

Thinking Outside The Box

Kieron Smith — Kingspan Cleanroom Systems



Thinking outside the box



“When designing a cleanroom, it is natural to focus on aspects such as hygiene, air cleanliness, thermal performance and control of temperature, pressure or light. But what about the external potential?”

Things to think about.....

- **Space Optimisation**
- **Ease of use**



Kingspan Cleanroom Systems provides clients with a range of walkable system options to ensure the cleanroom is built to that project's exact requirements

“A walkable cleanroom ceiling can provide considerable practical benefits, offering a neat solution for storage and supporting the cleanroom’s often-extensive mechanical services. In addition to offering faster installation and often removing the need for secondary steelwork, it also creates a straightforward access route for both installers and maintenance personnel.”

Why Walkable?



The standard for the design, construction and start-up of cleanrooms and associated environments, ISO 14664-4, advises that all services should be “*designed, located and installed such that the cleanroom is not compromised by contamination.*”

Benefits of Walkability

- ✓ The need for workers to enter the controlled environment when conducting maintenance or making modifications is removed.
- ✓ There will be no need to stop production, clean and re-sanitise the area every time there is a mechanical issue or routine checks are made, reducing cleaning costs and production downtime.
- ✓ More regular inspections of the cleanroom’s performance can be conducted. This can extend the lifespan of the unit and safeguard the health and safety of both internal and external staff.

However, walkable is not the same as non-fragile. While a surface may be perfectly able to bear the weight of a maintenance worker, if it is unexpectedly overloaded with additional machinery, people or the increased point load of a worker tripping and falling, it is likely to give way.

Rolls Royce



Deerland Enzymes



Other things to consider



- Safety
- Structural Strength
- Fire Performance
- Core

“investigations into incidents concerning insulated suspended ceilings identified that they are often caused by inadequate ceiling designs, and design loads that are not representative of the installation and maintenance activities that take place.”

Safety- The most important consideration



The different types of loads that the cleanroom ceiling is likely to be subjected to all need to be taken into consideration

- This includes the dead load of the construction itself and imposed loads such as maintenance activities
- This highlights the need for close collaboration between the designer, project engineer, manufacturer and end-user to accurately determine what loads the walkable ceiling can and will need to bear, and therefore the best materials and designs for the job.

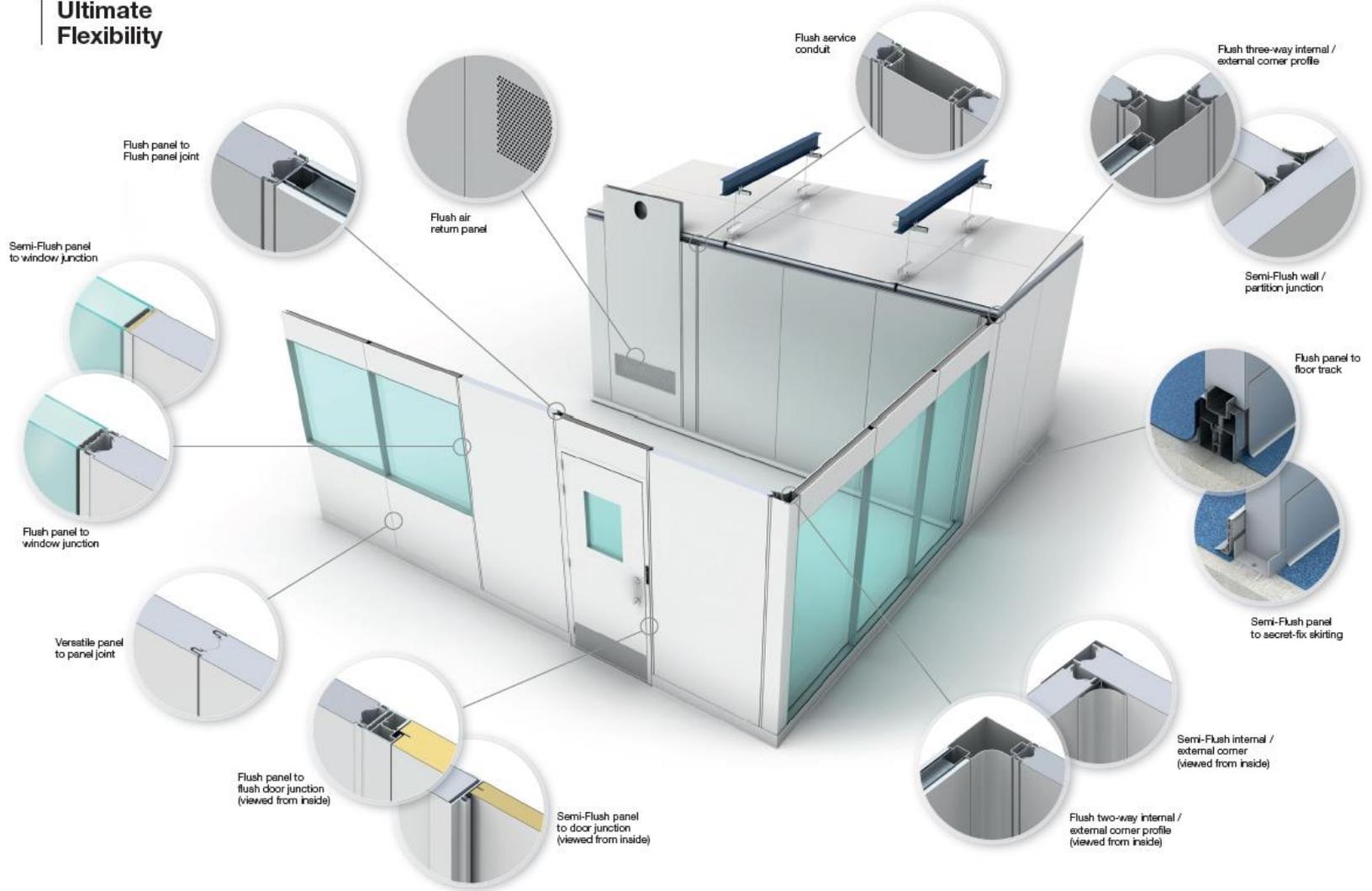
While the emphasis often lies with selecting the panel core with the best tensile strength, it is important to avoid the trap of the “single-element approach”. In 2010, in the UK, an investigation into a fatal accident where two men fell through the ceiling of a frozen food store.

The Investigation discovered that the insulated panels separated from the supporting steelwork due to failure of the bolts that secured them to the frame.

Rather than relying solely on the strength of a single component, a more holistic approach which views the panels as part of a wider cleanroom system, including the fixings, coatings and other details, is necessary to create structurally sound walkable ceilings that will stand the test of time.

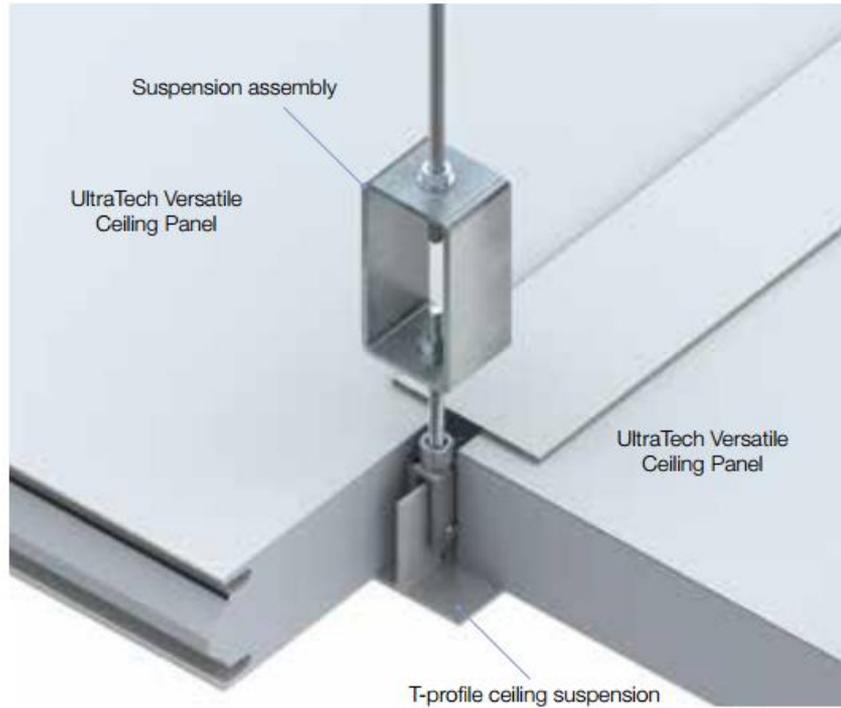


Ultimate Flexibility

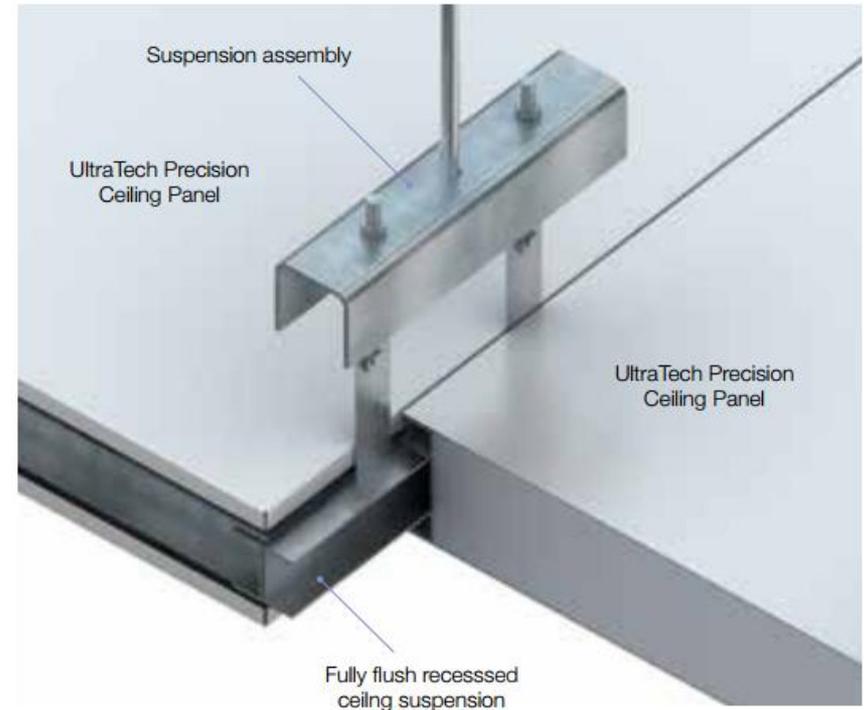


Walk on Ceilings

UltraTech Versatile Ceiling Suspension System



UltraTech Precision Ceiling Suspension System



Abec


Kingspan
Insulated Panels



Abec



MSD



System Approach

- In extension of this “system-approach”, incorporating fall-prevention equipment (such as handrails), edge protection and boarded walkways to distribute the weight into the initial design of the cleanroom can also help improve the safety of a walkable ceiling.
- Aside from the obvious safety benefits to the workers once the facility is up and running, including them in the design from the beginning ensures that the dead load of the construction, and therefore the potential additional load-bearing of the ceiling, is accurate.



The burning question



“It is one thing to ensure that a structure is safe to walk on, but will the selected material also perform in the case of fire?”

- The level of fire resistance needed varies with the specific application, however choosing a construction material that does not self-propagate fire is key to protecting the cleanroom.
- A material that carries FM Approval offers additional peace of mind, as it has not only been rigorously and independently tested, but will also meet any insurance requirements.
- Although a fire within a cleanroom that uses fire-resistant interior wall and ceiling panels will be small and contained, if the products being manufactured within it are smoke-sensitive, the physical and financial damage could be considerable
- In these types of environments, it would be advisable to choose a product that meets the standards of **FM 4882**.
- **FM4882** certifies that the material not only restricts the spread of the fire, but also limits the production of smoke, making them ideal for pharmaceutical manufacturing, food preparation or similar industries.

St James Hospital



“From an economical and performance point of view, the Quadcore panels were a more cost efficient solution in comparison to mineral fibre or an aluminium honeycomb system. Having the panels fully certified to FM 4882 requirements also made it easy to get approval from the local fire authority”

Michael Matthews, Technical Manager at BAM Contractors Ireland



What is FM Approval?



- FM Approvals is a global testing and certification service run by FM Global, a worldwide insurance company that specialises in loss prevention.
- Led by scientific research and rigorous testing, they ensure that every product that receives the coveted FM APPROVED mark meets the highest loss prevention standards of quality, technical integrity and performance.
- The certification is recognised and respected by consumers and accreditation organisations around the world

Benefits of FM

- As FM Approvals is conducted by a loss prevention insurer and accredited by numerous bodies, it makes the insurance process much simpler and quicker.
- Additionally, as a FM Approved interior wall or ceiling will not self-propagate fire, time and money can sometimes be saved on installing an automatic¹⁸ sprinkler system (providing the occupancy allows it).

Why Aim for FM?



- Fire prevention is a vital consideration for any construction project, and it is a particularly important factor to consider when specifying materials for a cleanroom.
- When exposed to fire, normal construction materials can deteriorate quickly, increasing the risk of the fire spreading through the facility and endangering life.
- In addition, the dust and debris released will contaminate the controlled environment therefore compromising its performance and destroying the processes and products within.
- The initial physical and financial damage of such an incident could be considerable and costly to fix, not to mention the cost and disruption caused by the inevitable production downtime.

materials which have been FM Approved can help reduce and even eliminate these potential hazards.

How Do They Test Materials?



- To achieve FM4880 Class 1 Fire Rating of Building Panels or Interior Finish Materials, products need to not only demonstrate that they do not self-propagate fire in small-scale material flammability tests, but also in whole room tests and, in some cases, corner tests at 25ft and 50 ft.
- The panels in these large-scale fire tests are installed in quantities and applications which replicate how they would be used in everyday field constructions.
- They are also exposed to a corner fire test to find out the extent of fire propagation.
- The results are then analysed to provide recommendations on limitations to the final application for which the wall and ceiling materials are FM Approved.
- For smoke-sensitive controlled environments in industries such as pharmaceuticals or food processing, even the smallest fire could be devastating.
- In these types of environments, it would be advisable to choose a product that has been tested to the standards of FM 4882, Class 1 Interior Wall and Ceiling Materials or Systems for Smoke Sensitive Occupancies – the only test of its kind in the world.
- This certifies that the material is not only designed to meet the requirement of FM4880 for interior wall and ceiling panels, but also generates less smoke.

Enhanced Fire Performance



LPS 1181 : Issue 1.2
Cert No: 260a & 186a

EXISTING PIR	QUADCORE
<p>FM 4880 Approval Standard for Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coating and Exterior Wall Systems</p> <p>FM 4881 Approval Standard for Class 1 Exterior Wall Systems</p> <p>FM 4471 Approval Standard for Class 1 Roof Panels</p>	<p>FM 4882 For smoke sensitive occupancy Class 1 interior wall and ceiling panels for pharmaceutical manufacturing and storage areas, food preparation and storage areas or similar occupancies with no height restriction. The only closed-cell insulated panel material approval to this level.</p>
<p>LPS 1181 Part 1 External cladding roof and walls Ext-B and Ext-A</p> <p>LPS 1208 Fire Resistance FR 30 and FR 60 certification for specific products</p>	<p>LPS 1181 Part 2* For internal wall and ceiling linings</p> <p>LPS 1208 additional options available for:</p> <ul style="list-style-type: none">• Increased spans• Full module width range (600-1200mm)• Removal of stitching screws• Increased orientation options <p>*Formal certification pending</p>

The Bigger Picture



There are dangers in falling for the 'single-element' approach and counting on just the strength of the panel core to make a ceiling walkable.

Both traditional and newer Cleanroom materials are available from manufacturers as a complete system, including fixings, coating options and even fall protection equipment.

This makes following a holistic design process even easier, as all the products are designed or selected to work perfectly together

- From a performance perspective, this has obvious benefits-
 1. making sure the construction envelope is airtight
 2. any joints are integrated and flush.

However, in terms of creating a safe and strong walkable cleanroom ceiling, it also offers assurances that all the components supporting the panels can bear the loads the cleanroom is designed to support.

Additionally, these systems often come with a long-term guarantee period, which gives both installers and end-users peace of mind.

Peace of mind, whilst a bit of a clichéd saying, is an incredibly important part of cleanroom design, construction and eventual use.

Final thoughts..



- *Like playing with an empty cardboard box, the design and construction of a cleanroom will ultimately always be dictated by what it needs to be on the inside.*
- *However, by considering the space around the cleanroom as a part of the system, it is possible to create a facility which not only performs to the highest possible standards, but also is easy and safe to maintain in the long term, offering greater value for money.*

Any Questions?



IPN **QuadCore**[™]
TECHNOLOGY