

Focus Of This Issue: Building Systems, Fire Safe Construction

A 'Green' Walgreens Distribution Center

Notice how clean the construction site is on a precast job! A clean site is one of the LEED criteria for achieving "greener" practice in construction. To gain further green rating, the exterior walls on this Walgreens Distribution Center in Windsor, Connecticut are all insulated with non-thermal conducting material to reduce heat loss. Many special panel areas required solid concrete for structural reasons; nevertheless, on average, the exterior walls

provided an R value of 13. Another advantage of precast panels, over tilt up panels for instance, was the construction and site work could be scheduled for maximum advantage, since all wall pieces were delivered when needed for direct installation (meaning the floor slab did not have to be poured in the beginning in order to provide the area for casting tilt up panels).



LEED - Clean site during construction.



Photos courtesy of Oldcastle Precast.

The typical wall panels were 8" thick, made as a sandwich of 2 1/2" concrete inner and outer withes plus 3" of insulation in the middle. The panels used carbon fiber truss technology for shear connectors between the inner and outer concrete withes. Panel widths varied from 10'-0" to 13'-7 1/2". The average panel height was 44 feet, with the maximum height being 56'. Some panels were designed to support the outer bay of roof joists near the top of the panel; other interior panels dividing the building into two halves were solid to support a mezzanine load near the panel mid-heights, and to provide the required fire separation.

Don Eichholz, Project Engineer with Alper Audi Inc, worked with Oldcastle Building Systems engineer Eduardo

Maravi, to establish the panel parameters and design requirements. The walls were connected to resist seismic category C forces on class D site/soil. This involved tying 3 or 4 pieces together with welded connections at vertical panel joints to form larger lateral load resisting wall segments

In addition to the usual man-doors and the row of high window openings, the loading dock door openings were also cast into the panels. Erection of the 375 precast wall units averaged 13 per day, with many days getting up to 16 pieces. Other credits: architect – Urbana Group PC; contractor – The Korte Company; precaster – Oldcastle Building Systems.

cont. on page 2

A 'Green' Walgreens Distribution Center *cont. from page 1*



Precast panels include window openings and rustication.

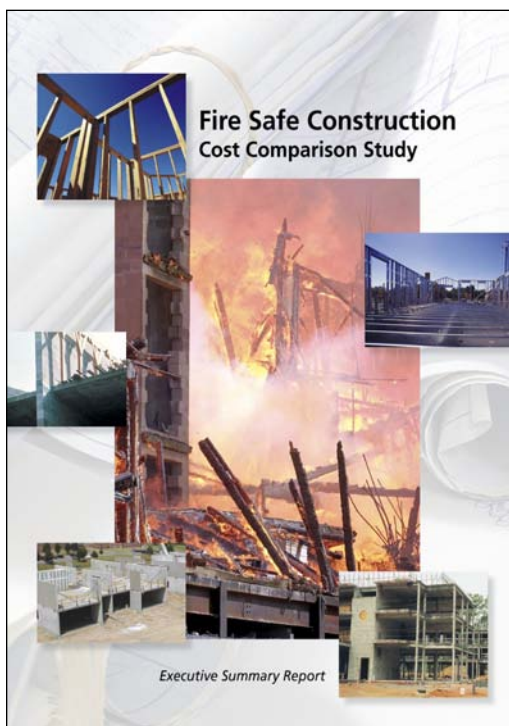


Loading dock openings cast into panels.

Fire Safe Construction – A Cost Comparison Study

It has long been the opinion of legislators, code-officials, builders, and design professionals that non-combustible concrete construction solutions are more costly than other alternatives such as gypsum fire walls with sprinklers. A recent study, sponsored by the New York/New England, Pennsylvania, and Mid-Atlantic Fire Safety Construction Advisory Councils and the Northeast Cement Shippers Association, was undertaken to accurately document the perceived increase in cost associated with the use of balanced design in a common multi-family residential building.

The objective of this study was to develop a construction cost model to accurately evaluate the relative construction cost of a multi-family building constructed using five different construction materials. The concept of multi-family would



include traditional apartment type buildings, condominium style buildings, student housing, elderly housing, and others.

To accurately evaluate the relative construction cost between each of the five building systems, it was determined that a multi-family residential structure should be schematically designed meeting all of the requirements of the International Building Code 2003 edition. Once designed, the building would be reviewed for code compliance, and cost estimates would be prepared for the building using each of the different building systems.

The design team assembled included: Architect and Engineer: Haas Architects Engineers; Code Official: Tim E. Knisely; Cost Estimation: Poole Anderson Construction.

New Members Welcomed

We are pleased to add two new Professional Members to PCANY Membership:

Steuben County Department of Public Works, represented by Steve Catherman, P.E., and HNTB Corporation, represented by Nicolae Simionescu, Vice President. This brings the number of Professional Members to 46, and our total membership to a new high of 120!

Introduction

With the phasing out of the three predominate model codes, BOCA National Building Code, SBCCI Standard Building Code, and ICBO Uniform Building Code, and implementation of the new International Building Code and associated family of codes, there has been a shift in the approach to fire safety in the built environment. This shift has been characterized as a shift away from the use of passive construction techniques, such as compartmentalization and the use of fireproof construction materials, in favor of an increased reliance on active fire control techniques such as sprinkler systems, allowing for construction to occur using materials that are more susceptible to fire damage.

In conjunction with this shift, there are also reservations with the current ASTM (American Society for Testing and Materials) methodology for testing fire assemblies ASTM E9, Standard Test Methods for Fire Tests of Building Construction and Materials. This test allows for the removal and replacement of the fire tested specimen prior to the initiation of the hose stream test. This test combination is intended to model the effects of the application of a fire suppression water stream immediately after the intense heat from a compartment fire. The effect of this provision is that the specimen is a virgin test specimen when the fire suppression stream is applied, theoretically allowing certain materials to artificially perform at a higher level than would be expected in the field.

In addition, it has long been the opinion of legislators, code-officials, and design professionals that non-combustible concrete construction solutions are more costly than other alternatives such as gypsum fire walls with sprinklers.

Due to the perception of elevated cost, and the aforementioned code and testing issues, the acceptance of a balanced design approach incorporating both passive and active protection systems has met with resistance. Passive design incorporates the compartmentalization of the fire, limiting fire spread and protecting both the building occupants and the responding firefighters. This system is in place at all times and is not subject to failure due to the loss of utility service. An example of this is the incorporation of non-consumable materials in the construction of floors and walls used for fire control. The active portion of the design uses a combination of detection systems to warn occupants, and sprinklers to control fire spread until the fire department arrives.

Currently, there is no reliable published documentation available to refute the perception regarding the increased building cost associated with this approach. Based on this lack of information, the design of a comparative study was undertaken to accurately document the perceived increased cost associated with the use of balanced design in a common multi-family residential building. It is our pleasure to present the outcomes of this study.



Construction Types

The following construction types and alternates were evaluated:

- Conventional wood framing with wood floor system (Type 5B Construction)
Alternate: Conventional wood framing with fire-rated wood floor system (Type VA Construction)
- light gauge Steel Framing with cast-in-place concrete floor system on metal form deck
- load bearing concrete masonry construction with precast concrete plank floor system
Alternate: Cast-in-place concrete floor system
- Precast concrete walls and precast concrete floor system
- Insulated Concrete Form (ICF) walls and precast concrete plank floor system
Alternate: Cast-in-place concrete floor system
Alternate: Interior bearing walls constructed of concrete masonry units (CMU)



With respect to the conventional wood framing system presented, the primary system is an unprotected construction Type VB with an alternate of protected construction Type VA. The additional construction type was presented since the Type VB construction is not permitted to be used

for a non-sprinklered building of this type that is four stories tall. For the proposed use and construction height using conventional wood frame Type VA would need to be used. Both systems are presented since the remaining systems are presented as un-protected framing systems.

For all systems other than the conventional wood frame systems, it was assumed that the partition walls within the dwelling unit would be constructed using metal stud finished with gypsum board.

Conclusion

Based on the construction cost estimates the cost associated with a compartmentalized construction method utilizing a concrete based material was generally less than 5 percent of the overall construction cost. Comparatively speaking this amount is less than the contingency budget typically recommended for the owner to carry for unanticipated expenditures during the project.

The minimal increase in construction cost can be paid for over the life of the structure. Materials like concrete masonry, precast concrete, and cast-in-place concrete have many other advantages beyond their inherent fire performance including resistance to mold growth, resistance to damage from vandalism, and minimal damage caused by water and fire in the event of a fire in the building. In many cases, with this type of construction the damage outside of the fire compartment is minimal. This provides for reduced cleanup costs and quicker reoccupation of the structure.

The photos and text for this article come from the Executive Summary Report, Fire Safe Construction Cost Comparative Study. This 20 page brochure is available free from PCANY or any of the many member companies of the Fire Safety Advisory Councils. Since its original publication, additional cities/localities have been studied, and work is continuing to evaluate insurance savings and other items.

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ENR Top 500 Design Firms

ENR's Top 500 Design Firms as a group generated \$69.61 billion in revenue in 2006, 17.5% above 2005's level. Congratulations to our many PCANY Professional Members listed (not only in the Top 500 list, but in many specialty categories as well):

Earth Tech Inc (plus nine specialty listings); HNTB Cos. (plus one specialty listing); Dewberry (plus ten specialty listings); Wilbur Smith Associates (plus two specialty listings); Greenman-Pedersen Inc (plus two specialty listings); Clough Harbour & Associates LLP (plus two specialty listings); Vollmer Associates LLP; Simpson Gumpertz & Heger Inc; C & S Engineers Inc; Erdman, Anthony and Associates LLP; Bergmann Associates Inc; Maser Consulting; Chas. H. Sells Inc; plus Edwards and Kelcey Inc in three specialty listings.

AIA/PCI Lunch BoxTalks

We have been advised that these one hour presentations (on eleven different subjects) now qualify for 1.0 PDH for engineers as well as 1.0 CEU for architects. The continuing education subjects are listed on the PCANY website – contact PCANY for further information.

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