
under floor SOX™
Plenum Air Dispersion Systems
Better Air
Dispersion for
Underfloor
Plenums
DUCT SOX®
Fabric Air Dispersion Products

UnderFloorSox (UFSox™) are DuctSox Fabric Air Dispersion Systems designed to distribute and disperse air to perimeter and high-heat load locations in Under Floor Air Distribution (UFAD) Systems.

UFAD Technology

UFAD system. *Picture provided by Center for the Built Environment*

UFAD is a unique method for delivering conditioned air in offices and other commercial buildings. Unlike conventional overhead air-mixing systems, UFAD Systems use the space beneath the raised access floor as a plenum to introduce air into the occupied space, usually through special floor-mounted diffusers. Typical applications that employ UFAD design are in high tech office and business spaces utilizing cable for voice, power, and data transmission.

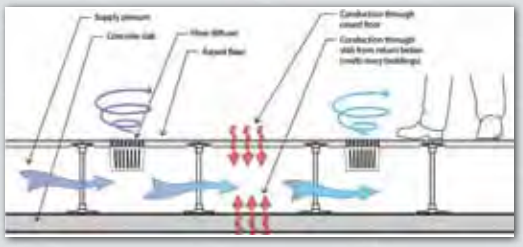
UFAD Systems are becoming increasingly accepted in commercial building space as the benefits, which are well documented by ASHRAE, can include:

- Improved employee comfort
- Reduced energy costs
- Improved indoor air quality
- Improved productivity and health
- Reduced floor to floor heights
- Reduced life cycle building costs

UFAD Models are based on Displacement Ventilation principles, requiring that the air stratifies from the floor to the ceiling, where it is either exhausted or recycled back into the space. New construction projects using UFAD Technology frequently qualify for LEED® credits for increased ventilation "effectiveness."

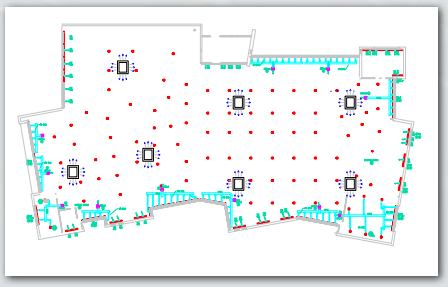
Challenges

One of the issues and challenges of UFAD Systems is thermal decay of the supply air to perimeter or special high-heat load zones. When this occurs, occupants in the warmer zones will generally increase the amount of air supply by adjusting their floor mounted diffusers. This can often lead to over mixing the air in the space causing destratification and possibly losing the benefits of UFAD technology. In some instances, system adjustments to accommodate perimeter zones result in overcooled interior zones.

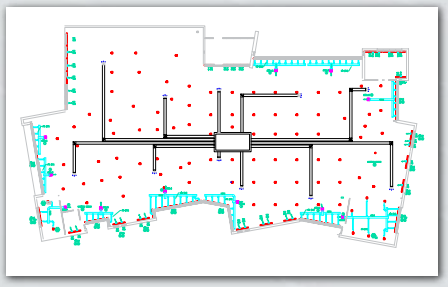


Common sources of thermal decay. *Picture provided by Center for the Built Environment*

To offset the loss in temperature and pressure for supply air over extended distances, designers have included the use of either air highways, ductwork, or more supply sources (chases or air towers) to convey conditioned air to those zones. While both options have benefits, they do have drawbacks to consider.



More supply sources or air columns

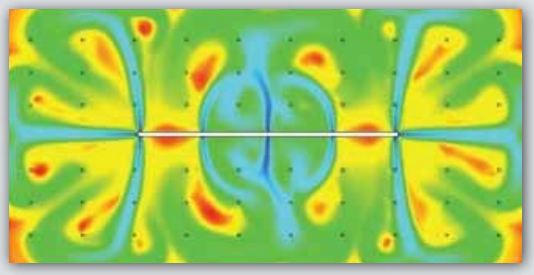


Metal ductwork/air highway

Adding supply chases or air towers for an open floor plan, especially in large projects, can be very expensive and may be difficult to coordinate due to building design and floor layout limitations.

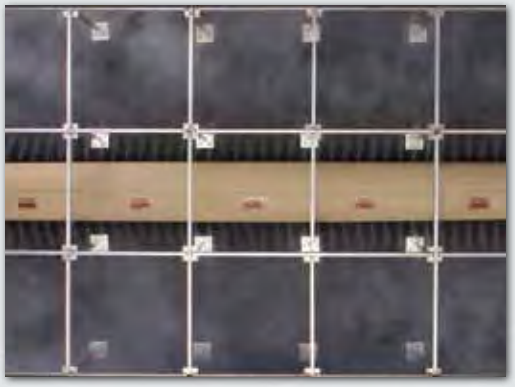
Airflow from ducted or air highway systems is not flexible and can create challenges for routing cable and reconfiguring office space.

Additionally, these systems function by dispersing the airflow at high velocities which may create uneven pressure and temperature distribution.



CFD model of a UFAD plenum with a metal supply with higher volume/velocity diffusers. Colors reflect temperature variation throughout the given floor plate. *Image provided by Center for the Built Environment*

UFSox are the best solution for UFAD Systems to supply air to perimeter and special high-heat load zones. The key advantages of UFSox are:



Even Air Dispersion.

This continues to be a significant feature and advantage of fabric air dispersion systems versus metal. Engineered vents and/or orifices and variable endcaps are designed to meet your application providing high entrainment ratios and uniform air dispersion patterns (low velocity).

These advantages maintain temperature control both under and above the raised access flooring, especially in extended distance locations.

Air Porous Fabrics.

UFSox reduces heat loss (temperature gain) or thermal decay over extended distances and to perimeter zones. Additionally, porous fabrics eliminate the risk of condensation to the ductwork.

Thermal gradient as air passes through porous fabric

Tests done at the Bio-Environmental and Structural Systems (BESS) Laboratory at the University of Illinois quantifies the temperature gradient or thermal barrier around the circumference of the ductwork.

Actual smoke test of air permeable fabric showing thermal barrier and mixing with air dispersion jet

Elbow Support System

Operable Endcap

Inlet Attachment

Simple Assembly & Installation.

- Lightweight, easy to handle and install
- Modular and zippered straight sections and fittings to meet the standard access floor height cavities from 12” to 18”
- UFSox lay on the floor and are positively located using tension cables at ends of straight runs and elbows
- Reconfigurable: Modular zippered sections allow for future re-design

Lower Total Cost.

UFSox Systems can be evaluated from both the initial investment and the lifetime ownership cost. Initial cost advantages of UFSox includes the cost of materials and installation related considerations (shipping, storage, handling, and installation labor). Lifetime ownership benefits are realized through efficiency of operation of the UFAD system. UFSox systems improve temperature consistency through floor devices and can reduce incidents of costly destratification. Consistent temperature within the UFAD plenum improves pressurization (balanced distribution), efficiency, and employee comfort.

under floor SOX™
Plenum Air Dispersion Systems

Inlet Connection
Zippered inlet collar secures to metal using DuctBelt and Anchor

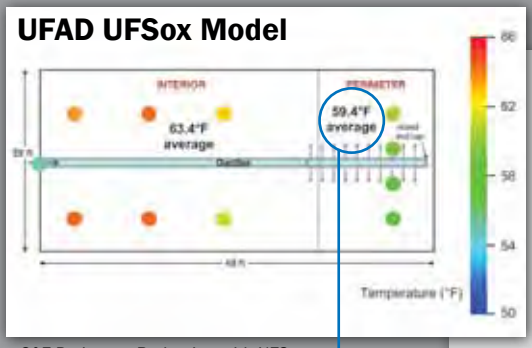
Radius Elbow
Unique elbow support and structure ensure alignment in standard floor grid

Operable Endcap
Allows adjustment to release airflow as needed

Active Section
Custom per application, airflow dispersed through one or both sides for optimum performance

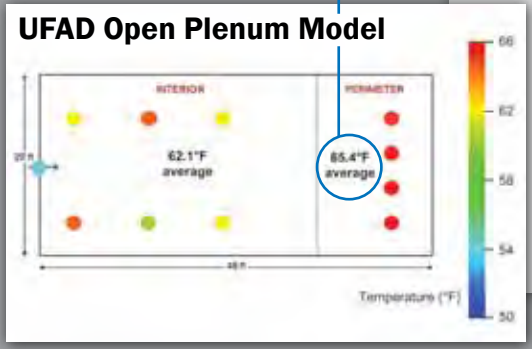
Airflow Tag
Application/product identification label

UFAD UFSox Model



6°F Perimeter Reduction with UFSox

UFAD Open Plenum Model



Full-scale Thermal Performance Tests, by the Center for the Built Environment (CBE) at the University of California, Berkeley, have investigated the impact of distributing cool supply air into an underfloor plenum using DuctSox.

For the test configurations studied, the results indicated that compared to an open plenum design, the use of DuctSox reduced thermal decay (temperature gain) in the perimeter zone. Overall, the temperature distribution within the plenum was more uniform with DuctSox. Adding DuctSox required some increased fan power, but this is still under investigation. Due to the promising results, CBE expects to conduct additional experiments on other DuctSox configurations.

Comments on research provided by Fred Bauman, PE, Center for the Built Environment, University of California, Berkeley