Roof Vent Protection from Wildfire Embers

Sandia Heights Homeowners Association
Environment & Safety Committee

by Dave Jenkins, Sandia Heights NM
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OUTLINE

- 1: Introduction
- 2: Why Harden your Home against Wildfire
- 3: Kinds of Roof Vents on Sandia Heights Homes
- 4: Vent Protection Tools and Supplies
- 5: Examples of Protection for Various Kinds of Vents
- 6 References, Education Videos, etc.

This seminar will focus on Parts 3-5.

Wildfire risk and reasons to install protection will be discussed as needed. Other wildfire preparation measures (landscaping, natural fuel removal or reduction, evacuation routes, etc.) may be discussed in future seminars depending on community interest.

PART 1 Introduction, Purpose, Disclaimer

- Please note that this entire presentation is available on the Sandia Heights Homeowners web site.

Introduction

- I am a 13 year resident in the Cedar Canyon neighborhood of Sandia Heights
- I never thought about wildfire until shocked by the 2023 Lahaina, Hawaii fire and scared by the 2025 Los Angeles fire.
- Have attended on-line seminars, BernCo wildfire education classes & read online materials
- Not a wildfire expert! Never fought a wildfire.
- Want to help protect my home and community from wildfire.
- I personally installed the measures described in this presentation on my own home.

GOOGLE: DEFINE Home Hardening for Wildfire Protection

- Home hardening is the process of using fire-resistant construction materials and maintenance practices to make a home more resistant to ignition from wildfire embers, direct flame contact, and radiant heat. It focuses on retrofitting or building with specific materials to seal vulnerable areas, such as roofs, vents, and windows, preventing embers from entering. (*calfire.gov*)

HOME HARDENING SEMINAR PURPOSE

- Summarize and distribute information available from public sources to Sandia Heights residents & their contractors regarding wildfires and home hardening measures.
- Demonstrate home hardening measures from public sources which I installed on my own home
- Provide references to information sources for further study
- Encourage Homeowners to take action on their own property

DISCLAIMER

- **NO HOME IS FIRE PROOF! The measures described in this presentation do not guarantee protection of your home against all fires under all conditions.**
- Each home is different. Each fire is different
  - Ignition location, season, time, weather & wind, fuel, access, other fires, etc.

- *No regulatory body or insurance provider in New Mexico currently requires implementation of the home hardening measures against wildfire.*
  - This may change in the future. Insurance companies have left some States where risk is too high. Regulations may be imposed **IF** the State of New Mexico becomes an "Insurer of Last Resort"

- Without regulation or "official" guidelines for New Mexico, much of this presentation is based on measures which have worked or been recommended or required elsewhere.
- **At this time, homeowners choose the home hardening measures most appropriate for their home and situation.**

We can Harden our Homes against Wildfire Embers

- This presentation shows simple measures to harden homes against embers from wildfires.
- Includes examples of retro-fit screening on roof vents typically found on homes in Sandia Heights.

- **HOME OWNERS must decide if these measures or others described in the videos referenced are suitable for you, your home and your neighborhood.**

Part 2
WHY HARDEN YOUR HOME AGAINST WILDFIRE?

Key Concepts to be Covered

- What makes Sandia Heights vulnerable to wildfire.
- Wildfires and Home Ignition
- How to make typical homes in Sandia Heights more resistant to wildfire.

- **The more homes protected, the more the neighborhood is protected.**

- **Homes resistant to wildfire make time for fire fighters to control the fire without diverting resources to secondary fires**

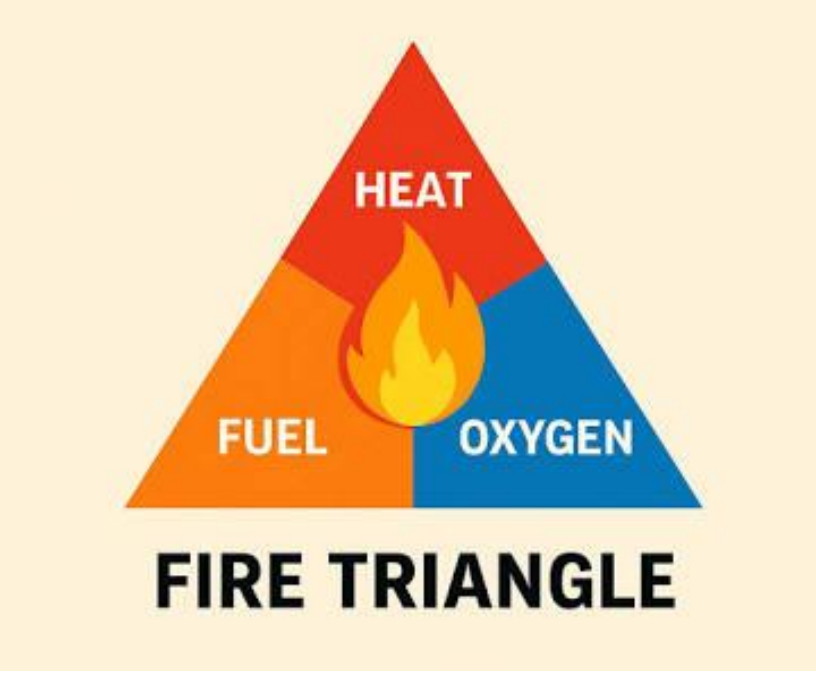
What makes Sandia Heights vulnerable to wildfire?

- Borders 3+ miles of National Forest Boundary plus undeveloped land of the Sandia Pueblo
- Accumulated dried vegetation in miles of arroyos in every Sandia Heights neighborhood.
- Natural and man-made sources of ignition can occur anytime
- Any fire (electric, kitchen, dryer lint, fireworks, outdoor burning, lightening) can become a neighborhood wildfire under some conditions
- Typically have low humidity and frequent high winds

What Makes Fire ?

- Fire needs three essential components:
  - **fuel**, **heat**, and **oxygen (** + source of ignition**)**
  - If any of these elements are removed or restricted, the fire cannot start or will self extinguish quickly.
  - Oxygen level hard to reduce & we can't move our homes!
- **Fuel management is a key to limiting wildfire temperature and duration**

Don't let your house become wildfire fuel! Removing dried leaves and other potential fuel materials near your home and on your roof can improve the odds your home might survive a wildfire.



Wildfire Strategy in Sandia Heights

- Wildfire protection strategy may differ depending on lot size, home construction, topography, vegetation, etc.
- Sandia Heights is located in the Wildland/Urban Interface (WUI) zone
  - Some houses are on large lots with natural fuel adjacent to house (Wildland Zone).
    - Natural vegetation is principal fuel
  - Houses on small lots in the Urban Zone may be only 10 feet apart. Direct contact with fire & radiant heat from an adjacent home fire is a threat.
    - Houses are the principal fuel as in the LA fire in January 2025

What has been Done Already?

- SHHA has sponsored seminars about wildfire
- SHHA is evaluating emergency evacuation routes
- After the LA fire, Sandia Heights Utilities added generator capacity to pump water if PNM turns power off.
  - Generators pump water and do not supply power lines to homes.
- Also have water in storage tanks around Sandia Heights.
- Water lines and fire hydrants are present throughout Sandia Heights unlike some communities nearby.

PREPARE BEFORE A FIRE STARTS

- A catastrophic fire may require immediate evacuation. There may be no time to implement personal home protection measures.
- **What can an individual homeowners do to reduce the risk of home loss during wildfire?**
- 1: Lower risk of home ignition
- 2: Install passive protection measures which function without assistance.
- 3: Reduce local fuel supply to slow fire spread and reduce fire temperature and duration.

3 CAUSES OF HOME IGNITION BY WILDFIRE

Flying embers are the cause of up to 90% of homes destroyed by wildfire

When we think about wildfires, we generally envision huge walls of flames engulfing homes. The reality is that most homes do not ignite from direct contact with a flame front. In fact, it's estimated that 90% of homes are destroyed indirectly by wind-borne embers that are carried ahead of the fire perimeter. When the heat generated by an intense wildfire is combined with wind, small burning embers can travel several miles away from the fire perimeter.

THREE REASONS HOUSES BURN DURING A WILDFIRE

https://www.frontlinewildfire.com/wildfire-news-and-resources/wildfire-embers-how-homes-catch-on-fire/

3 Causes of Home Ignition by Wildfire

- Direct Contact with the fire.
- Radiant heat from burning structures or vegetation.
- Airborne embers.

- The first two of these ignition causes require close proximity to the fire.
- Airborne embers are the biggest problem because they can cause home ignition miles downwind from the fire front.
- **This is why 50-90% of home ignitions by wildfire are caused by airborne embers.**
  - **Many embers and lots of flammable targets = more fires**

3 Ignition Causes – Flying Embers Most Important

- **Some estimates state more than 90% of home ignitions by wildfire are caused by windborne embers ahead of the fire front.**

- *"Wind-blown embers are the principal cause of building ignitions."*
  - (Quarles, Stephen L. Vulnerability-of-Vents-to-Wind-Blown-Embers_IBHS AUG 2017)

- **"In southern California, over half of homes which are damaged or destroyed by wildfire are ignited by windblown embers."**

  (Pauline Allen, Resource Conservation District of the Santa Monica Mountains)

- **Protection against Secondary Fires from flying embers must begin before the fire starts.**

Consequences of Secondary Fires

- **<u>Flying embers can ignite homes more than a mile from the active fire.</u>**

- Secondary fires started by wildfire embers divert fire fighters, equipment and water from the front lines of firefighting.
  - U.S. fire departments typically equipped to fight 1 large house fire and protect adjacent structures.
  - 2nd or 3rd fire may require longer response time from farther fire departments.
  - More importantly, the 2nd or 3rd house fire tells the fire departments the fire is getting out of control.

- **Preventing or delaying secondary fires reduces chance of burning entire neighborhoods.**

FRONTLINE WILDFIRE DEFENSE

There are things we can do to reduce our home's risk from wildfire.

Preventing ember ignition can save homes

In March of 2019 the Insurance Institute for Business & Home Safety (IBHS) simulated an active wildfire by showering embers on a duplex house structure in their test chamber in South Carolina. The house was built and landscaped on one side as a wildfire-resistant structure, and on the other side with common materials used when wildfire resistance is not a consideration. The wildfire-resistant side did not burn, highlighting the fact that if embers don't have any fuel to ignite, the chance of a home being destroy by wildfire is reduced significantly.

https://www.frontlinewildfire.com/wildfire-news-and-resources/wildfire-embers-how-homes-catch-on-fire/

Why install roof vent protection?

IT MAKES **TIME** for firefighters!

- Reducing home vulnerability to wildfire embers helps prevent secondary fires, allowing fire fighters to concentrate equipment and available water at the main fire.
- New fires behind the lines diverts resources (manpower, equipment and water) and reduces chances of controlling the fire.
- **Longer ignition time and fewer home ignitions makes more time for fire department to control the main fire.**
- **Start protection effort on your roof! Its relatively cheap & highly effective.**

- **SEE** **https://www.pbs.org/video/weathered-inside-the-la-firestorm-l31r0b/**

We Can't Stop All Fires, BUT We Can Limit and Delay Certain Conditions

- Limit Home Ignitions (Secondary Fires) away from the main fire
- Limit fire spread by creating fuel breaks
- Defendable Space helps limit loss of property and life
- **GOAL: Create time for firefighters to use resources (trucks, water, personnel) at the main fire without diversion to secondary fires.**

Part 3: Kinds of Roof Vents on Sandia Heights Homes

Homes in Sandia Heights may have many kinds of vents to the outside

- Parapet vents & roof space vents (usually passive ventilation)
- Furnace & water heater vents (fans not always operating)
- Fireplace chimney vents
- Bathroom & kitchen fan vents & dryer vents (low temperature forced air vents).
  - –NOTE: Dryer vents require different protection from other vents
- Whole house vacuum systems (may be similar to dryer vents.)

IF NOT PROPERLY PROTECTED, ALL OF THESE VENTS MAY ALLOW EMBERS FROM A DISTANT FIRE TO ENTER YOUR HOME.

Vents on Homes in Sandia Heights which may NOT require protection

- Whole house vacuum systems may vent to canister in garage not directly outside.
  - If house has whole house vacuum system with outside vent, find & evaluate need for protection from embers.
- Wet plumbing vents
  - usually toilet & sink vents which have wet vapor traps
- Radon system vent covers are not recommended
  - Radon system should never have openings to interior of home.

Part 4: Vent Protection Tools and Supplies

Please note: Materials prices quoted are 2025 prices.

MATERIALS NEEDED

- **Wire screening 1/8 inch mesh. USE metal wire only. $30**
- EXAMPLE: 12 in. x 20 ft. Kwikmesh Utility Screen Roll. Made from 1/8 inch corrosion resistant galvanized expanded metal.
  - For example GOOGLE: kwikmesh
- Other conveniently sized rolls used for ventilation, vent repair, rodent and insect control, and tree trunk protection are available.

Kwikmesh is a rigid strong screen, stands against wall without folding or bending. Suitable for small flat vents such as parapet vents, NOT for making mesh basket around vertical pipe vents.

Fasteners

Box of Self-Drilling (self starting) hex-head screws. $7

I used a hex-head driver in my drill to install the screws. Buy the right screw heads for the driver of your choice. Any good quality steel wire for securing screens. Steel zip-ties may be useful.

Materials Needed

Steel wire for securing screen bottoms

Screw fasteners

KwikMesh screen OR similar flat metal screen

Stainless Steel Roll 24” wide with 1/16”, 1/8”, #7 OR #8 mesh for vent bonnets

Steel Zip Ties

TOOLS NEEDED

- Drill with driver for screws selected
- Extension cord (if needed)
- Metal snips or strong scissors.
- Pushing or molding tool to press wire into corners

Options & Cautions

- Screen mesh size should be 1/8” to 1/16” (see Mesh Chart shown later).
- **DO NOT** use cloth, fiberglass or “soft window” screens which likely are flammable and may melt or burn sooner than metal.

- Screens should be made of metal (stainless steel OR aluminum).
  - Aluminum screen is usually cheaper and easier to cut.
  - Stainless steel has higher melting temperature than aluminum (2600°F vs 1220°F) but is more expensive.
  - Decide which screen is best for your home.

- Keep roof clean to lower fire temperature and duration.

- Vents close to ground level (not on roof such as through-wall dryer vents & some fire place or heater vents) may be more easily exposed to direct flame and may require specialized vents.
  - See Commercially Available Vents shown later.

Recommendations for SCREEN MESH SIZE

- California Building Code Chapter 7A regarding new construction in wildfire-prone areas specifies noncombustible mesh screen covers between 1/16 inch and 1/8 inch (Quarles, Stephen L., Vulnerability-of-Vents-to-Wind-Blown-Embers_IBHS AUG 2017 p. 3).

- Institute for Business & Home Safety: Vents shall be covered with a noncombustible, corrosion-resistant mesh with openings not to exceed 1/8-inch in diameter for ember-resistance. (IBHS Wildfire Protected Home Standard 2025).

- ¼-inch mesh screening should NOT be used to cover any vent (Quarles, Stephen L., Vulnerability-of-Vents-to-Wind-Blown-Embers, IBHS AUG 2017 p. 22).

- SEE MESH SIZE CHART SHOWN NEXT PAGE

Screen Mesh Guide

				Mesh #				
1.000	mm =	0.039	inches					
1.588	**mm =**	**0.063**	**inches**		**1/16"**	**Recommended range for**		
2.360	**mm =**	**0.093**	**inches**	**8**		**vent screens for wildfire**		
2.800	**mm =**	**0.110**	**inches**	**7**		**ember protection (multiple**		
3.175	**mm =**	**0.125**	**inches**		**1/8"**	**sources)**		
3.350	mm =	0.132	inches	6				
4.000	mm =	0.157	inches	5				
6.350	mm =	0.250	inches	3	1/4 "			

Be careful when purchasing wire mesh. Labels are not always marked clearly. Check Material & Mesh size. Only 4 choices of commonly available mesh meet the recommended size for wildfire ember protection. Inspect before you buy and try to use ONLY 1/16” 1/8”, #7 or #8 mesh screen. Various products available in hardware stores and on-line market sites.

Part 5: Examples of Protection for Various Kinds of Vents at Sandia Heights

Parapet Vents
Furnace & Water Heater Vents
Bathroom & Kitchen Fan Vents
Fireplace vents
Dryer Vents

Parapet vents & roof vents

- Located on parapet back side (roof side) of many Sandia Heights homes.

- These usually have a rectangular metal cover with louvered openings (SEE next page pictures).

- Louver openings provide ventilation
  - **But are large enough to allow a wildfire ember the size of a pea to be driven inside the parapet AND INSIDE THE WALLS OF YOUR HOUSE where dust, debris or paper insulation backing may be ignited.**

What do Parapet Vents look like?

Typical roof vent. Notice the bent louvers which will admit larger particles.

Please Note: Some homes which have been re-roofed do not have parapet vents. They have been covered.

2 LOUVERED SCREEN COVER OPTIONS

- **1. IF** louvered cover can be removed, cut the fine wire mesh screen to fit the louvered screen + 1-inch on all four sides
- Wrap fine screen around louvered cover and replace on the parapet.
- **OR** Replace with commercial louvered vents with screen attached available from local hardware stores if it fits your vents.

- **2. IF** removing louvered cover may damage stucco, leave existing louvered cover in place.
  - Cut the wire mesh screen to fit the louvered screen outside edge and screw to the existing cover.
  - SEE NEXT PHOTOS .

Wire Mesh Installation

Place precut screen over the existing louvered vent. Screw into louvered cover using self-starting screws. Add screws where necessary to insure a tight fit along edges.

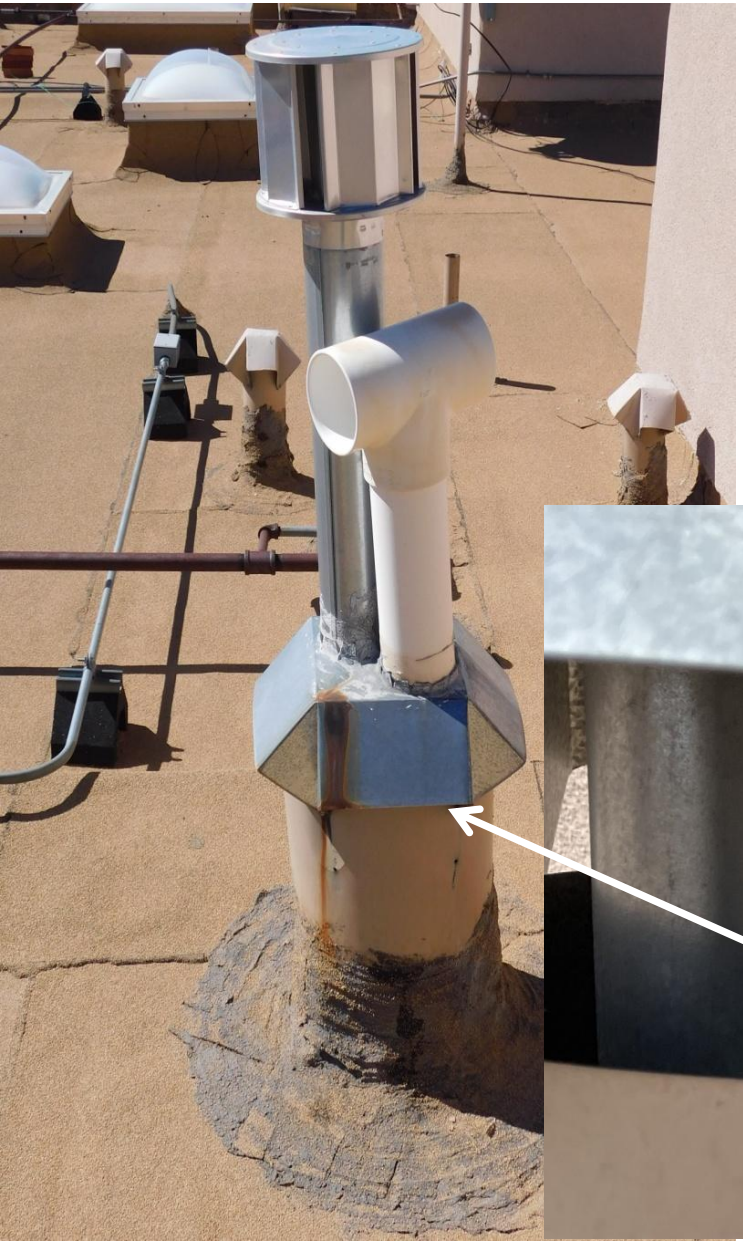
KwikMesh 1/8” stainless steel wire screen over existing louvered parapet vent

OTHER KINDS OF ROOF VENTS & OPENINGS

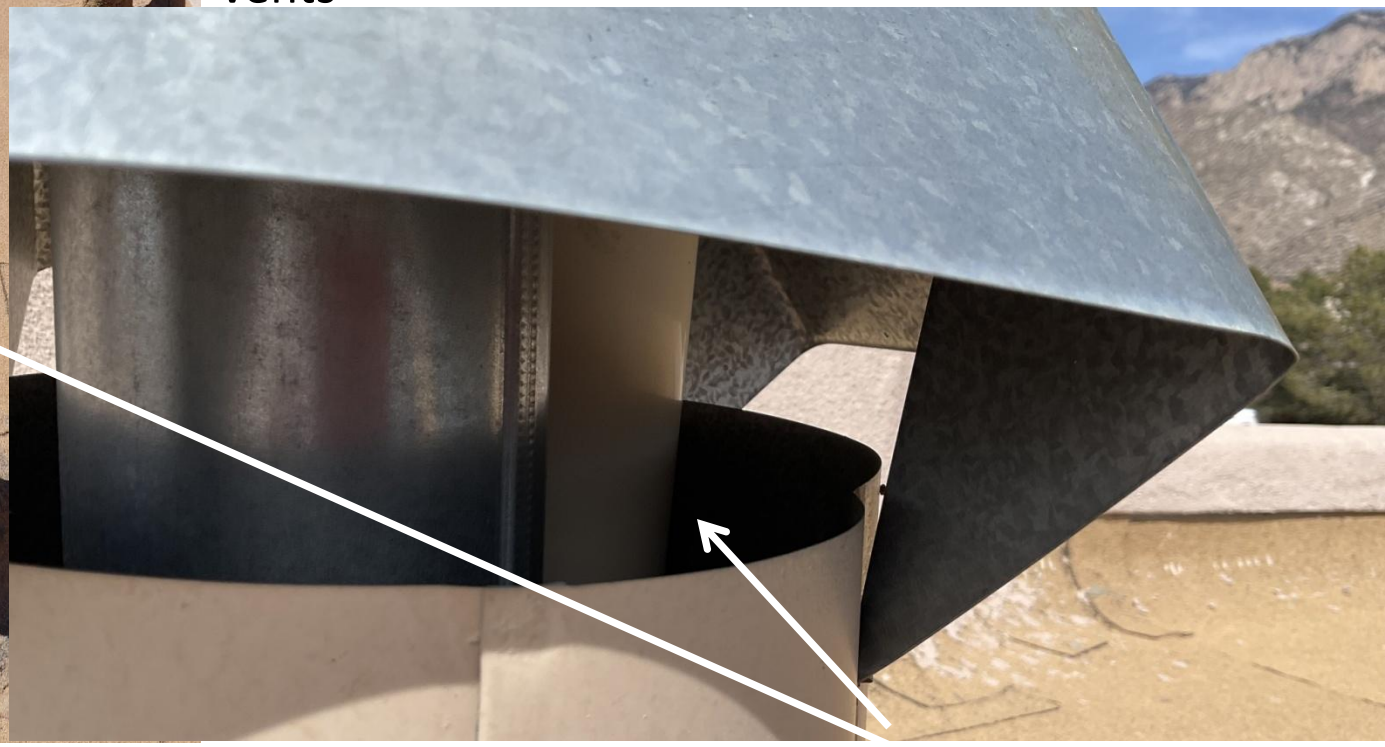
- Furnace & Water Heater Vents
- Bathroom & Kitchen Fan Vents
- Fireplace vents
- Dryer Vents

- Wet plumbing vents are excluded.
- Skylights are not discussed in this presentation, but consider replacing Plexiglas skylights with double pane tempered glass.
- Always keep roof clean and clear of burnable materials especially near skylights & solar panels.

Furnace & Water Heater Vents (Outside Unprotected)



Furnace (PVC) and water heater (galvanized) chimneys are inside double wall chimney shown in left picture. Photo below shows ember pathway which could blow under the chimney top and enter the double wall space directly into the garage. (**SEE NEXT SLIDE**) ALSO NOTE three ceiling fan vents in the left picture. SEE later pages for protecting these vents



Pathway for embers to inside of garage.

Furnace & Water Heater Vents (Inside)

Inside view of combination furnace (PVC) and water heater (metal) vent chimney. Water heater chimney no longer used but was left open by electric water heater installers. The double wall chimney space is open to the outside. **Embers could enter the garage along the pathway shown on the previous slide.**

Furnace & Water Heater Vents inside garage.#2

I checked 6 houses on my street. ***5 of 6 have this problem!***

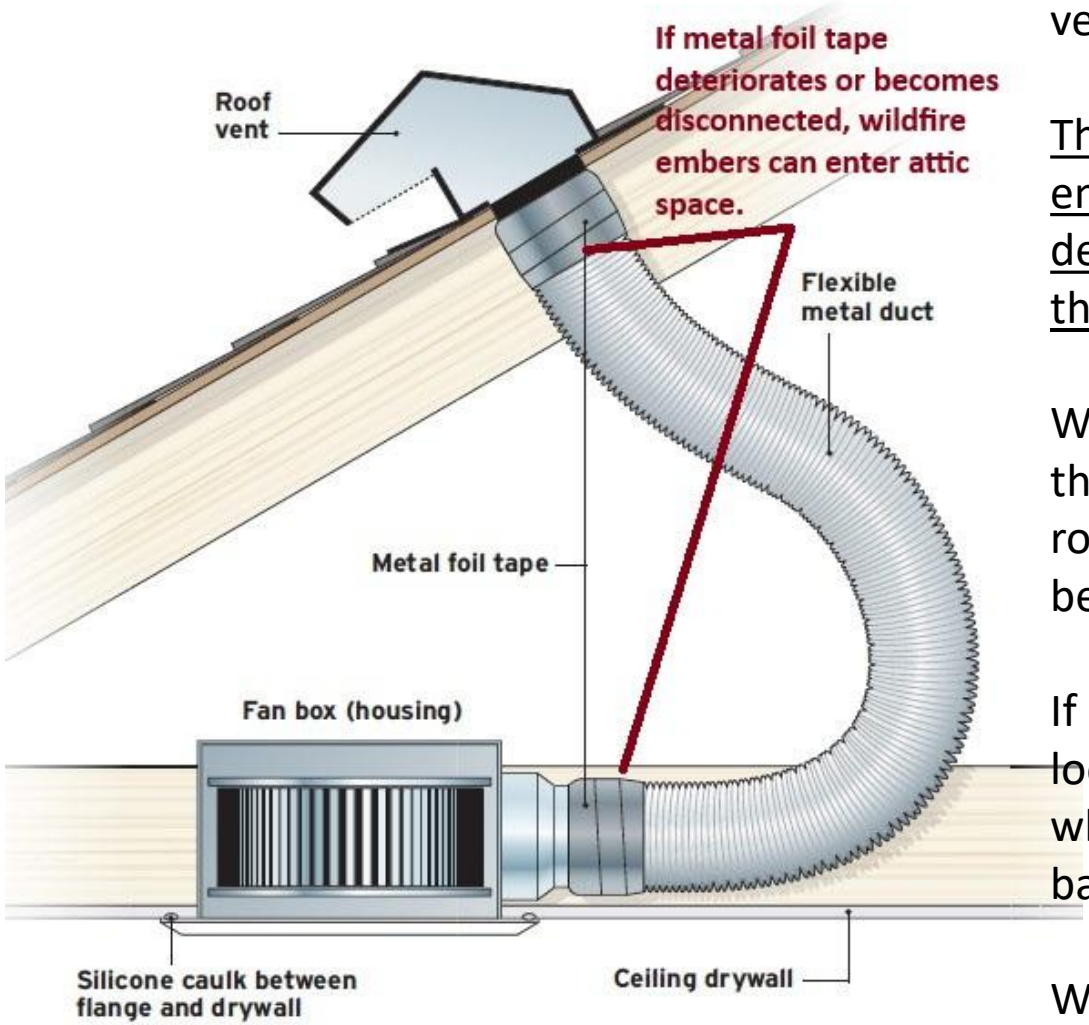
Large particles (wildfire embers OR 2” steel washer on a string) can get inside the garage from the roof. Supplemental screening on the roof is needed. See next page.

Mesh over Double Wall Chimney

Strip of wire mesh around chimney exhaust held in place with twisted black wire or metal zip ties.

Oversize mesh basket to improve air flow over the entire double walled chimney held in place with twisted black wire.

The Problem with Bathroom & Kitchen Fan Roof Vents!



This picture shows fan vent installed in a pitched roof. Installation in a flat roof is very similar.

<u>The glue on metal foil tape sealing both ends of the Flexible Metal Duct can deteriorate and disconnect from the roof or the fan.</u>

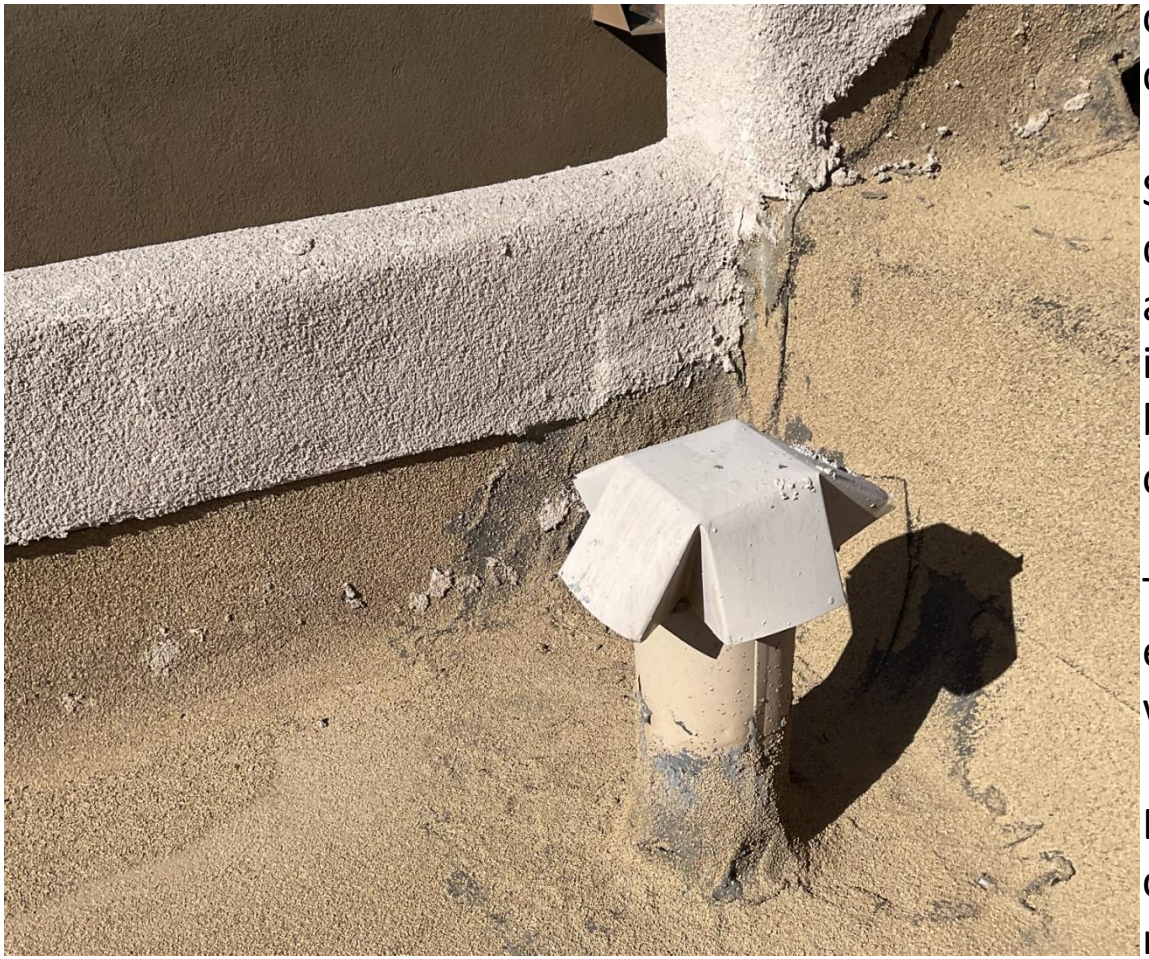
When a new fan is installed, the fan end of the Flexible Duct may shrink back into the roof. It may not be reachable and may not be reconnected.

If either end of the Flexible Metal Duct is loose, embers may enter the attic space where dust, debris or paper insulation backing may be ignited.

Wire mesh over the roof vent avoids this problem.

Never use plastic flexible duct material

Bathroom & Dryer Fan Vents (unprotected)



Bathroom and dryer vents should be connected by flexible aluminum foil ducts to the fan, NOT plastic.

Sometimes the duct is missing or disconnected from the fan body allowing the fan to push exhaust air into the truss & insulation space between the roof and the home ceiling instead of outside.

The roof space may be dusty or have exposed paper insulation backing which could ignite inside the roof.

Dryer should have good screen cleaned after each use which does not release lint to roof.

INSTALLATION TIP:

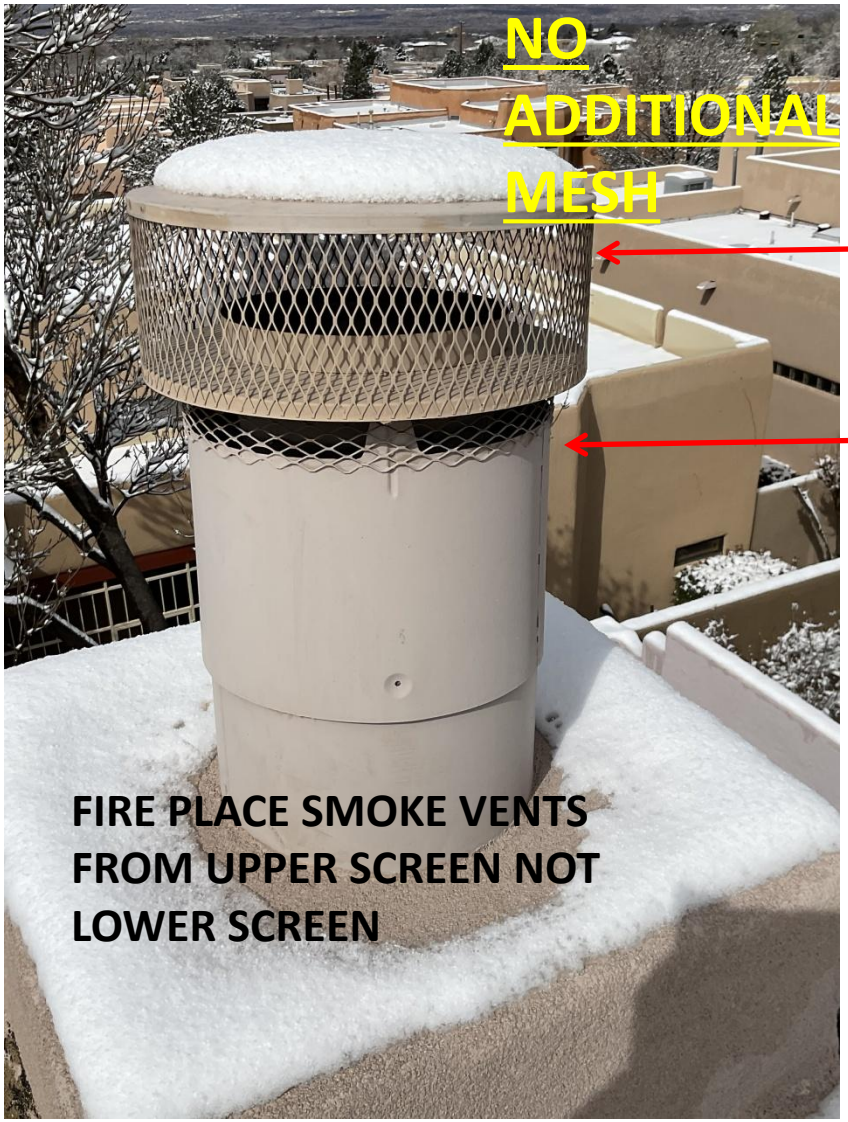
Turn dryer on to find dryer vent on roof.
Flush toilets to find wet toilet vents on roof.
Turn bathroom fans on to find … etc.

Mesh over Bathroom Fan Vents

Secure the screen with black wire OR sheet metal screws into the original vent housing TO PREVENT MICE FROM ENTERING. Over-size screening to improve air flow.

Mesh over Fireplace Vents

Fine mesh added to double wall screen (lower), not firebox chimney screen (upper).



If you feel a breeze from your fireplace when fire is out, embers may be able to enter your home through the chimney. IF your fireplace doesn’t have a damper OR sealed doors, consider installing a different chimney hood. The path from the firebox to the outside should never allow embers inside your home.

INSPECT EXTERNAL CHIMNEY
A neighborhood chimney with problems

Flat 1/8 " KwikMesh screen may be too rigid to screen a round chimney.

Break in chimney metal may be hard to see. Inspect carefully.

Break in exterior double wall may allow embers inside home.

Inspect all external vents carefully.

NOTE: I have not seen this chimney personally. All homes are different. All vents must be inspected and protected to prevent entry of flaming embers. Some repairs may require professional roofer.

Dryer Vents Not To Be Screened!!!

- Dryer vents
  - Dryer require special consideration
  - Dryer lint is very flammable
  - Dryer vents typically required to have a metal flap which opens with internal pressure
  - Commercially available products may best suit dryer vent protection

Dryer Vents - Background

- Dryer lint can be highly flammable. Clogged dryer vents cause thousands of house fires annually and are the #1 cause of appliance-caused fires in homes. (https://dryerventheroes.com/albuquerque/)
- Dryer exhaust duct **must be metal, never plastic**
- Dryers should have built-in lint trap screens to prevent lint build-up in the vent duct, on the roof or in the roof vent. Lint trap screens should be cleaned before each use. Lint should NOT buildup on a roof. If it does, the lint trap screen may not be working correctly.
- All installations of roof vent protection should inspect dryer duct material on the back of dryer and should recommend metal ducts IF house uses flexible plastic ducts.

Dryer Vent Covers

- Many commercial options available for horizontal (**through the wall**) dryer vents
  - Typically have a movable flap which opens by forced air.
  - Some use a movable cup which is lifted by forced air
- Dryer Vent Covers for vertical pipes through a flat roof are more difficult. Typical flat flap vent may be opened by wind, **BUT**
- ALL guidance and recommendations say dryer vents should have a flap & SHOULD NOT BE SCREENED.

Part 6: References, Google sources & video guides

- There are many good education videos and publications available on line. Here are some suggestions of places to start learning about wildfire protection and management.

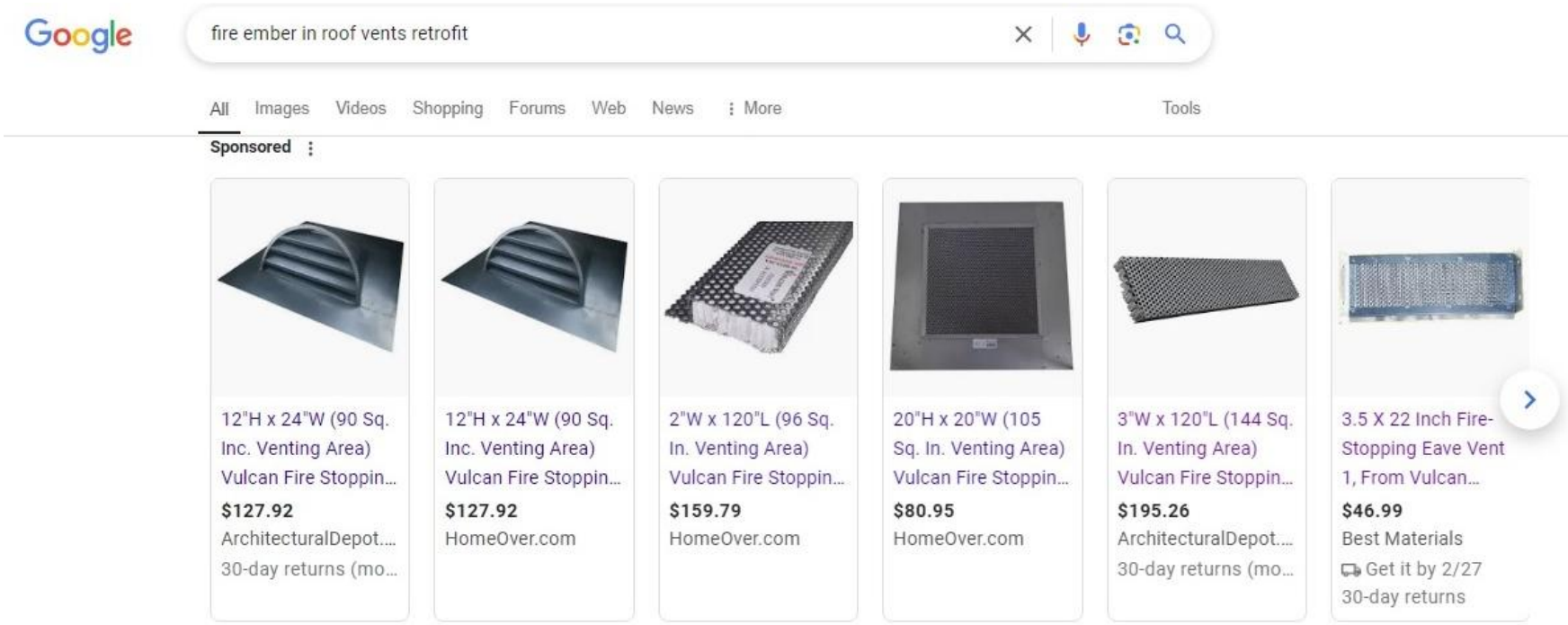
Commercially available roof vent protection (All Types)

- Many commercially products are available which will fit into a standard sized vent hole.
- Some products contain layers of wire mesh in a metal frame.
- Some contain mesh treated with a coating which swells at 700°F, closing the vent to both embers and flames. These may cost $75 to $250 per vent.
- The typical small house in Sandia Heights may have at least 5 roof parapet vents and 5 or more fan vents, breathers and others.
- For examples of commercially available roof vent protection **GOOGLE:** wildfire roof vent protection

Commercially Available Alternatives

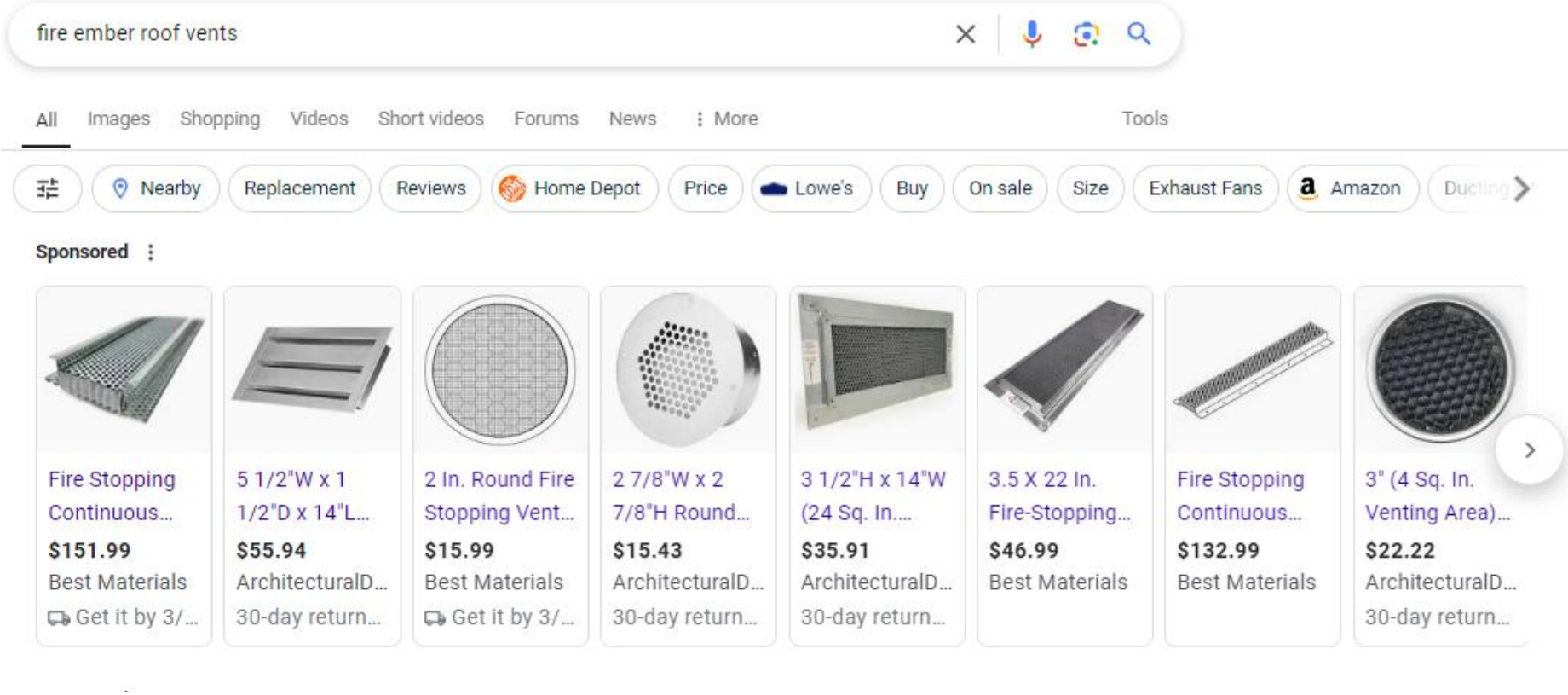
Screens which can exclude embers from vents are available from the usual hardware and building supply sources. Prices vary from $50 to $200 per vent.

GOOGLE: fire ember roof vents retrofit



Commercially Available Alternatives

Specialty Screens Depending on your Needs



Useful New Mexico Publication "LIVING WITH FIRE"

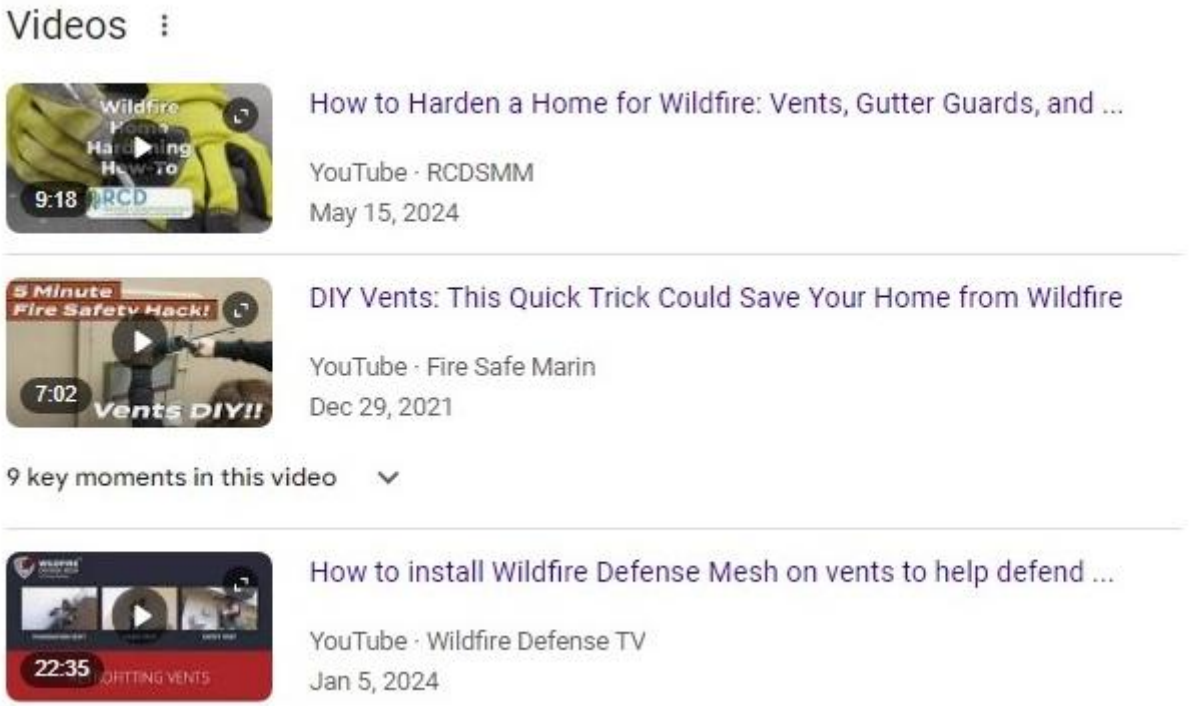
- https://www.emnrd.nm.gov/sfd/fire-prevention-programs/living-with-fire-guide-new-mexico/

- https://www.emnrd.nm.gov/sfd/wp-content/uploads/sites/4/LivingwithFire_2018_NMStateForestry_FINAL.pdf

Other On-Line Educational Resources

- https://www.youtube.com/watch?v=kEZPdnwdmGY
- https://www.youtube.com/watch?v=-twZRaQu4Ig
- https://www.livingwithfire.org/resources/publications/

Additional Information

- 

https://firesafemarin.org/harden-your-home/fire-resistant-vents/

https://www.chubb.com/us-en/individuals-families/resources/protect-your-home-from-wildfires-with-ember-resistant-vents.html

https://ibhs.org/wp-content/uploads/member_docs/Vulnerability-of-Vents-to-Wind-Blown-Embers_IBHS.pdf

https://www.pbs.org/video/weathered-inside-the-la-firestorm-l31r0b/