UFAD Heating / Cooling Design

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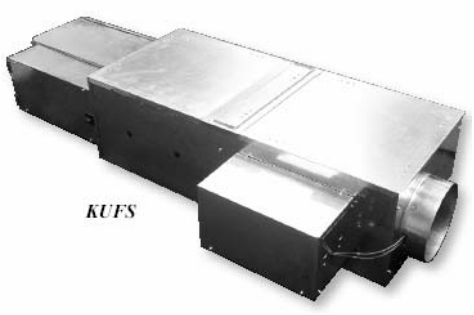
UFAD HEATING AND COOLING DESIGN GUIDE

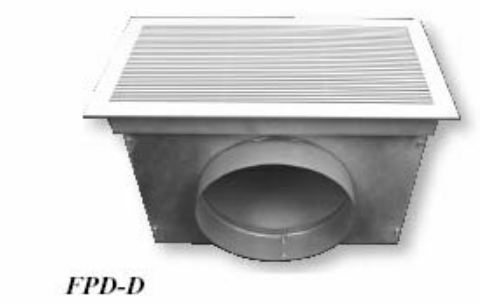
Providing heating and cooling at the perimeter with a UFAD system poses several difficulties not encountered with overhead systems. The pressurized underfloor air, typically provided at 62°F near the core, will often be 65°F, or warmer, at the perimeter. This means that the underfloor pressure, typically about 0.05-0.08" is insufficient to provide enough air to meet peak cooling demand. In winter, heating this previously cooled air creates a conflict with ASHRAE 90.1 Energy Standard, often cited in many building codes. Meeting both of these requirements causes the engineer to create somewhat complex systems at the perimeter, often employing fan powered units, electric or hot water coils, and variable geometry diffusers.

As UFAD systems have matured, complex systems have developed to solve these issues. Krueger has developed an application to solve these situations, employing several components. Primarily, a low profile, underfloor series fan box, the KUFS, is used to both boost underfloor air quantities above what would be available with UFAD pressure alone, for cooling perimeter spaces. The unit is provided with a heating coil, either electric or hot water, to provide heat to diffusers located at the perimeter.



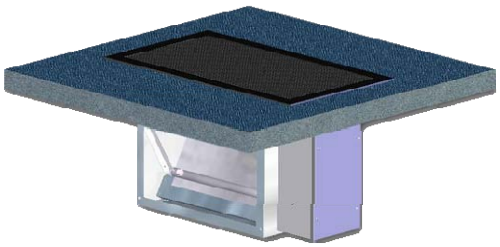
KUFS

To avoid reheating previously cooled air, the induction port on the KUFS can be connected to one or more 1850 – FPD-D floor diffusers located in the adjacent interior spaces. This draws room air from the occupied space, heating it, and returning it at the perimeter.

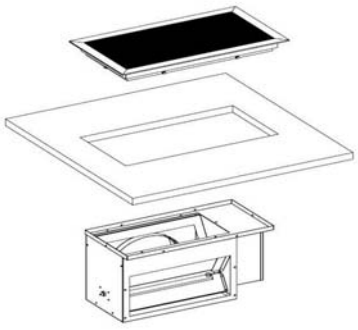


FPD-D

If supplemental cooling is required in that location, an FPD-HC plenum may be used in place of the FPD-D. This unit had both a duct connection on one side, and a damper on the other. In cooling mode, it supplied a variable quantity of cooling air from the pressurized underfloor plenum. In heating, it becomes a floor return as the plenum damper closes exposing the ducted connection to the induction port on the KUFS.



FPD-HC



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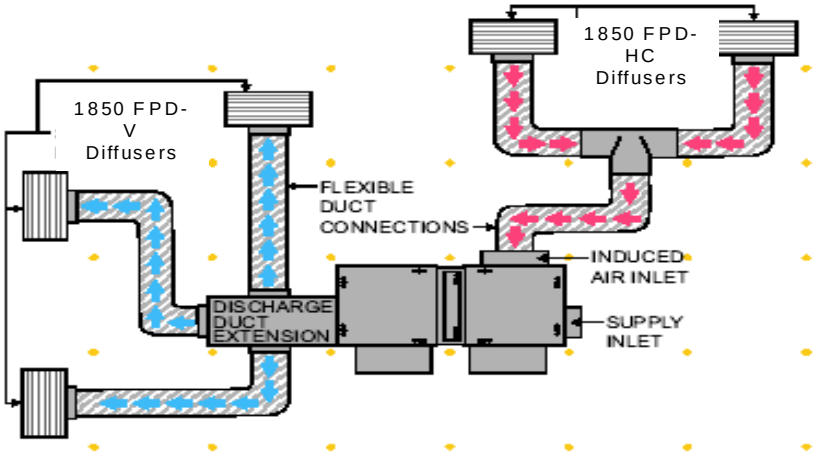
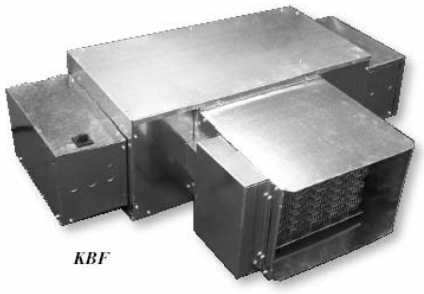
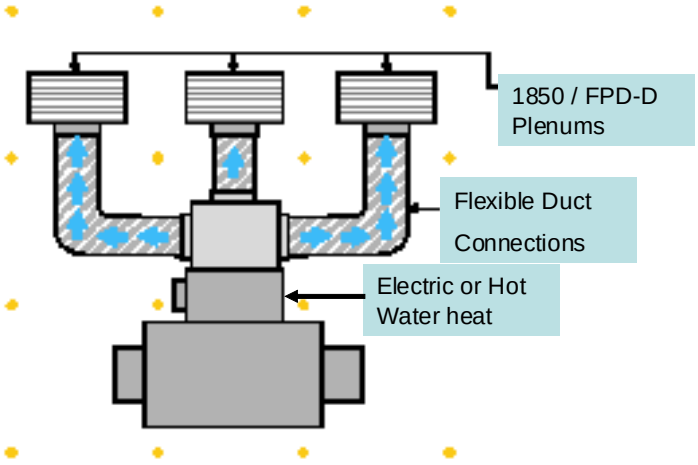
Such a system would look like this:



In partial heating mode, some air is drawn through the interior FPD-HC diffusers, while some underfloor air is supplied at the same time through the same diffuser. Short circuiting is not likely in this case, as the momentum of the supplied UFAD air will carry it up and away from the side of the diffuser that is acting as a return.

In some cases, it may be possible to simply use a booster fan coil underfloor, such as the Krueger KBF. This may be supplied with a hot water or electric heating coil as well, and connected to a series of 1850 FPD-D plenums.





In some designs, the KUFS or KBF discharge may be connected to a continuous plenum extending along the perimeter, instead of individually ducting to each perimeter diffuser. While seemingly simpler, there are significant leakage issues that must be coordinated with all contractors and building trades.

IN CONCLUSION

One should be aware that the Government Services Administration (GSA) no longer recommends using hot water under the floor, as they have discovered that water leaks are difficult to discover, and when found, the source is often difficult to locate.

In many cases, it may be advisable to take care of perimeter heating and cooling demand with more conventional overhead systems. Throwing cold air upward can result in long throws, especially if the air is 65°F or warmer. See the Krueger UFAD Engineering Guide (at www.Krueger-HVAC.Com) for guidance on the effect of long throws in high cooling demand situations. The use of 55°F supply air with an Air Column mixing air as it enters the UFAD cavity can allow the ducting of 55°F air to the perimeter, either underfloor or overhead, reducing the diffuser throw, and increasing comfort by reducing drafts at full cooling load situations.

Attached are submittals for the Heating and Cooling plenums for use with UFAD systems.

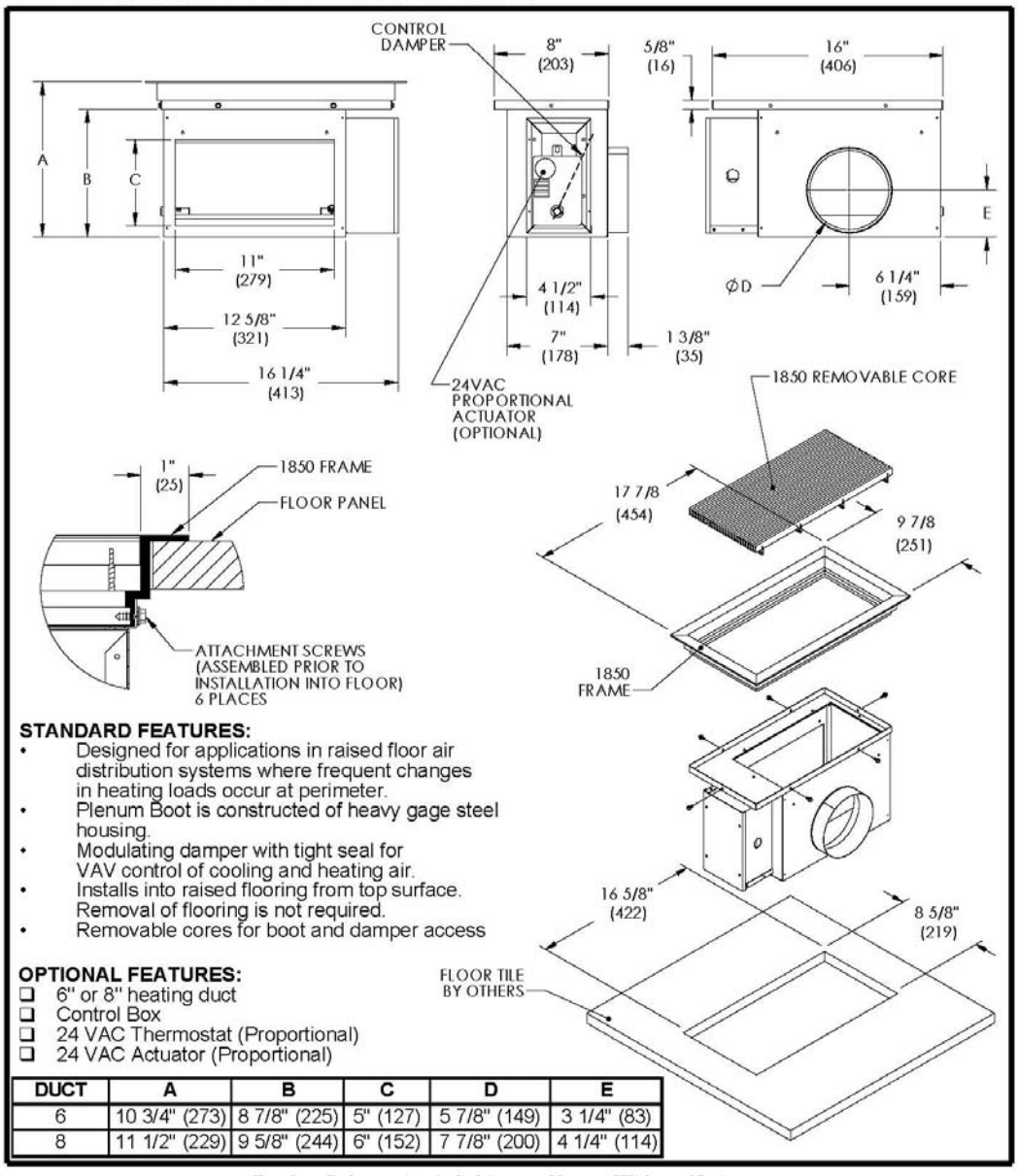
JOB NAME _____
ARCHITECT _____
ENGINEER _____
CONTRACTOR _____
LOCATION _____

SUBMITTAL SHEET
Form Number TUF 031-HC.0 Effective Date 11/06
New Issue

KRUEGER
Excellence in Air Distribution

FPD-HC

HEATING/COOLING RAISED FLOOR PLENUM



STANDARD FEATURES:

- Designed for applications in raised floor air distribution systems where frequent changes in heating loads occur at perimeter.
- Plenum Boot is constructed of heavy gage steel housing.
- Modulating damper with tight seal for VAV control of cooling and heating air.
- Installs into raised flooring from top surface. Removal of flooring is not required.
- Removable cores for boot and damper access

OPTIONAL FEATURES:

- ❑ 6" or 8" heating duct
- ❑ Control Box
- ❑ 24 VAC Thermostat (Proportional)
- ❑ 24 VAC Actuator (Proportional)

DUCT	A	B	C	D	E
6	10 3/4" (273)	8 7/8" (225)	5" (127)	5 7/8" (149)	3 1/4" (83)
8	11 1/2" (229)	9 5/8" (244)	6" (152)	7 7/8" (200)	4 1/4" (114)

Product Information is Subject to Change Without Notice

JOB NAME _____
ARCHITECT _____
ENGINEER _____
CONTRACTOR _____
LOCATION _____

SUBMITTAL SHEET
Form Number TUF 032-B.0 Effective Date 11/06
New Issue

KRUEGER
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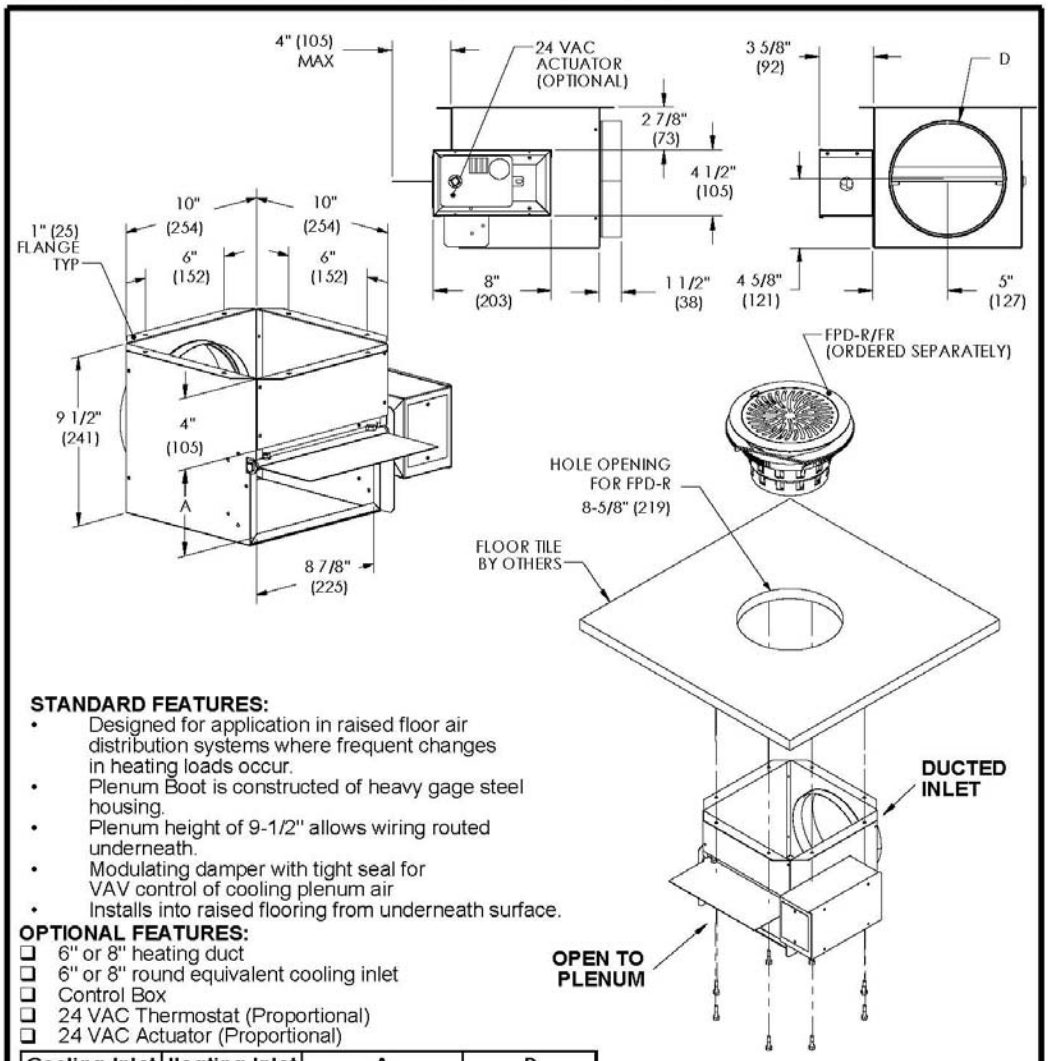
FPD-B

RAISED FLOOR PLENUM BOOT FOR ROUND DIFFUSER



STANDARD FEATURES:

- Designed for application in raised floor air distribution systems where frequent changes in heating loads occur.
- Plenum Boot is constructed of heavy gage steel housing.
- Plenum height of 9-1/2" allows wiring routed underneath.
- Modulating damper with tight seal for VAV control of cooling plenum air
- Installs into raised flooring from underneath surface.

OPTIONAL FEATURES:

- ❑ 6" or 8" heating duct
- ❑ 6" or 8" round equivalent cooling inlet
- ❑ Control Box
- ❑ 24 VAC Thermostat (Proportional)
- ❑ 24 VAC Actuator (Proportional)

Cooling Inlet	Heating Inlet	A	D
06	06	3" (76)	5 7/8" (149)
06	08	3" (76)	5 7/8" (149)
08	06	4 7/8" (124)	7 7/8" (200)
08	08	4 7/8" (124)	7 7/8" (200)

DIMENSIONS ARE GIVEN AS INCHES (MM)

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