METL SPAN®

PERFORMANCE REDEFINED

BUILDING SCIENCE CORPORATION DIGEST OF INSULATED METAL PANELS

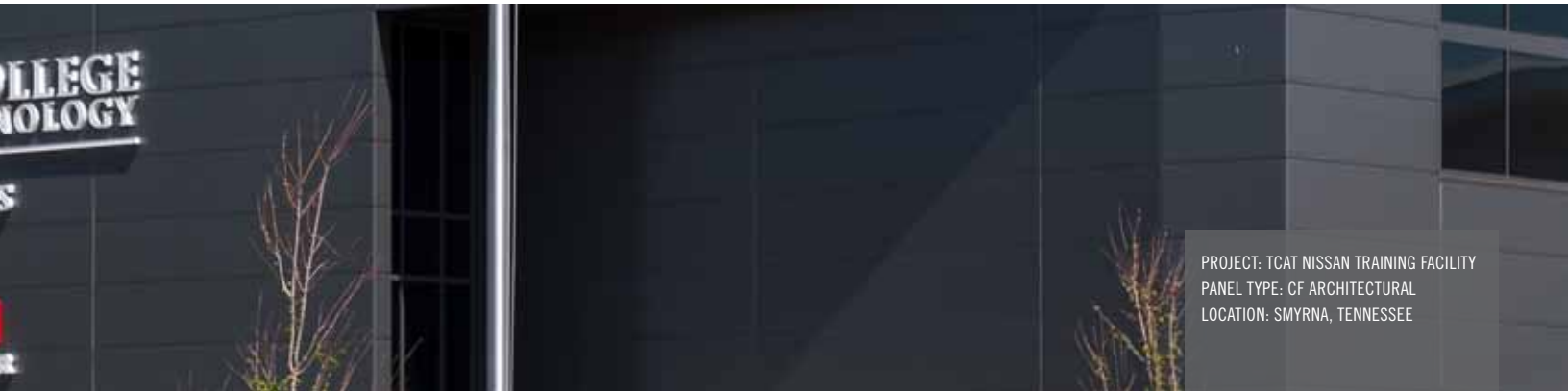
PROJECT: INNOVATION FIRST INTERNATIONAL
PANEL TYPE: CFR, SANTA FE
LOCATION: GREENVILLE, TEXAS

PROJECT: KANSAS CITY URBAN YOUTH
PANEL TYPE: LIGHT MESA
LOCATION: KANSAS CITY, MISSOURI

PROJECT: LISEGA
PANEL TYPE: MESA
LOCATION: KODAK, TENNESSEE

PROJECT: METROHM
PANEL TYPE: CF ARCHITECTURAL
LOCATION: RIVERVIEW, FLORIDA

PROJECT: MOHAWK COLLEGE
PANEL TYPE: STRIATED
LOCATION: STOWEY CREEK, ONTARIO

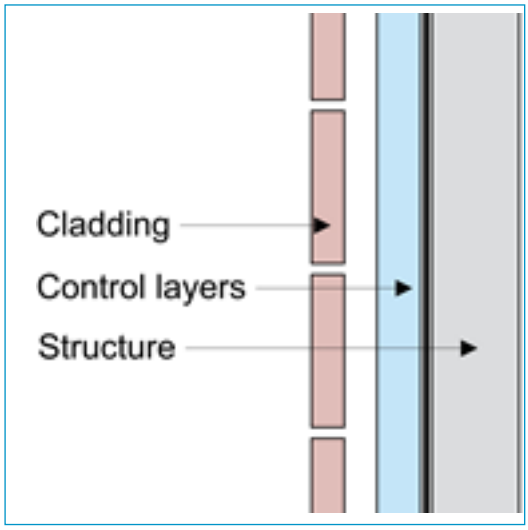


PROJECT: TCAT NISSAN TRAINING FACILITY
PANEL TYPE: CF ARCHITECTURAL
LOCATION: SMYRNA, TENNESSEE

INSULATED METAL PANEL SYSTEMS FEATURES & BENEFITS

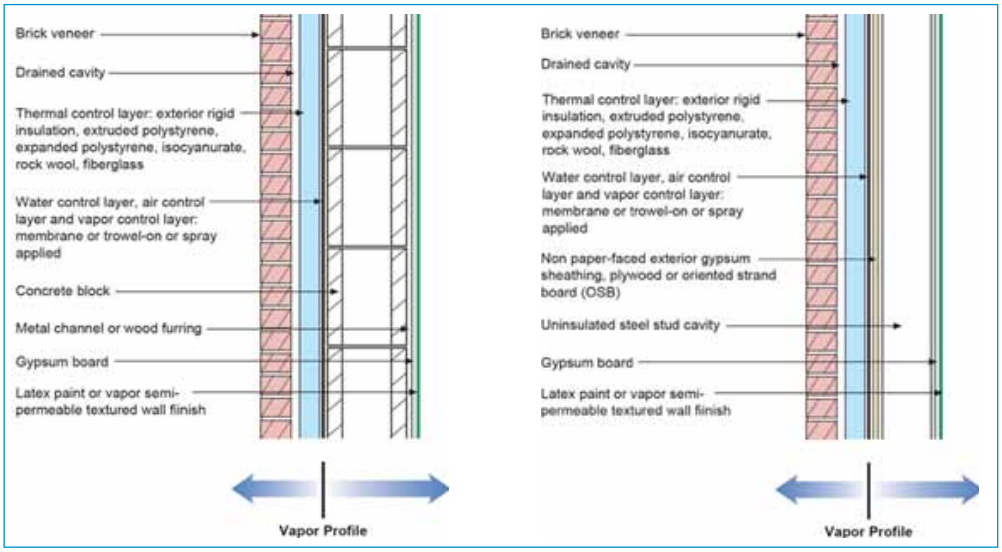
With increased political focus on energy independence and climate change there is a growing demand to make buildings more efficient. Results show that the increased insulation and reduced air leakage afforded by insulated metal panel assemblies can achieve significant energy savings, as high as 22% depending on the application.

The building enclosure is an environmental separator; defined as the physical component of a building which separates the interior from the exterior environment. There are four control layers that dictate the overall performance of this separator: water, air, vapor and thermal control. The water, air and vapor control layers are all located on the exterior of the structure. The thermal control layer is located on the exterior to the other three control layers. The continuity of the control layers is the key to the performance of the building enclosure; impacting comfort, energy efficiency, durability, and overall building occupant satisfaction.



Controlling these building enclosure layers is key to performance but not all layers are equally important. Controlling water in the liquid form (rain and ground water) is the most critical and not only impacts the durability and sustainability of the building but also mitigates the highest risk of failure. Air flow control is desirable as it impacts comfort, indoor air quality, building efficiency and operating costs. Thermal control is typically limited to comfort issues and operating cost expenses. Controlling vapor is normally limited to extreme climate differences between interior and exterior climates which impact operating expenses, energy efficiency and anti-microbial performance.

The dual location of both air and vapor control layers with an insulated metal panel system allow this assembly to function successfully for both refrigerated and cold storage building facilities in all climates.

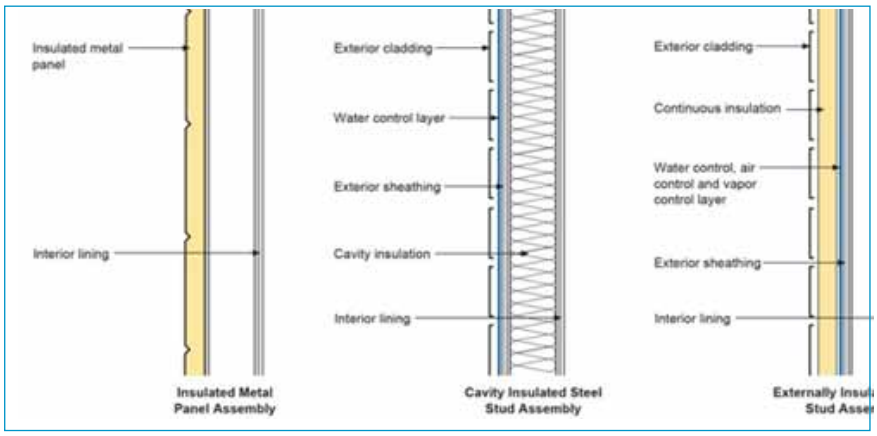


COMPARISON WITH ALTERNATIVE SYSTEMS

Cavity insulated and externally insulated metal building and steel stud assemblies

The biggest issue with metal building and steel stud assemblies is thermal performance. Thermal performance is affected by 2 major issues:

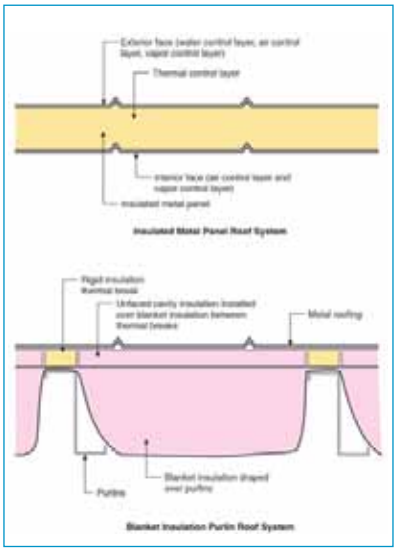
- The conductivity of the steel framing/steel studs
- Air leakage through and around improperly installed internal frame or cavity insulation



Both of these factors when combined reduce the effective thermal resistance of the assembly by over 50%. The most effective manor to address these factors is to install continuous insulation on the exterior of the metal framing or steel studs instead of relying upon the cavity insulation for thermal control purposes.

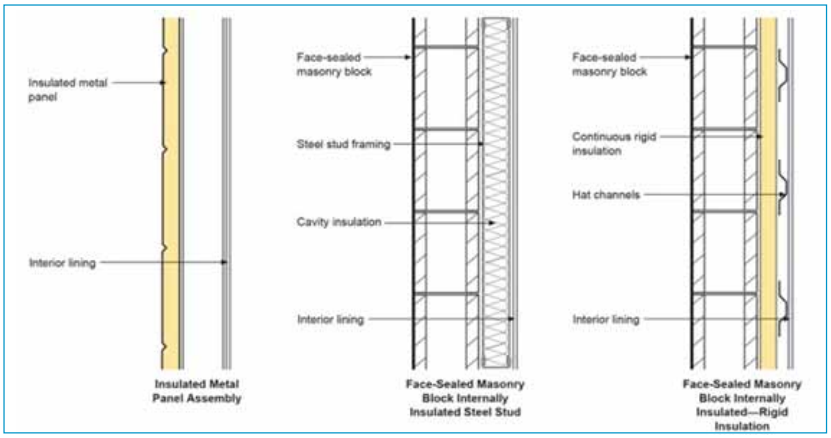
Blanket Insulation purlin roof systems

Thermal conductivity issues exist with blanket insulation purlin systems. Thermal breaks do not address air leakage through and around blanket insulation when such insulation is not installed in an airtight manner. The thermal performance of such insulated blanket insulation systems does not provide comparable performance to insulated metal panel roof assemblies. Blanket insulation purlin systems are not suitable for refrigerated building assemblies as it is extremely difficult to make them airtight from the outer surface, leading to condensation problems.



Face-sealed masonry block assemblies

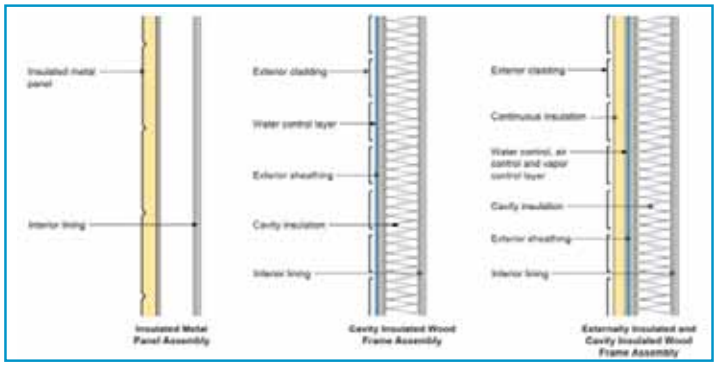
Face-sealed masonry block assemblies can be internally insulated with a steel stud/ cavity insulation approach or with a continuous rigid insulation approach. When steel stud cavity insulation approaches are used, they are subject to the same issues as cavity insulated metal building and steel stud assemblies mentioned above. They are limited to mixed and hot climates due to the impermeability of the exterior masonry blocks. These issues can be addressed by installing continuous impermeable rigid insulation directly to the interior of the exterior masonry block. From a thermal perspective when continuous impermeable rigid insulation or spray polyurethane foam is used, such assemblies function similarly to insulated metal panel systems.



COMPARISON WITH ALTERNATIVE SYSTEMS

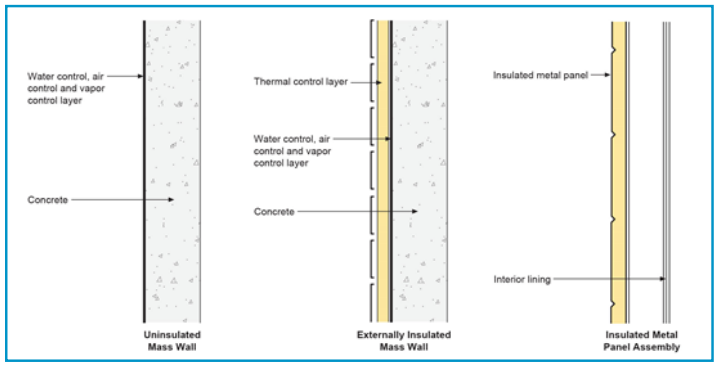
Cavity insulated wood frame assemblies and externally/ cavity insulated wood frame assemblies

Cavity insulated wood frame assemblies do face similar air leakage issues through and around improperly installed cavity insulation. These issues can be addressed by installing continuous external insulation as in the case of metal building and steel stud assemblies. The continuous external insulation reduces the temperature difference across the cavity insulation reducing the effect of convection. Wood frame assemblies with continuous external insulation function similarly to insulated metal panel assemblies.



Non-insulated (Concrete Tilt-up) and insulated mass wall assemblies

The thermal performance of non-insulated and externally insulated mass wall assemblies are compared to insulated metal panel assemblies. The mass has to be sufficient to modulate the inward heat gain during the day and the outward heat loss at night—the thickness of the mass wall shifts the sinusoidal assembly response of the inward daily heat flux approximately 6 hours. When the diurnal temperature swings are not consistent, non-insulated mass walls function poorly. When the mass is charged with thermal energy and exterior temperature swings trend upward significant conditioning energy is necessary to overcome the thermal inertia of the mass for the enclosure to remain comfortable. Light mass assemblies are able to react to conditioning energy quickly in comparison, limiting the applications of this assembly to specific hot-dry climates.



Non-insulated mass walls are problematic in hot humid climates and mixed humid climates. The latent load of the outdoor air introduced by the humidity makes it difficult to use ventilation air for energy removal at night. It is necessary to control whole building ventilation using enthalpy controls.

Non-insulated mass walls are problematic in cold and serve cold climates as the interior surface of the mass wall stays below the comfort level as there is insufficient thermal energy available from the exterior even with consistent diurnal swings.

Insulated metal panel systems provide all the required functions needed from a proper building enclosure with less materials needed to install and provide a better performing, energy efficient building.

PROJECT: UPPABABY
PANEL TYPE: CF ARCHITECTURAL
LOCATION: ROCKLAND, MASSACHUSETTS

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