

PRE DRY-IN CONSTRUCTION: THE EVOLUTION OF CONSTRUCTION STARTS FROM WITHIN.

Buildings define our communities by reflecting who we are, how we view ourselves and how we wish to be seen. Construction is not simply a matter of enclosing a volume of space, but is a complex blending of function, aesthetics, community needs and owners' desires. These must fit within the practical constraints of climate, available resources and schedule demands. Little wonder that construction is so intensely competitive and successful contractors must continually find new ways to cut costs and protect margins without sacrificing quality or client satisfaction.

The search for better, faster and more efficient construction methods drives innovation and has brought about revolutionary changes in building materials and construction technology. One such example is the introduction of moisture and mould-resistant gypsum panels, which facilitate changes to traditional job sequencing that can significantly improve both scheduling and installation quality. But it is important that contractors consider more than just material substitution. They must consider all aspects of system performance and only then can new construction practices be implemented in a manner that truly delivers the desired product faster, more efficiently, and at lower cost.

A significant development in the drywall industry has been the introduction of what is known as "pre-rock," "top-down" or "topping-out" construction. All of these refer to installing some portion of drywall "pre dry-in," well in advance of closing up the structure and making it weather tight as in conventional industry practice. As the multitude of names infers, this practice is still evolving and an industry-wide glossary of terms and standard practices has not yet been developed. First introduced to speed construction and resolve a specific problem in ceiling plenums, pre dry-in construction now extends to include all interior drywall installation when the building has not yet been dried-in. The purpose of this white paper is to discuss the advantages and limitations of this practice, including some of the key system performance factors to be considered when evaluating the suitability of pre dry-in construction for a particular project.

Any discussion of pre dry-in construction should begin with the original concept of top-down construction.¹ Pre dry-in construction entails coordinating the trades so that the drywall trade installs the interior metal framing and then hangs drywall only in the plenum above the finished ceiling plane before the Mechanical, Electrical and Plumbing (MEP) trades install ducts, conduit and pipes that penetrate the plenum walls.

Traditional construction practices installs MEP first, followed by the metal framing and drywall once the building has been enclosed and is weather tight, or dried-in. In some locales this is required by code. However, traditional sequencing leads to the cumbersome and time-consuming process of fitting and piecing together gypsum drywall around duct and pipe penetrations like pieces of a jigsaw puzzle. That creates the possibility for quality and fire-resistance ratings to be compromised at difficult-to-reach joints and penetrations.

In contrast, pre dry-in construction avoids these difficulties and results in faster, easier installation of the gypsum panels with tighter fits around the penetrating items. In the plenum space, joint finishing can usually be done quickly and simply by fire-taping the joints.² Hence, pre dry-in construction can speed construction and reduce costs while simultaneously improving quality and finish.

Installing metal framing and drywall ahead of MEP requires that drywall be hung before the building has been fully closed in. Therefore, the interior construction is not protected from weather for a period of time.

Restricting this practice to the plenum space above the ceiling plane provides partial protection from weather exposure from the roof or floor deck above, and also ensures that water will not collect and pool where it will be in direct contact with the gypsum panels. However, the panels at the perimeter are more exposed to the elements. As such, standard paper-faced gypsum board is not suitable for these limited outdoor exposures and special water and mould-resistant gypsum panels should always be used for this application.

The water and mould resistance of glass-mat gypsum panels are considered superior to water-resistant paper-faced gypsum boards. As a result, glass-mat gypsum panels have become the preferred panel for weather-exposed applications where they have performed well. This logic is now being extended to interior spaces where pre dry-in construction has come to include hanging the gypsum drywall over the full floor-to-ceiling height of the wall. It is no longer limited to just the partial wall of the plenum space above the ceiling plane. This practice creates much greater exposure risks, even for glass-mat faced gypsum panels, that must be understood and considered carefully.

The pre-dry-in concept is essentially building “inside-out” with interior walls that are traditionally protected from the weather going up before the building envelope is closed in, thereby temporarily exposing interior systems to outdoor conditions. While glass-mat interior gypsum panels and other specialty gypsum panels are now warranted for up to 12 months exposure to the elements, there is still a risk that too much water will compromise even water and mould-resistant panels. Thus, all manufacturers exclude warranty coverage where there is excessive moisture, “cascading” water, or weather events such as tornadoes, hurricanes and major thunderstorms that combine wind and water.

And moisture is not the only problem. Freezing conditions and very high temperatures can also cause problems, especially if the panels are not suitably conditioned to the end-use occupancy conditions (temperature and relative humidity) before joint compound and paint are applied.

More than the performance of the drywall panel alone should be taken into consideration when deciding if this is the right option for your project. Many project specific factors weigh upon whether or not the contractor can anticipate benefits from pre-rocking or will increase the risk and liability for the job. There is no easy rule-of-thumb that can be used for this calculation. The risk factors associated with building in a Gulf Coast climate versus New England, or the Southwest high desert plains versus a Pacific Northwest rain forest, are markedly different and affected by such factors as climate and season, project duration and design details that can mitigate or amplify moisture exposures:

- It is well established that the most important and effective means of preventing mould growth in buildings is through moisture control. Mould spores are ubiquitous in nature and require only a film of dust or dirt to support growth, even on inorganic substrates. Dirt on the surface of the gypsum drywall or collecting in wall cavities may be sufficient to foster the germination of mould spores if environmental conditions are conducive to mould growth. Such is the case even if the gypsum drywall itself does not deteriorate from moisture exposure.
- An additional source of concern is moisture pooling in the bottom track of the metal framing runner channels combined with dirt in the wall cavity, this can lead to mould growth, which then may contribute to indoor environmental quality (IEQ) problems at a later stage of the building's life. In some climates and at certain times of the year the amount of precipitation that can be expected is small and such considerations present very low risk. However, in other locations or in jobs that may have exceedingly long periods of exposure the potential for mould growth and IEQ problems may increase the added risk due to pre dry-in installation of gypsum drywall unacceptably. In all cases, contractors are advised to blow dirt out of framing members and dry the walls before enclosing wall cavities that have been exposed to water.
- Metal framing and screw fasteners specified for interior applications are generally not manufactured to the same level of corrosion resistance as required of building components approved for use in exterior applications. The risk of corrosion with resulting staining or mechanical failures must be taken into account in deciding if the framing or fasteners that are specified can withstand the rigors of the outdoor exposures anticipated for the job.
- One should also consider what other materials are being used in the wall and their suitability for pre dry-in construction. Glass fiber, mineral wool and cellulose insulations used for sound damping or fire resistance can absorb surprisingly large amounts of water that is difficult or impossible to dry out afterwards. Moisture trapped in the wall assembly may damage expensive wood trims, cabinets and flooring, for example to warp permanently in a building that is not yet dried in. Other materials may react chemically in a wet environment, whereas they normally experience no problems in dry interior applications.

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- Interior assemblies generally are not designed to withstand wind loads and other mechanical loads from extreme weather. Again, in some climates and certain seasons this may not be a concern, but if there is a likelihood the structure will stand open during a period of storms and high winds, then fastener spacing and structural design need to be reviewed and revised as appropriate for the interior walls to withstand the resulting loads and movements.
 - Water that runs easily down a glass-mat panel will end up on the floor, sometimes disappearing from view into the subfloor. This must be dried out before the floors are finished.

The common thread in all these cautionary notes is that moisture could affect many other materials than just the gypsum drywall itself. A second common thread is that the contractor must not only take into account how much water can get into the building, but also how it will get out. New construction typically involves far more moisture than would be experienced in permanent occupancy. New concrete, paint and other coatings introduce large amounts of moisture. Waiting until it dries out may not be practical or sufficient. In some cases, professional drying services will need to be brought in. The gypsum drywall manufacturer may warrant the performance of the gypsum drywall, but the contractor is responsible for the resulting assembly.

In conclusion, the practice of pre dry-in installation of drywall has become an important new tool for contractors and construction managers to consider. It can speed construction, reduce costs and improve quality by eliminating certain drywall installation and scheduling problems. Like any tool, however, it can also be misapplied and cause serious problems. We wish to provide some perspective and caution for those who mistakenly believe one size fits all and that this is a sure solution for every project. This has been a brief listing of general considerations that should be taken into account when evaluating the use of this tool. There are projects for which pre dry-in construction is an appropriate and excellent choice, but there will also be those for which it is not. As noted above, the challenge is daunting and the risks can be large. But with proper consideration of all the factors that influence the final outcome, the risks become manageable.

¹ "The Lowdown on Top-Down Construction", WB2474/03-09, United States Gypsum Company, ©2009.

² Fire-taping is the commonly used term for a Level 1 finish in the Levels of Finish specified by ASTM C840 Standard Specification for Application and Finishing of Gypsum Board. See also, GA-214-2015, *Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum Panel*.

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