Building Knowledge = Firefighter Safety

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Risk Based Response Assignments

The buildings, structures and occupancies that comprise typical response districts pose unique and consistent challenges during structural fire attack. The variety of occupancies and building characteristics establish varying degrees of risk potential, with defined and recognizable strategic and tactical measures to be taken-sometimes uniquely to each occupancy type. Although each occupancy type presents variables that dictate how a particular incident is handled, most company operations evolve from basic principles rooted in past performance and operations at similar structures. This is based on what I define as; "predictability of performance."

When we look at various buildings and occupancies, past operational experiences; those that were successful, and those that were not, give us experiences that define and determine how we access, react and expect similar structures and occupancies to perform at a given alarm in the future. Naturalistic (or recognition-primed) decision-making forms much of this basis. We predicate certain expectations that fire will travel in a defined (predictable) manner that fire will hold within a room and compartment for a given duration of time, that the fire load and related fire flows required will be appropriate for an expected size and severity of fire encountered within a given building, occupancy, structural system.

We used to know with a measured degree of predictability, how our buildings would perform, react and fail under most fire conditions. This is what our years of fireground experience provided us, and how we ultimately would predict, assess, plan and implement our incident action plans and ultimately deploy our companies-based upon the predictable performance expected. Conventional Construction Structures (CCS) had this "predictably of performance." You know, that typical residential structure, the 2-1/2 story wood frame, the three story brick and joist type III occupancy, the four story frame multiple occupancy, etc., etc. Unlike Engineered System Structures (ESS) whose predictability is rooted in the fact that they are unpredictable.

Engineered Structural Assemblies & Systems (ESS)

The emerging fire service issues affecting buildings, occupancies and structural systems related to ESS is only beginning to take hold a prominent role and level of significance that is long overdue. The fire service has been dealing with the operational issues and line-of-duty deaths related to ESS since the 1980s and now in 2009, we're finally raising these ESS issues to a dialog point that is influencing firefighter safety, survival and operations. (Refer to the Underwriters Laboratory's (UL) UL University on-line training module for a state-of-the art presentation on Structural Stability of Engineered Lumber in Fire Conditions and performance results that correlate towards redefining fire suppression operations)

The fire service is beginning to fully recognize the merits in adjusting, altering, and changing our strategic and tactical ways of doing business in the streets. It's becoming self evident in the fire service that it's no longer acceptable to think that ESS buildings and occupancies will perform in the same manner as CCS buildings and occupancies and that tactics deployed in both CCS and ESS buildings and occupancies will react under similar strategic and tactical plans and tasks. These unique and inherent factors within the ESS profiles must give us a new standard for operational deployment; strategies and

tactics that are defined by the risk profile of the building, its engineered structural systems, materials and methods of construction and the fire loading present.

Considerations for changing fire flow rates, the sizing of hose line and the adequacies for fire flow demand and application rates, staffing needs for safe operations, considerations for defensive positioning and defensive operating postures must be considered, and it warrants repeating again; Reckless-Aggressive firefighting must be redefined in the built environment and associated with goal oriented tactical operations that are defined by risk assessed and analyzed tasks that are executed under battle plans that promote the best in safety practices and survivability within know hostile structural fire environment- with determined, effective and proactive firefighting.

THE Predominate Fire Service Challenge....
There's a **NEW** Lexicon to add to your operational safety vocabulary and incident action plans...
Do you know what they represent and how these components, assemblies and systems may affect or influence incident operations?
Do some research and check these terms out for starters.
It's a Lot More than just talking about "Light Weight" Construction....

- ✓ From Plywood-CDX….to…
- ✓ Particle Board- PB
- ✓ Orient Strand Board-OSB
- ✓ Structural Composite Lumber- SCL
- ✓ Laminate Strand Lumber- LSL
- ✓ Laminate Veneer Lumber-LVL
- ✓ Structural Insulated Panels-SIP
- ✓ Parallel Strand Lumber-PSL
- ✓ Machine Stress Rated Lumber- MSR
- ✓ Medium Density Fiberboard-MDF and MDL (Lumber)
- ✓ Finger Jointed Lumber-FJL
- ✓ Adhesives…..

Take a look at an informative posting over at the Firegeezer. He has some great contributed information and manufacturer "insights" on the subject engineered wood I-joists and beams and firefighter safety. There are some interesting statistical extrapolations, correlations and conveniences' that attempt to make the case. *But then again, You be the judge.* Take at look at the presentation developed by the American Forest and Paper Association.

In preparation for a program presentation at IAFC FRI in Dallas the end of this month on Building Construction, specifically aimed for Command and Company Officers, it occurred to me that many personnel have not taken advantage of an exceptional instructional and training resource tool available to them (FREE) thru the Underwriters Laboratory (UL) Online University , where they offer over 1500 courses, many of which have direct interest to the Fire Service.

One program of note is the **Structural Stability of Engineered Lumber in Fire Conditions**, **online CBT.** This two-hour presentation summarizes a research study on the hazards posed to firefighters by the use of lightweight construction and engineered lumber in floor and roof designs. The program provides comparative test results related to legacy (conventional) versus modern engineered construction systems. The operative insights that I want to draw your attention to are the opportunities to gain mission critical insights on time to collapse timelines, as well as operational limitations and readings related to thermal imaging devices while working above fire involved floor or roof areas.

Pay particular attention to the time-to-collapse sequences and times; consider these in you IAP and tactical deployment. The tests also provides indicators that floor or roof assembly deflection (give or bounce), which has been a universal tactic as an possible indication of imminent collapse, may actually not be a reliable indicator, with some floor assembly tests having a deflection of less than 3/4" immediately before structural failure. Add to this carpeting or lightweight concrete coatings, top-side surface temperature (TIC readings) may change little even as the structural integrity of the support system is rapidly diminished below.

You do not have the buffer of allotted operational time that you might have presumed. These faulted assumptions may have catastrophic consequences. In my lecture series Buildings on fire: Engineered Structural Systems & Fireground Operations, as I've traveled around the country presenting these programs, common themes prevail from coast to coast; the fire service assumes it has more operational time than is actually present before a collapse will occur, that the collapse will be isolated and survivable, that RIT will prevail in a successful outcome and that there is an inadequate knowledge base of understanding of ESS, legacy/conventional construction and the relationships of command risk management and tactical operations by commanding officers.

I would encourage you to invest some time in taking this program and gaining a fresh view of Engineered Structural Assemblies & Systems (ESS) and how these emerging test results and data may influence your field operations the next time you're in the street confronted with fire suppression operations in an occupancy with suspected or known ESS.

Other important Reference links:

NIOSH **Publication No. 2009-114:** Preventing Deaths and Injuries of Fire Fighters Working Above Fire-Damaged Floors

NIOSH **Publication No. 2005-132:** Preventing Injuries and Deaths of Fire Fighters Due to Truss System Failures

Volunteer Deputy Fire Chief Dies after Falling Through Floor Hole in Residential Structure during Fire Attack—Indiana

First-floor collapse during residential basement fire claims the life of two fire fighters (career and volunteer) and injures a career fire fighter captain - New York, Report

Career Fire Fighter Dies After Falling Through the Floor Fighting a Structure Fire at a Local Residence - Ohio

Colerain Township, Ohio Double LODD Preliminary Report

Career engineer dies and fire fighter injured after falling through floor while conducting a primary search at a residential structure fire - Wisconsin

NFPA Report on Light Weight Construction