Reduce Risk Through High-Performance Precast

— By Greg Winkler, AIA, LEED AP and Brad Parrot, Attorney at Law

Designing and constructing our environment is exciting. We make monuments and efficient work spaces, heighten learning experiences, house, entertain, heal, and the list goes on, benefiting many generations to come. While the rewards are great, there are risks however. Construction participants seem too slow to embrace change, too quick to point fingers, and too myopic in our individual views of our work. Often, this leaves design professionals as the sole catalysts for change. Design professionals move the industry with little outside help and, at times, in the face of great opposition. It is time for tradesmen to join the design team and help propel our industry into the next century. The precast concrete industry is doing just that.

– Greg Winkler, AIA, LEED AP is the executive director of the Mid-Atlantic Precast Association (MAPA), a precast concrete trade organization representing twelve diverse manufacturers in six states and the District of Columbia. A graduate of Georgia Tech with a Master of Architecture degree, Greg has over 27 years of experience as an architect and project manager. He is the author of three construction-related books, and is currently writing a book on the International Green Construction Code for McGraw-Hill Professional.

– Brad Parrot has more than 14 years experience in the legal profession and is a partner with Hudson Parrot Walker in Atlanta, Georgia. He specializes in construction law and has served as lead counsel in over 20 trials and arbitrations throughout the United States and is national trial counsel for several of the construction industries largest participants.

How does a designer effectively transfer some of the risk of the design?

According to professional liability insurer CNA/Schinnerer, 64% of professional liability claims against architects and engineers are filed by the clients who employ them. Only about 13% of such claims stem from contractors and their subs.[1] Managing client expectations for design professional services, therefore, should be a central driver in any architect's desire to reduce professional liability. A few years back, *Architectural Record* summed up the situation well: "In general, professional liability claims are more likely to be the result of a failure to manage expectations than due to a spectacular construction failure, particularly where the client has little experience with other construction projects. Their understanding of what comprises an architect's scope of work and the quality and timing of the final product may be unrealistic, but that does not prevent claims from being filed and even going to trial or arbitration."[2] After a designer issues drawings for construction, control transfers to the construction team to execute the design. Control also transfers to the fabricator to successfully execute a given scope of work. Risk transfer is only successful when the downstream party is able to withstand the risk (i.e. you can't get blood from a turnip).

Precast concrete producers provide early design assistance to architects and engineers. Because of the nature of the product and how it is produced and erected, precasters provide detailed schematic or preliminary design phase input on budget and schedule conformance. Early involvement of the precaster is beneficial to both owner and the design professional, as it allows them to consult on the factors that affect the erection of the panels and their overall performance and costs. Further, precasters tend to have sophisticated in-house engineering departments, sophisticated production facilities, and professional management. In short, Precasters reduce risk because they are able to successfully and competently execute the Owner's project goals and the design team's design intent. Couple these abilities with the fact that precast is widely recognized as the fastest construction system, and project risks are reduced in terms of design risk transfer, product quality,

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and time/schedule.

How does a designer avoid change order claims?

In the construction industry, the reality is that each participant seeks to build walls around its scope, sometimes going so far as to view the project with tunnel vision. Lawyers coach construction firms to refuse to comment on, consider, or acknowledge the existence of any other trade. In recent years, fantastically low margins—or negative margins—have served only to exacerbate this reality. In many instances, a subcontractor will 'fold his tent' rather than perform a scope of work at tremendous loss. This environment creates an incentive to call out every design imperfection and seek change orders.

What we as an industry need is greater collaboration. A precaster is ideally situated to do so. For example, compared to a cast-in-place parking garage builder, a precaster will design, fabricate, and install the garage from the footings up. All that the design team needs to design are corollary items like footings/foundations, approach ramps, stairs, railings, signage, etc. A precaster is not likely to seek a change order due to design, because they largely execute their own designs for parking structures.

Multi-trade facades create unnecessary risk.

The façades of most buildings are comprised of a number of products from different manufacturers, often installed by various trades. Consider a typical cavity wall envelope:

- Light-gage steel framing and exterior sheathing (carpentry sub)
- Cavity wall insulation (insulation sub)
- Interior gypsum board finish (drywall sub)
- Exterior brick veneer (masonry sub)
- Flashings, waterproofing membranes (carpentry or waterproofing sub)
- Sealants (painting or waterproofing sub)

Cavity walls, in particular, require multiple trades, each with their own submittals, product substitution requests, and Requests for Information (RFIs). The dilemma with cavity wall construction is that the large number of trades places a burden on the architect to detail completely, and requires the contractor to ensure that all the work represented in the documents is covered by the various trades and well-coordinated. The use of multiple products requires careful attention to differential movement and expansion joint requirements to ensure that cracking and other problems do not occur after the work is completed. Masonry products may expand or contract (brick vs. concrete masonry), and require slip joints to accommodate differential movement. Low masonry base walls require more frequent expansion joints to accommodate their movement.

This precast concrete panel combines three finishes into one efficient element saving time, material and money.

Precast concrete can provide the same aesthetic treatments, including brick, window and door surrounds, bullnose treatments, and other effects, without the detailing issues present in built-up construction. And in most cases, it all comes from a single-source provider. Precasters are normally classified as "Tier One" subcontractors, meaning they hold a large portion of the construction contract. Where the envelope of a build-

ing is entirely composed of precast, the architectural detailing is predominantly aesthetic in nature, with the precaster handling the details of how the aesthetic intent is carried out in the precast. High-performance precast insulated wall panels allow the architect to adjust the interior and exterior thicknesses of concrete, as well as the thickness of the embedded insulation, to accommodate specific project needs.

Dew point analysis can be used to determine where within the wall assembly the dew point will occur. Typically this is within the exterior wythe of the insulated concrete unit and is exfiltrated out the exterior wall, causing none of the insulation damage or mold threat typical found in aging cavity walls. Often, precast concrete insulated sandwich wall panels can also be used as the finished interior, reducing the need for drywall, and the related materials, labor, and mold potential associated. The high-strength concrete (typically 5000 psi and greater) does not expand or contract significantly, and the dimensional change that does occur is accommodated in the sealant between panels. A concrete wythe of 3 inches or greater constitutes a code-compliant vapor barrier, and is a rain barrier rather than a rain screen, and thus does not require a cavity air space or drainage. In short, collaborating with and using precast brings to bear a decrease in risk with an increase in performance.

How does Precast help deliver Green/Sustainable Structures?

Professional liability for green, or sustainable design, has been evolving over the past few years to where design professionals may face greater liability if the buildings they design fail to meet energy or operational performance expectations (i.e. a performance guaranty). The International Green Construction Code, for instance, includes an optional ordinance that may be adopted by code jurisdictions specifying that the general contractor must provide a bond to the code jurisdiction that can be used to pay for modifications should the building fail to meet performance standards specified in the code compliance documents. This new risk, though aimed at contractors, will inevitably affect design professionals as well. Again, collaboration with a Precaster presents an advantage. Precasters have the ability to handle delegation of design duties, offering an effective sharing of risks. As long as the delegated duties are clear, collaboration should render reduced risk and a better delivered product.

Another aspect of green design that may represent a growing liability risk for architects is that of poor indoor environmental quality (IEQ). CNA/Schinnerer relates one example of this liability risk in a sustainable design guide they publish for policyholders:

Lured by the promise of "healthier and more productive occupants" basic to LEED publicity, a tenant rented space in a LEED Silver-certified building. At the end of the year, the tenant's records indicated a greater use of sick leave, increased complaints by employees of eyestrain and drafts, and reduced output from the clerical staff. The tenant demanded a rent rebate from the project owner based on a false promise of a healthful workplace and increased productivity. The owner sued the architect for not designing a healthful workplace and the tenant sued the architect for bodily injury based on poor indoor air quality.[3]

Mold is a common culprit in IEQ claims (representing 1% of CNA/Schinnerer claims overall), but offgassing of volatile organic compounds (VOCs) and excessive ambient noise may well be future subjects of claims against architects.

This is why design professionals should take care in specifying and detailing envelope systems that prevent moisture intrusion beyond the face barrier, or create dew-point conditions that allow moisture to collect in cavity situations where it can foster mold growth. Similarly, architects must exercise even more care in the design of interior finishes to minimize VOC issues and create an interior environment that is free from harsh lighting, noise, or thermal distractions that can reasonably be argued do not meet the standard of care for a productive and safe indoor environment.

Precast concrete offers some strong advantages in both of these areas. Concrete has virtually no VOC offgassing. When used as the interior finish of a building, a painted or pigmented precast wall can easily allow an architect to meet the increased VOC requirements of LEED and the International Green Construction Code. Because precast is typically not stored on the site prior to erection (and has low moisture permeability), building flushout prior to occupancy is more easily accomplished. Precast insulated panels also do not provide any food source for mold growth, or contain a cavity where hidden moisture can generate IEQ problems.

Overall, risks associated with construction are changing. High-performance precast concrete offers many ways to help reduce these risks both short and long-term.

Notes:

1. "From Risk to Profit: Benchmarking and Claims Studies." Victor O. Schinnerer and Company. Inc., 2011.
2. Peeler, Casius. "Professional liability insurance: When to get serious. "*Architectural Record*, December 2007. http://archrecord.construction.com/practice/startUps/0712insurance-1.asp
3. Ballobin, Kristin. "Sustainable Design Risk Management." Victor O. Schinnerer and Company, Inc., 2008.

For more information on these or other projects, visit www.pci.org/ascent.