



Fire Service Considerations

A Primer for Building and System Designers



SFPE Fire Service Committee



Target Audience

Any of these “designers” without fire service experience:

- Architects
- Fire protection engineers
- Engineers of other disciplines
- System design technicians (such as sprinkler or fire alarm)

Who are your “customers”?

- Owners
- Developers
- General contractor
- Occupants
- Tenants
- Others?



Photo by Mat Chibbaro

What about these “customers”?

The fire service makes use of many building features and systems.



Photo by Mat Chibbaro

What's so different about a firefighter's job?

- Hazardous environment
- Physically exhausting
- Infinite variety of “workplaces”
- Constantly changing conditions
- All times of day or night
- Any weather conditions
- Crew variations
 - Fill-in personnel / crews
 - Mutual aid
- Unfamiliar locations



Photo courtesy Lingohocken Fire Co.

Why is decision-making so challenging for firefighters?

- Time-sensitive
- Lives & businesses in the balance
- Limited available information
- Conflicting information
- Erroneous information
- Frequent inability to wait for additional information



Photo by Vito Maggiolo

Offensive vs. Defensive attack

Why do firefighters operate inside of a building instead of outside?



Photo by Vito Maggiolo

Initial Decisions

- Early decisions can set the stage for the entire operation
- It takes critical time to relocate apparatus, hose lines, ladders, etc.
- Better information to help early decision-making can be particularly helpful



Photo by Vito Maggiolo

Efficiency vs. Safety

If the fire service can operate more efficiently and effectively, they can:

- Operate more safely
- Mitigate an incident quicker



Photo by Vito Maggiolo

This should result in:

- Increased safety of occupants
- Decreased losses for owners and tenants

Incident Phases

- Discovery
- Notification
- Dispatch
- Turnout
- Response
- Size-up
- Set-up
- Utility control
- Entry
- Control
- Suppression
- Ventilation
- Overhaul
- Salvage
- investigation



Photo by Vito Maggiolo

What is not under the control of designers?

These scenarios account for many firefighter deaths and injuries every year:

➤ Vehicle safety (driving, seat belts)

➤ Medical events

(such as heart attacks, strokes)

➤ Exterior fires

(such as vehicles, wildland)



Photo courtesy of
FirefighterCloseCalls.com

How can designers make a positive impact on FF Safety?

- Building:
 - Design
 - Construction
 - Commissioning
- Fire protection systems :
 - Design
 - Installation
 - Acceptance testing
- Uniformity of features within a given department's area.
- Pre-incident planning
- Drills / exercises
- Building code and fire code improvements

Photo by Mat Chibbaro



Fire Service Types (by compensation)

- Career
- Volunteer



- Call
- Combination

NOTE: Regardless of compensation, any firefighter can be “professional”

Fire Service Types (by response mode)

Stations can be:

- fully staffed
- unstaffed (home response)
- partially staffed



Photos by Mat Chibbaro

Fire Service Types (by area/population served)

- Municipal (county, city, town)
- State
- Federal
- Tribal
- Prison
- Military
- Industrial fire brigade
- Private subscription
 - Full service
 - Contract subscribers only



Photos by Mat Chibbaro

Types of services provided

- Structural fire suppression
 - Interior
 - Exterior only
- Aircraft fire suppression
- Wildland firefighting
- Maritime fire suppression
- Emergency medical service
 - Basic life support
 - Advanced life support
 - Aviation ("medevac")
- Vehicle suppression & extrication
- Technical rescue
- Hazmat
- Any combination of the above



Photo by Mat Chibbaro



Photo by Vito Maggiolo

Apparatus Types - Pumpers

Primary equipment carried:

- Water
- Pump
- Hose
- Portable extinguishers

Access considerations:

- Hose lays
- Pumper-mounted master stream

Other terminology:

- Engine
- Wagon



Photos by: Mat Chibbaro

Apparatus Types - Aerial

Primary equipment carried:

- Aerial (fixed) ladder
- Ground (portable) ladders
- Tools

Access considerations:

- Aerial ladder reach
- Aerial ladder obstructions
- Distance to carry ground ladders

Other terminology:

- Truck
- Ladder



Photos by Mat Chibbaro

Apparatus Types - Other

Types:

- Rescue squads
- HAZMAT units
- Breathing air or lighting units
- Brush fire vehicles

Primary equipment carried:

- Tools
- Specialized equipment

Access considerations:

- Most equipment can be hand-carried
- Access for pumpers will satisfy needs



Photo by Mat Chibbaro

Fire Department Staffing and Standards

- Number of firefighters per unit
- 2010 NIST study:
 - Crew sizes of 2, 3, and 4
- NFPA
 - 1710 – career
 - 1720 – volunteer
 - 1000 series: qualifications
 - 1500 series: safety
- OSHA regulations
 - Fire brigade standard
 - Respiratory standard



Photo by Vito Maggiolo

Standard Operating Procedures



Photo by Mat Chibbaro



Photo by Vito Maggiolo



How can I help firefighters plan before an incident?

- Communicate before & during design – with operations staff as well as fire code enforcement / planning
- Invite to acceptance testing of systems
- Provide plans to fire service - building & systems
- Store plans on site for easy retrieval
- Facility liaison
- Facility emergency contact



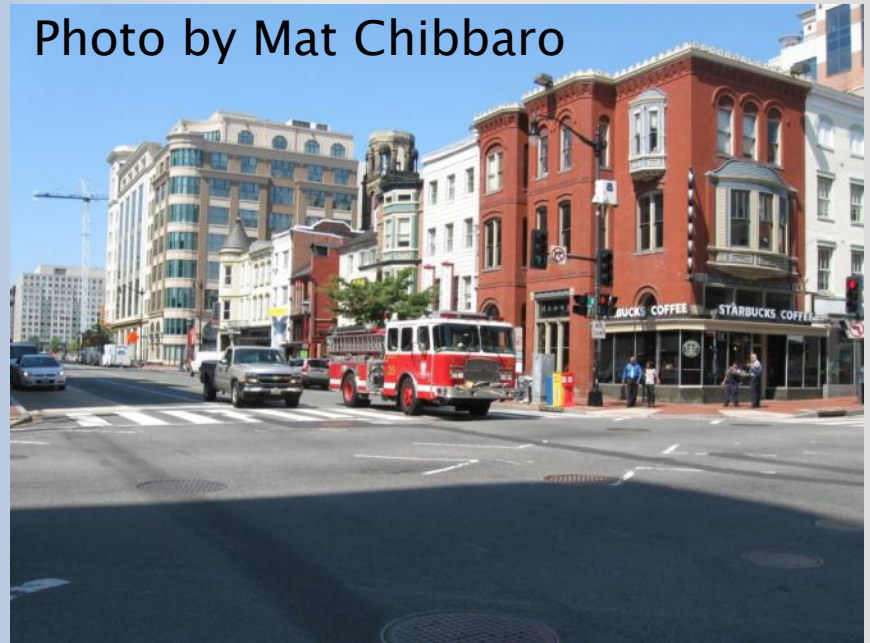
Specific considerations

- The next series of slides will look at specific categories of building and system considerations.
- Think in terms of how you can apply these concepts where the codes and standards allow variations or options

What will help firefighters locate the building?

- Street name signage / block numbering
- Address clarity
- On-site signage
- Diagrams
- Automatic alarm reporting

Photo by Mat Chibbaro



What will help fire apparatus access the site?

- Access to as much of perimeter as possible
- Fire lanes:
 - Closed to public: address security measures
 - Open to public: address parking issues, marking, & signage
 - Clearance height & width, radius, grade, load
- Dead ends: turnaround features
- Permanent paving material
- Avoid traffic calming devices
- Aerial access:
 - Proximity to building
 - Overhead obstructions
 - Outrigger extension



Photo by Mat Chibbaro

How can I facilitate water delivery?

➤ Hydrants

- Location, spacing, & position
- Marking, locking

➤ Adequate fire flow

➤ Adequate water quantity (storage)

➤ Dry hydrants

- Cisterns
- Natural or man-made ponds



Photo by Mat Chibbaro



What will help firefighters access and maneuver within the building?

- Site design (ground ladders)
- Key boxes
- Door identification / standards
- Stairs: marking, width
- Elevators & fire service lobbies
- Marking of utilities & fire protection systems
- Access for vertical ventilation
 - Photovoltaic systems
 - Rooftop gardens

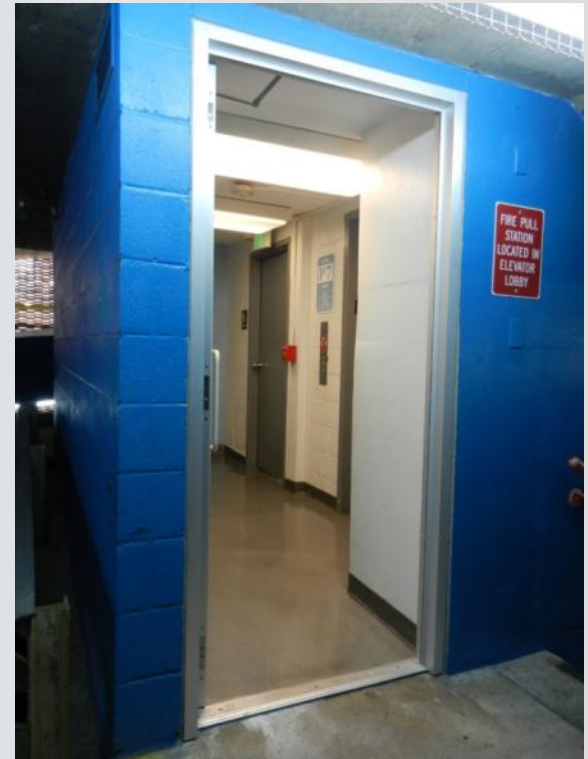


Photo by Mat Chibbaro

What will help keep operating firefighters safe?

- Building info signs
- Lightweight construction marking
- Vacancy status signs
- HAZMAT management plan
- HAZMAT information statement
- Shaftway marking
- Skylight marking or barriers
- Photovoltaic system signage



FIGURE Q.1.2.3 Sample Sign for Fire Fighter Safety Building Marking System.

Diagram from NFPA 1

What suppression system features will help firefighters?

- Valve location, access, marking
- Fire pump location, access, marking
- Standpipe design pressure
- Avoiding pressure reducing valves
- Hose valve locations vs. stair enclosures
- Fire department connections:
 - type, interconnection
 - number, location, position
 - marking, signage
 - obstructions
 - security, physical protection



Photo by Mat Chibbaro

What alarm system features will help firefighters?



Photo by Mat Chibbaro

- Fire alarm annunciator
- Building diagram (can be on annunciator):
 - Surrounding streets, N arrow, entry & exit points
 - Stairs & elevators: ID and levels served
 - Utilities (water, gas, elec, generator, elevator machine)
 - Location of water service, fire pump, fire alarm panel
 - Standpipe & FDC locations
- Design to preclude unwanted fire alarms
- Fire command center location, size, equipment

What other systems will help firefighters?

- Radio coverage & retransmission systems
- Simple smoke control panels
- Firefighter emergency power systems
- Firefighter breathing air systems



Have I considered phases in construction or demolition?

- Temporary water supply
- Temporary stair, lighting, & enclosure
- Standpipe & connection
- Access points
- Phased occupancy



Photo by Mat Chibbaro



NY Deutsche Bank - photo from NIOSH report

Have I considered structures other than buildings?

- Tunnels
- Piers & wharfs
- Bridges



Photo by Mat Chibbaro

Resources

- National Emergency Training Center's Learning Resource Center
- OSHA's "Fire Service Features of Buildings and Fire Protection Systems"
- NFPA Standards
- ICC Codes
- Guidelines from AHJ



THANK YOU!

To find out more about the Society of Fire Protection Engineer's Fire Service Committee go to www.sfpe.org.