Healy Community Wildfire Protection Plan 2024

Appendix B - Home Ignition Zone

This should be read with the respective CWPP documents for Denali Borough, Cantwell, McKinley Village, Healy and Anderson, including the Appendices A, C and D.

This report was funded by the US Forest Service through the Alaska Division of Forestry and Fire Protection. It was prepared for the Denali Borough Alaska by Bintel Inc with partners Fire Adaptive Solutions, FirePoint Forestry and Athena Intelligence.

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Appendix B – Home Ignition Zone Recommendations

Introduction and Home Ignition Zone Definitions

INTRODUCTION

The Top Priority in the Conclusion Section of all the Denali Borough CWPPs is homeowner/resident home hardening and defensible space. Specific recommendations for the Home Ignition Zone (HIZ) priorities below are described further in this appendix:

1) for existing structures to implement defensible space techniques and be fire hardened to the greatest extent practical.
2) for ignition resistant construction and defensible landscaping to be incorporated into future development.

Most homes in all the Communities of the study area will benefit from fuels management in the Home Ignition Zone (HIZ) and structure hardening. Even vacant and abandoned residential properties should implement the practices in this appendix. Proper HIZ maintenance and structure hardening will help prevent fires that could spread to surrounding structures or wildland fuels and reduce the potential for structure loss through ember cast in the event a fire does involve the structure.

Structure hardening and ignition resistant plantings will be discussed later in this appendix, but first, we'll cover the basic practices involved in fuels management in the HIZ. The defensible space concepts presented below can be applied to closely built groups of homes as well as individual homes built on larger lots with greater spacing. In fact, in high density neighborhoods where structure separation distance is small, cooperative participation in fuels removal and modification is imperative as the ignition of a single structure has a disproportionate effect on surrounding structures compared to neighborhoods where structure spacing is greater. The authors and stakeholders of this report recognize the difficulty involved in coordinating groups of homeowners and land managers; however, the creation of defensible space and structure hardening will produce the greatest benefits for the protection of life and the conservation of property from the effects of wildfire. For more information on broader community protection, please visit https://fireadaptednetwork.org/ .

What is The Home Ignition Zone?

There are primarily two factors that determine a home's ability to survive wildfire: the ignitibility of the structure, and the quality of the defensible space surrounding it. These two factors are combined in the HIZ (See **Figure 1**), which considers both the structure itself and the space surrounding it when designing actions to mitigate the effects of wildfire.

One of the greatest challenges to limiting the potential damage from wildland fires in the study area is the lack of adequate defensible space. In neighborhoods where, for any number of reasons, it is impossible to create adequate individual defensible spaces, cross-boundary cooperation will be necessary to execute effective treatments. Throughout the study area, land

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adjacent to homes is of varied ownership, and any fuels modifications extending beyond lot boundaries will require collaboration and perhaps special permission to implement. Homeowners need to be aware they cannot cut and dump behind their property to create defensible space.

Under extreme conditions, wildland ignitions could quickly involve homes located on the edge of natural fuels and spread through neighborhoods by house-to-house transmission. This type of fire spread was observed in the 2018 Camp Fire that destroyed over 18,000 structures, most of which were burned in the first four hours of the fire and resulted in 85 civilian fatalities. The town of Paradise lost 95% of its structures.[1] It is not possible to develop effective individual defensible space where structures are spaced close together; however, it is possible to create linked defensible space by building defensible perimeters around clusters of dwellings and replacing flammable vegetation and manmade materials near and between structures with ignition resistant plantings and noncombustible materials.

Much of the following general defensible space information has been adapted from guidance provided by the Alaska Wildland Fire Coordinating Group. The entire *Firewise Alaska* PDF document may be viewed on this website, https://fire.ak.blm.gov/content/admin/awfcg/D.%20Brochures%20and%20Educational%20Materials/Firewise%20Alaska%20Part%201.pdf .

The specific distances quoted below are guidelines, and depending on circumstances of fuels, topography, and ownership, these distances may need to be modified. Although there are no state level code requirements for defensible space management in Alaska, municipalities and local fire departments may have their own regulations. No such local regulation exists within the Denali Borough; however, the following recommendations are based on widely accepted standards.

Defensible space is defined as an area around a structure that has been modified to reduce fire hazards. Natural and manufactured fuels are treated, cleared, consolidated, or substituted with ignition-resistant landscaping to slow the spread and intensity of fire. The development of defensible space involves zones in which different techniques are deployed. These zones should be developed for every structure on the property including detached garages, storage sheds, barns, etc., as well as the home. The specific design depends on many factors, including, but not limited to, the size and shape of buildings, construction materials, topography, and vegetative type. Although some defensible space standards exempt buildings less than 120 square feet that are not used for habitation, research published in NIST Technical Note 2205, *WUI Structure/Parcel/Community Fire Hazard Mitigation Methodology* demonstrates small auxiliary fuels including outbuildings, fences and even vehicles can act as fuel jackpots reducing structure separation distance and potentially creating a high exposure to residences. Tight spacing of fences, sheds and other auxiliary fuels also negatively affect the safe operation of responders as well as the survivability of structures.[2] Their conclusion is that small auxiliary fuels (including

structures) should be removed or relocated if they are within 25 feet of the target (residence or other asset to be protected).[3]

It is very important to ensure where relocation of flammable materials, such as wood piles, away from the home is recommended, that relocation does not place those materials too close to other flammable structures or linear features, such as fences, that could create a pathway for fire to adjacent properties. The location of cars, boats and recreational vehicles is often not considered in defensible space plans, but these are combustible and can provide pathways for fire spread. Relocation of fuels can be difficult to accomplish in higher density neighborhoods, such as some in Anderson City and Central Cantwell, and is a tactic best suited for larger lots where combustibles can be more adequately separated. In developments with small lots, and/or little structure separation, removing hazardous fuels and replacing combustible architectural features with non-combustible alternatives is likely to be the best way to create defensible space. When planning defensible space, the location of flammable structures and other fuels should always consider not only the distance to structures on that individual property, but distances to structures and flammable features on adjacent properties.

The zone definitions below conform to Firewise Alaska designations. Zone 1 is defined as within 15 feet of structures, Zone 2 extends from 15 to 30 feet of structures, and Zone 3 from 30 to 100 feet of structures (or to the property line if it is less than 100 feet).

In addition to the resources on the Firewise Alaska website (https://fire.ak.blm.gov/content/admin/awfcg/D.%20Brochures%20and%20Educational%20Materials/Firewise%20Alaska%20Part%201.pdf), an Alaska specific Firewise vegetation guide including a list of fire-resistant plants, and also flammable plants that should be avoided, can be found on this website, https://www.muni.org/Departments/Fire/Wildfire/Documents/Firewise_Alaska_Vegetation_Guide.pdf .

While these websites are useful references, the distances given vary and should be considered guidelines. Local fire authorities should always be consulted when planning defensible space treatments.

Zone 1 is the area within 15 feet of the structure. Zone 1 distance is measured from the outside edge of the eaves, decks, or other attached projections.

- In general, nothing should be planted in the first three to five feet from the structure, and ground cover should be limited to non-flammable materials such as gravel, cement, or flagstones. Outside three to five feet of the building, but still within 15 feet of structures, rocks, gravel and small fire resistive plantings, such as flowering plants, should be used to edge the building. No combustible bark or mulch should be used for landscaping in this zone.
- Conifers (planted or native) and vegetative debris such as dead or dying vegetation, leaves, needles, cones and bark should be removed.

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- Combustible items on decks such as outdoor furniture, planters and flammable ornaments should be limited.
- Needles and any other flammable debris should be removed from any decks or projections and raked to five feet away. Raking this material more than five feet has not been shown to significantly reduce the likelihood of ignition and is not recommended.
- Remove any branches that overhang the roof or are within 10 feet of a chimney or stovepipe.
- Firewood and any lumber piles should be relocated to Zone 3.
- Trash and recycling bins, boats, RVs, and other combustible items should be located outside this zone.

Zone 2 extends from 15 to 30 feet from the structure and is managed to reduce the intensity of approaching fire. Fuels management in this Zone consists of the following:

- Remove any stressed, diseased, dead, or dying trees or shrubs.
- Create at least 10 feet of crown spacing between individual, or small groups of white spruce and other conifers. Groups of two or three trees may be left in some areas, but a spacing of 30 feet is recommended between such groupings.
- Remove ladder fuels and prune branches from tree trunks up to a height of at least six feet for trees 12 feet or more in height or 1/3 of the tree height for smaller trees. The remaining branches should be no less than 10 feet from other trees. Trees should be pruned in late summer or fall, and limbs should be cut no less than ¼ inch from the trunk to preserve tree health.
- Leave a minimum distance of 2 ½ times the mature height between groups of shrubs.
- Groups of shrubs should be no larger horizontally than twice the mature height.
- There should be a vertical gap of at least three times the height of any shrubs to the lowest branches of trees.
- Mow grasses to a maximum height of three inches. This is especially important after grasses have cured.
- Woodpiles and burn barrels should be located outside Zone 1, and preferably outside Zone 2, but regardless of location there should be a 10-foot clearance down to mineral soil around any woodpile. Do not make woodpiles any larger than necessary.
- Propane and fuel oil tanks should have 10 feet of clearance to mineral soil in all directions. Ideally propane tanks should be located where there is no flammable vegetation for at least 20 feet from the tank's exterior.
- Remove dead or dry vegetation such as piles of leaves and needles.

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- Avoid heavy accumulations (known as jackpots) of fuels on the ground including logs, slash, mulch piles or storage piles of other flammable materials, both natural and man-made.

The distances given here are minimums and should be increased for slopes and dangerous terrain features. We strongly recommend a fire or forestry professional be consulted when planning defensible space in steep or complicated topography.

Zone 3 is designed to provide a gradual transition between Zone 2 and the natural vegetation condition of the surrounding lands. This zone extends from 30 to 100 feet, or to the property line if it is less than 100 feet, from structures and is managed to promote vegetative health and limit fire behavior. Generally pruning trees in late summer or fall is best for tree health. A useful guide to mitigating spruce bark beetle that has heavily infested spruce stands in the southern areas of the Denali Borough can be found at www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5303039.pdf .

Healthy forests usually contain various ages, heights, and species; however, reducing ladder fuels and maintaining or creating crown spacing should be primary concerns. Your local fire department should be consulted for management guidance for properties extending beyond 100 feet from structures and for defensible space planning in steep or complex topography.

Existing structures can be difficult to fire harden. Removal, reduction and/or relocation of fuels should always be implemented as the primary defensive measure. Creating defensible space is not a one-time job. To be effective, defensible space must be maintained on an on-going basis.

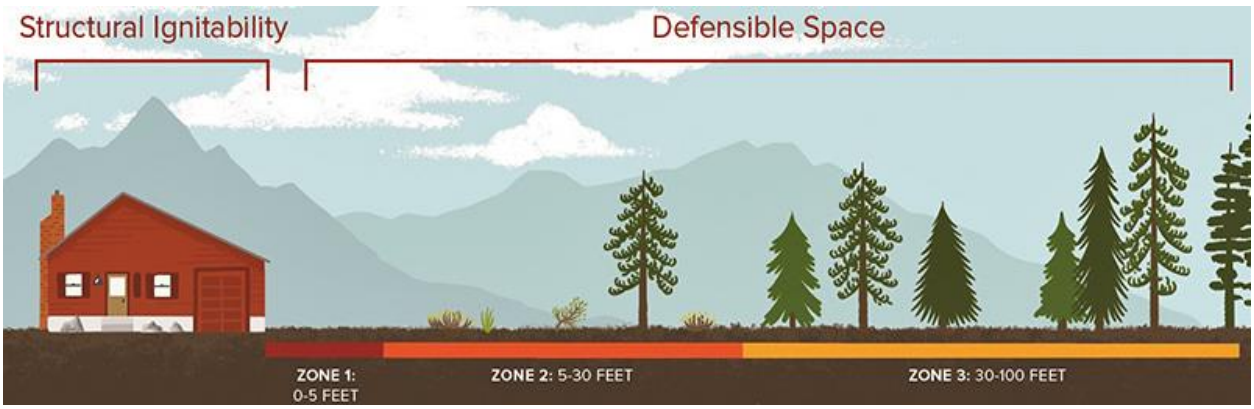

Figure 1 - The Home Ignition Zone[4]

Ignition Resistant Landscaping and Structure Hardening

Ignition-Resistant Landscaping

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Ignition-resistant landscaping generally includes widely spaced trees, low-fuel volume shrubs, and herbaceous groundcover. Ignition-resistant, native re-vegetation should be considered at least as far as the 30-foot perimeter of Zone 2. In areas where it is practical and desirable, replanting with fire-wise species and implementing proper planting practices will provide the following benefits:

- Reduce fire risk by limiting the ability of invasive and flammable species to return.
- Protect bare soils from erosion.
- Promote natural beauty and ecological stability without sacrificing adequate wildland fire protection.

Examples of fire-wise planting practices would be to space trees widely to interrupt the continuity of aerial fuels, plant low-fuel volume shrubs (usually no greater than 18 inches in height) and integrate decorative rocks and non-combustible natural features into the landscape design. Deep watering trees through the summer, fall and during dry periods will keep trees alive and deter insects. Healthy, well-irrigated plants are less flammable, and irrigation systems can reduce the intensity and spread of surface fires.

Drought-resistant plants and irrigation systems should be utilized in newly planted areas. Existing plants that are fire resistant do not have to be replaced to reduce the fire risk; however, flammable varieties such as white spruce should be avoided. There is an Alaska specific Firewise vegetation guide available here, https://www.muni.org/Departments/Fire/Wildfire/Documents/Firewise_Alaska_Vegetation_Guide.pdf . Emphasis should be placed on the use of the fire resistive species listed here. Any retained natural vegetation needs to be maintained at a conservative fuel level and arrangement. Decorative rocks should be integrated into the design. Stone will help anchor and stabilize soil, break fuel continuity, and provide a natural look to the landscape.

Careful planting of a Firewise landscape can provide open space and common areas with natural beauty and ecological stability without sacrificing adequate wildfire protection.

To retain the health and vigor required to be fire-resistive, plants require maintenance. Vegetative maintenance is a critical factor in safeguarding these species' ignition-resistant qualities and continuing resistance to undesirable fire effects. On-going maintenance should include adequate watering, removing of dead material, weed control, cutting grasses to three inches or less, pruning trees and shrubs to prevent the buildup of ladder fuels, and removing surface fuel jackpots. Ladder fuels and fuel jackpots contribute to crown fire development and ember cast during fires.

It is important to remember fire mitigation is not a one-time job. Defensible space should be maintained year-round, and reducing structural ignitibility is an ongoing process.

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The Importance of Reducing Structural Ignitability and Individual Parcel Assessments

In their 2013 publication *How Risk Management Can Prevent Future Wildfire Disasters in the Wildland-Urban Interface,* David E. Calkin, Jack D. Cohen, Mark A. Finney, and Matthew P. Thompson come to the following conclusion:

"The demonstrated inability to suppress wildfires under extreme weather conditions and the fact that many homes are not destroyed when exposed to these wildfires indicates that reducing home ignition potential is key to effectively reducing home destruction. Because home ignitions are primarily determined by conditions on private property, the principal authority, and thus, primary responsibility for preventing WUI home destruction lies with homeowners rather than public land managers."[5]

As mentioned earlier, the HIZ is comprised of the structure itself and the area within the first 100 feet (or depending on topography as much as 200 feet). Individual home hazard assessments can provide a road map for homeowners to reduce the ignition potential of the HIZ; however individual assessments rely heavily on the evaluation of conditions existing from the structure up to as much as 200 feet out. As such, they are most effective when lot sizes are one acre or greater.

Many homes throughout the Denali Borough, especially isolated homes on large lots, could receive the most benefit from parcel-level hazard assessments; however, in neighborhoods where lot sizes are less than an acre and placement of outbuildings results in reduced structural separation, it is unlikely individual parcel assessments will yield much actionable information. We recommend individual parcel assessments focus on areas where the average lot size is one acre or larger and structure separation is 100 feet or greater. For neighborhoods where homes are located closer together, we recommend focusing on reducing HIZ ignition potential through linked defensible space and structure hardening tactics discussed in this appendix. In areas where structure separation distances and lots are large enough to benefit from parcel-level assessments, the data gathered should be integrated with the Community-level structural ignitability analysis presented in *Appendix A: Communities* to establish a framework for cooperative future mitigation efforts.

Structural Hardening Recommendations

NEW DEVELOPMENT

The best time to reduce the ignitibility of a home is before it's built. Therefore, we recommend during the planning stage questions such as these be addressed:

- Can the adjacent fuels be modified to create adequate defensible space for homes considering the fuel type and topography?

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- What is the potential fire behavior and ember cast from fires approaching the development during both typical and extreme fire weather conditions and can structures be constructed to be stand-alone in those conditions?
- Will complex forms or flammable materials in the architectural design trap heat and embers?
- Are the road widths, grades and surfaces adequate for safe operation of emergency vehicles and evacuation of residents?
- Does the design of roads and driveways include adequate pullouts, turnarounds and sufficient access to water for fire suppression?
- If there is no readily accessible water supply for fire suppression, should one adequate for the proposed number of homes be included in the development?
- Are there multiple safe access points to residences?
- Are streets and home addresses visibly marked with consistent, reflective signage?

EXISTING COMMUNITIES

Although some of the factors impacting the survivability of structures are best addressed before the home is built, there are important steps that should be taken to improve the chances of survival for existing homes.

Construction materials are rated for relative fire resistance using the Flame Spread Index, which measures how fast and far flames spread over specific materials. The lower the number the better. Materials with a flame spread rating of 0-25 are classified as Class A, materials with a rating of 26-75 are classified as Class B and materials with a rating of 76-200 are classified as Class C.

The role of embers in structure loss cannot be overstated. Embers are generated by burning materials and lofted by wind and convective heat ahead of the main fire front. Structures are vulnerable to ember penetration in numerous ways. Some of the more common areas are discussed below.

Roof: Unfortunately, there are homes and outbuildings in the study area with flammable roofs. The roof of a structure has a significant impact on its ignitability and the likelihood of house-to-house fire spread. Class A roofing materials such as asphalt shingle, metal, and terracotta tile are considered the most resistant to embers and firebrands. Roofing products with a Class C rating should not be used for roof repair, replacement or new construction in wildland, WI or WUI locations. We recommend future use of any functional or decorative wood shingle, tar paper, untreated OSB or other flammable roofing material for repair or replacement be prohibited.

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Decks: There are many homes in the study area with wooden decks, stairs and/or projections. According to some fire authorities, wooden decks are so combustible that when a wildfire approaches, the deck often ignites before the fire reaches the house.[6] The shape of decks and outdoor stairs makes them excellent traps for heat and embers. Nothing flammable should ever be stored under decks or projections because of this.

We recommend that as wooden decks and projections found throughout the study area become in need of repair or replacement, fire resistant decking materials be strongly encouraged. The quality and number of choices for wood substitute building materials have grown exponentially in the last decade, and homeowners are no longer limited to materials with an inferior look and finish. The following is a comparison of the fire resistance of commonly available deck materials.

- **Steel and Aluminum** – The most fire resistive materials commonly used for decks are steel and aluminum. Steel steps and deck frames with aluminum deck material are not receptive to ember cast and, in most cases, not compromised by even direct flame impingement. These decks may have steel, concrete or heavy timber supports (6" x 6" or greater). In this application heavy timber supports are unlikely to ignite if they are anchored in concrete. Due to their vertical orientation and connection to non-flammable materials, ignition from ember cast or surface fire is unlikely, however timbers used for this application should be treated with fire retardant chemicals even though their low surface to volume ratio makes them less susceptible to ignition than lighter wood supports.
- **Composite Materials** – Composite deck materials are made of wood and plastic fibers and vary widely in their fire resistivity. In general, composites are a better choice than wood for deck material but any composite deck product for use in WUI, WI or wildland areas should be specifically designed to reduce fire spread and ember generation. Look for composite deck products that have Class A or Class B ratings.
- **Trex Decking** - Trex decking is an example of a fire resistive composite material. Trex products, however, vary in their composition and some are better than others for fire resistivity. Some Trex products only carry a Class C rating. The Trex "Select" and "Transcend" deck boards are rated as Class B. When exposed to high temperatures Trex melts rather than burns so fire spread from ember generation is not a concern like it is for treated wood decks. If you're looking to buy any composite deck material, be sure to let your salesperson know your intended use is to replace a deck in an area with high wildfire potential.
- **PVC Decking** – PVC deck boards are usually made from 100% polymer and contain no wood fibers. Some PVC decking has been engineered to earn a Class A rating, however that is not true for all PVC decking. Although PVC does not contribute to ember cast and, when properly engineered, resists fire spread, PVC has a melting point of 185° F and a service temperature of only 140° F. Fire line intensity in most wildland fires exceeds these temperatures. Like composites, which generally melt at between 250° F and 350°

F, PVC decks melt instead of burn, which does not contribute to fire spread, however the low melting point of PVC decks makes their structural integrity questionable after even a minor flame exposure.

- **Treated Wood** - Although wood treated with fire retardant chemicals can receive a Class A rating, we do not generally recommend treated wood for deck material due to the fact that high UV and weather exposure will cause the chemical treatment to leach away over time leaving you with fire resistance no better than a traditional wood deck. There are some very dense hardwoods available with natural fire-resistive properties, but these tend to be very expensive and require frequent cleaning and treatment with UV resistive oils (some of which are quite flammable) to maintain their appearance.
- **Aerated Concrete** – Even though traditionally it hasn't been used for decks, aerated concrete blocks made of aluminum and concrete are half the weight of traditional concrete blocks and can be cut with a handsaw. Like steel and aluminum, this material is non-combustible. It also has robust insulation properties. This material looks like traditional concrete blocks and cannot imitate the look of wood like modern composites and PVC deck materials can. Other than exotic hardwoods, aerated concrete block is the most expensive material mentioned here.

In addition to reducing fire hazards, these materials usually require much less maintenance than wood. In areas where fire behavior predictions call for low to moderate intensities, it is helpful to isolate existing wooden decks from the energy of fires by building a non-combustible patio and wall below the deck to limit the heat trap effect. The best design is to enclose the deck completely to create a solid form.

Windows quickly fail when exposed to the radiant heat of a wildfire. Once windows have failed, they provide a direct path for embers and heat to enter the home and ignite the inside. Although some of the newer homes in the study area have more heat resistive windows, such as low E Thermopane (double glazed) and tempered glass patio doors, most older homes are likely to have conventional single-pane window glass. This is especially true of homes that were built originally as seasonal residences.

We recommend replacing single-pane windows with modern double-pane windows that will improve the resistance to breakage from heat exposure by up to double the exposure time.[7] Homes near heavy fuels should consider installing heavy, non-flammable window coverings that will afford the home some additional protection from embers in the event windows break. Homes in these areas should also consider replacing large windows (2 feet or more wide or tall) with smaller panes that are more likely to stay in place even if fractured by heat.

Vents are another location where embers can enter the structure. Vents, especially vents on the downhill side of the home, should have flammable vegetation removed as per Zone 1 defensible space standards and be protected by non-flammable landscaping features such as stone or brick that will block the heat path of the fire. Vents in eaves and soffits should be covered with a non-combustible mesh with openings 1/8" or smaller to slow the ingress of

embers. Any open eaves should be enclosed to prevent them from becoming a trap for heat and embers. When enclosing an open eave, a flat soffit is preferred over a sloping soffit to limit the heat trap effect.

Propane and Fuel Oil Tanks: Above-ground propane tanks should be installed at least 30 feet from homes (outside Zones 1 and 2). This recommendation is for new installations, not existing tanks. Any coal piles maintained for primary, or backup home heating should also be located at least 30 feet from structures. A 10-foot buffer down to mineral soil in all directions surrounding propane and fuel oil tanks should be established and maintained. All flammable vegetation should be removed from within 20 feet of tanks, lines, and meters.

Historic fire events have proven that poor construction techniques and materials are linked directly to structure loss, reinforcing the message of the research quoted earlier in this appendix. The Insurance Institute for Business and Home Safety (IBHS) wildfire research center has developed a video demonstrating how various home construction materials burn during an ember storm (https://www.youtube.com/watch?v=IvbNOPSYyss).

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For more detailed information regarding structure hardening and vulnerabilities of various construction methods and materials, please see the following links:

- Fire resistant materials and techniques for new home construction). https://uphelp.org/guest-blog-fire-resistant-building-materials-for-new-home-construction/?print=print
- https://www.ready.gov/sites/default/files/2020-03/home-builder-guide-construction-defensible-space.pdf (FEMA *Home Builder's Guide to Construction in Wildfire Zones*)
- https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1141 National Fire Protection Association (NFPA) 1141, *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas*.
- As part of the Emergency Response and Responder Safety Document Consolidation Plan (consolidation plan) as approved by the NFPA Standards Council, NFPA 1141 has been combined into a new consolidated Standard NFPA 1140. As a result of this action, the current edition (2017) of NFPA 1141 shown in the link above is the last published edition of NFPA 1141 content as a stand-alone standard. For further information and text of the current consolidated Standard, go to NFPA 1140 at, https://www.nfpa.org/codes-and-standards/nfpa-1140-standard-development/1140
- https://www.youtube.com/watch?v=vL_syp1ZScM *Your Home Can Survive a Wildfire* NFPA video presentation.
- https://ibhs.org/wp-content/uploads/member_docs/Lessons-Learned-from-Waldo-Canyon-Fire_IBHS.pdf (Lessons learned from the Waldo Canyon Fire)

REFERENCES/CITATIONS

[1] https://www.fire.ca.gov/our-impact/remembering-the-camp-fire
[2] https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.2205.pdf (Pages 19, 20 and 34).
[3] Ibid (Page 32).
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