
What is Compartment Fire Behavior Training?

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Compartment fire behavior training (CFBT) integrates the topics of fire behavior, fire streams and ventilation within a structural firefighting context. Safe and effective structural firefighting operations require: 1) A solid understanding of how a fire develops within a compartment or structure. 2) The ability to “read” fire behavior indicators. 3) Knowledge of how tactical operations will influence fire development and the environment inside the building. 4) A high level of skill in the application of these concepts. Often the topics of fire behavior, fire streams, ventilation, structural firefighting tactics, and live fire training are treated as related, but independent topics within fire service training. CFBT provides an integrated framework for developing structural firefighting knowledge and skills. While CFBT programs vary in duration and specific content, they generally integrate the following topics through classroom and hands-on training: Basic Fire Behavior, Fire Development in a Compartment, Extreme Fire Behavior, Fire Behavior Indicators, and Fire Suppression and Ventilation Tactics

Basic Fire Behavior

While seeming to be so fundamental, basic fire behavior is the starting point for understanding both fire development and fire control operations. However, the major difference between simple textbook definition of terms and concepts and CFBT is the direct application of theory to real world application.

While the origin of CFBT methods and practices can be traced to Sweden, this approach to developing firefighting knowledge and skill is throughout the world. Ed Hartin (USA) and Nils Bergstron (Sweden) deliver CBFT to a group of Malaysian fire officers attending training (below).



Photos by John McDonough

Fire Development

How does a fire develop inside a compartment? What controls fire growth and spread, the fuel or ventilation? Significant changes occur when a fire transitions from fuel controlled to ventilation controlled. Of critical importance to firefighters is the impact of their tactics based on the stage of fire development. Failure to recognize and manage the hazards presented by a ventilation-controlled fire may result in increased risk to firefighters, increased fire spread, or extreme fire behavior.

Malaysian fire officers conduct fire development experiments using a “dolls house” (below left). Shan Raffel (Australia) points out key fire development phenomenon while conducting training in CFBT cell (below right).



Photos by John McDonough

Extreme Fire Behavior

Many firefighters can provide a definition of flashover or backdraft and list the signs indicating potential for these types of extreme fire behavior. However, firefighter injury and fatality data indicates that their potential is often unrecognized on the fireground. Flashover, backdraft, and smoke (fire gas) explosion all involve rapid fire progress, but are substantially different phenomenon. Understanding how they occur and developing the ability to recognize both obvious and subtle cues indicating potential for extreme fire behavior is a central element of CFBT.

Classroom training alone does not provide a realistic understanding of extreme fire behavior. Transfer of theory to practice requires realistic training in a live fire environment. CFBT cells (typically constructed from steel shipping containers) provide a safe and effective training environment in which to build fire behavior knowledge. Nils Bergstrom, a senior instructor with R ddningsverket (Swedish National Rescue Services Agency) describes the containers as a firefighters laboratory. Nils also reinforces that a CFBT cell is simpler and more controllable

than a structure fire, students must recognize that skills developed in the cell must be adapted and transferred to various structural and fire conditions.

Nick Sutcliffe (UK), Ed Hartin (USA), and another fire officer (UK) prepare for a session in a demonstration cell while attending CFBT Instructor training in Uppsala, Sweden (below left). A “window” cell is used to provide full-scale demonstrations of fire development, flashover, and backdraft (below right).



Photos by Ed Hartin

While often referred to as “flashover training” CFBT involves much more than simply learning to recognize and react to impending flashover conditions. Firefighter’s safety is dependent on early recognition of the indicators of a range of extreme fire behavior. Recognition aids in selection of strategies and tactics to manage risks and effectively control the fire.

Fire Behavior Indicators

Size-up involves determining the problems presented by the incident. One key element in this process is recognition of current fire conditions, likely fire progress, and the potential impact of tactical operations. Fire behavior indicators are visual, audible, and tactile (i.e. feeling changes in temperature) cues that can be used to “read the fire”. Fire behavior indicators can be divided into five basic categories: 1) Building, 2) Smoke, 3) Heat, 4) Air Track, and 5) Flame. Building factors are not specifically dependent on the fire, as they exist prior to ignition (i.e. construction, avenues of fire travel, fuel load, ventilation profile). Smoke, heat, and flame are fairly obvious indicators, but can provide a great deal of information about developing fire conditions. Air track is not quite so obvious, but is critical in assessing fire conditions. Air track involves the movement of both air and smoke (i.e. air moving in the lower area of a doorway while smoke moves out the top).

Firefighters and officers in Gresham, Oregon use fire behavior theory and their personal experience to develop a concept map illustrating fire behavior indicators during CFBT (below left). John McDonough (Australia) debriefs participants on their observations following a CFBT live fire session (below right).



Photos by Ed Hartin

Fire Suppression and Ventilation Tactics

Developing a high level of skill in fire suppression and ventilation tactics requires deliberate and ongoing practice. CFBT provides the opportunity not only to integrate fire behavior theory and firefighting practice, but also to develop proficiency in critical skills. Practical application often begins in a simple single compartment cell constructed from a steel shipping container. However, practice in fire suppression and ventilation also extends to more complex props such as a large volume cell or acquired structures.

Instructors from the UK and USA prepare for a training evolution in a large volume cell (below left) located at the R ddningsverket College in Rosersberg, Sweden. Use of acquired structures by Gresham Fire and Emergency Services personnel (below left) provides the highest level of realism in CFBT, but also presents the same hazards encountered on the fireground.



Photos by Ed Hartin and Pat McAbery