

Operating Guideline # 834

Evidence Based Structural Firefighting

December 8, 2023



PURPOSE:

The purpose of this Operating Guideline is to encourage firefighters to use evidence based structural firefighting tactics.

ISSUE/RATIONALE:

The modern fire environment consists of structures constructed of lightweight building materials, open floor plans, double pane windows and furnishings made from synthetic materials. Individually each of these factors impacts fire behaviour, but collectively these factors lead to faster fire propagation, shorter time to flashover, rapid changes in fire dynamics, shorter escape times, and shorter times to collapse.

GUIDELINE:

1. All members of the Muskoka Lakes Fire Department should take the 180 minute [“Evidence Based Structural Firefighting”](#), UL Fire Safety Research Institute online course. This online training course is based on NFPA 1700, it is primarily designed to help firefighters understand why firefighting tactics are changing based on modern construction, newer on-scene technology, and evolving fuel loads. This course will help firefighters understand how to assess and approach the scene of a fire based on the latest science-based fire dynamics research and testing, and be better prepared to evaluate a fire’s growth and spread and utilize up-to-date control methods.
2. Data collected has proven that the average home is increasing in size, meanwhile the size of the lot has decreased. Larger homes equals more air in the home, closer to the next fuel or home lot.
3. Modern homes often have larger open floor plans, these plans allow heat and smoke to travel throughout the structure. Less compartmentation may reduce the safe egress time for occupants and allow the fire to spread before the arrival of the fire department.
4. Building materials and construction methods are changing bringing more lightweight engineered components created with synthetic fuels and more airtight windows.
5. Today fires are predominantly fuelled by synthetic fuels, resulting in faster heat release rates and shorter times to flashover.
6. Collapse of floor and roof systems are occurring under the 17 minute timeframe, which means that collapse of these systems is likely to occur within the fire department’s operational time frame. Incident Commanders should account for this information.
7. Thermal imagers have limited use in determining floor assembly condition or conditions under the floor.
8. Sounding the floor may not be a reliable technique to assess the stability of the floor assembly.
9. Providing oxygen to a ventilation-limited fire increases the heat release rate, temperature and pressure in the structure along the exhaust portions of the flow path.
10. Fires attacked and controlled from the exterior openings from the front and/or rear of the structure resulted in improved conditions throughout the structure.
11. Survivability of occupants relates to the occupants proximity to the fire, elevation in the space and isolation from the fire.

Operating Guideline # 834

Evidence Based Structural Firefighting

December 8, 2023



12. Remove any potential victims as soon as possible, a primary search needs to be conducted in all involved and exposed buildings.
13. Water is the most effective firefighting agent.
14. Exposure control is intended to limit fire from extending and limit its growth. Apply water directly on exposed surfaces using a straight stream.
15. The steeper the angle will allow the best dispersion, this application coats all surfaces with water. This will rapidly reduce the temperatures and improve survivability in adjoining spaces. Straight stream is preferred to limit air entrainment.
16. When flow and move is happening, O pattern is preferred.
17. Apply the O pattern before entering the fire compartment will cool the advance for the attack team.
18. Doorway deflection early is better to control the fire from a safe position.
19. Initial steep angle water stream application is best when entering compartments.
20. In some situations we need to limit air reaching the fire to hold fire growth, this is called non ventilation by closing or restricting openings in the structure.
21. Horizontal ventilation leverages natural ventilation currents, buoyant smoke is replaced by denser fresh air due to the gravity current. This must be coordinated with water application.
22. Vertical ventilation leverages air pressure differentials and exhausted from openings located above the area of fire. This must be coordinated with water application.
23. Positive pressure attack, exhaust must be established before the fans are activated and this must be coordinated with water application. Vent must be larger than inlet, not effective in large open spaces.
24. Positive pressure ventilation, used post fire control. Outlet should be established before the fan is activated, more openings made in the structure during PPV, the more efficient it will be. This must be coordinated with water application.
25. The size up process begins before arrival, pre incident planning for target hazards will allow needed resources and operational plans to be determined in advance. Plans can provide information on the structure, contents and occupancy to help decision-making.
26. Early and smart dispatch can enhance the effectiveness of the emergency response by initiating resources appropriately based on estimated arrival times, order of arrival, existing hazards and known risks.
27. Weather can always influence emergency responses through wind, temperature, humidity and precipitation the affects on the fire behaviour.
28. Occupancy status is essential for the incident assessment, factors such as life safety, building types, and fire loads.
29. Time of day must be a part of pre arrival considerations. Visibility, occupant status, and the effect on response time are factors.
30. Upon arrival all the following should be considered:
 - Witness statements
 - Access concerns (driveways)
 - Building height, size and stability
 - occupancy type

Operating Guideline # 834

Evidence Based Structural Firefighting

December 8, 2023



- construction type and era
- wind direction
- fire location, size and extent
- civilian and firefighter safety profile
- flow path
- exposures
- fixed fire protection systems
- resources

31. The 360 walk around is essential to check fire conditions, close openings, focus on all occupants by maintaining tenability of the likely avenues of exits. Utilities such as electrical drops, Propane/Oil tanks, Natural gas service, pre existing structural hazards, hazardous grade changes, roof type, and presence of hydrants / connections. TIC's should be used to help determine fire location and extension.

32. Specific factors that can help decision making include:

- Smoke (Volume, Velocity, Optical Density, and Colour)
- Fuel Load
- Openings presence and location (doors, windows, vents, skylights, fire holes)
- Flow path assessment – neutral plane? Direction of flow?
- Weather wind and temperature can affect pressure in structure
- Access to structure – ladders, tools, hoses, resources
- Fire Progression – where it is, where is it going, what are we doing
- Determine position of suppression crew avoid flow path and call it

33. IAP, use the Risk Assessment of risk a lot to save a lot, risk little to save little and risk nothing to save nothing as a guide. Establish strategy Offensive or Defensive.

34. Offensive strategy involves taking direct action to mitigate problem. When we confirm the structure is not that involved in fire, fire dynamics are understood, and sufficient resources are present to deal with the fire attack and rescue, then this strategy is appropriate.

35. Defensive strategies is appropriate if the hazards outweigh the ability to safely operate inside the structure. Goal is to isolate or stabilize the incident so that it does not get any worse. All control ops should occur in positions outside the exclusion zone.

36. Strategy must be communicated to all on scene via radio.

RESPONSIBILITY:

It is the responsibility of all firefighting staff to comply with the provisions of this Operating Guideline.

REFERENCES:

- [Occupational Health and Safety Act](#) clauses 25(2)(a,d,h)
- [S. 21 Firefighter Guidance Note: 6-26, Structural Fire Fighting – fire streams and ventilation](#)
- [UL Fire Safety Research Institute training portal](#)

Operating Guideline # 834

Evidence Based Structural Firefighting

December 8, 2023

