## SECTION 6 - WILDLAND/URBAN INTERFACE

The purpose of this section is to provide wildland firefighting agencies some tactics and techniques to protect structures from wildland fires. **This section is not intended to train structural firefighters nor preclude agency policy dealing with fires in the wildland/urban interface.**

## KINDS OF WILDLAND/URBAN INTERFACE

Where people, structures and wildlands meet is called the wildland/urban interface. This interface has received attention because of the many disastrous wildfires in these interface areas (e.g., Dude Fire, Glen Allen, Oakland Fire, Black Tiger, Mound House, etc.).

There are three types of wildland/urban interface.

A *mixed interface* occurs when structures are scattered over a large wildland area. Isolated cabins surrounded by large blocks of industrial or public wildland would be a good example of a mixed interface. Large wildland fires in this type of interface may endanger only very few structures.

*Occluded interfaces* are defined as isolated areas of wildland within an urban area. New York's Central Park and Los Angeles' Griffith Park come to mind as examples of occluded interfaces. Many structures are at risk, but the potential for severe wildland fire behavior is low due to small total wildland area.

A *classic interface* is found when many structures, often on small lots, border wildlands on a broad front. The inter-mix of vegetation and structures can put many structures at risk in what would otherwise be an average wildland fire in terms of behavior and damage to the wildland resource. This classic interface area represents the greatest potential for loss of life.

## STRUCTURAL FIRE BEHAVIOR

Structural fire behavior differs from wildland fire behavior in many ways. Fuel loadings may be a factor of 300 or more times greater than wildland fuel loadings. Fuel moistures of structural fuels are greatly influenced by indoor relative humidity, and timelag of treated woods may be much longer than one would expect when used to dealing with only size-related timelags. Radiant and convective heat in the interior of a structure is retained and not lost to the atmosphere. Oxygen supply available in structure interiors has a major impact on structural fire behavior. Structure fires may be oxygen-limited as opposed to wildland fires which usually are fuel limited.

Fuel types in structural fires are not limited to naturally occurring materials. Synthetic fuels present a wider range of fire behavior and can produce highly toxic combustion materials, in addition to the ever present danger posed by carbon monoxide.

There are also risks associated with structural fires that are not usually present in wildland fires such as structural collapse, flashover, electricity, hazardous materials, etc.

## WILDLAND/URBAN FIRE SIZEUP CONSIDERATIONS

Wildland/urban fire sizeup considerations differ somewhat from wildland fire. The paramount consideration, however, is the same in both, *rescue/life safety.* This consideration applies to firefighters as well as to structure occupants. *Operations necessary to protect life, such as search and rescue in a burning structure, should only be undertaken by trained and experienced firefighters equipped with full turnout gear and self-contained breathing apparatus.* Smoke and toxic gases are the greatest hazards in structural firefighting.

The following are considerations for a wildland/urban fire sizeup:

A. Structures and improvements.

1. Number, arrangement, and kinds of exposures.

   Look at the placement of improvements and anticipate fire behavior.

2. Note clearance around structure(s) (defensible space),

3. Size, height, and occupancy type.

4. Construction features: roof coverings, wood shake or shingle roofs (probably the greatest single hazard), wood siding, decks, eaves (exposed vs. covered), attic vents, rain gutters (empty or full of debris).

5. Safety and rescue.

   Evacuation could involve both people and animals. Note safe refuge areas (outside and inside or behind structures). Consider other hazards, some hidden (septic tanks - which can collapse when subjected to heavy weight, insecticide storage), and some obvious (power lines, liquefied petroleum gas [LPG] and fuel tanks).

6. Water supplies. Note location, availability, and reliability.

7. Combustibles located near structures (wood piles, vehicles, vegetation, etc.). Can they be removed?

B. Access. Note ingress and egress and one-way or narrow roads. Can firefighting equipment get into the area to protect structures? Consider the width of bridges and their load limits.

C. Fuel

1. Type of fuel (grass, brush, timber, ornamentals). Note the size and arrangement and continuity of fuels, and their proximity to structures and improvements.

2. Age of fuel. Observe the amount of dead material in fuel.

3. Consider structure fuels. These can be high volume fuel that produces large amounts of radiated and convective heat. Wood shake and shingle fires are difficult to extinguish and may cause spot fires.

D. Weather. Observe site specific weather.

1. Wind - note windspeed and direction (probably the key element of wildland fire behavior). Local winds may be quite different from general winds. They will be influenced by topography, fuels, structures, and in major fire incidents, by the fire itself.

2. Temperature-affects fire behavior as it affects your fuels (solar heating and drying).

3. Humidity-dryer air is better able to pick up moisture from the fuel. The result is that less time is required for heat buildup and combustion.

4. Stable vs. unstable atmosphere-are you experiencing major wind shifts and firewhirls? Both are indicators of unstable weather conditions.

E. Topography. Observe the following and anticipate their effects on fire behavior.

1. Canyons-wide vs. narrow, box, or chute.

2. Ridges-saddles and chimneys.

3. Slope-steep vs. flat terrain.

4. Physical barriers-both natural and artificial; roads, rivers, green belts, fuel breaks, cliffs, or large bodies of water.

F. Fire behavior - observe local fire behavior.

1. Fire location, speed, and direction. The basic determination of how far away it is and how fast it is moving. This will give you approximately how much time you have before structures may be involved.

2. Firewhirls.

3. Spotting--can you anticipate spot fires prior to the fire front reaching you? This could affect your attack plan and the safety of firefighters.

G. Resources

Are there enough resources on hand or do you have time to order and receive additional resources? Consider the following:

1. Other entity and/or agency involvement such as law enforcement for road closures and evacuation. Structural fire departments.

2. A last minute fuel clearance effort. Evaluate the terrain. Is it suitable for dozers, engines, or hand crews? Structural protection and workforce. Consider firing out around structures. Do you have the necessary resources?

3. Structural protection and workforce. Consider firing out around structures. Do you have the necessary resources?

4. Air support (fixed wing and helicopters). They both have limitations.

5. Terrain for access. It may be suited only for smaller, more versatile equipment.

6. Water needs and sources. Water tenders may be needed.

7. Need and availability of special equipment.

## STRUCTURE TRIAGE

Structure triage is the sorting and prioritizing of structures requiring protection from wildland fire.

Triage can be required of anyone at any time on a wildland/urban fire incident; from the incident commander doing reconnaissance to an engine crew moving into position.

The goal of triage is to do the most good with what you have and to not waste limited resources or time. It requires categorization of threatened structures as:

- Needing little or no attention for now.
- Needing protection, but savable.
- Indefensible.

There are no absolute answers, but five factors to help make a triage decision are:

- Firefighter safety
- The structure itself
- Surrounding fuels
- Fire behavior
- Available resources

Consider the following:

A. Firefighter safety

1. Ingress/egress routes
    - One way/two way
    - Slope and steepness of road
    - Bridges
2. Power lines
3. Smoke/visibility
4. Hazardous materials
5. LPG and overhead fuel storage

B. Structure construction features, condition, and exposure.

1. Roof
    - Combustible-wood shakes, tar paper, etc.
    - Non combustible-tile, metal, or fiberglass, etc.
    - Pitch-debris on roof or in gutters
2. Siding
    - Combustible-wood.
    - Non combustible - metal, brick, etc.
3. Heat traps
    - Open gable
    - Vents without screens or non fire resistant screens
    - Overhanging decks
4. Windows
5. Size of building
6. Shape of building
7. Position on slope

C. Surrounding fuels

1. Size and arrangement
2. Age
3. Proximity to structure
4. Loading
5. Types
    - Resistant or flammable
    - Landscape/ornamental
    - Grass, brush, timber, exotic (palmetto, etc.)
    - Wood piles

6. Landscaping-railroad ties, wood fences

7. Defensible space, access

8. Yard accumulation

9. Flame or heat duration

10. Explosive-liquified petroleum gas (LPG) tanks, diesel or gas storage tanks

D. Fire Behavior

1. Rate of spread and direction
2. Topographic influence
3. Weather influence
1. Flame length
5. Spotting
6. Natural or other barriers

E. Available resources

1. Kind and type equipment available

   - On site resources (water, equipment, ladders)

   - Location

   - When available-response time

2. Capabilities and limitations

   - Mobility

   - Water/foam

   - Retardant

## WILDLAND/URBAN INTERFACE FIREFIGHTING TACTICS

**This section is intended to provide some basic tactics to deal with wildland fire in the wildland/urban interface within the policy of your agency. If your agency policy does not include structure firefighting, the information in this section is not suggesting that you enter burning structures or fight structure fires.**

Generally, the moving fire controls the action. Mobility, wise water use, and methods effective in wildland fire control are commonly required. Resources defending structures must be mobile, resourceful, and self-reliant.

Implementing tactics of structural firefighting should generally consider structure triage. That is, concentrate on doing the most good with what you have and to not waste limited resources or time. Concentrate on the savable structures rather than the hopeless.

Initial Actions

Turn the traffic control over to law enforcement. To gain access to threatened structures will require sorting out the traffic problem. Clear existing traffic to *0* make way for fire equipment, and keep it moving.

Come up with a traffic plan. Identify routes into and out of the area. Where roads are too narrow to allow two way traffic you may need to set up a one-way loop. When possible, post signs or individuals to indicate the routes and directions. Note weight limits or bottlenecks that may limit some equipment.

Evacuation may be desirable to clear the area for firefighting operations and minimize risk to citizens. Civilians can be asked to leave, but only law enforcement has the authority to make them leave. Little is to be gained by arguing with someone who will not leave.

Prior to evacuation, and if time exists, homeowners and firefighters can make some structure preparations to minimize a structure's receptiveness to ignition and fire spread. Assistance in the preparations can come from other sources such as engine crews, hand crews, and heavy equipment.

1. The roof is the most readily and frequently ignited part of a structure exposed to wildland fire. Remove any easily ignited material that is lying on the roof. Clear needles and leaves off of the roof and out of the rain gutters.

2. Remove or separate intermediate fuels that pose a threat to the structure. Move woodpiles away from buildings. Remove combustible vegetation near the structure. Remove flammable awnings and other combustible materials that attach to buildings.

3. Cover openings and potential openings. Any entry of fire or firebrands into the structure greatly increases control problems and the likelihood the structure will be damaged or destroyed. Concentrate your efforts on those openings on the side of the structure that are most exposed.

    - Vents and ducts, even though covered with screen, need to be covered. Use whatever can be nailed or propped over the hole that is not easily ignited.

    - Windows should be closed with screens attached. Even if windows are intact it is worth covering them to keep them from being broken by heat or hose streams. Use plywood, sheet metal, or flat panels.

    - Large openings such as doorways or breezeways are hard to cover. Sheets of plywood, or even tarps and salvage covers can be used.

    - Evaporative coolers can be ignited by firebrands getting into the pads. It they cannot be covered, turn on the water pump and turn off the blower.

4. Interior structure preparation.

    - Remove light curtains and easily ignited materials from the vicinity of windows. Drapes made of readily flammable material should be drawn back or taken down.

    - Close non-flammable window coverings such as blinds, or shades and drapes.

    - Turn off fans, coolers (except water coolers), or anything that blows air.

    - Turn off gas (LPG or natural) at the source.

    - Leave electricity on to run pumps, provide lighting, etc.

- Leave a porch light and a central interior light on to provide visibility in dark and/or smoky conditions.

- Do not lock doors and make sure doors can be opened.

5. If the homeowner has a ladder, place it in position to provide access to the roof. Place the ladder in a visible location so anyone needing access to the roof can see it.

6. Connect available garden hoses and test for water pressure.

7. Vehicles that will remain on site should be parked in the garage or away from flammable material near or underneath the vehicle. Park vehicles headed out with the keys in the ignition. Close the doors and windows, but do not lock the vehicle. Make sure vehicles will not interfere with the movement of fire equipment or block the driveway.

8. Pets and livestock that are free to move around generally will manage to avoid being burned. If they are fenced or chained, they may need to be freed. Troublesome or frightened pets might need to be placed in the garage, residence, or other enclosure.

Confronting The Fire At The Structure

Deciding how to handle the fire itself is challenging. It requires considering the fire environment, the structure, and the situation of adjacent crews. Consider the following four general situations, and decide which one applies. It is quite possible that the situation may change in the course of the fire.

1. Spotting zone.

   You are in the spotting zone, where firebrands are the major problem. The main fire may move through later (putting you in a different situation), or it may never get there.

   Airborne firebrands are the biggest problem, and the threat may exist for several hours. Firebrands may ignite new fires a mile or more ahead of the main fire.

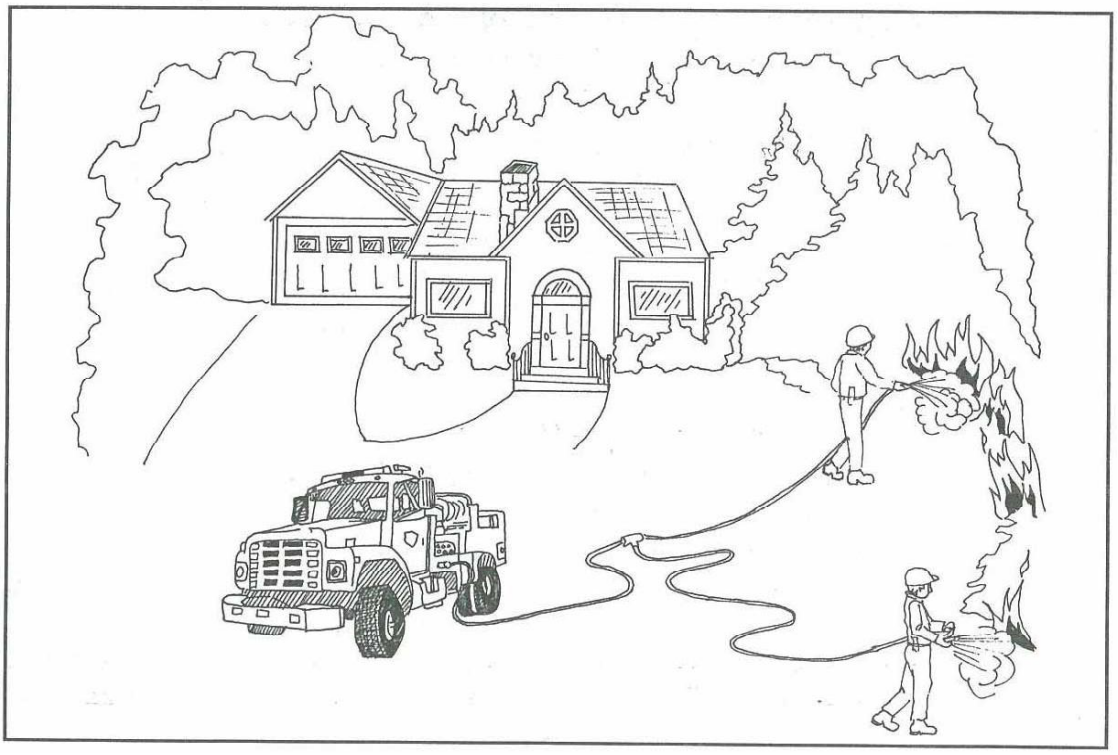
Remain mobile enough to quickly reach any point within your area of responsibility. It may not be necessary, or desirable, to deploy lines except to actually put out a fire. When deploying line you should not deploy more than 250 feet of hose.

Constantly check for new ignitions; this is not a time to relax your vigilance. Watch prime receptive fuels such as roofs and woodpiles. Patrol as necessary, and post lookouts with communications. If a spot fire occurs, attack it quickly. Make sure it is completely out, or at least has a good enough control line that it cannot spread. When deploying lines you should not deploy more than 250 feet of hose.

2. Full containment around the structure.

Full containment of the wildland fire before it gets to the structure(s) is possible. You can stop the wildland fire short of the structure itself (see Figure 1). Your control line will completely surround the structure or will join adjacent control lines.

Figure 1 – Full Containment



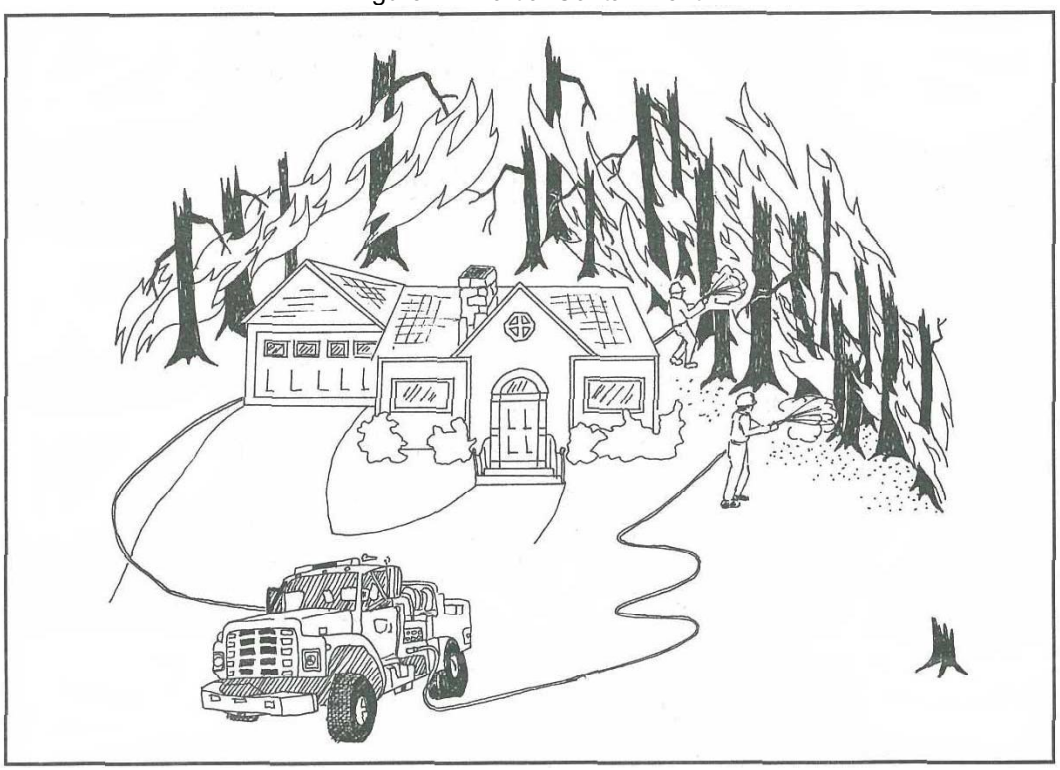
Cut off the fire before it reaches the buildings, essentially at the outer edge of the yard or where wildland fuels begin.

If you have time to wait for the fire and it's not too intense simply put it out when it reaches the control perimeter. Use water, handtools, or let it burn into a fuel break. Such fires might be burning in light fuels and not be driven by wind or slope. If you cannot wait for the main fire, or if the fire will be too intense for direct control, you can fire out from a control line.

3. Partial containment around the structure.

   Only partial containment is possible. You may be able to modify or diminish the fire as it hits, but the fire will move past the structure before you can establish control (see Figure 2).

Figure 2 – Partial Containment



If there is not enough time or the fire intensity will not allow you to establish complete containment, you can still attempt to reduce the fire's intensity as it moves towards the structure.

Use your working lines to knock down the segment of the fire that is moving directly toward the structure. It may also be possible to light a backfire from a short section of control line to take out the most threatening segment of fire front.

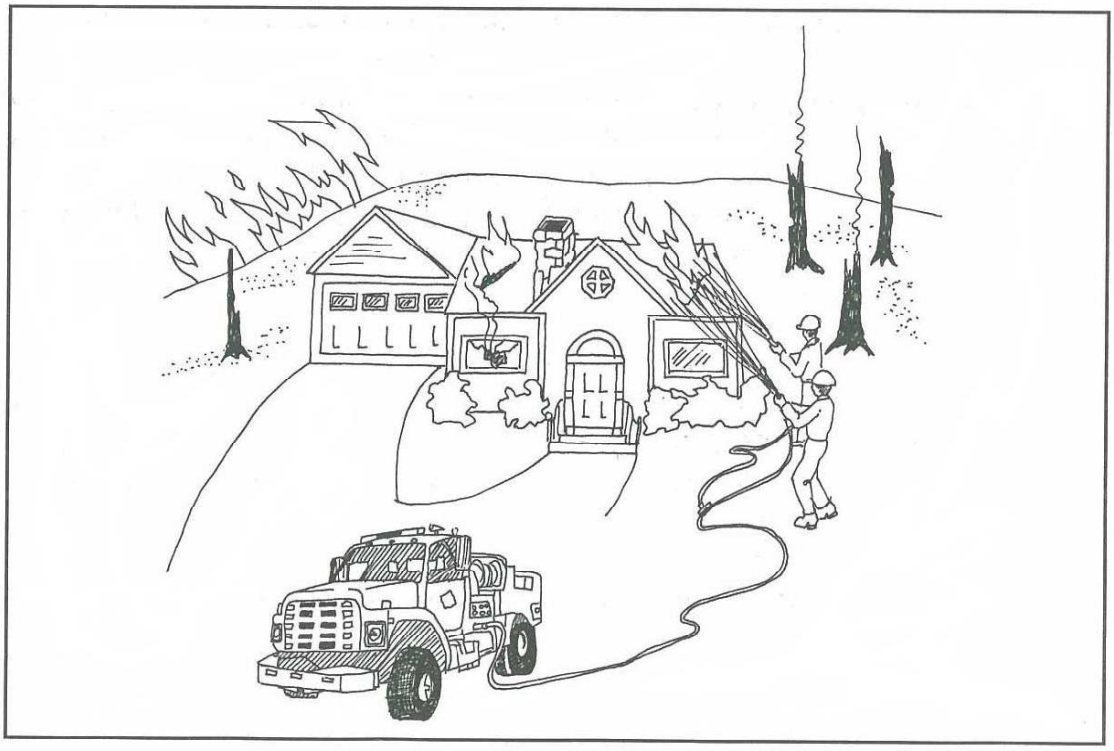
When you have split the fire front, use your working lines to lead the fire on around the structure. Essentially, peel the fire back and around the building.

After the main fire passes, put out any fire remaining on the fringes. Quickly check the structure for fire. Remember the common ignition points, and check thoroughly.

4. No containment around the structure.

No containment is possible. The wildland fire will blow through essentially unchecked. Your effort will have to be directed to the structure (see Figure 3).

Page 3 Figure 3 – No Containment



Direct all hose lines onto the structure and allow the wildland fire to bum past. If your position becomes undefendable or the fire intensity threatens your safety, then retreat to your pre-established safety zone and re-enter the area when the fire has passed. Again, remember the common ignition points, and check thoroughly. If the structure is on fire direct your effort to putting out the fire.

Flammable roofs are frequently ignited by wildland fires. When the fire on the roof is small, the key is to attack the fire immediately. It can be extinguished from the outside at this stage. Make sure the fire is out and remove the involved shingles to make certain.

When the fire has spread across the roof, the structure is seriously threatened, especially in high wind. The following outlines a technique that has saved some well involved structures with fire.

- An exterior line should be directed at the roof fire from close range. Working from the upwind side place the water stream at an angle to get water under the shingles. If the fire is on the downwind side of the roof, knock it down the best you can and then get some water directed up at the edges of the shingles.

- Simultaneously take a line into the interior to attack the fire in the attic or inner spaces of the roof if there is no attic. You want to intercept and stop the fire as it advances. Estimate where you think the leading edge of the fire is. Pull down the ceiling at that point and forget looking for the crawl hole, it usually takes too much time.

- Get a stream of water on the advancing fire edge as quickly as you can. Since fire is usually running up the roof slope, you will be directing the stream so that it gets somewhat in between the shingles. Use water only as needed. Indiscriminate use will cause excessive damage.

- Firefighters on the interior line should be wearing full protective turnout clothing and breathing apparatus.

Water Application

Wise water use is critical to the success of structure defense efforts! Effective application is the key to conserving water.

The timing of water application with respect to the passage of the heat wave is important. Wetting down structures and roofs before the fire arrives is usually a waste of time and water. In the face of winds, low humidity, and fire, the wetted surfaces will soon dry out and be susceptible to ignition. However, application of foam to structures prior to fire passage has demonstrated favorable results.

Use water to knock down the fire in surface fuels and prevent fire from spreading to structures if at all possible.

During the peak of the heat and smoke, it is tempting to squirt water at the wall of flame, hoping that it will somehow improve things. But, it will probable do little good and will waste water.

To escape the intense radiant heat, seek refuge behind something that blocks it. Duck behind a wall or stay below the roof peak on the sheltered side. Then step out and put water where it counts.

Remember to save enough water for self protection.

Summary Of Wildland/Urban Firefighting Concerns

What is your agency's policy on fighting fires in the wildland/urban interface and fighting structure fires? You must operate within your agency's policy and guidelines.

Look at all the factors that may influence your selected method of attack. A major difference from the usual structural tactics is that the fire source will be external to the building and not within. The structural fire is going to start on the outside of the building.

What kind of access is available? Is the road or driveway accessible with your equipment? Is the road blocked by a locked gate? Is there space to park one or more units? Can the trucks be turned or must you back all the way in? Are the homes on a cul-de-sac?

Take a good look at the forest fuels adjacent to the building you are to protect. Consider the species, the spacing or density; are there slash piles or other flashy fuels likely to become involved? Is there any clearing around the building?

Is there a water source near the building? Must water be delivered by a water tender? How far is it to the nearest water opportunity? Can you set up a portable pump?

Look out for open garage doors that allow firebrands to start an interior fire. Wood piles near the building will require a lot of water to control if ignited.

Heating oil storage tanks or bottled gas will present another hazard that must be considered.

Be alert for electric power lines. Downed poles or sagging lines are often encountered in the wildland fire.

How is the wildland fire spreading? In what direction and how fast? How will the wind and other weather factors affect the fire's advance? Are there any existing fire breaks or other topographic features that will influence the fire? How intense is this fire? Is it a crown fire? Are there any slash piles that may cause spotting or hot spots?

What is your position relative to the fire and its spread?

Dense smoke may hamper your movements and may disrupt your radio communications. How many buildings are endangered? Do you have enough equipment and personnel?

Assess the risk--consider all the factors: access, fire prone property elements, water source, hazards, fire behavior, forest fuels, weather, and number of buildings.

You must know the capabilities of your firefighters. Have they been trained in structural fire operations? Are relationships with other agencies clear and understood by all those involved? Are command and communication channels established?

Review the structural watch out situations on the next two pages.

**THE STRUCTIURAL SITUATATIONS THAT SHOUT "WATCH OUT"**

Presented by
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to
Region Three Engine Operators Workshop
April 9, 1991

1. Structures are wooden construction with shake shingle roofs.
2. Access is poor, i.e., roads are twisting with sharp curves, narrow single lane roads, dead end roads, inadequate turning radius at road ends, etc.
3. You have inadequate water supplies to attack the fire.
4. Natural fuels are within 30 feet of the structures.
5. There are strong winds and erratic fire behavior is occurring.
6. Structures are located in a "chimney" or canyon situations.
7. There are panic-stricken publics in the vicinity (known or suspected).
8. Structures have open crawl spaces and contain added fuels under the structure.
9. Bridges in the vicinity are narrow and/or have light or unknown load limits.
10. There are propane tanks or elevated fuel tanks present (most rural situations have).
11. There are septic tanks and leach lines (most rural situations have).
12. There are garages with closed, locked doors.
13. The structure is burning with puffing vs. steady smoke emissions.
14. Windows of the structure are black or smoked over.
15. Windows of the structure are bulging.

**CREATIVITY AND INNOVATIVE THINKING AT ITS BEST:**
**An adaptation of the structural firefighting watch out situations and the related six components of structural triage as re-evaluated and made easier to remember**

by
Jay W. Tischendorf
Hotshot Crewmember
Payson Hotshots

Structural "Watch Out Situations" can be remembered by the words - ALWAYS THINK SAFE - which stand for:

A - Access is poor (i.e., roads are narrow, twisting, single lane tracks with inadequate turning radii).

L - Load limits of local bridges are light or unknown, and the bridges themselves are of narrow proportions.

W - Winds are strong and erratic fire behavior is occurring.

A - Area contains garages with closed, locked doors.

Y - You have an inadequate water supply to attack the fire.

S - Structure windows are black or smoked over.

T - There are septic tanks and leach lines. (These are found in most rural situations).

H - House or structure is burning with puffing rather than steady smoke.

I - Inside and/or outside construction of structures is wood and they are topped with shake shingle roofs.

N - Natural fuels occur within 30 feet of the structures.

K - Known or suspected panicked publics are in the vicinity.

S - Structure windows are bulging and the roof has not been vented.

A - Additional fuels can be found in open crawl spaces beneath the structures.

F - Firefighting is taking place in or near chimney or canyon situations.

E - Elevated fuel or propane tanks are present.