

Structural Anatomy™

**Operational Safety at
Deconstruction and Demolition Sites**

**Awareness and Operational
Considerations Briefing**

Developed:

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Operational Safety at Deconstruction and Demolition Sites

- ❑ Fire operations for structures undergoing construction, alterations, deconstruction, demolition and renovations present **significant risks and danger to operating personnel.**
- ❑ This reality was clearly validated when; two FDNY firefighters died in the line-of-duty during a seven-alarm fire that tore through the abandoned Deutsche Bank skyscraper in lower Manhattan, next to ground zero in New York City on Saturday August 18, 2007.



The Deutsche Bank Building

- ❑ Located at 130 Liberty Street adjacent to quarters of FDNY Engine 10, Ladder 10
- ❑ Once a 40-story high-rise structure- systematically reduced to 26-stories at the time of the fire.
- ❑ Significant building contamination from numerous toxic substances including asbestos and lead resulting from the destruction of the World Trade Center during the 9/11 attacks
- ❑ Required the deliberate floor-by-floor dismantling effort as part of the deconstruction process that would ultimately remove the building from its present site.



Two FDNY firefighter fatalities

- **Fr. Joseph Graffagnino, an eight year veteran and**
 - **Fr. Robert Beddia a twenty-three year veteran, both assigned to Engine 24 and Ladder 5 in SoHo.**
- The seven alarm fire was being worked with a contingent of over 275 firefighters
 - the pair became trapped on the 14th floor of the building after being overcome by blinding concentrations of dense smoke after their air supply was depleted during the course of combat fire suppression operations.



Signal 5-5-5-5



Deutsche Bank Deconstruction

**More and more facts are emerging
During the on-going investigations,
providing insights into fire department
operations, physical building
conditions, risk profiles, hazards and
deficiencies.**

- ❑ The fact that the Deutsche Bank building was being dismantled floor by floor- that it was undergoing **"Deconstruction"**
- ❑ The building was a primary **target hazard** containing significant operational vulnerabilities, hazards and dangers posing life threatening risk to unsuspecting firefighting personnel.
- ❑ Building undergoing **asbestos abatement** further compounds the degree of risk present.



Structures undergoing construction, alterations, deconstruction, demolition

- ❑ Unique & Dangerous elements confronting incident commanders, company officers & operating forces demands clear understanding-
- ❑ Fire suppression operations in buildings during construction, alterations, deconstruction, demolition and renovations present significant risks and
- ❑ Consequences that require a methodical and conservative approach towards incident stabilization and mitigation.



One Meridian Plaza, PA 1990

3-Firefighter LODD

Strategic & Tactical Approach



- ❑ You cannot implement **conventional** tactical operations in these structures.
- ❑ Doing so jeopardizes all operating personnel and
- ❑ Creates unbalanced risk management profiles
- ❑ Typically NOT favorable to the safety and well-being of firefighters.

Emerging elements that apparently were present at the Deutsche Bank building fire;

- ❑ Deconstruction; the high-rise steel frame structure was being systematically dismantled from the top down.
- ❑ Structural assemblies, systems and components were being removed as part of the asbestos abatement and decontamination efforts, creating varying levels of system integrity, exposures and vulnerabilities.
- ❑ Various deconstruction stages throughout the building created exposed structural systems, building components and features that posed significant safety risk to personnel.
- ❑ The building's exterior was shrouded in a scaffolding system, with limited accessibility and travel volume. Unprotected external scaffold support systems present.
- ❑ Asbestos Abatement Plans created; Abatement Zones, Buffer Zones and Deconstruction Zones- Each with significant operations risks and hazards.



Challenges...

- ❑ Interior abatement zones were constructed that created undefined and maze-like conditions.
- ❑ Enclosed exterior window walls that were replaced with plywood sheathing creating impenetrable enclosures, limiting egress paths, ventilation paths and providing susceptible fire loading and flame spread potential.
- ❑ Introduction of significant transient combustible loading, i.e., plywood sheathing and panels, poly sheeting and plastics and other Class A materials



Hazards....

- Access and egress systems were changed or removed.
 - Stairwells were eliminated, boarded-up or enclosed.
- Compartmentation, enclosures, fire separations and fire barriers were compromised, dismantled or removed,
 - creating undefined open areas, horizontal and vertical voids, plume ways and travel paths.
- Officials state that in addition to the non-functioning stand pipe, fighting the fire was made difficult by the asbestos abatement, which created "maze-like conditions."
 - Many areas were partitioned off with plastic, and hallways and walls one would find in other buildings had been torn out.
 - Workers told officials they had been stripping asbestos from beams, and the fire spread quickly through gaps and holes in the structure.



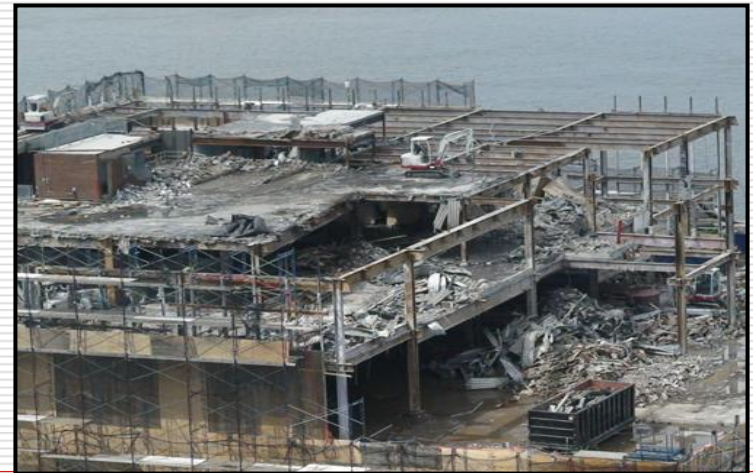
Risks....

- ❑ Designed active and passive fire protection and suppression systems, coatings, enclosures and features were in varying stages of removal, dismantling or non-functional.
- ❑ The fire standpipe system was non-operational, compromised and disconnected.
- ❑ The fire sprinkler system was non-operational
- ❑ There were no apparent controls of potential ignition sources: i.e., evidence of discarded cigarette butts in non-smoking areas.
 - The cause of the fire is presently under active investigation, though officials ruled out acetylene torches, which were not in use at the time of the fire by workers dismantling the building. Investigators are looking into whether the fire was started by a worker smoking, officials stated.



Precursors....

- ❑ Staging of compressed gas cylinders, flammable and combustible liquids; i.e. Acetylene, oxygen, oils, diesel and gasoline fuels etc.
- ❑ Temporary power distribution and lighting systems, devices and equipment
- ❑ Construction machinery, equipment, motorized apparatus, tools and devices.
- ❑ The state of the building, the asbestos abatement hazard and heavy smoke made conditions especially difficult for firefighters,
- ❑ Firefighters resorted to using ropes to haul hoses up from the street to support the fire attack.
- ❑ Getting out was no easier than getting in. Only one of the two construction elevators was working and could carry only five or six men at a time, sources said. Yet dozens of firefighters were inside.



The Perfect Storm....

- ❑ Deconstruction work was halted for a week in May of 2006, when a 22-foot-long section of pipe fell from the 35th floor and went through the roof of the quarters of FDNY Engine 10, Ladder 10.
- ❑ It was determined at the time the subcontractor responsible with bringing the building down had little experience in bringing down large towers in urban settings
- ❑ The fire apparently started in the 17th floor according to workers who first reported the fire.
- ❑ The worst of the fire was on floors 14 through 19, but construction holes and vents created unchecked condition that allowed the fire to travel unabated up and down through the floors, igniting floors 20 through 26 as well.



Refer to posted articles on Firehouse.com

Operations

- ❑ Firefighters on the 14th floor thought they were safely below the blaze - and in a prime position to tackle it - when they were suddenly surrounded by fire and dense black smoke.
- ❑ The two firefighters became trapped in the building and died of what appeared to be cardiac arrest resulting from exposure to carbon monoxide.
- ❑ The two firefighters were found on the 14th floor close to a hose line after numerous Mayday alerts were communicated and rapid intervention rescue efforts initiated by command.

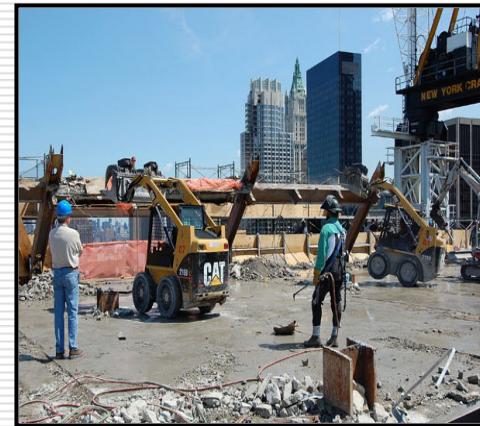


Safety Considerations

- ❑ **Bottom line, buildings undergoing construction, alterations, deconstruction, demolition and renovations can pose significant risk to suppression operations and lead to firefighter injuries and fatalities.**
- ❑ The unique and dangerous elements confronting incident commanders, company officers and operating forces demands a clear understanding that fire suppression operations in buildings during construction, alterations, deconstruction, demolition and renovations present **significant risks and consequences**,
- ❑ Requires a **methodical and conservative** approach towards incident stabilization and mitigation.
- ❑ **You cannot implement conventional tactical operations in these structures.**
- ❑ Doing so jeopardizes all operating personnel and creates unbalanced risk management profiles that are typically not favorable to the safety and wellbeing of firefighters.

The National Fire Protection Association- NFPA Standard 241

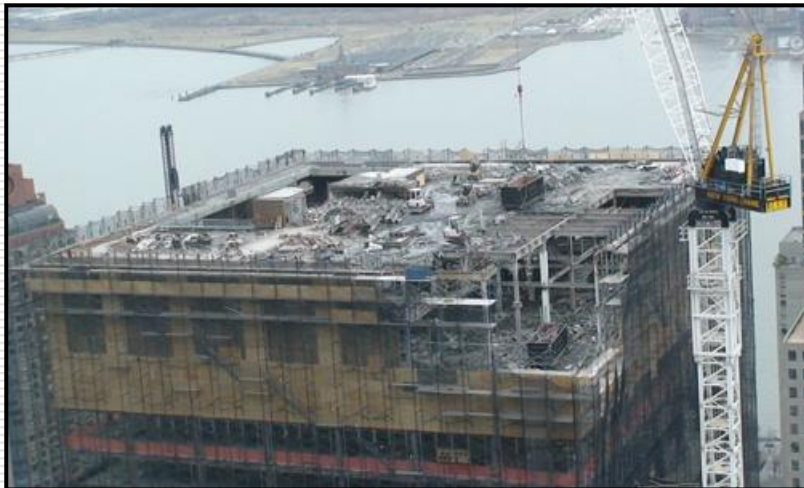
- NFPA Standard 241 for Safeguarding Construction, Alterations, and Demolition Operations provides fire service personnel with good insights into what constitutes planning, preparedness, prevention and mitigation methods to prescribe minimum safeguards for construction, alteration, and demolition operations in order to provide reasonable safety to life and property from fire during operations.



SAM and MELT

- Command and company officers should consider a number of crucial factors in accessing and determining acceptable risk management profiles, **situational awareness management profiles (SAM)** and operational deployment modes that may lead to the **most error likely tactic (MELT)** that may require the most needed change in incident command management or tactical deployment.

Safety Considerations



Structures undergoing construction, alterations, deconstruction, demolition and renovations

- Assessment considerations
- Construction Type
- Stage and/or Phase of construction, alterations, deconstruction, demolition and renovations
- Site conditions and accessibility
- Exposures
- Resources
- Operating procedures
- Knowledge and Situational Awareness
- Communications

Safety Considerations

- The magnitude and complexity of the incident will be directly proportional to the size of the building/construction site and corresponding age profile (vintage) of the existing building, if under renovation, and degree of construction. Operational deployment and the IAP must be addressed during strategic and tactical incident management and risk profiling

Safety Considerations

- ❑ Degree of exposed construction, systems, assemblies
- ❑ Degree of incomplete connections, systems, assemblies
- ❑ Transfer and integrity of structural dead loads and support systems
- ❑ Civilian Occupancy Load/ or at risk
- ❑ Number of exposures
- ❑ Transient Combustible Fire loading
- ❑ Flammable/combustible materials
- ❑ Compressed gases and vessels
- ❑ Exposed electrical and utility services
- ❑ Unprotected openings
- ❑ Obstructions
- ❑ *What are some other safety issues?*
- ❑ *What can you add in risk reduction?*



Safety Considerations

- ❑ Accessibility, movement and transport
- ❑ Lighting
- ❑ Fire protection suppression system integrity
- ❑ Availability of internal and operable standpipe systems
- ❑ Availability of water supply sources
- ❑ Degree of Compartmentation
- ❑ Presence of temporary structural support systems
- ❑ Construction equipment, appliances and apparatus present
- ❑ Presence of fire zone separations or fire cut-offs
- ❑ Presence of Special Hazard Operations; i.e., asbestos, lead or toxin abatement



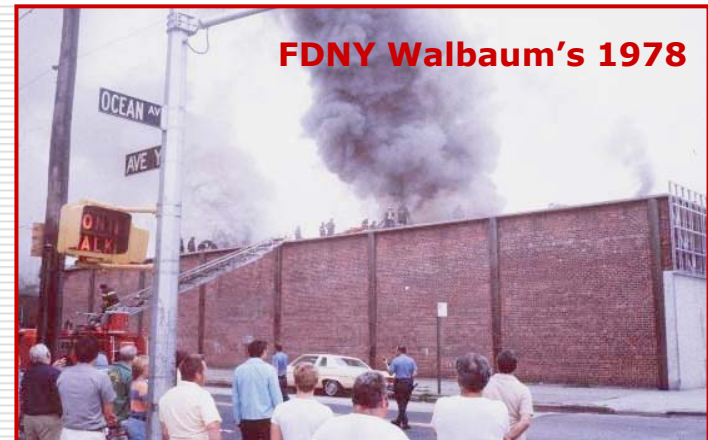
Proactive engagement, preparedness and planning....



- ❑ Can offer safe and effective success paths when addressing structures undergoing construction, alterations, deconstruction, demolition and renovations.
- ❑ The key here is not to assume these buildings and environments can be managed strategically and tactically under the same premises as other day-to-day occupancies and structures.

Recognition Primed Decision Making (RPDM)

- If recognition primed decision making (RPDM) gives us one truism that is predicable, it's the fact that fire suppression operations in structures undergoing construction, alterations, deconstruction, demolition and renovations are;



Situational Awareness Management

- ❑ High Risk/ High Consequence,
- ❑ High Degree Situational Awareness Based
- ❑ Can kill firefighters
- ❑ Are Predictably- Unpredictable, BUT Manageable
- ❑ Demand competent incident management
- ❑ Require effective company officer leadership
- ❑ Necessitate skilled Firefighters
- ❑ Can be (under circumstances) written-off
- ❑ Assume rapid and unchecked fire travel
- ❑ Assume unpredictable transient combustible fire loading
- ❑ Assume increased fire flow demands for suppression effect



Situational Awareness Management

- ❑ Assume rapidly changing
- ❑ Consider hose stream deployment time in the absence of supporting fixed standpipe or sprinkler systems.
- ❑ Require Pre-Planning Awareness and Pre-incident Knowledge
- ❑ Demands Air Management Considerations
- ❑ Timely deployable resource; manpower and equipment
- ❑ Mobilization/ Reflex Capabilities of Response Companies
- ❑ Incident Command Flexibility
- ❑ Conservative Risk Management Profiling AND Conservative Tactical Deployment
- ❑ Situational Awareness Management – SAM
- ❑ Identification of the Most Error Likely Tactic- MELT



What's in your backyard?

Take a look at what's going on in your first or second due areas. What about your battalion, the adjacent district or community or area? Chances are there's a lot in the way of structures undergoing construction, alterations, deconstruction, demolition and renovations.

- ❑ Are you prepared? If not, what needs to be addressed?
- ❑ What can you implement to reduce the risk & increase the safety margin for your personnel?
- ❑ Are your personnel adequately trained to deal with these types of situation?
- ❑ Are Skills sets, Situational Safety Awareness and knowledge adequate?
- ❑ What are the most error likely tactics (MELT) that you think would be deployed if you responded to a incident involving structures undergoing construction, alterations, deconstruction, demolition and Renovations?
- ❑ Discuss your local risk factors and what can be done strategically & tactically



Take the time to do a walk-thru, pre-plan and predict. Incident Safety Demands it!

One last note to ponder; From the New York Times; “FDNY Tactics, pre-plan and inspections questioned”.

- *....a lot of questions are being asked about FDNY's lack of pre-planning and inspections, the failed standpipe system, and firefighting tactics. Investigations are underway into what FDNY, the building's owners and the contractors did or didn't do.*
- *... at one point, more than 100 firefighters were inside the building even though the fire was out of control and wildly unpredictable — and that those men had to be called out. And they were inside even though, unlike the situation in the twin towers, no workers were trapped.*
- *“Clearly firefighters were sent into a deathtrap,” said Stephen J. Cassidy, president of the Uniformed Firefighters Association. “I think the Fire Department’s position is they didn’t know how bad it was. We certainly need to find out why they didn’t know.”*
- *Fire Commissioner Nicholas Scoppetta directed his investigators to determine why the department did not have a plan in place to fight a fire in the building.*

What insights can we learn from some of the immediate information presented from this incident?

What are you going to assess, consider and be cognizant of, should you be confronted with a similar type alarm today, next week or in the future?

Safety



- ❑ Learning from the past, understand the impacts today, don't repeat them tomorrow....
- ❑ NO History Repeating Events!

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Buildingsonfire.com Launching in 2009

A dedicated fire service reference, informational and learning website & informational portal devoted entirely to Building Construction, Firefighter Safety and Command Risk Management

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