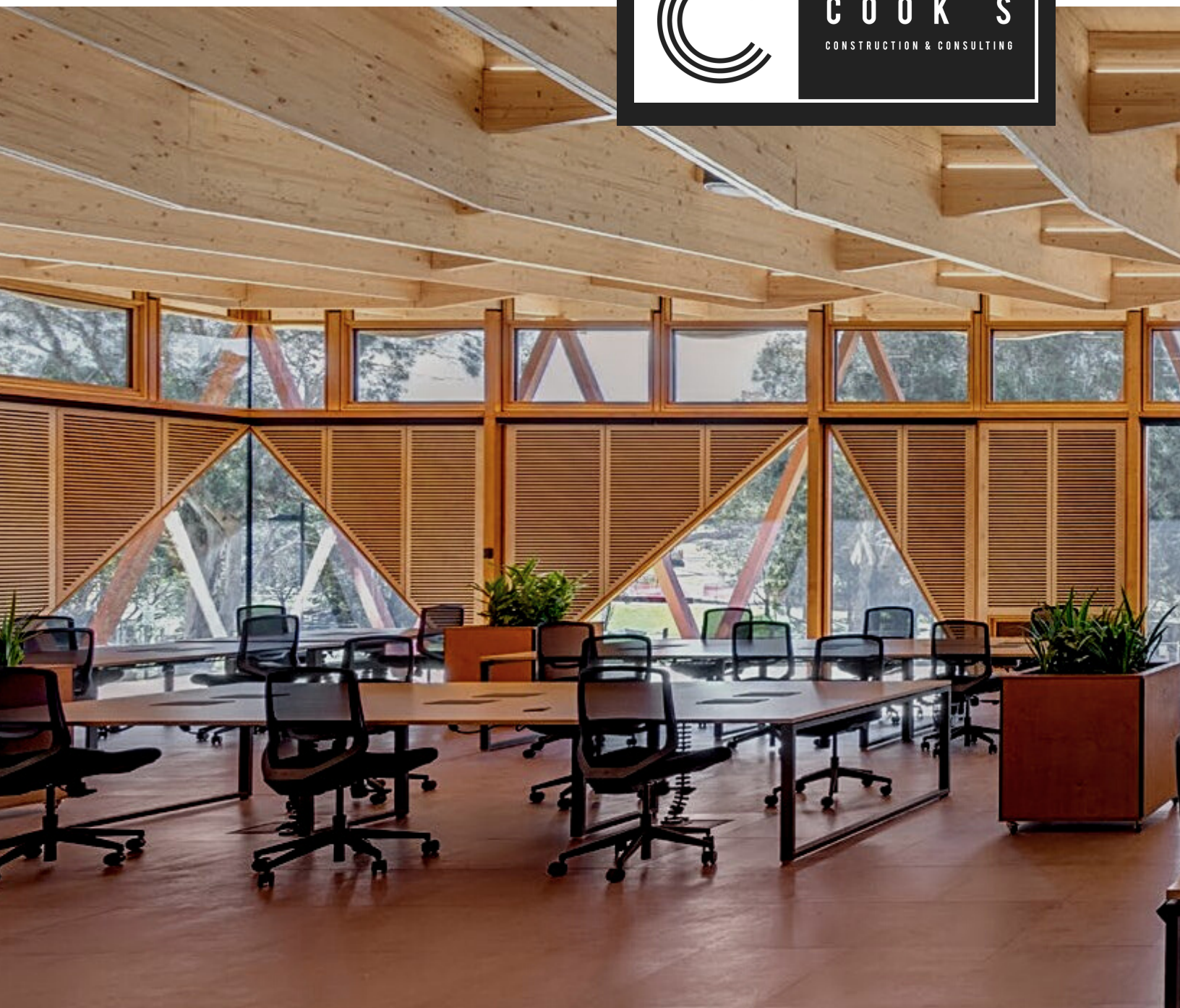
RAISED ACCESS FLOOR &
UNDER FLOOR AIR DELIVERY

MASS TIMBER & UFAD

COOK'S
CONSTRUCTION & CONSULTING



MASS TIMBER OFFICE BUILDING

MASS TIMBER & UFAD

Cook's Construction is pleased to present a proposal for the implementation of under floor air distribution (UFAD) by way of a raised access flooring (RAF) system for a new mass timber office building development. The mass timber design lends itself to a UFAD system for several reasons, one being the ability to expose virtually all of the timber ceiling. The UFAD system also allows for the complete distribution of both mechanical and electrical infrastructure within the floor plenum space, maximizing the exposed timber ceiling and timber supports. The RAF and UFAD systems not only enhance the look of the already exceptional mass timber design, but also add future flexibility, easier reconfigurations, improved occupant comfort, greater ventilation effectiveness and an overall improvement on occupant well being.

COST SAVINGS & VALUE ENGINEERING

When comparing UFAD to traditional OH systems several cost considerations must be carefully evaluated. The UFAD system virtually eliminates the duct work, not only exposing the mass timber design but also reducing schedule, on-site labor & materials on the project, creating a more sustainable and environmentally friendly build. The UFAD system improves indoor air quality buy introducing air from the occupants feet, (not mixing with the existing air as seen with OH systems) and naturally expelling the pollutants away from the occupied zone. This natural form of circulation can reduce energy usage by up to 30%!

When designing a building, the tenant improvement costs are a major factor, with a UFAD system the mechanical components are in place during the base build, reconfiguration and flexibility are extremely simple and reduces tenant costs which leads to higher retention and longer leases. With in floor diffusers and removeable raised access flooring panels, re-configuring your space is cost effective and there is no lost time due to construction/renovations.

MASS TIMBER - OFFICE BUILDING
COST SAVINGS & UFAD

UNDERFLOOR AIR DISTRBUTION

UFAD - Underfloor Air Distribution is the cleanest and most efficient way to distribute the conditioned air within a space. The evenly distributed conditioned air operates at a lower static pressure, reducing energy usage which results in lower operating costs, whilst improving air quality within the space due to the natural stratification from the floor delivery method. The air is introduced from the occupants feet, pushing & expelling the polluted air from within the space, essentially delivering fresher air more consistently when compared to the traditional overhead, mixing systems.

COST SAVINGS - With a raised access flooring system, and delivering the air in the form of UFAD, the savings are realized in a variety of ways.

1.) Reduced overall building heights - The ability to reduce the floor-to-floor heights by close to **12"** results in significant cost savings. Reduction in curtain walls, exterior and perimeter glass and an overall material & construction schedule savings. Based on previous studies, we estimate a savings between **$2-$3/sqft.**

2.) Reduced energy consumption & lower energy costs - The UFAD design lends itself to improving the efficiency of a buildings air delivery system in several ways, the first being **higher supply air temperatures.** Due to the lower velocity of the supply air, and the simple fact that the fresh air doesn't have to combat the existing room air and fight its way down to the occupants, the air can be introduced at a more moderate temperature. This in itself allows for reduced energy costs in cooling and heating the outside air. This also provides a strategy to utilize the **economizer** to the fullest capacity - with a higher supply air temperature allowing us to utilize the outside air to cool the building for longer periods throughout the year - thus saving the need to cool as much outside air, resulting in lower energy costs.

3.) Reduced life-cycle building costs - The flexibility of a raised access floor contributes to an improved visual appeal and significant costs savings with a deletion of overhead ducting & VAV system, perimeter heat/cool systems, wiring & controls. Studies have shown a near **$5-$6/sqft of savings.**

4.) Reduced materials and decreased construction schedule - With the raised floor and UFAD approach, the duct work reserved for traditional construction is essentially eliminated. This, in addition to workers being able to work predominantly at floor level, not only increases safety but also reduces material, reduces the **carbon footprint** and improves the overall construction schedule.

5.) Reduced capital cost - The cost of the standard rooftop AHU's can be significantly discounted due to the lower fan speeds, meaning a reduction in size and strength of the standard AHU in an overhead scenario. This can result to as much as a **$2-$3/sqft savings.**

MASS TIMBER - OFFICE BUILDING
INDOOR AIR QUALITY & UFAD

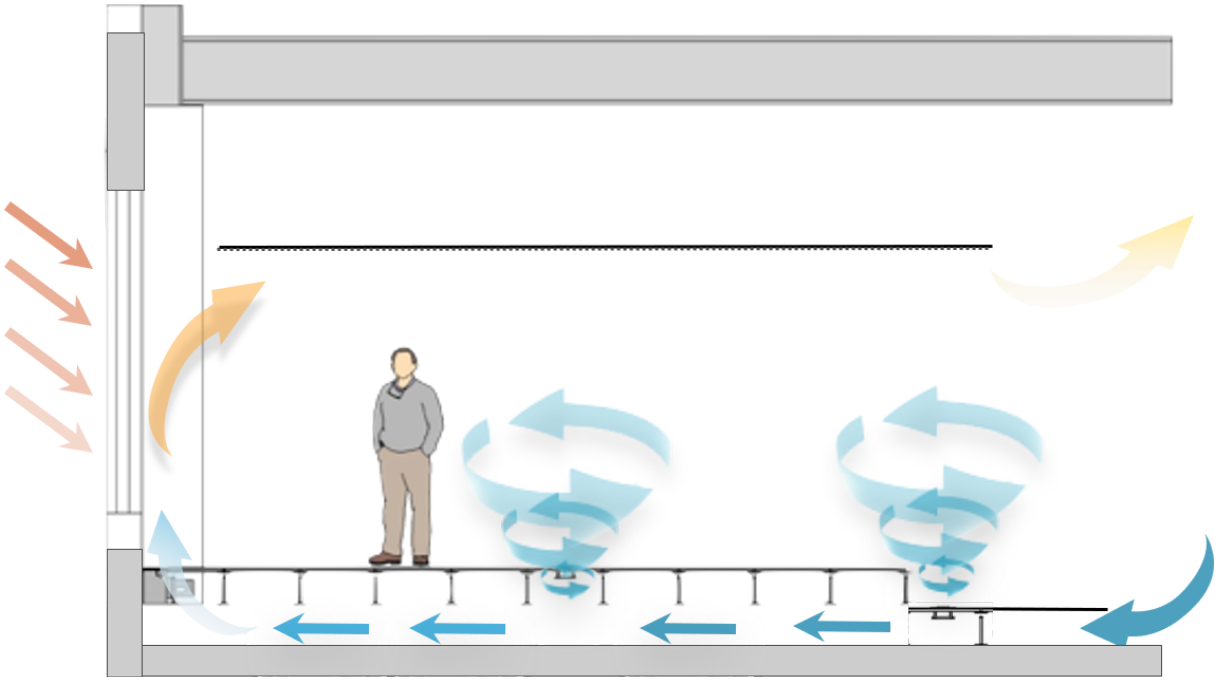
UNDERFLOOR AIR DISTRBUTION

UFAD - Underfloor Air Distribution is the cleanest and most efficient way to distribute the conditioned air within a space. In addition to energy and cost savings mentioned on the previous page - UFAD offers significant benefits from a health & WELL building standard,

1.) Ventilation effectiveness (VE) - The UFAD system moves air from the floor to the ceiling, this minimizes the "mixing" of the room air (when compared to overhead mixing systems) which improves VE and efficiency. The measure of an HVAC systems ability to remove airborne pollutants is called, "ventilation effectiveness." VE is the measurement of particulates in the air measured both outside and inside the space - VE for UFAD systems, as outlined by ASHRAE is at 1.2, vs the traditional OH which is measured at 0.8.

2.) Natural convection - Heat plumes generated from occupants, office equipment & lighting, combined with the warming of the new conditioned air from the UFAD system to move from the floor to the ceiling, cleansing the occupied zone.

3.) Personal control comfort - The UFAD system offers a system that allows the occupants to personally control the air flow within their work area. Traditionally the UFAD system will permit a floor-level diffuser every **200-250qft**, meaning each of the buildings occupants will have access to open and/or close the air flow within their own vicinity.



MASS TIMBER - OFFICE BUILDING

EXAMPLES OF MASS TIMBER AND UFAD

Underfloor Air Distribution (UFAD) System

The Beam will feature a **UFAD** system; an enhanced alternative to traditional overhead sheet metal-ducted VAV systems. While traditional HVAC systems mix supply and return air above the occupants, wasting energy and contaminating the air supply, UFAD uses the walking surface as a plenum to distribute air more efficiently. The air is dispersed from the floor and returns through the ceiling, naturally rising as it heats. As a result of this direct upward flow, the UFAD system's air is cleaner and uses less energy to provide a healthier work environment.

TOP BENEFITS OF UFAD

FLEXIBILITY
- Customizable layout
- Less labor intensive adaptability

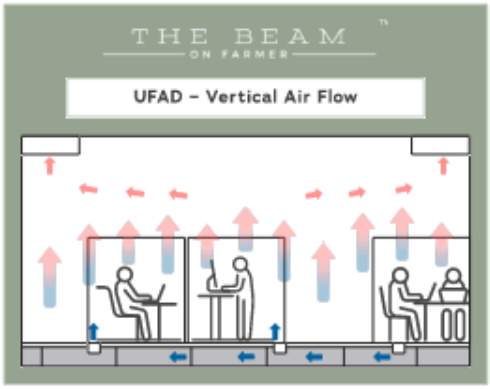
ENERGY EFFICIENCY
- Reduced operating costs
- Allows for lower temperature set point

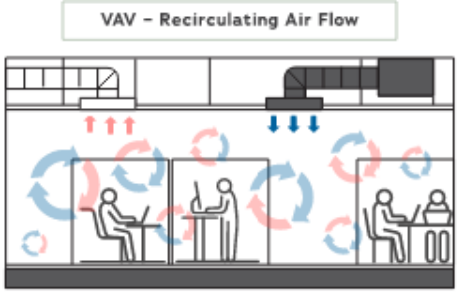
HEALTHY AIR
- Best-in-class air quality
- Exceeds ASHRAE 62.1 standards
- Individual air distribution

NOISE
- Reduces floor to floor sounds transfer
- Low velocity air reduces noise from HVAC systems

THERMAL HEALTH
- Individual air flow control
- Increased microspace comfort

AESTHETIC
- Complements exposed timber
- Mechanical, electrical, low voltage/IT all under floor
- Efficient design leading to lower construction costs

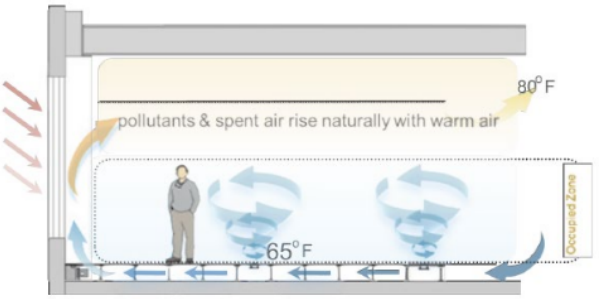


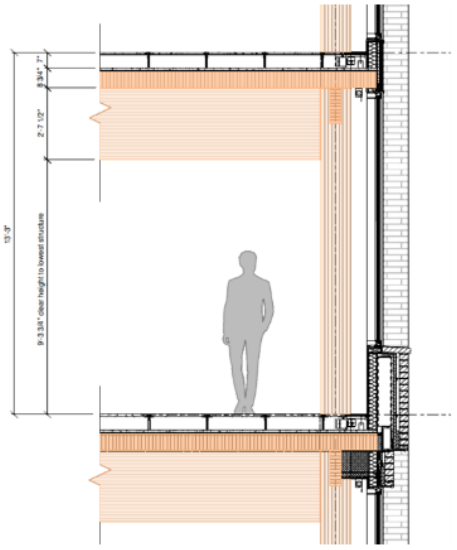


MASS TIMBER - OFFICE BUILDING

EXAMPLES OF MASS TIMBER AND UFAD

Underfloor Air Distribution

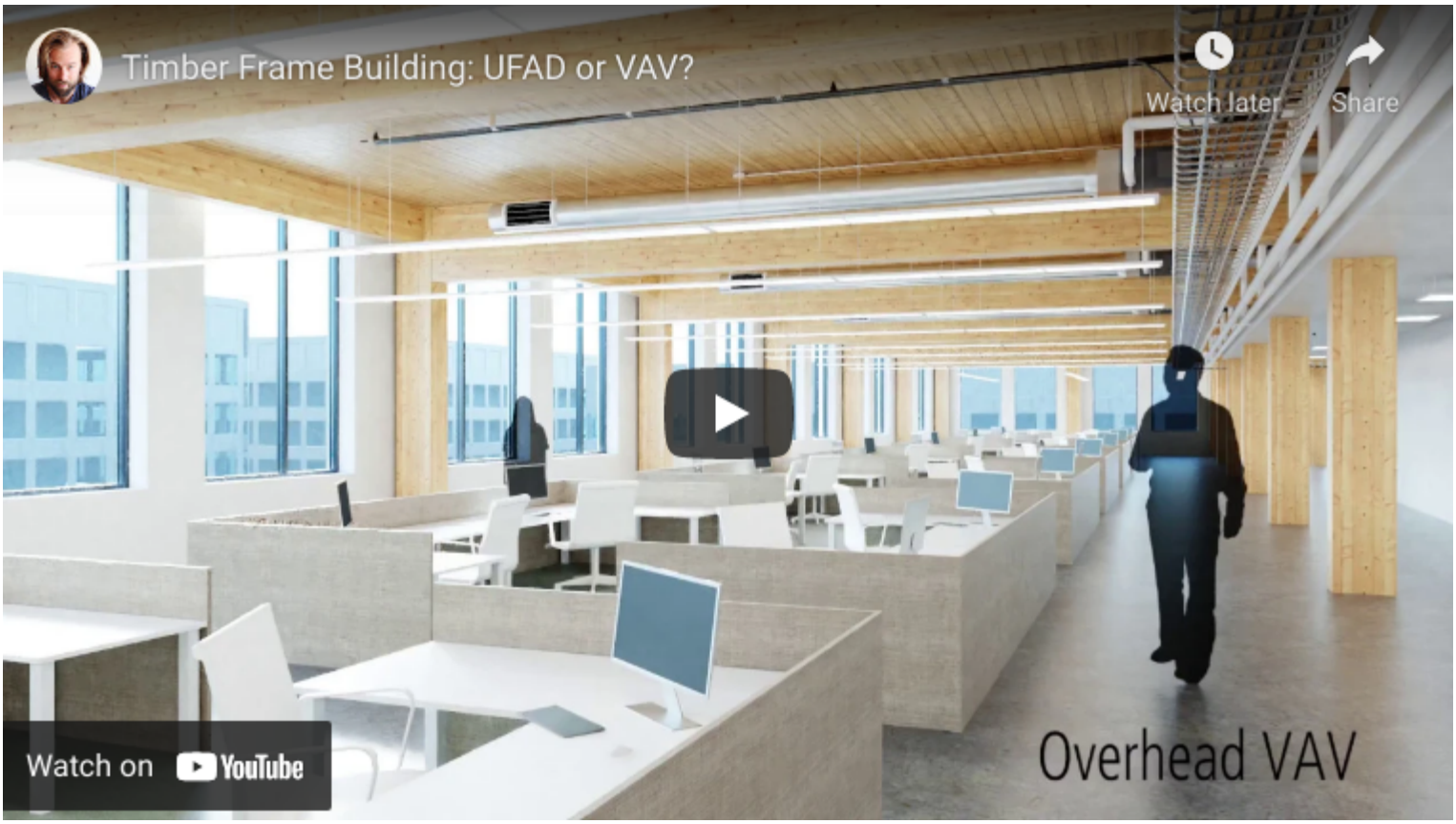




- Precise temperature control
- Reduce “draft” complaints
- Better indoor air quality
- Increased mechanical efficiencies
- Flexibility for alteration of floor plans
- No unsightly wall and ceiling vents

MASS TIMBER - OFFICE BUILDING

EXAMPLES OF MASS TIMBER AND UFAD



Timber Frame Building: UFAD or VAV? - YouTube

CLICK ON THE WRITTEN LINK ABOVE TO JUMP TO THE VIDEO