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Live Fire Training: In Acquired Structures-Building Prep

There has been a lot of press devoted to training with live fire in structures that are either donated to or acquired by fire departments. Unfortunately, most of the press has covered injuries or death in training that went terribly wrong. Live fire training is inherently dangerous, as is our job. To get the most out of live fire training it has to be realistic. The more realistic we make it the more dangerous it becomes. Even the most realistic live fire training does not come close to a real structure fire with all of the combustible materials and other intangibles (wind, accelerants, victims, etc.)



Photo-1 This ending should be planned for.

So the question becomes how do we train with live fire safely and still create a worthy learning experience? The answer comes in knowing the rules of live fire and building a great training exercise around them. This first article will explore how to prep a building for a live fire training exercise. Prepping a building correctly helps create a worthy learning experience while minimizing the danger. (A subsequent article will deal with the actual burn day.)

So where do we start? We have this house that has been donated to our fire department and we want to use it for a live fire exercise. What do we do first? Well, the first thing to do is get a copy of NFPA 1403, Standard on Live Fire Training Evolutions 2007, which covers live fire training. This publication covers all of the information dealing with live fire training. It covers everything from what you can use to burn, to what needs to be prepped, to the paperwork and permits needed before you can start.

The section covering fire training in acquired structures should be adhered to ensuring a safe training session. Remember, getting everyone safe should be the goal in training too.

So we have acquired a copy of NFPA 1403, have read it, have gotten all of the required paperwork and permits from the building owner and are now ready to prep the building. The following is an easy to follow list of what to do:

(Note: If sheetrock was removed or damaged during the asbestos inspection then it must be replaced.)

1. Clean out the structure. Completely remove all garbage, appliances, furniture, wall coverings (cork, mirrors, pictures etc.) and generally return the structure to semi-inhabitable. It is easier to work when there isn't debris in the way. Debris pile should be far enough away from structure so that it does not become an exposure. Kitchen cabinets can be left if desired. Ordinary combustibles are allowed as long as the burn characteristics are known and the instructor in charge documents them. (Section 4.3.8 NFPA 1403).

2. Remove all outlet covers, light switches, plug covers, gas or water pipes etc. and knock in the electrical box behind the cover (or anything else that sticks out) so that nothing sticks out beyond sheetrock (**Photo-2**). It is okay to make small holes larger because they can always be covered.

3. Fill all holes in walls with any type of foaming insulation spray. This stuff expands to fill the holes and dries to a hard flame resistant substance in about 24 hours (**Photo-3**).



Photo 2- Remove all outlet covers.



Photo 3- Allow foam to dry for 24 hrs.

4. Remove all ceiling fixtures including lights, bathroom fan covers, HVAC vent covers, kitchen vent pipes and anything else sticking out of the ceiling. Pay attention to the stove vents as sometimes they are hidden in a cabinet (**Photo-4**).

Again, make sure that nothing is sticking out beyond the level of the sheetrock. This is more critical than the wall holes for obvious reasons. Any uncovered hole in the ceiling is a direct route to the attic.

5. Cover all holes in ceiling with sheetrock. Cut sheetrock 3 to 4 times bigger than the holes and secure with sheetrock screws (**Photo-5**).

6. Find and cover any attic access holes. Other attic access means will be created.

7. Remove all wall furnaces, window (and under window) A/C units, hot water heaters and cover large holes with sheetrock (**Photo-6**).



Photo 4- Check inside cabinets for hidden



Photo 5- Cover all openings in the ceiling with sheetrock.



Photo 6- Cover all openings in the wall with sheetrock.

8. Remove all interior doors. Exterior doors will also have to be removed but can remain until burn day for security.

9. Remove all windows. Take out the entire window including all glass and sashes leaving only the frame. (The frame can also be removed if necessary). Create an easy to exit window covering (blow-out window). The covering works to keep light out and smoke in making a more realistic fire. Should anyone need to exit quickly they can just push thru the bottom of the blow-out window and roll out.



Photo 7- Using OSB and spikes for blow-out windows.

There are two ways to attach the window to the building. Using OSB or plywood, cut pieces big enough to cover the entire window opening. Method 1 entails driving two large spikes above the window about six to eight inches from the edge and drilling two large holes in the OSB to match. When the OSB is placed on the holes, it covers the window (**Photo-7**). Multiple pieces for each window can be pre-made for easy replacement, if burning in the same room multiple times.

The other method involves using hinges and placing them where the spikes and holes are. This method also allows easy exiting but is more labor intensive and makes it harder to replace windows if they get damaged by fire. Using hinges will make it more difficult to remove the window entirely if, for example, the room(s) need to be cleared quickly of smoke. This method does offer more security if that is a concern.

10. Make exterior doors outward swinging instead of inward swinging. All exits must be able to open without any use of hardware. The best way to do this is by removing the door entirely and using a piece of OSB in its place (**Photo-8**). The outward swinging door allows for easy exiting thus creating a blow-out door. Nothing should keep the door from opening. If a real door is used, then all of the hardware (door knobs and deadbolts) should be removed.

11. Mark all hazards. Using highly visible spray paint go around and mark all hazards that cannot be removed. This must be done both inside and outside. Pipes sticking up, steps and other trip hazards should be marked by the paint. (**Photo-9**).



Photo 8- Using OSB and hinges to create a blow-out door.



Photo 9- Clearly mark all hazards, including steps.

12. Mark burn rooms numbers. Part of the master plan, Incident Action Plan, of the live fire exercise will be the order in which the rooms are used. The room order should be spray painted on the interior (**Photo-10**) and exterior (**Photo-11**) of the building so that all involved will know which room is being used.



Photo 10- Clearly mark the burn rooms according to the Incident Action Plan.



Photo 11- Clearly mark the burn rooms according to the Incident Action Plan.

13. Mark exits on interior walls. Marking of exits allows anyone who becomes disorientated to find a way out. Arrows and the word “EXIT” can be used to show the direction of travel to the exit. This should be done close to the ground so that someone crawling can see them under the smoke. Windows can be marked by painting below them onto the floor (**Photo-12**). Again, anyone crawling around looking for a window can use the paint as an indicator.



Photo 12- Clearly mark all exit points, including interior windows.

14. Reinforce burn corners with extra layer of sheetrock. Put up a second layer of sheetrock in the corners and on the ceiling where the fires are to be built. This will give some extra protection if the room is to be used for multiple fires or for multiple days. OSB



can also be used to further protect the structure. OSB provides additional fire roll over at reduced fire quantity. In other words, using OSB allows you to build somewhat smaller fires but still getting the desired roll over. (**Photo-13**)

Photo 13- Reinforce burn corners with extra layers of sheetrock and OSB.

15. Provide attic access at gables. Remove the gable vents and make hole large enough for a firefighter in full PPE to climb thru. This allows for immediate knowledge of the conditions of the attic during the entirety of the exercise. A small door can be made to fit over the attic access point if windy conditions are expected or to keep the smoke in.

16. Pre cut a hole in the roof. If fire does get into the attic a pre-cut hole will slow the progress of the fire and allow for immediate access. The hole can be covered if windy conditions are expected and to keep the smoke in.

17. Cut off doors so that charged hose can fit underneath. Notching or taking a few inches off the bottom of the doors allows for the doors to be closed even when hose lines are stretched thru them. This helps to reduce the amount of smoke loss as well as the amount of light let in. (Remember that nothing is latching the doors closed. The doors are blow-out doors and must remain immediately open-able.)

18. Make doors out of windows or make doors thru walls. If additional means of egress are wanted then make them. Sometimes the structure is small and may only have one or two doors. By making windows into doors hose stretching scenarios can be varied as well as providing a second means to exit your fire setters (To be explained in Part II). Also, by making interior door ways thru walls, hose can be pulled from different points adding to the versatility of the building. This is especially true if the structure is a duplex or series of rooms not connected by interior doors (as in a hotel). Now hose can be stretched from one end of the structure to the other instead of just room to room (**Photo-14**).

To conclude this portion prep, materials and manpower should be addressed. Obviously, the amount of each will depend on the size of the structure. The larger the structure the more materials and manpower will be needed to prep. Other factors that affect manpower needs will be condition of structure and type of live fire exercise. If the building is in disrepair, or if the asbestos abatement removed a significant amount of sheetrock, manpower hours will climb dramatically. Replacing missing or removed sheetrock is critical in creating a safe training environment and cannot be overlooked.



Photo 14- Adding doors through walls can provide different paths for fire attack..

If too much has been removed, and manpower is limited, consider using a different building. If the live fire exercise is covering multiple days with each room being used more than once, the prep work will have to be more extensive. Extra layers of sheetrock, or OSB, will be needed to reinforce the burn areas, adding to the prep time. For a typical 2000 square foot single family dwelling, with sheetrock intact, plan on 80-100 man hours for complete prep. (10 workers for one day or 5 for two days) Materials should include sheetrock (one half to a full unit), OSB (One unit if reinforcing burn rooms), sheetrock screws, foaming insulation, spray paint, screw guns, generators, saws (chain saws or circular saws work fine), nail guns (easier to hang sheetrock and OSB with nail guns than screw guns) and any other carpentry items that most firefighters have.

Live fire training is the most dangerous type of training that we can do. It is also the most beneficial. Duplicating real fire scenarios with the intent of learning from them is best done under live fire conditions. Propane buildings and burn buildings are good but live fire in acquired structures is the closest training to the real thing we can do. Keeping the live training safe is of paramount importance and begins with the prep of the building.

Prepping a building correctly creates the safest environment while allowing for the most realistic training possible. Realistic training gives us the best chance of getting everyone home and ultimately that should be our goal. Train hard, train right.

{This article would not be possible without the exhaustive work put in by many individuals, two of which I must acknowledge, Chief Frank Drayton (Vacaville F.D.) and Captain Mike Taylor (West Sacramento F.D.). These two individuals have led the way in live fire training and have shown many of us how to do it the right way.}