Community Infrastructure

FEMA

Home Builder's Guide to Construction in Wildfire Zones **Technical Fact Sheet No. 17**

Purpose

To provide guidance about neighborhood and community-wide fire-safe practices that will enhance fire protection in wildfire zones. Guidance pertains to community infrastructure, including roads used for evacuation routes and emergency access, and emergency water supply. Although a home builder may not have control over these elements, community officials and homeowners should be aware of measures that can be taken on a community-wide basis to increase the chances of an entire neighborhood's survival in a wildfire.

Background

- Poorly designed or inadequate infrastructure can hamper fire-suppression efforts and put citizens and firefighters at risk. Reducing the risk of wildfire damage and destruction requires implementing measures beyond those involving an individual building or parcel. It is also essential to enhance mitigation measures at the neighborhood and community levels, which will effectively expand the zone of protection beyond the individual parcel or building.
- The local fire agency, state forestry or natural resources departments, the local office of emergency management, or other local organizations should be contacted to obtain information about the hazards and risks in an area.

Key Issues

- Emergency response vehicles may need to access a wildfire area at the same time evacuation traffic is leaving the area. Firefighters need safe access along roads to reach the wildfire and access water resources.
- Visible street signs and property addresses provide firefighters with critical response and location information. Property addresses are often not visible, and a road name may occur more than once in a jurisdiction.
- Wildland fuels and landscape vegetation along roads can place firefighters in extremely hazardous situations.
- Water resources for wildfire suppression are vital and need to be accessible.

Guidance for Roads and Driveways

- Roads should be wide enough to allow evacuation and emergency vehicles simultaneous access. Minimum width is 20 feet for access roads and 12 feet for driveways (see Figure 1).

- The maximum grade of roads and driveways should be determined by the local jurisdiction but in general should not exceed a grade of 16 percent.
- Roads and driveways should provide sufficient vertical clearance to allow for large emergency vehicles. The minimum is 13.6 feet (see Figure 1).
- Roads should support a minimum of 40,000 pounds to allow for heavy emergency vehicles.
- Appropriate signage, including but not limited to weight and vertical clearance limitations and one-way road and single-lane conditions, should be posted and fully visible on noncombustible signs and posts.
- Gated access from a public roadway should be set back from the roadway at a distance that is sufficient to allow emergency equipment to clear the traffic lane. A distance of 50 feet should be adequate for most equipment (see Figure 2).
- Turnarounds should be at the end of roads and on driveways that are longer than 150 feet. The minimum inside turning radius should not be less than 30 feet, and the outside turning radius for a turnaround should be 45 feet from the center line of the road. If a hammerhead/"T" is used, the top of the "T" should have a minimum length of 60 feet (see Figure 3).
- Roads and driveways should provide all-weather access, which may require asphalt or concrete surfacing.

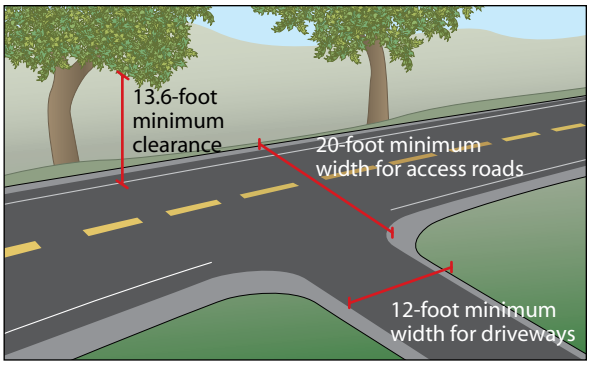

Figure 1. Road with adequate width for emergency vehicles.

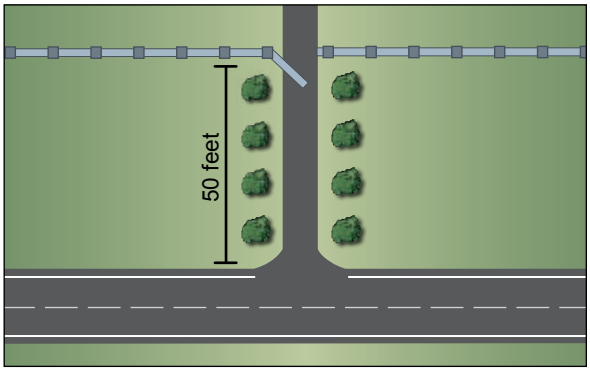

Figure 2. Gated access with a 50-foot setback that allows emergency vehicles to clear the traffic lane.

Figure 3. The top of the "T" used for a turnaround (Anchor Point Group, Boulder, CO).

Address and Signage

- Public and private roads and streets should be identified by a name or number through a consistent jurisdiction-wide system that provides for sequenced or patterned numbering and/or non-duplicating naming within each jurisdiction.

- Size of letters, numbers, and symbols for street and road signs should have a minimum 4-inch letter height and 1/2-inch stroke, be reflective, and contrast with the background color of the sign. The sign and sign support should be constructed of noncombustible materials.
- Street and road signs should be visible and legible from both directions of vehicle travel for a distance of at least 100 feet and be mounted at a height of 7 feet from the road surface to the bottom of the sign.
- All buildings should have a permanently posted address at each driveway entrance and should be visible from both directions of travel along the access road.

Fuel Modification

- Reducing the volume and density of combustible vegetation reduces the intensity of wildfire. Strategic fuel modification along access and egress routes increases safety for emergency fire equipment and evacuating citizens (see Figure 4).
- Areas such as golf courses, schools, and large parking lots should be labeled as safety zones for citizens unable to evacuate or for firefighters. It is critically important that these areas be evaluated by fire professionals before a safety zone is designated.

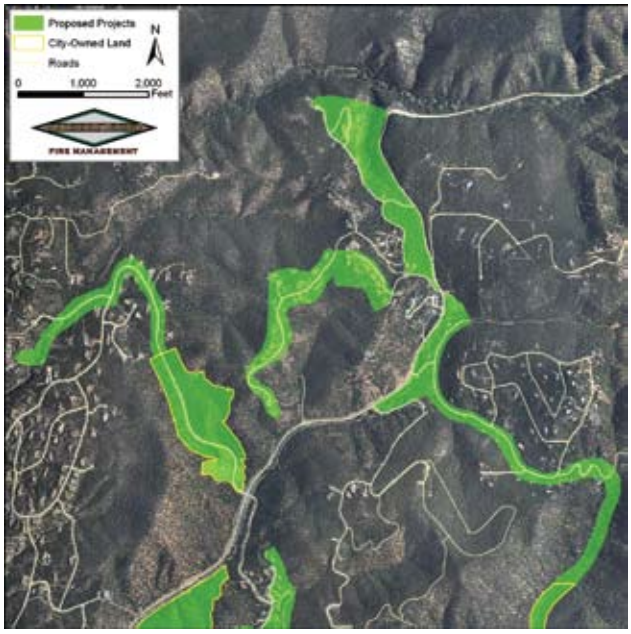

Figure 4. Example of a map depicting areas for planned fuel modification along evacuation routes/fire access roads (Anchor Point Group, Boulder, CO).

Guidance for Emergency Water Supply

- Community-wide water supplies need to be available and accessible.
- Signs should be provided indicating access to each water source.
- Vegetation should be maintained at each water source to allow safe access to the source.

Water Tanks and Pressure Systems

Some community water systems use tanks and cisterns to store emergency water supplies. Individual properties may be supplied with potable water through on-site wells or limited distribution systems due to the dispersed nature of the community or the cost of installing a major water delivery system.

- Water tanks should be constructed of highly fire-resistant materials such as steel, concrete, or ferrocement. Fiberglass tanks may be placed underground. All cisterns or water tanks used for

emergencies should have a fire department connection. The local jurisdiction may specify the size and type of fire department connection.

- Pressurized systems with hydrants should conform to the local jurisdiction's requirements or recommendations for spacing, flow, and pressure.
- Installation should meet National Fire Protection Association standards at the minimum.

Dry Hydrants

Many rural areas do not have access to the pressurized hydrants that are common in larger communities for firefighting. When pressurized systems are not available, dry hydrants are recommended. Dry hydrants are a relatively inexpensive way to provide a ready source of water for firefighting

A dry hydrant is a non-pressurized pipe system that allows fire equipment access to a nearby source of water such as a lake, stream, pond, residential pool, or cistern with a minimum water depth of 2 feet, or a water source such as a tank that is not directly accessible to a fire apparatus (see Figure 5).

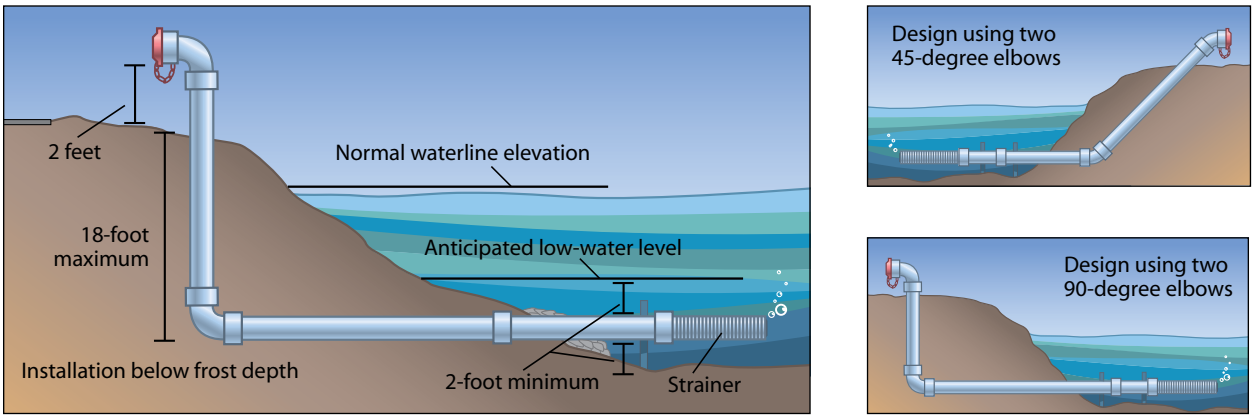

Figure 5. Dry hydrant designs.

Considerations

The fire-suppression capabilities in the area, as discussed above, should be considered when selecting a construction site (see Fact Sheet #3, Selecting the Construction Site).

For more information about infrastructure, see FEMA's *Wildfire Hazard Mitigation Handbook for Public Facilities*.

Effectiveness

The effectiveness of the recommended measures varies significantly, depending on the infrastructure elements that are present in the community.

Resources

California Administrative Code Title 14, Division 1.5, §1270–1276.

International Code Council. 2006. *2006 International Wildland-Urban Interface Code.*

National Fire Protection Association. 2001. *NFPA Standard 1142: Standard on Water Supplies for Suburban and Rural Fire Fighting.*

Natural Resources Conservation Service. Dry Hydrant Design Drawings. http://www.sc.nrcs.usda.gov/technical/dryhydrant.html.

Lagucki, T. and K. Mancl. Fire Protection in Rural Areas: Dry Hydrants for Ponds. The Ohio State University Fact Sheet: Food, Agricultural and Biological Engineering. http://ohioline.osu.edu/aex-fact/0422.html.

Rancho Santa Fe [California] Fire Protection District. Standard for Driveways, Dead-Ends and Looped Access Ways. http://www.rsf-fire.org/prevention/access_requirements.asp. Includes information on fire access road and fire hydrant specifications (specifications and ordinances may be different for other states, cities, and districts).

State of Minnesota. The Dry Hydrant Concept. http://files.dnr.state.mn.us/ assistance/backyard/firewise/dryhydrant_advantages.pdf.

Winter, A., S. Holman, S. Kett, and R. Dolan. 2006. *Taylor [Florida] Community Wildfire Protection Plan.* http://www.fl-dof.com/publications/fire_pdfs/taylor_fl_cwpp_complete.pdf. Includes improvements to wildland fire response, such as installation of dry hydrants and upgrades to communications equipment.