

structural forum

Should Architects Be Allowed To Do Structural Engineering?

By Daniel L. Lavrich, P.E.

The issue of the practice of Structural Engineering by Architects as being incidental to their practice of Architecture has been debated for many years. In many parts of the Country, single family residences are not greatly regulated regarding structural design. In fact, neither an Architect nor an Engineer is required to prepare plans for single family residences in many areas. Perhaps we should rethink the need for Professional design of the structural aspects of such buildings. In South Florida, this has been a major area of concern since Hurricane Andrew and even more so since the recent rash of Hurricanes to pummel the State.

Although by State Law neither an Architect nor Professional Engineer are required to prepare plans for single family residences in the State of Florida, in South Florida the requirements are different. In Dade and Broward Counties (made up of primarily the Miami and Ft. Lauderdale areas), it is required by local amendment that single family residences be designed by either a Registered Architect or a Professional Engineer. However, the local Code does not require an Engineer for the structural aspects of the design, nor does it specify a *Structural* Engineer. An Architect may prepare the entire set of plans.

The single family residences designed and built today in the South Florida marketplace are more complicated than ever before. There are longer span roof trusses, higher unbraced masonry walls, larger window and door openings and numerous attractive design features that increase the structural complexity of today's single family residential buildings. The result is the need for more detailed structural analysis, not only to resist gravity loads, but to resist the 140+ mph wind-produced lateral and uplift forces that are required by ASCE-7 and the Florida Building Code. The residences of today can no longer be designed by just picking some values out of a span table to satisfy the simplest of gravity loads.

There has been growing concern among some persons that the structural design of some buildings in South Florida has been lacking in adequacy. This has been particularly pointed toward the design of single family residences. For many years, it had been the practice of some Architects to not use the services of a Professional Engineer. Some Architects felt that it was

adequate to only incorporate the "minimum" prescriptive requirements of the Building Code into the structure, and to neglect a rigorous structural analysis, particularly as it relates to wind produced lateral and uplift forces. This methodology was found to be greatly inadequate in the wake of Hurricane Andrew and, independent of construction deficiencies, many houses failed due to poorly designed structures. The minimum prescriptive requirements of the Building Code are clearly not adequate to resist all of the forces to which buildings are subjected. Structural analysis is required for even the simplest of structures.

In addition, builders want their buildings to be built faster, lighter and cheaper. In order to accommodate such wishes, design and construction methods require more careful and technical analysis to achieve the necessary load resistance with minimal effort and cost. The achievement of maximum efficiency in design usually requires working closer to the edge, and requires more care and attention to detail. The result is a smaller margin for error.

General Business Practices

After Hurricane Andrew, the use of Professional Engineers to design structures in South Florida became more accepted on single family residences. However, some Architects still resist the need for Structural Engineers, and opt to try to do the structural design by themselves.

Other Architects employ Professional Engineers to redline or markup their plans, and analyze only specific components of the building rather than to perform a complete structural analysis of the building system

as a whole. In this instance, the Engineers seldom actually sign and seal their work. The Architect incorporates the Engineer's design into their Architectural plans and the Architect signs and seals the entire set of plans, taking responsibility for the structural design that they didn't do and were not competent to perform.

Some Architects go further and employ an Engineer to really look over the entire building and actually design the structure. However, even in this case, many times the signing and sealing of the work is done by the Architect, and not the Engineer.

I believe that the above practices are in conflict with Florida Statutes which prohibit design professionals from signing and sealing plans depicting designs which they are not competent to perform, or that were not prepared by them or under their direct control. I presume that most states have similar requirements.

Perhaps Architects should rethink the way they do business in relation to structural design and the use of Engineers. Most specifically, they should separate the areas of responsibilities by producing separate Architectural and Structural plans sealed by the appropriate responsible party, and honestly recognize their own limitations of knowledge, education, training, and experience when it comes to structural engineering design.

Education, Training, Knowledge and Experience

Does an Architect receive adequate training in the principles of structural engineering to actually design the structural aspects of

buildings, including single family residences – particularly of the complexity that are being designed and built in today's competitive construction environment?

With today's trend of downsizing the coursework required for a college degree, architectural students may only receive exposure courses keyed to recognizing the significance of the design of structural components to be utilized in buildings, and are not trained to structurally design complete buildings. As any structural engineer knows, a building must be designed as a complete system so as to provide complete and continuous transfer of loads through continuous load paths. A building cannot be designed piecemeal on a component by component basis. The structural designer of record must recognize the performance of the building as a whole, and not just individual components thrown together. Otherwise, gaps in the load paths may occur, compromising the structural integrity of the building. Do Architects receive sufficient training to understand and address such issues?

There is growing concern that even engineering students are not receiving enough training in structures to be able to adequately perform as Structural Engineers. This is a topic that Craig Barnes has been

studying for several years. For a more detailed discussion of this topic, I suggest reading my article in the April 2003 issue of *STRUCTURE magazine* entitled "Basic Education, A Practitioner's Point of View."

If there is a real concern that engineering students may not be receiving enough structural engineering education to adequately practice structural engineering, how can one even begin to conclude that architectural students have received enough structural engineering education and training to safely perform structural design?

Changing Course

Even after Hurricane Andrew in 1992, the areas of Florida north of Palm Beach had been somewhat resistive in response to suggestions that they adopt stricter regulation of structural design and construction, such as was implemented in South Florida after Andrew. Perhaps Hurricane Andrew wasn't close enough to home for those areas. I wonder if that attitude will change as a result of the recent damage caused by Hurricanes Charley, Frances, Ivan, and Jeanne that left their mark in virtually every part of Florida. Would damage have been less if better structural designs had been employed?

Perhaps more competent designs, coupled with better inspection of construction, would indeed result in more hurricane resistant construction. The construction and inspection issues are worthy of diligent study, debate and consideration; but, it is self evident that every structurally sound building must start with a competent and efficient structural design. Who should be relied upon to provide such design?▪

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