Titus
Redefine your comfort zone.™

AIR DISTRIBUTION

PRODUCTS

CORE

06

ADVANCING THE SCIENCE OF AIR DISTRIBUTION

UNDERFLOOR

Rethink what air management systems can be.
Revise your notion of functionality.
Redefine your comfort zone.™

Comfort, Redefined.

Since 1946, Titus has focused on technologically advanced products that create the highest degree of comfort.

We've consistently led the industry by breaking the barriers of expectation and convention when it comes to technology. We've redefined how technology drives, influences and supports air management. And by being first to market with the most innovative approaches to air distribution, we're proud to say that the marketplace has taken notice, and is counting on us to lead the way into the next decade. A challenge we're more than happy to accommodate.

Titus has raised the bar on design, proving that functional can also be beautiful. And we've redefined what it means to be energy efficient, with a collection of smart technology products that optimize the use of natural resources.

Titus has also redefined what it means to work with an air management products partner. We pride ourselves on listening and responding so that we can not only meet expectations, but also exceed them. Service has been, and will always be, our main focus at Titus. And, it's why so many of our customers keep coming back.

Welcome to your new comfort zone. It starts here.

Overview

TAF-R diffuser installed in a conference room at the Palo Verde Energy Education Center in Buckeye, Arizona.

INTRODUCTION TO UNDERFLOOR

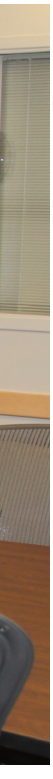
The interest in UnderFloor Air Distribution (UFAD) has increased significantly in the U.S. market over the last fifteen years. There is currently several million square feet of access floor air distribution systems being designed across the country.

In 1997 Titus introduced the TAF-R diffuser and the TAF-G grommet, which were installed in the Owens Corning World Headquarters. Since then, Titus, ASHRAE, and the engineering community have continued to learn about UFAD systems. In the time that Titus has participated in UFAD designs in the US, we have continued to introduce new products to meet the needs of this unique application.

HOW IT WORKS

ASHRAE Applications Handbook (2011) describes UnderFloor Air Distribution Systems (UFAD) as Partially Mixed Air Distribution. Where traditional ceiling or high sidewall supply outlets condition the space by creating a thermal mixing zone from the floor (ankle level) to near the ceiling, Underfloor systems create a mixed zone from the floor to the top of the occupied zone (6' above the floor), and let the upper zone be fully stratified. The height of the mixed zone is controlled by the height of the air jet to a velocity of 50 fpm. The ideal throw height of the jet is to 4' – 5' above the floor. Contaminates above the mixed zone will rise through the stratified zone and be carried out of the room through the return.

Where a fully mixed system uses the area within one foot of the interior walls as a mixing zone, a floor outlet uses the area around the outlet where mixed air velocities are greater than 50 fpm. Floor outlets used in the interior area (more than 12'-15' from a perimeter wall) are typically round producing a swirl air pattern. The mixing zone, typically known as



the "clear" zone is defined by the manufacturer. It is recommended that occupants not be permanently stationed in the clear zone.

UFAD systems utilize the space under an access floor as an air plenum. Properly designed UFAD systems take advantage of thermal stratification.

ASHRAE recommends that, for comfort, the temperature in the occupied zone be between 73°and 77°F, relative humidity be between less than 60%, and the maximum velocity in occupied zone be 50 fpm in cooling or 30 fpm in heating.

The key to successful access floor systems is the ability of the access floor diffuser to rapidly mix room air into the supply air at low velocities. Because supply air is introduced directly into the occupied zone, it is important that the supply air reach the ASHRAE recommended temperature and velocity, mixing of the supply air into the space should happen rapidly.

The typical application for a UFAD system is the open plan office. Floor space is at a premium in a cubicle so a smaller clear area around the diffuser will allow more usable space in the cubicle. The UFAD diffuser manufacturer defines the required clear area that their diffuser needs to achieve the ASHRAE recommended temperature and velocity.

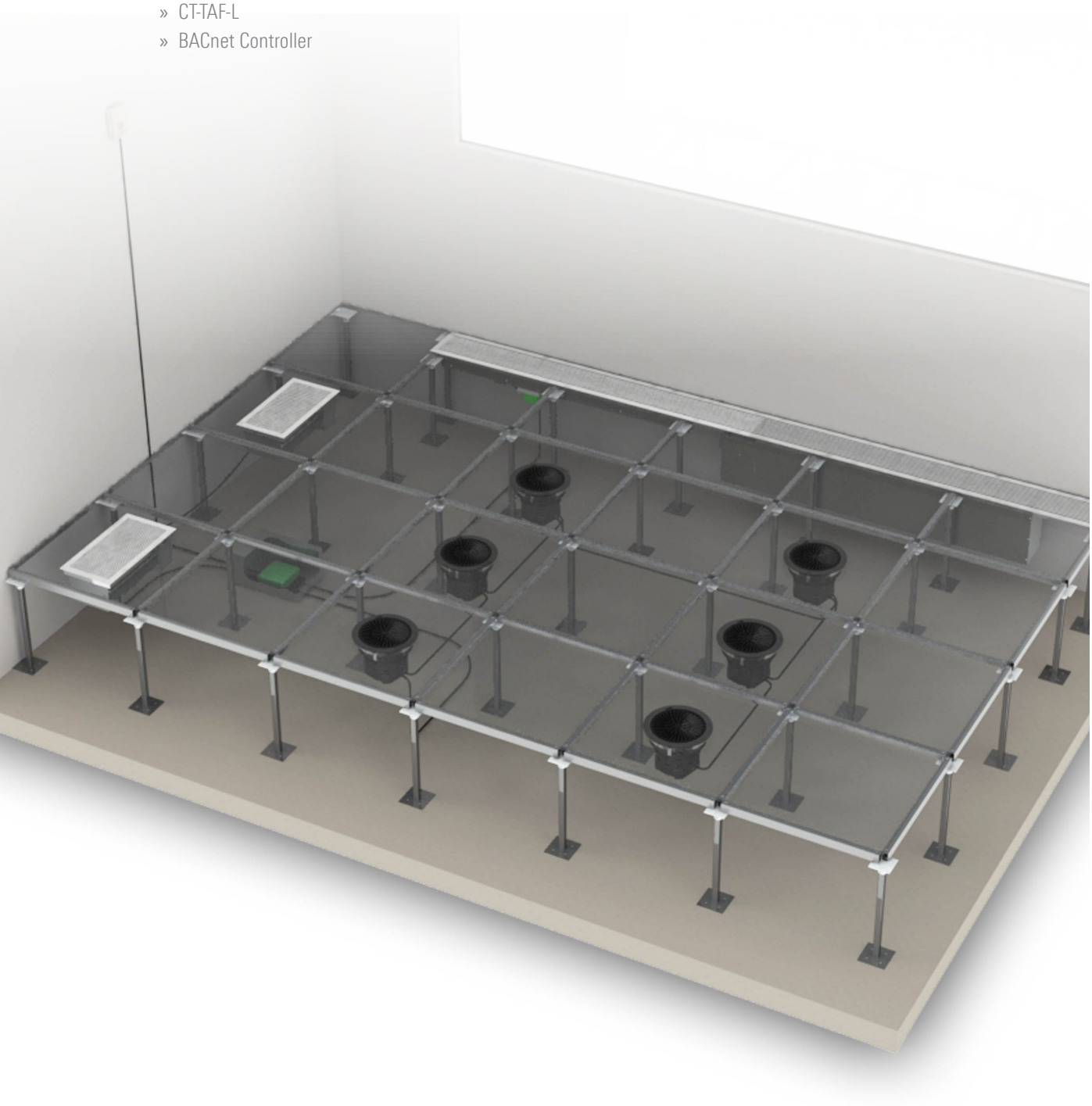
Originally UFAD systems were for computer rooms. The design intent was to cool computer equipment and not to provide comfort. The computer room design concept typically provides too cold of a space for comfort.

While the early interest in UFAD systems was primarily due to companies' need to easily rearrange office layouts, information and communications based offices, the economics of ownership, and green building programs such as LEED have largely influenced the growth of UFAD.

UNDERFLOOR LAYOUT

Underfloor products shown

- TAF-R
- TAF-V
- TAF-L-V
- TAF-L-W
- CT-TAF-L
- BACnet Controller



UNDERFLOOR ROUND PRODUCTS

Titus underfloor products can contribute towards achieving the following credits:

- LEED EA Credit 1: Optimize Energy Performance
- IEQ Credit 6.2: Controllability of Systems
- IEQ Credit7.1: Thermal Comfort - Design
- MR Credit 1.1: Building Reuse

TAF-R / TAF-R-FR

HIGH INDUCTION UNDERFLOOR DIFFUSER

- Diffuser can be installed after flooring and carpet installation are complete
- Actuated option can have a maximum of six daisy chain units together utilizing the standard 12ft. plenum cable
- GreenSpec Listed Product
- Trim ring's extra wide flange is designed to prevent carpet from pulling away from the diffuser
- Can contribute toward LEED certification

energy solutions fire rated

TAF-R / TAF-R-FR

The TAF-R is designed for application in underfloor air distribution systems. All components are constructed of a high-impact polymer material that is designed to resist damage from traffic. The TAF-R diffuser is also a GreenSpec® Listed product and is available in standard light gray or black. Additional colors may be specified to match any building's interior scheme. This model can contribute toward achieving LEED Credits.

TAF-R diffusers with swirl face installed in the floor of a library

TAFR-AA

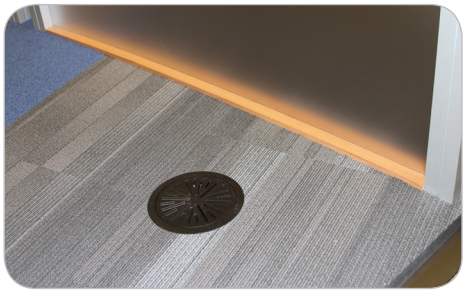
HIGH INDUCTION ALUMINUM UNDERFLOOR DIFFUSER

- Designed for applications in pressurized underfloor air distribution systems
- All aluminum construction, durable enough to resist foot traffic. Exceeds NFPA 90B requirements
- Architecturally appealing face designs are available in standard black or gray color. Optional special colors are available upon request. Wood grain finish options also available.
- The trim ring's extra wide flange is designed to prevent carpet from pulling away from the diffuser
- Diffuser can be installed after flooring and carpet installation are complete
- Converts easily from a swirl pattern to a displacement pattern (and vice versa) without moving floor panels or trim rings

energy solutions fire rated wood grains

TAFR-AA

The TAFR-AA is designed for application in underfloor air distribution systems. All components are constructed of aluminum, including the basket portion, making it ideal for all levels of office traffic. The TAFR-AA is also a GreenSpec® Listed product and is available in standard black or light gray. Additional colors and wood grain finish options are also available to match any building's interior scheme. This model can contribute towards achieving LEED Credits.



TAFR-AA diffuser with displacement face installed in the floor of a training room

TAF-G

FLOOR ACCESS FOR POWER, DATA, & PHONE / CABLE LINES

- Installs into same trim and mounting rings as the TAF-R
- Allows "through-the-floor" power/data/phone cable access
- All components constructed of a high impact polycarbonate material designed to resist damage from traffic
- Grommet can be installed after flooring and carpet installation is complete

TAF-G

The TAF-G is designed for the use in underfloor systems. It allows "through-the-floor" power/data/phone/cable access. All components are constructed of a high impact polycarbonate material designed to resist damage from traffic.

TAF-G diffuser installed in the floor of an office cubicle

UNDERFLOOR LINEAR PRODUCTS

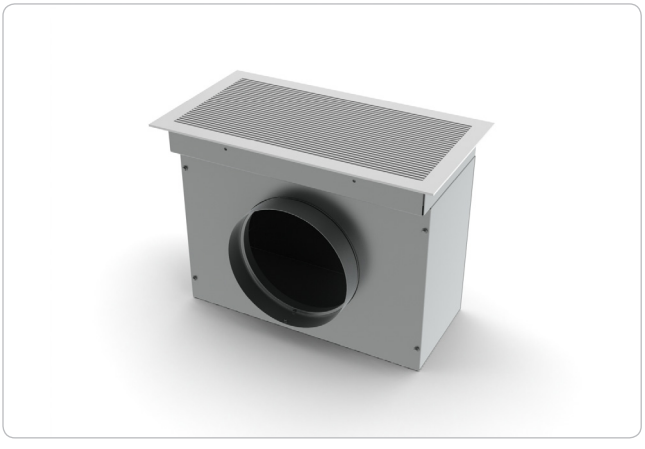
Titus underfloor products can contribute towards achieving the following credits:

- LEED EA Credit 1: Optimize Energy Performance
- IEQ Credit 6.2: Controllability of Systems
- IEQ Credit7.1: Thermal Comfort - Design
- MR Credit 1.1: Building Reuse

TAF-D

UNDERFLOOR DIFFUSER PLENUM WITH INLET

- Designed for floor applications and utilized for ducted applications
- Heavy gauge steel plenum
- Installs into access flooring from top surface, removal of flooring is not required
- CT-TAF frame drops into plenum opening and sits on top of carpeting
- Can contribute toward achieving LEED certification



energy solutions

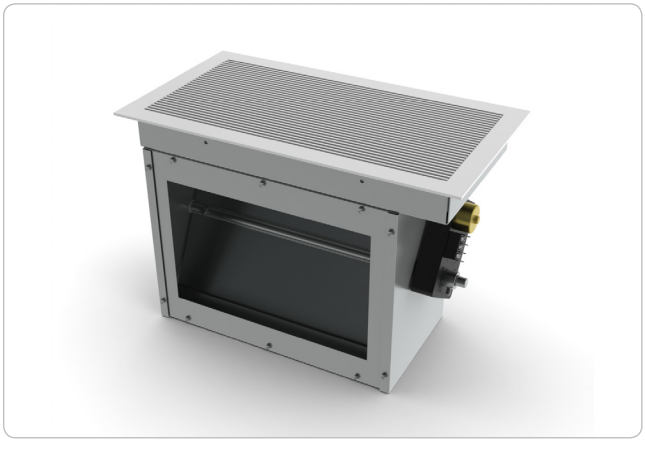
TAF-D

The TAF-D ducted plenum is constructed of a heavy gauge steel and is designed for application in underfloor air distribution systems. It is used as a ducted supply or return unit.

TAF-HC

HEATING / COOLING PLENUM WITH DUAL INLET & DAMPER

- Delivers constant volume heating and VAV cooling within the same unit
- Can be ducted for heating and provides variable air volume cooling control
- Heavy gauge diffuser designed for floor applications
- Installs into access flooring from top surface, removal of flooring is not required
- CT-TAF frame drops into plenum opening and sits on top of carpeting
- Diffuser core available in single or multi-piece configuration
- Can contribute toward achieving LEED certification



energy solutions

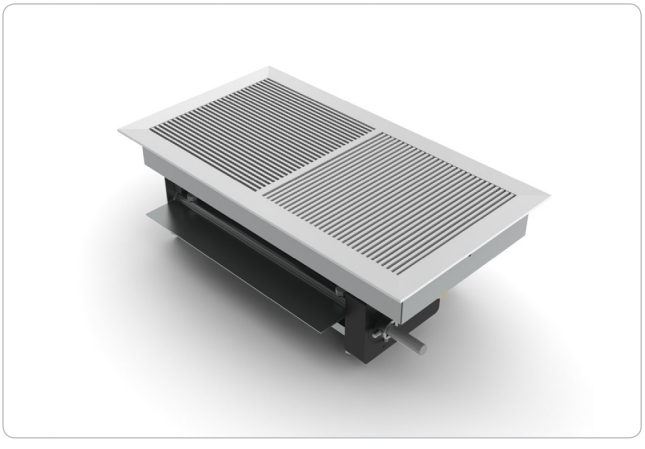
TAF-HC

The TAF-HC ducted plenum is constructed of a heavy gauge steel and is designed for application in underfloor air distribution systems. It is used as a ducted supply or return unit.

TAF-V

UNDERFLOOR VARIABLE VOLUME DIFFUSER PLENUM

- Designed for areas with frequent changes in heating loads
- Provides variable air volume cooling only control for non-ducted applications
- Tight close-off damper with optional 24 VAC electric actuator
- Available with single or multiple diffuser cores
- Heavy gauge diffuser designed for floor applications
- Installs into access flooring from top surface, removal of flooring is not required
- CT-TAF frame drops into plenum opening and sits on top of carpeting
- Can contribute toward achieving LEED certification



energy solutions

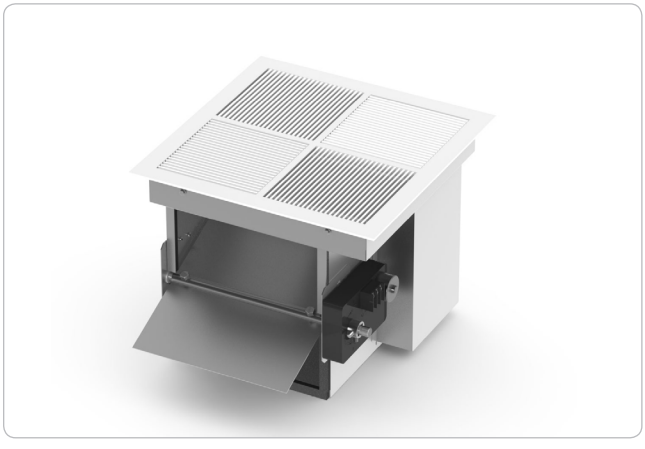
TAF-V

CBAB bulkhead beams are the ideal solution for single room hospitality spaces, such as hotel, dorm, and hospital rooms. With their shallow height, ceiling heights can be maximized creating an open and inviting space. Bulkhead chilled beams are great for use in retrofit of buildings which were not originally built with HVAC systems originally installed.

TAF-V MULTICORE

UNDERFLOOR VARIABLE VOLUME DIFFUSER PLENUM

- Designed for areas with frequent changes in heating loads
- Provides variable air volume cooling only control for non-ducted applications
- Tight close-off damper with optional 24 VAC electric actuator
- Available with single or multiple diffuser cores
- Heavy gauge diffuser designed for floor applications
- Installs into access flooring from top surface, removal of flooring is not required
- CT-TAF frame drops into plenum opening and sits on top of carpeting
- Can contribute toward achieving LEED certification



energy solutions

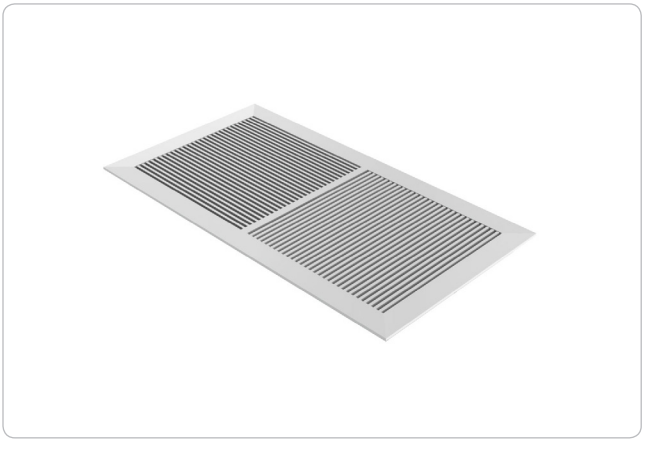
TAF-V MULTI 4-PIECE

CBAC bulkhead beams are the ideal solution for single room hospitality spaces, such as hotel, dorm, and hospital rooms. With their shallow height, ceiling heights can be maximized creating an open and inviting space. Exposed bulkhead chilled beams are great for use in retrofit of buildings which were not originally built with HVAC systems originally installed.

CT-TAF

LINEAR BAR DIFFUSER FOR UNDERFLOOR APPLICATIONS

- Fixed linear bar diffuser for underfloor applications
- Diffuser cores are available in single, dual, and quad core configurations
- CT-TAF frame drops into plenum opening and sits on top of carpeting
- All deflection bars are fixed and parallel to the long dimension
- Standard finish is #26 white
- Wood grain finish options available



energy solutions wood grains

CT-TAF

Titus CT-TAF diffusers are fixed linear bar diffuser for underfloor applications. The CT-TAF is designed to be integrated with the TAF-HC, TAF-V, and TAF-D plenums.

UNDERFLOOR TAF-L PERIMETER SYSTEM

Titus underfloor products can contribute towards achieving the following credits:

- LEED EA Credit 1: Optimize Energy Performance
- IEQ Credit 6.2: Controllability of Systems
- IEQ Credit7.1: Thermal Comfort - Design
- MR Credit 1.1: Building Reuse

TAF-L-R

UNDERFLOOR FIXED LINEAR BAR DIFFUSER RETURN PLENUM

- A fixed linear bar diffuser plenum for underfloor perimeter return applications
- Designed to be integrated with the CT-TAF-L linear bar grille
- Drops into perimeter slot and sits on top of the raised floor tile (by others) and a perimeter angle
- 20"x 8" inlet can be used for ducted or non-ducted applications
- Unit Size: 48" length

energy solutions

TAF-L-R

The TAF-L-R is a fixed linear bar diffuser plenum constructed of galvanized steel for underfloor perimeter return applications. The return plenum drops into the perimeter slot and sits on top of the raised floor tile.

TAF-L-V

UNDERFLOOR DIFFUSER WITH VARIABLE APERTURE PLATE

- A variable linear bar diffuser plenum for underfloor perimeter supply applications
- Designed to be integrated with the CT-TAF-L linear bar grille
- Designed to provide a uniform throw pattern throughout its operating range
- 24 volt electric damper actuator is supplied with the assembly
- Unit Size: 48" length

energy solutions

TAF-L-V

The TAF-L-V is a variable linear bar diffuser plenum for underfloor perimeter supply applications. The TAF-L-V cooling plenum has an engineered throw pattern that never breaks through the stratification layer created by the UFAD diffusers in the core. The dual aperture plate design allows the TAF-L-V/CT-TAF-L assembly to maintain this engineered throw pattern while modulating the airflow volume.

TAF-L-W

UNDERFLOOR DIFFUSER WITH FIN-TUBE HEAT PLENUM

- A fixed linear bar diffuser plenum for underfloor perimeter heating applications
- Designed to be integrated with the CT-TAF-L linear bar grille
- Drops into perimeter slot and sits on top of the raised floor tile (by others) and a perimeter angle
- Has a fin tube assembly in the plenum
- Unit Size: 48" length

energy solutions

TAF-L-W

TAF-L-W is a fixed linear bar diffuser plenum for underfloor perimeter heating applications. The TAF-L-W's self-contained fin-tube heats the perimeter by utilizing the room air instead of the supply air. By allowing the denser cold air to flow into the TAF-L-W plenum while simultaneously inducing room air into the plenum, the TAF-L-W returns the warmer air to the window or exterior wall through natural convection.

TAF-L-E

HEATING PLENUM WITH FIN-TUBE SCR ELECTRIC HEATING ELEMENT

- Designed to be integrated with the CT-TAF-L linear bar grille
- Drops into perimeter slot and sits on top of the raised floor tile (by others) and a perimeter angle
- Has an SCR electric heat fin tube assembly in the plenum
- ETL listed at 120V, 208V, 240V, 277V at 1.1 kw maximum output
- Unit Size: 48" length

energy solutions

TAF-L-E

The TAF-L-E is a fixed linear bar diffuser plenum constructed of galvanized steel for underfloor perimeter heating applications. The heating plenum drops into the perimeter slot and sits on top of the raised floor tile. The TAF-L-E has a SCR electric heat fin tube heating element. The unit is available at 120V, 208V, 240V, 277V, and has an ETL listing.

CT-TAF-L

A FIXED LINEAR BAR DIFFUSER FOR UNDER-FLOOR PERIMETER RETURN APPLICATIONS

- Designed to be integrated with the TAF-L-V, TAF-L-E, TAF-L-R, and TAF-L-W plenums
- CT-TAF-L core drops into frame which drops into perimeter slot and sits on top of carpeting
- Installs into the TAF-L plenums from the top surface, removal of the flooring is not required
- Sections can be joined end-to-end for continuous appearance using alignment clips
- Dimensions: Order continuous length; 6" width

energy solutions wood grains

CT-TAF-L

Titus CT-TAF-L is a fixed linear bar diffuser for underfloor perimeter return applications. It is designed to be integrated with the TAF-L-V, TAF-L-E, TAF-L-R, and TAF-L-W plenums. The CT-TAF-L installs into the TAF-L plenums from the top surface. Removal of the flooring is not required.

UNDERFLOOR TERMINAL UNITS

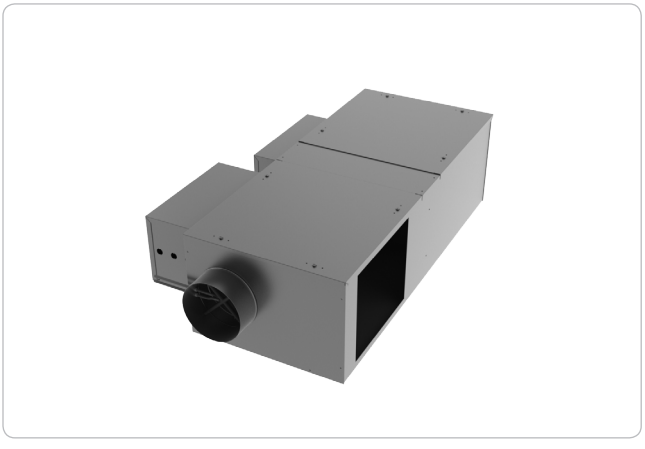
Titus underfloor products can contribute towards achieving the following credits:

- LEED EA Credit 1: Optimize Energy Performance
- IEQ Credit 6.2: Controllability of Systems
- IEQ Credit7.1: Thermal Comfort - Design
- MR Credit 1.1: Building Reuse

LHK

UNDERFLOOR SERIES FAN POWERED TERMINAL

- » Dual density insulation, coated to prevent erosion meets requirements of NFPA 90A and UL 181
- » Energy efficient fan motor, permanent split capacitor type, mounted in variation isolators
- » Pressure independent primary airflow control
- » Adjustable SCR fan speed control, with minimum voltage stop
- » Inlet Sizes: 9", 10" / Unit Sizes: 3, 4



energy solutions

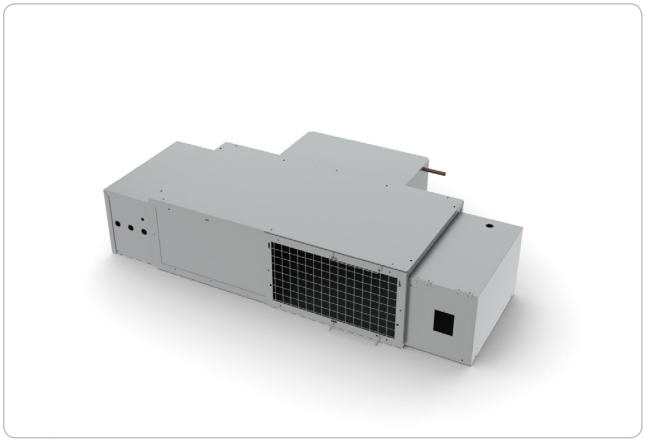
LHK

The LHK UnderFloor Fan Powered Terminal Unit is designed to be installed in the underfloor plenum of an access floor grid system. Constructed of a heavy steel casing that is leak resistant, the LHK contains an energy efficient fan motor. Like the PFC, the LHK fits within the modular pedestal systems of the raised floor and is available in various heights to fit under 12" through 18" raised floors.

PFC

UNDERFLOOR BOOSTER TERMINAL UNIT FOR PERIMETER APPLICATIONS

- Energy efficient fan motor, permanent split capacitor type, mounted in variation isolators
- Adjustable SCR fan speed control, with minimum voltage stop
- Single point electrical connections
- Ultra-high efficiency ECM motor available
- Unit Sizes: 10, 14, 16



energy solutions

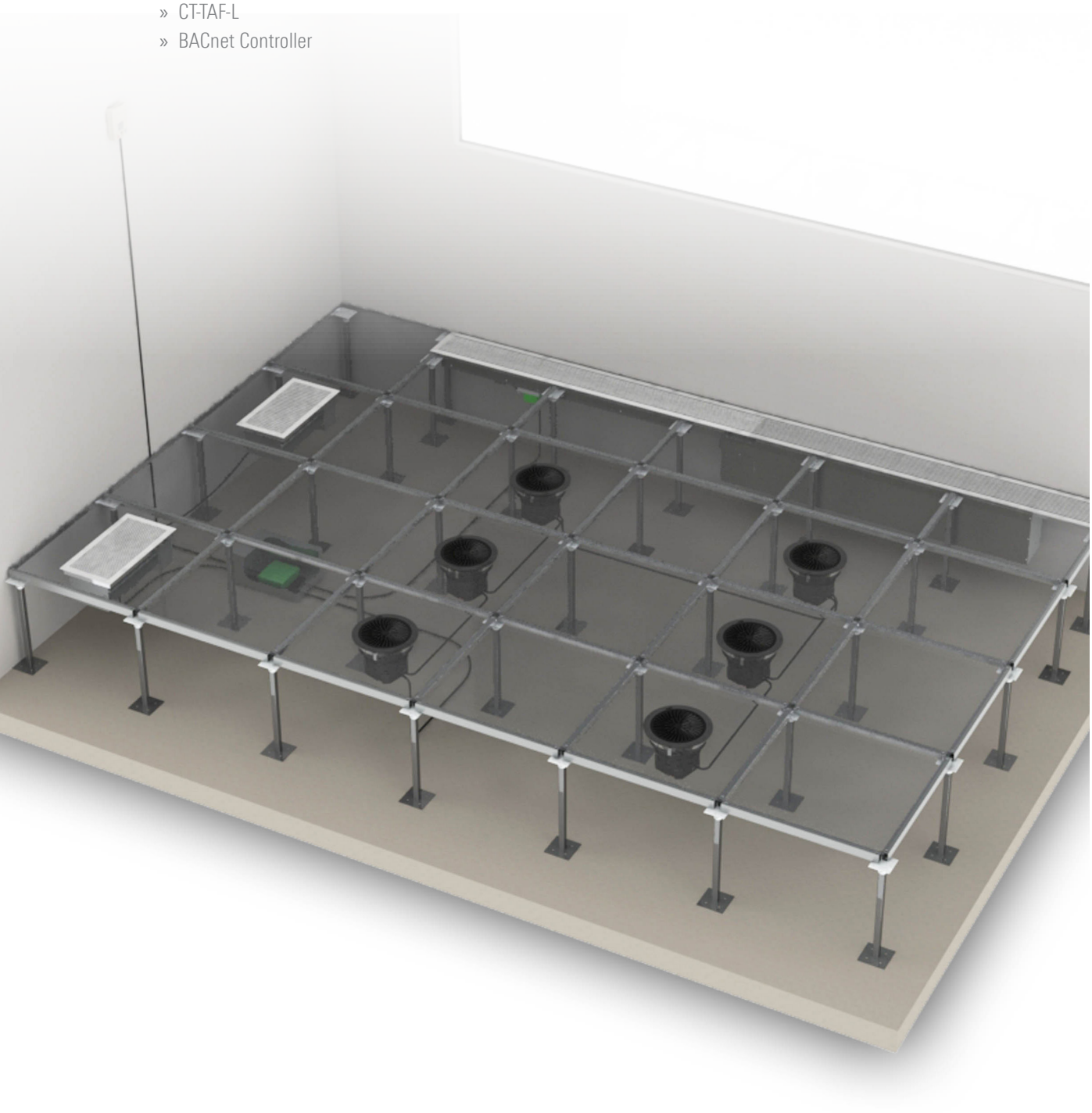
PFC

The PFC was designed to be used as a booster unit for perimeter applications. The PFC fan powered terminal unit is designed to be installed between the pedestals in an underfloor system and installed in a floor 12" to 18" in height.

UNDERFLOOR LAYOUT

Underfloor products shown

- TAF-R
- TAF-V
- TAF-L-V
- TAF-L-W
- CT-TAF-L
- BACnet Controller



UNDERFLOOR ARTICLE & CASE STUDIES

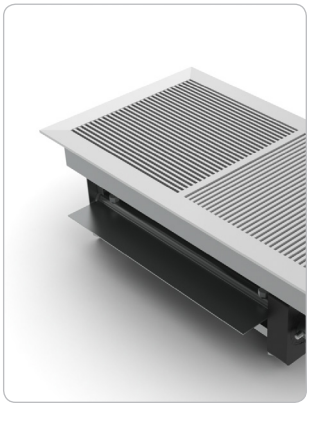
Titus underfloor products can contribute towards achieving the following credits:

- LEED EA Credit 1: Optimize Energy Performance
- IEQ Credit 6.2: Controllability of Systems
- IEQ Credit7.1: Thermal Comfort - Design
- MR Credit 1.1: Building Reuse

Underfloor Systems

PROVIDING COMFORT, FLEXIBILITY AND ENERGY SAVINGS

UnderFloor Air Distribution (UFAD) systems have been used for comfort-conditioning office spaces in United States office buildings since the early 1990s. Systems were initially employed in high-tech office spaces where in addition to occupant comfort, ease of office space re-configuration (churn) was a priority for building owners. UFAD systems deliver air to occupied spaces through floor-mounted outlets supplied by conditioned air from a pressurized plenum beneath the suspended floor.



DESIGNING YOUR SYSTEM

A properly designed UFAD system takes advantage of thermal stratification. The key is to have a diffuser that rapidly mixes air without penetrating the stratification layer at the ceiling. The pressurized plenum -- the area between the slab and raised floor -- is essentially a large duct maintained at a constant pressure differential to the room above; typically between .05 and .10 in. pressure (w.g.). This pressure is maintained through the supply of conditioned air from a number of supply-duct terminations. The spacing and location of these ducts are dependent on the air supply requirement and the plenum depth which typically ranges from 12" to 24". If zone control is desired from the underfloor plenum, it can be partitioned into separate zones. The return air for a UFAD system should be located at the ceiling or high sidewall.

This allows heat from the ceiling light to be returned before it is able to mix with the occupied zone. There is also a small amount of "free cooling" due to the natural buoyancy of hot air.

Some of the concerns typically associated with these systems are humidity, dirt, spillage, and leakage. A potential problem with the higher supply temperatures used in access floor air-distribution systems is the higher potential moisture content of the 60-65°F supply air most commonly used in these systems. The supply system must reduce relative humidity to less than 65°F. Potential solutions are either the reheat or blending of air to achieve a 65°F supply, 55°F dew-point condition. System designs utilizing condenser water reheat, run-around coils (face, bypass), and other strategies can be employed to solve these potential design problems. Other options include the use of desiccant dehumidification. Although underfloor air-distribution systems are not recommended for areas with a high potential for spills such as bathrooms, cafeterias and laboratories, small spills are not a problem for most applications. Typical swirl diffusers used within the interior have a dirt/dust receptacle to catch spills and dirt from normal daily use. The dirt/dust receptacle has a basin that will hold anywhere from 4-6 fl. oz. of liquid. The dirt/dust receptacle can easily be removed and cleaned to keep dirt out of the underfloor plenum. Leakage is typically due to poor sealing or the construction quality at window/wall locations, stair landings, electrical outlets, etc. These areas have to sealed and framed so the supply air does not travel up the wall toward the return air. There can also be leakage between the floor panels which can be reduced by staggering the carpet tiles over the floor tiles. The key is to limit the number of penetrations into the raised floor which will reduce the number of areas that need to be sealed.

Since typical floor plenum pressure is less than .10 in w.g. (25 Pa), energy-efficient low-pressure fans can be used. In place of complicated and expensive duct systems required to supply air to each individual air outlet in a ceiling system, UFAD systems deliver air to building zones using a limited amount of ductwork to create an air highway.

Where a traditional overhead mixed system provides comfort-conditioned air from the floor to the ceiling, partially mixed systems like UFAD save energy by providing comfort-conditioning in the lower occupied spatial zone. They allow the upper zone to stratify.

In the core of the building where loads are relatively constant, round (swirl) or rectangular outlets are located in the floor near the occupants. Outlets typically deliver 80-100 cfm (38-48 l/s) of conditioned air to the space. Some of the units have volume control adjustability by the occupants to increase individual comfort levels. The round swirl diffusers are typically available with an occupant adjustable flow regulator that can be either manually adjustable or by the use of a room sensor that is connected to an actuator mounted directly on the diffuser. Installation of swirl units has been made easy by replacing the mounting ring which was previously attached to the unit beneath the floor tile with spring clips to provide a press fit directly into the floor tile. A recent ASHRAE research project (RP-1373) has also provided data to show that when the height of the air plume to a terminal velocity of 50 fpm (.25 m/s) is limited to 4.5 feet (1.4 m), the air change effectiveness (ACE) is improved in the breathing zone. This research has now been recognized by ASHRAE Standard 62.1-2010 with Addenda A in Table 6-2 by allowing an Ez rating of 1.2 for these conditions. This means that the ventilation (outdoor) air supplied to the zone can be reduced by 16.7%. For LEED projects where the credit point for IEQ credit 2 is desired, this 16.7% can be used in reaching the goal of 30% increased ventilation air.

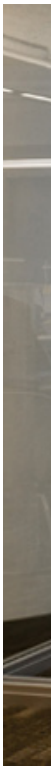
THE PERIMETER CHALLENGE

Some of the biggest challenges for underfloor design occur on the perimeter of the building where loads are higher and dynamically changing due to effects of radiation and temperature conduction on the skin of the building. Where the core of the building is mainly impacted by nearly constant heat loads, the perimeter system must accommodate swings in heat loads and heat losses that can occur in a relatively short period of time.

A common method of handling perimeter loads to locate a fan-powered terminal in the floor plenum near the perimeter. These fan-powered terminals are ducted to outlets located on the perimeter. A typical outlet would be a linear bar grille with either a boot plenum or continuously fed plenum underneath. Equipped with an option hot water or electric heating coil, the fan unit can deliver warm air in response to a space thermostat. Unfortunately, as linear grilles get longer, the mass effect of the discharge air jet projects the air higher than required. If the throw from the outlet is too long and reaches the ceiling, it may deflect downward into the space and create unwanted drafts in the interior zones. In some cases, cool air from the floor plenum is supplied to the perimeter zone through the fan-powered unit.

For LEED projects, the operational cost of energy to run a fan-powered terminal can be minimized by using ECM fan motors. ECM motors operate at an efficiency of 70% or greater. The cooler operation of an ECM motor -- and enhanced construction -- contribute to a longer life and lower life-cycle cost when compared to standard construction PSC motors. An additional benefit of an ECM motor is ability to control the fan speed during operation to provide increased energy savings and better occupant comfort in the occupied space. ECM motors can also utilize remotely controlled speed controllers (pwm) that can be controlled through a building management system.

New technology in perimeter systems can lower installed/operational costs and improve comfort along the perimeter zones. By installing a continuous bar grille along the perimeter, variable air volume (VAV) cooling and plenum heating coils can be attached as needed to condition the perimeter. These cooling and heating units are passive and do not require the use of a fan terminal. The bar grille can be connected together to provide a continuous architectural appearance around the perimeter or can be installed in sections as required for comfort conditioning. The core of the bar grille is removable from the room to provide access to the unit's working components.



The VAV cooling units employ an electrically actuated sliding damper, which opens and closes a series of transverse apertures to vary the volume of cool air supplied from the pressurized underfloor plenum into the space. The sliding damper opens and closes to provide the amount of conditioned air required to manage the changing conditions as directed by a room thermostat located in the occupied zone. The transverse apertures manage the supply air to allow room air to be included into the air pattern. Introducing supply air in small bundles helps in managing the projection from the outlet and prevents long throws which create drafts in the occupied space.

The heating plenums also attach to the linear bar grille. The heating plenums are passive in operation and do not require a fan powered terminal to supply air or heat. Located parallel on the perimeter at the glass, the heating unit mixes the cool convection currents flowing down the glass with warm-air currents traveling across the floor. These mixed currents are induced into the inner chamber of the plenum and flow up through the heat exchanger. The warm current then exit the linear grille at the glass and flow upward via convection to heat the cool air in front of the glass.

The hydronic heating units have a finned-tube heat exchanger with heat supplied through a hot-water pipe and controlled by a water valve to provide the precise amount of heat required to satisfy room conditions. The electric heating units are of fin-tube construction and have an SCR control to match the changing heat requirements in the space. The ETL listed heaters can be found in 120V, 208V, 240V, and 277V supply circuits. The modular construction of the VAV cooling and the fin-tube water or electric heating units allows the installation to match the requirements of any climate zone. Where winter conditions prevail, more heating units can be installed to meet heating needs. Where hot summer conditions prevail, additional VAV-cooling units can be employed to match the cooling requirements.

To claim maximum energy efficiency and occupant comfort, care should be taken during construction to seal all floor panels. Additional care should be taken to seal all openings through the floor either into the space or into the walls where plumbing or electrical equipment penetrates the floor plenum. Regular inspection during construction will minimize problems upon building completion and commissioning.

In recent years, the application for UFAD systems has shifted from owner-occupied high-tech facilities to a more general variety of building spaces aiming to achieve LEED certification. UFAD provides superior comfort by supplying conditioned air where it is required near the occupant. Additional occupant comfort can be achieved by installing small units in the core of the building with individually adjustable dampers controlled by the occupant. By conditioning only the occupied area and stratifying the upper zone with air supplied form the low-pressure floor plenum saves energy. Additional energy can be saved by employing a passive VAV-cooling and fin tube heating system on the perimeter.

For your next LEED project, take advantage of UFAD to provide lower energy (EA c1), controllability of systems for thermal comfort (IEQ c6), and thermal comfort (IEQ c7).

CASE STUDY

Palo Verde Energy Education Center

Buckeye, Arizona

Client - APS
Representative Office - Norman Wright Mechanical
Architect - Arrington Watkins Architects
LEED Certification - LEED Gold Certified

ABOUT THE PROJECT

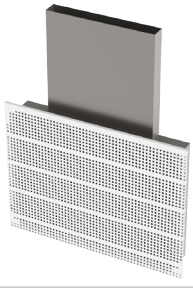
Palo Verde's Energy Education Center (EEC) opened in 2011. The main purpose for this facility is to serve as an emergency base of operations in the event of a crisis at the Palo Verde Nuclear Generating Station (PVNGS), which is conveniently located 22 miles away. During non-emergency times, the center is used as a technical and education facility. Information from the PVNGS is displayed via live data streams and monitored closely by employees at the facility. They are able to communicate instanly with the individuals at the plant and other officials around the world if any issue arises at the nuclear plant.

The EEC was designed by Arrington Watkins Architects to be an energy-efficient, state-of-the-art building and incorporates the latest technologies in creating sustainable structures to achieve this goal. Some of the Green Building concepts utilized in this LEED Gold Certified facility are that it uses heavy insulation for the building envelope, has specialized sizing and shading on all the windows installed and the air distribution system.

THE TITUS SOLUTION

The HVAC system in the EEC uses Displacement Ventilation and UnderFloor Air Distribution (UFAD). A Displacement Ventilation system is similar to an UnderFloor system in that is uses warmer supply air

TAF-R



DVIR

and lower pressures then a conventional overhead system. As a result, displacement ventilation systems have many of the same benefits of UFAD systems, such as longer economizer periods, potential energy savings from the warmer supply air and lower horsepower fans, and quiet operation. Both systems allow fresh, conditioned air to distribute properly throughout the center.

The main products featured in the Palo Verde Energy Education Center are the TAF-R UnderFloor diffuser and the DVIR Displacement Ventilation diffuser. The TAF-R is a GreenSpec Listed product available in either standard light gray or black. All components of the unit are constructed of a high-impact polymer material designed to resist damage from heavy foot traffic. Additional colors may be specified to match any building's interior scheme. This model can help contribute toward achieving the following LEED Credits - LEED EA Credit 1: Optimize Energy Performance; IEQ Credit 6.2: Controllability of Systems; Thermal Comfort, IEQ Credit 7.1: Thermal Comfort - Design, and if the building utilizes an existing structure, MR Credit 1.1: Building Reuse.

The DVIR is a rectangular displacement diffuser with a one-way discharge air pattern designed for flush mount applications. Constructed of galvanized steel and aluminum, the DVIR is designed for in-wall applications and supplies a large volume of air at low velocities into the occupied zone. This model can contribute toward achieving the following LEED Credits - LEED EA Credit 1: Optimize Energy Performance; IEQc2: Increased Ventilation; and IEQc7.1: Thermal Comfort - Design.

THE END RESULT

The Palo Verde Energy Education Center is equipped to handle any emergency situation that would arise from the nearby nuclear plant. Plant personnel and government leaders would be able to relay information to news, media and law enforcement officials in the event of any emergency. Having a facility such as this ready to provide assistance at a moments notice will definitely ease the concerns of the surrounding community in the event of a crisis.

CASE STUDY

Walnut Creek Public Library

Walnut Creek, California

Client - City of Walnut Creek
Representative Office - Norman Wright Mechanical
Architect - Group 4 Architects
LEED Certification - LEED Gold Certified

ABOUT THE PROJECT

The new Walnut Creek Library opened on July 17, 2010. Designed by Group 4 Architects to achieve LEED Certification, this new facility has many amenities that the young and old can utilize for several years to come. Eventually earning LEED Gold Certification from the USGBC, the library contains a large meeting room, conference room and a new technology center that can be used by anyone. The children's area is designed to foster reading in an open and inviting environment that has views of the garden while the young adult area is designed for the technologically advanced teens of today.

The library also incorporates a wide variety of Green Building design elements, including daylight harvesting, an advanced mechanical system and utilizing recycled materials. The placement of 80% of parking spaces under the building and plaza areas reduces the heat island effect of paving and preserves space in the Civic Park as well.

THE TITUS SOLUTION

An equally important and vital piece to the green design was to have an energy-efficient HVAC system in place that offered sustainable features as well. The Walnut Creek Library selected the Titus UnderFloor Air Distribution (UFAD) system as well as the FlowBar to achieve this goal.

TAF-R

FLOWBAR

The main underfloor product featured in the library was the TAF-R diffuser. The TAF-R is a GreenSpec Listed product that is available in standard light gray or black. All components are constructed of a high-impact polymer material that is designed to resist damage from foot traffic found in libraries. Additional colors may be specified to match any building's interior scheme. This model can help contribute toward achieving LEED EA Credit 1: Optimize Energy Performance; IEQ Credit 6.2: Controllability of Systems; Thermal Comfort, IEQ Credit 7.1: Thermal Comfort - Design, and if the building utilizes an existing structure, MR Credit 1.1: Building Reuse.

Another high performing and energy saving product that can be found in the library is the Titus FlowBar. The FlowBar is an architectural linear diffuser that maximizes engineering performance without sacrificing aesthetic considerations of the design architect. FlowBar's outstanding performance allows higher airflows than conventional linear diffusers. The wide array of slot widths allow for more CFM per linear foot while minimizing noise and pressure loss.

Conventional linear diffusers are supported by the duct system and in most cases are installed after the ceiling system is in place. For complete ceiling integration, the FlowBar system is offered with a large selection of flange styles compatible with various ceiling applications. Our unique clip/hanger support system allows for quick and easy installations. The FlowBar system actually supports and becomes an integral part of the ceiling system and is installed along with the ceiling suspension system.

The Titus FlowBar offers a new concept of air distribution that fully integrates with all ceiling systems. The FlowBar system is available in continuous linear, incremental linear and square configurations. This entire series of diffusers is available with two unique pattern controllers as well.

THE END RESULT

The Walnut Creek Library is a shining example of what can happen when the community and the designer are fully engaged with the design of a new facility. This collaboration allowed the Group 4 Architects to create an aesthetically pleasing building that will service this community for many generations to come.

Icons

contributes toward energy savings by reducing operating costs of air distribution devices

energy solutions

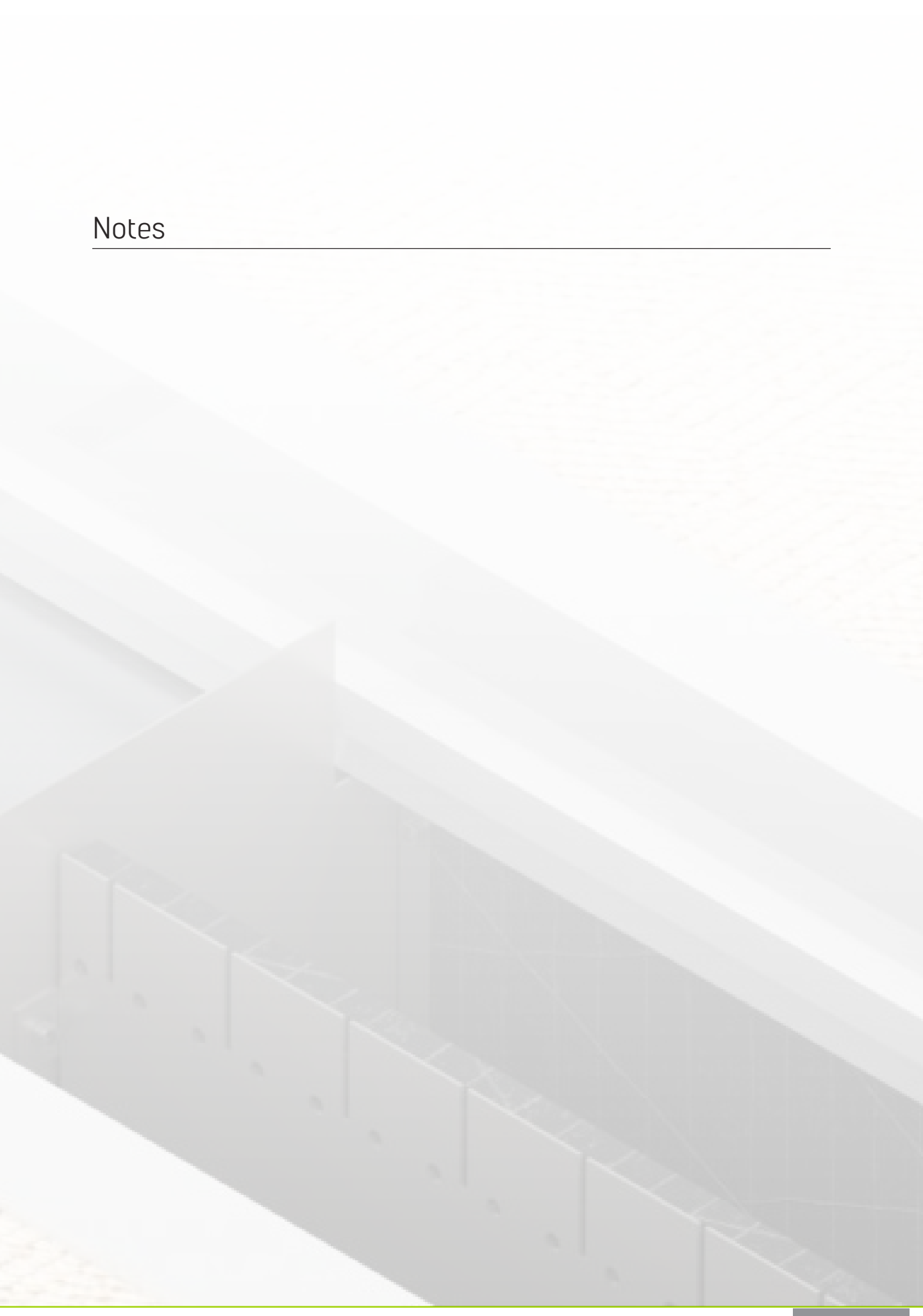
for use in all applications that require UL Fire Resistance products

fire rated

finish options that resemble woodgrains, perfect for high-profile architectural applications

wood grains

Notes



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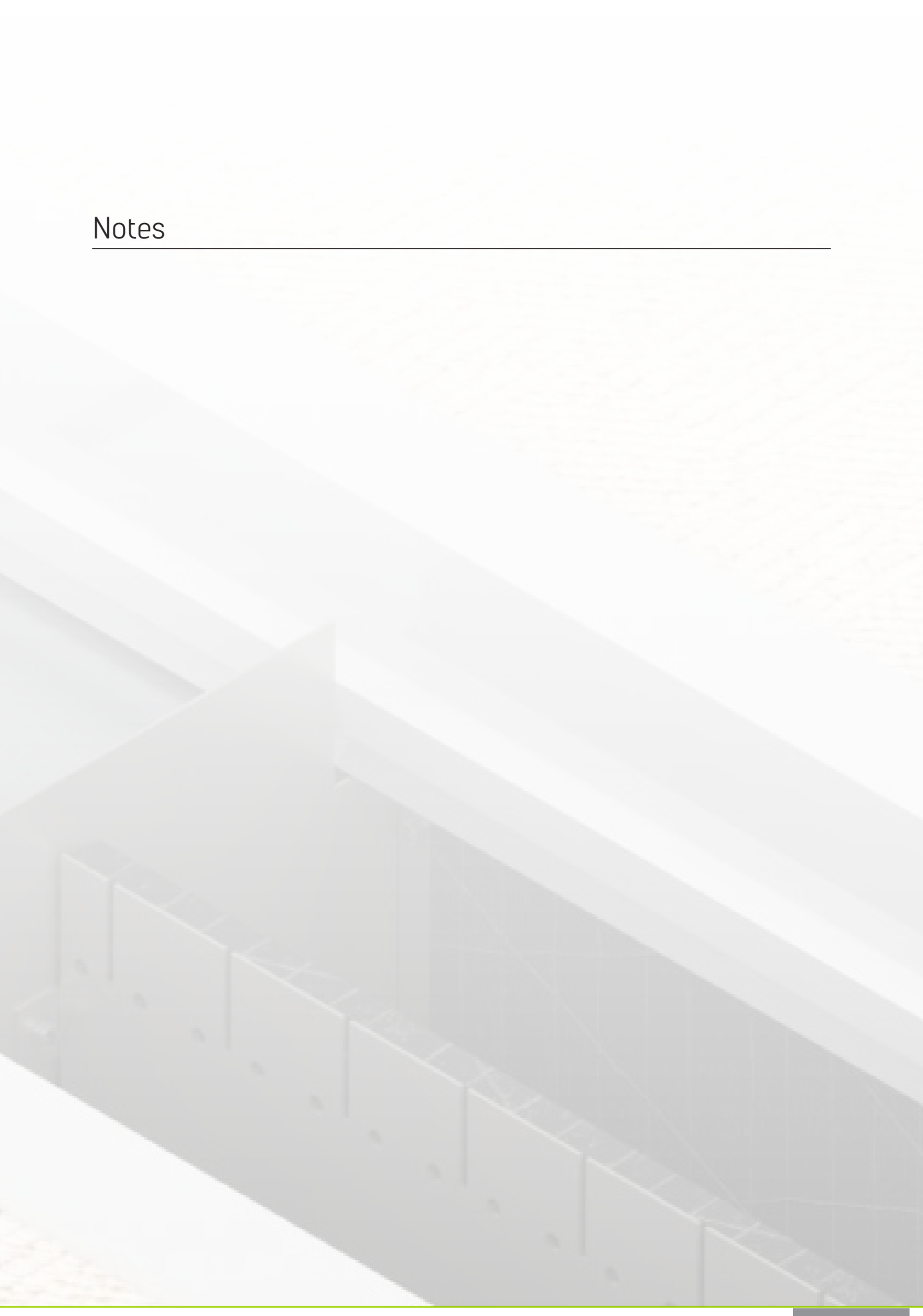

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