T14 rating × 2.28 (VFAS-1, high speed). Output in Btu/ft at 120°F average water.

II Vulcan fan-assisted perimeter heating

01

air

Fan-assisted finned tube

02

horizontal_ split

Trench units

03

bolt

Power Core

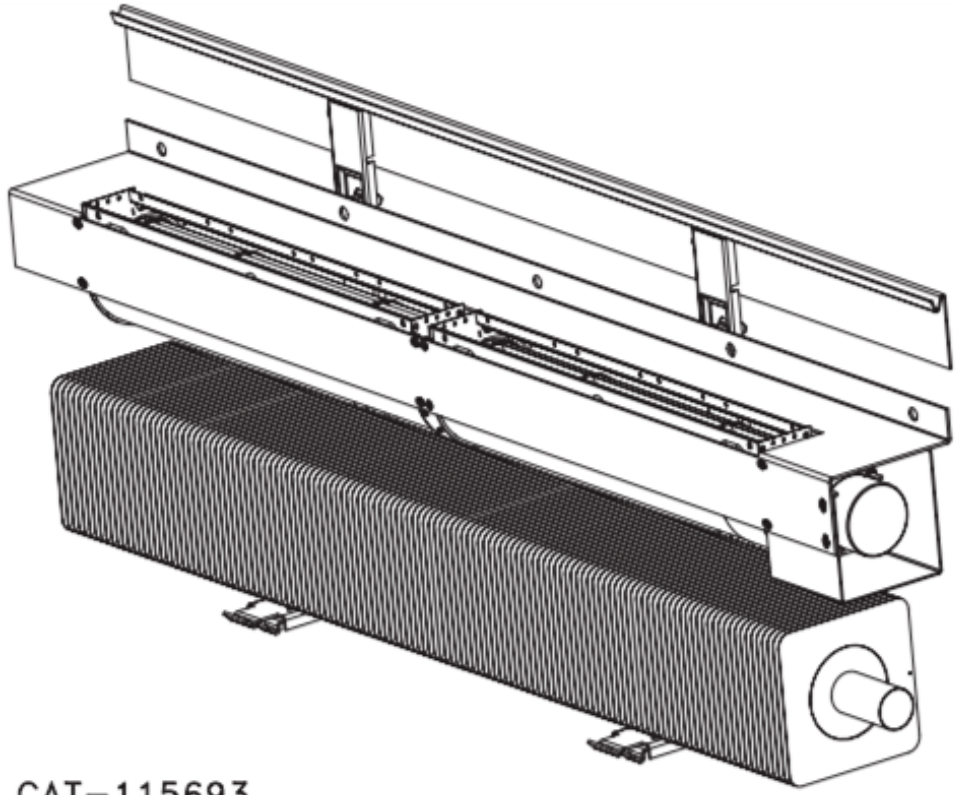
Fan-assisted finned tube

01 A bracket supports a 24V DC EC motor/blower assembly.

02 Fan assistance can add output to new or existing finned-tube installations.

03 Assemblies can run the full length of the element or only where additional output is needed.

04 Single- and dual-fan arrangements are available.



Up to 2.28× finned-tube capacity

MAX RATING

2.28×

Finned-Tube Capacity Multiplier

Peak Output Boost

Requires depth 3 or 4 enclosures operating at high fan speed setting.

01 **High-Speed Enclosure Scope**
VFAS-1 applies the 2.28 multiplier to depth 3 and 4 enclosures at high fan speed.

02 **Baseline Rating Corrections**
Start with the selected finned-tube rating and apply normal altitude, glycol and flow corrections.

03 **Fan Factor Calculations**
Then apply the fan-assist multiplier and the fan-speed factor.

04 **Conditional Application**
The multiplier is conditional, not a universal rating for every installation.

Fan-assist rating example

Step	Output / factor
LV4-S24 with VC3/4-433 at 120°F AWT	430 Btu/ft
3 fps water velocity, 5.1 GPM	Base selection
Altitude correction (DC, near sea level)	None needed = 430 Btu/ft
High-speed fan assistance	× 2.28 = 980 Btu/ft
7V fan-speed correction	× 0.85 = 833 Btu/ft

VFAS-1 method applied at DC conditions (no altitude correction). Vulcan's published example at 4,000 ft gives 732 Btu/ft at 7V.

Retrofit fit and clearance

01

Element & Piping Layout

Review element tiers, supply and return pipes, valves and bracket locations.

02

Clearance & Accessories

Allow space for slip joints, gussets, grilles and louvers.

03

Damper Recommendation

Dampers are not recommended. Remove existing dampers for retrofit applications.

04

Location & Enclosure Guide

Use the VFAS-1 location guide. Some enclosure styles and tier arrangements are excluded.

Vulcan trench units

01 PERIMETER HEATING

Recessed floor units provide hydronic perimeter heating.

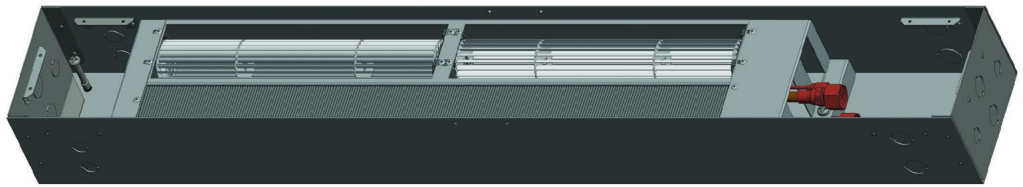
02 HEAVY-DUTY CONSTRUCTION

A heavy-duty steel enclosure contains a copper tube/aluminum fin coil and a 24V DC EC motor/blower assembly.

03 FLEXIBLE SPECIFICATIONS

Two standard depths and four standard lengths support a range of applications, including low water temperatures.

EQUIPMENT OVERVIEW



Trench integration at the perimeter

01

tune

Adjustable leveling feet support installation.

02

grid_on

Architectural grilles include linear bar and heel-proof options by request.

03

link

Easy-break end tabs allow continuous grille installations.

04

verified_user

Trench units are ETL listed for safety.

Trench output depends on design conditions

01 BASE RATINGS

Base ratings use high speed at 10V, 60°F entering air and 185°F entering water.

02 PUBLISHED CORRECTIONS

Apply the published corrections for water-to-air temperature difference, fan speed and grille free area.

03 HEEL-PROOF GRILLES

A 50% free-area heel-proof grille has a 0.77 heat-output factor and a 0.85 airflow factor.

04 HIGH FREE-AREA GRILLES

Grilles with at least 70% free area require no grille correction.

Trench selection example

Condition	Value
Base model and flow	TH10-48 at 2.00 GPM
Base output at 185°F EWT / 60°F EAT	17,447 Btuh
120°F EWT / 60°F EAT factor	0.47
7V fan-speed factor	0.85
50% free-area grille factor	0.77
Calculated output	Approximately 5,367 Btuh

Illustrative calculation using VTCH-2 factors. Base rating already reflects 2.00 GPM.

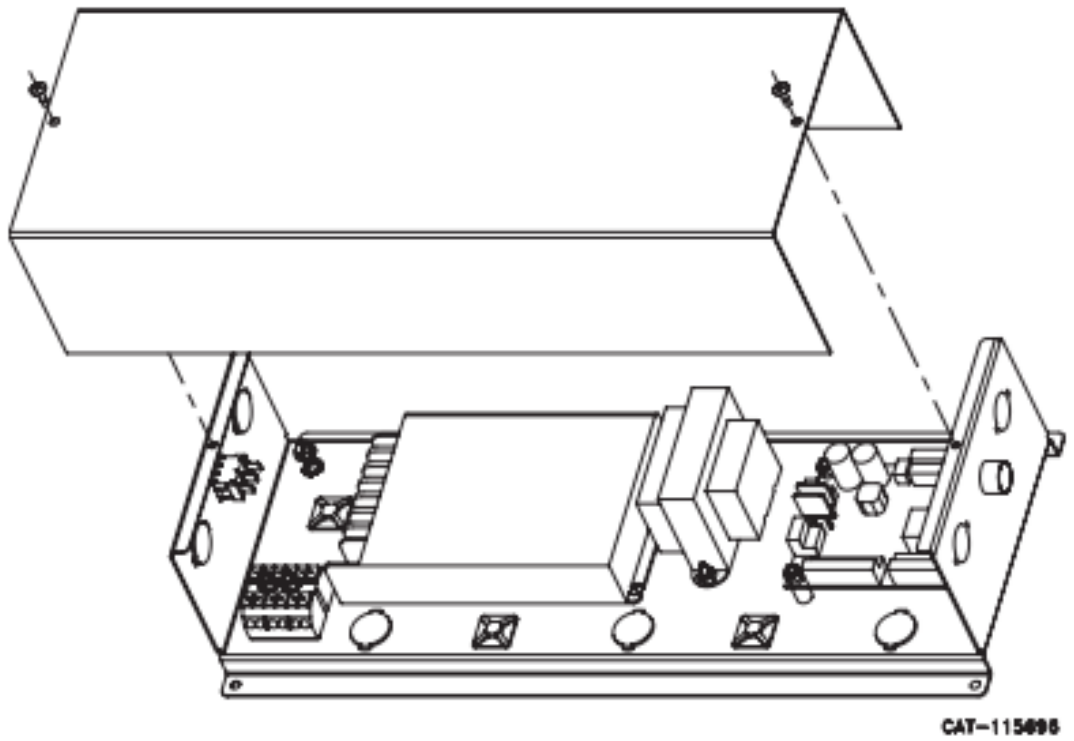
Power Core

01 Core Integration
Power Core combines an AC/DC converter, 40VAC transformer and ECM control module.

02 System Connectivity
Powers and connects trench units and fan-assisted assemblies.

03 Durable Enclosure
The pre-painted black, 18-gauge enclosure mounts in the floor or wall.

04 Safety Control
A built-in service switch provides a means to break power.



Power Core connection limits

Connected unit type	Maximum units per Power Core	Active finned-tube length
TH-33 trench	21	—
TH-48 trench	16	—
TH-62 trench	9	—
TH-78 trench	8	—
Single-fan finned tube	18	22.2 ft
Dual-fan finned tube	10	24.7 ft

Limits depend on unit size and assembly type. Use the VPCS-1 wiring diagram for the selected arrangement.

III Radiant ceiling panels

01 **Space Efficiency**
Overhead panels free perimeter wall and floor space.

02 **Thermal Comfort**
Radiant heating can improve comfort near cold exterior surfaces.

03 **Architectural Integration**
Panel location and ceiling coordination are part of the design.

Ceiling Panel Installations





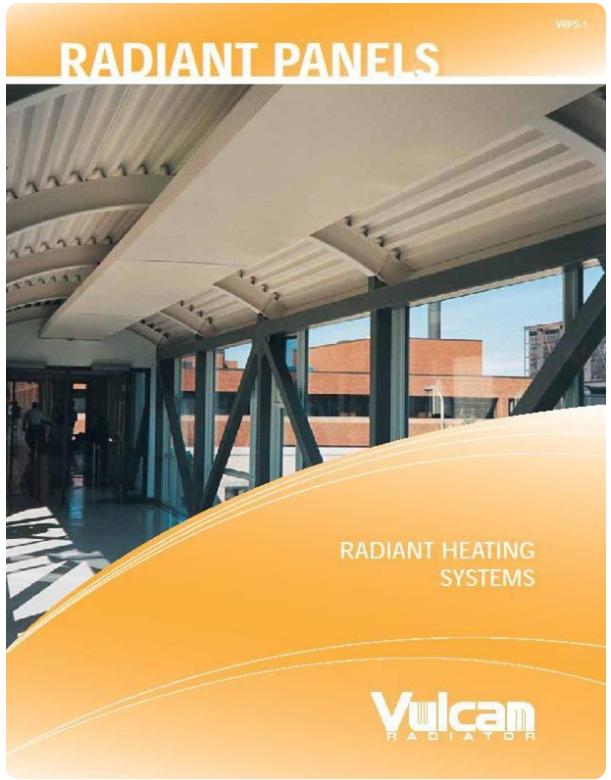
Vulcan radiant ceiling panels

01 **Linear and modular styles.**

02 **Multiple ceiling or wall installation arrangements.**

03 **Factory-assembled panels up to 16 ft long and 36 in wide.**

04 **Modular panels match acoustic ceiling panel sizes and can be silk-screened to match.**



IV Electric heat

01

Hydronic Alternative

Electric heating serves locations where hydronic distribution is impractical.

02

Heatrex Offerings

HDS represents Heatrex electric fin-tube heat, unit and cabinet heaters, and duct coils.

03

Runtal & Vulcan

Runtal adds electric decorative radiators. Vulcan offers electric fin-tube heat.

Electric Heating Equipment





Vulcan electric baseboard

01 Top or sloped air discharge.

02 Wall, wall-to-floor or pedestal mounting.

03 Bottom or front air inlet.

04 Published options range from 100 to 250 watts per foot.

05 Controls and accessories support the selected arrangement.



V Runtal architectural panel radiators

01

Product Portfolio

HDS represents Runtal flat-panel, vertical, electric decorative and steam radiators.

02

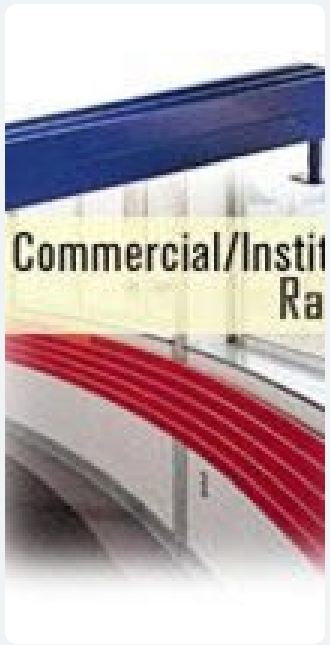
Heat Transfer Method

Architectural panel radiators transfer heat through both radiation and convection.

Radiator Series & Applications



Decorative / Panel



Commercial



Towel Radiators

Runtal design flexibility

01

Construction Efficiency

Unitary construction limits the number of trim pieces.

02

Design Integration

Piping, color and mounting choices help integrate heat into the room.

03

Selection Parameters

Radiator selection must match required output, water conditions and mounting constraints.



Runtal forms and applications

01

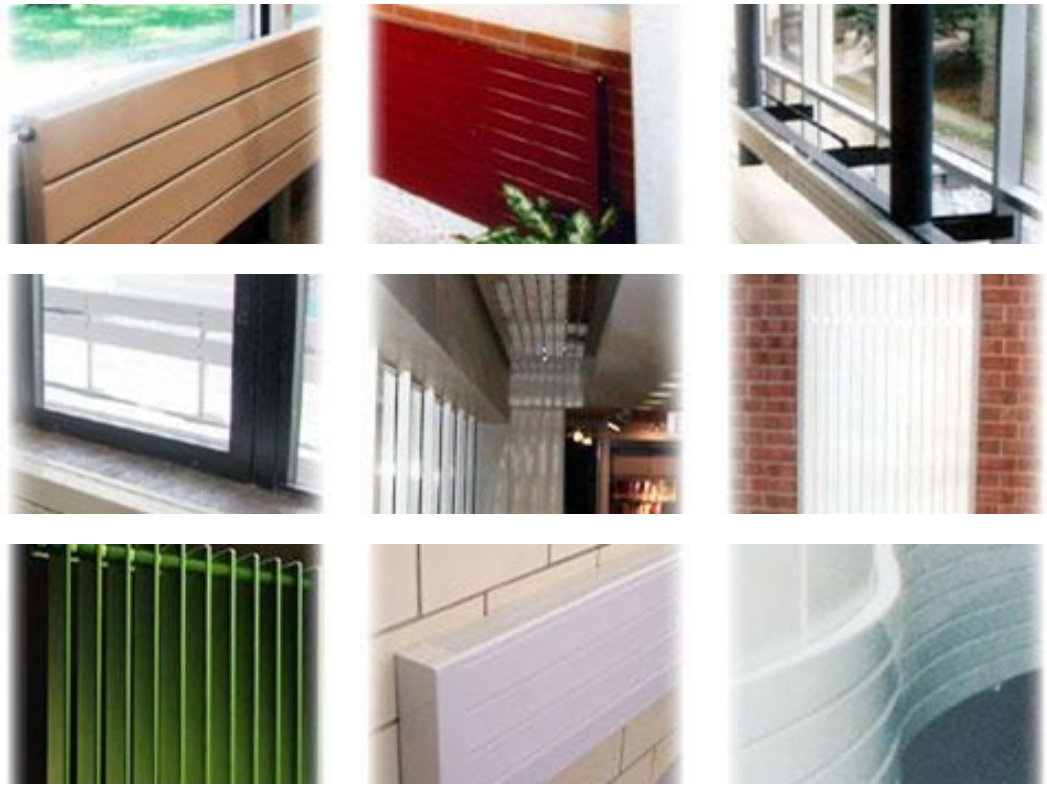
Forms & Styles

Runtal forms include panels, convectors, vertical radiators, ceiling styles and specialty designs.

02

Application Appendix

The application appendix shows historical examples. Confirm model availability and ratings for a new project.



Electric architectural radiation

01

Architectural Integration

Electric baseboard integrates perimeter heat into the architectural design.

02

Runtal Representation

HDS represents Runtal electric decorative radiators.



Steam trap and valve upgrades reduce steam waste

01

Trap Performance & Restoration

Failed steam traps waste live steam. Tunstall thermostatic and float-style traps, plus rebuild kits for most manufacturers, restore trap performance.

02

Thermostatic Valves & Radiators

Macon thermostatic radiator valves with non-electric operators add room-by-room control, and Runtal steam radiators replace worn units.





Hydronic flow and temperature drop

01 General Approximation

For water, the familiar approximation is:

GPM = Btuh ÷ (500 × ΔT)

02 Standard Temp Drop

At a 20°F water-temperature drop:

GPM = Btuh ÷ 10,000

03 Practical Example

Applying 20,000 Btuh heating load:

Example:

20,000 Btuh ÷ 10,000

= 2 GPM

Flow rate, pressure drop and heat output

01 Co-Varying Dynamics

Flow rate, pressure drop and heat output vary together.

02 Lower Flow Benefits

Lower flow can reduce pumping demand and lower return-water temperature.

03 Boiler Efficiency

Lower return-water temperature can support condensing-boiler operation.

04 Heat Transfer Limits

Check heat output and flow regime. Very low flow can reduce heat transfer.

Project selection discussion

01 Space & Heat Loss

Required perimeter heat loss and available installation space.

02 Temps & Flow

Design water temperatures and flow, or electrical service for electric heat.

03 Access & Aesthetics

Architectural appearance, mounting and service access.

04 Controls & Power

Fan power, control arrangement and grille selection where applicable.

Questions and project support

Reach out to our engineering team for technical guidance and project assistance.

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Website
www.hydronicdesignsolutions.com

Visit our web portal for technical documentation, product catalogs, engineering calculators, and application guides.

Runtal application examples

Architectural overview and project selection guidance

Architectural Applications

Primary Installation Environments:

- Hospital and healthcare facilities
- Building vestibules and high-traffic entryways
- Cast-iron radiator replacement applications

Project Selection Context

Historical Model Reference

Historical model names and finishes presented in this section are shown for contextual and historical comparison.

Specification Action

Always confirm current availability, design ratings, and specs with our engineering team prior to final project selections.

Perimeter and overhead applications



Perimeter Style in a library



Perimeter Style in a hospital lobby

Curved and segmented radiators



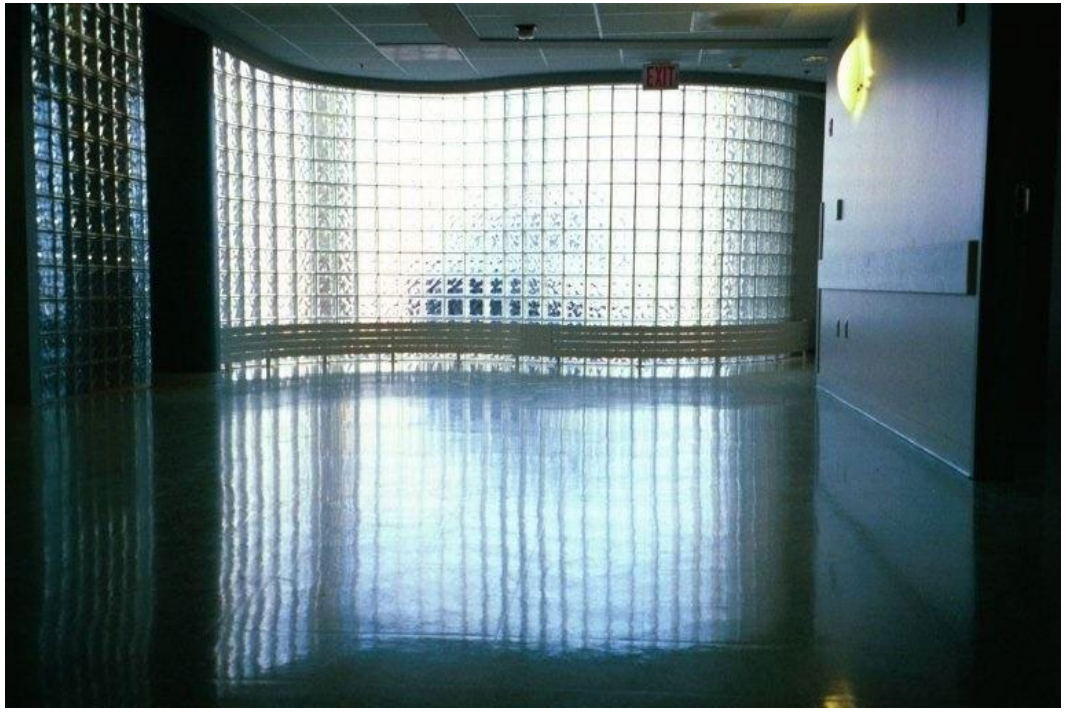


Compound field-curved RF-2 in a college classroom



Curved R-6 radiator in a hospital corridor

Curved and segmented radiators



R-4 on floor posts in a hospital



Field-curved, post-mounted RF radiators

Curved and segmented radiators



Segmented R-5 radiators



Replacing cast-iron radiators

R2F and R3F applications



R2F-1 radiator mounted on the window mullion at Sibley Elementary



R2F-9 convector in a vestibule