

INFRARED IMAGE OF EXTERIOR WALL COLUMN ENCLOSURE:



Millions of Dirhams in damage was caused by overlooking the penetration of the Air and Vapour barrier in a flawed value engineering study for a building wall assembly.

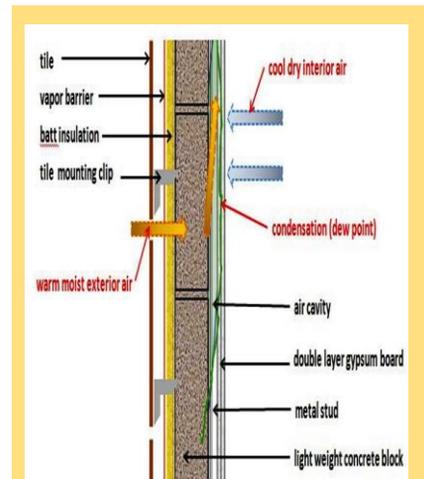
A Case Study- Unintended Consequences of Cost Cutting in Value Engineering

Our Case Study Building was designed with an attractive but costly stone façade. Typically with a stone façade in this climate the stone panels were to be bolted to the lightweight masonry block wall with steel cleats through foil backed rigid foam panels. This original design scheme was value engineered to produce a similar exterior look at a lower cost. The replacement system used large ceramic tiles in place of the exterior stone panels. The tiles layout now featured attractive open vertical and horizontal joints which required multiple aluminum cleats shot-stapled through the rolled rock-wool insulation with flexible foil backing that now replaced the rigid foam insulation. The interior side of the lightweight concrete block wall used lightweight metal studs with two layers of gypsum board attached to provide a smooth base for a high level interior finish.

The value engineering process was flawed in that it did not take into account the effect of the proposed solution on the vapor barrier which in effect is the true point of separation between the outside and inside environments. The installation of the open jointed ceramic tile with the aluminum angles stapled through the soft backed rock-wool batten insulation repeated and randomly punctured the insulation's foil layer; this layer which was to act as the vapor barrier was now completely permeable. This is particularly important because if our GCC climate with its year round relatively high humidity exterior air mixes with our nearly full-time A/C cooled drier interior air, this now permeable barrier allows for a massive mold invasion.

Green Building Solutions (GBSI) was hired to investigate this unwanted condition with an infrared survey and smoke path analysis. GBSI was also brought on the building team to recommended materials and sealants for the most cost-effective solution to rectify the building envelope.

The rectification of this “cost- saving” value engineering exercise ultimately cost millions of dirhams as over 85 % of the entire 8-story structure facade had to be 100% replaced. The process was costly for two reasons; not only the cost of materials and manpower but also lost revenue due to closing of interior areas of the building during the 2.5 year solution investigation and ultimate renovation.



This diagram illustrates how the multiple penetrations became a conduit for warm, moist water laden air flowing through the porous block wall mixed with cool, dry interior air. When the moist outside air meets the cooled, drier air-conditioned air the water vapor in the exterior air condenses into liquid water. The interior gypsum board walls had a constantly replenished source of moisture, which allowed mold spores to settle and feed on the gypsum board paper backing. The mold damage was wide spread and indiscriminate as the entire façade provided no barrier to exterior water vapour and air penetration.