

FIRES

part 1

BURNING MATERIALS, VEGETATION, HOMES & CARS

A Google AI conversation 8,08.2026

/ Simona Panaitescu

https://www.google.com/search?q=what+is+the+temperature+of+ALuminum+melt+point%3F&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIGCAEQ_LhhA0gEJMjg3NjRqMG03qAlAsAlA&sourceid=chrome&ie=UTF-8&udm=50&fbs=ABfTbFVyMZGZf1hfvX9uKjN_-G8c4u0nXx4bElpwm1lnNH832UV2GkpKEK36HumGR10Evz150YHLBZQrC7jm5_C-J-Of2Q2-5NUPD-TCpE8QyvvVIQ0CkdxEEAqsZqW0D68D58P2afldorgANWKJGEiDXfIEJFp9eDzfr7CE0Ez67Lb-dbr5lJNrkdtR3Nj7fUU0R12K95Y&aep=10&ntc=1&mstk=AUTExfA1NfUDFUGmoncdmEj2J0Tpdgtgl2fe_m7jIUajOg6HMuXFAW76B4B01wrRwOt96lSfWVcQrfEf-APa9a-5pisyknsgmACABsl6eYl_csvbm6JJTztgLUpGbErnWfMvzCFNL1JtZsFGASfgYap7FddS064nRkdH0Ge8tVLCkumHwrKQqVdeheZ8PSwSY0l2E7wE2K8QGv5njI0ehwCjXHI05X0Vr2PekIAHwadtYsYJfRBrjfuekRgxSN8LsfzMn9N2FJxyfrjZ-6_FdOuQUeWosa6x7cJ00hTHb9MPHVkSTt0mNk_abNT2B0yXdCrORL0e71kgSAeQK5DD-LmoCGpVMIC5K17Q&aioh=3&csuir=1&cs=1&atvm=2&mtid=ClT2apiSLdKbhbIP3ZDduQ4

what is the temperature of Aluminum melting point?

The melting point of pure aluminum is **660.32 °C** (1,220.58 °F) or **933.47 K**. Its boiling point is much higher at **2,470 °C** (4,478 °F). [\[1\]](#)

Key Temperature Scales

- **Celsius:** 660.32 °C
- **Fahrenheit:** 1,220.58 °F
- **Kelvin:** 933.47 K [\[1\]](#)

Factors Affecting the Melting Point

- **Alloy composition:** Mixing aluminum with other metals like copper, silicon, or magnesium changes the exact melting range (often lowering it slightly into a melting range rather than a single fixed point).
- **Purity levels:** Higher purity aluminum strictly matches the 660.32 °C mark, while trace impurities can alter the transition threshold. [\[1, 2, 3, 4, 5\]](#)

I will tailor my next response. Just tell me:

- ☐ Specific **aluminum alloy** (e.g., 6061, 7075, cast aluminum)
- ☐ **Heating method** or application context
- ☐ Target **temperature units** (extra detail needed)

Just reply with your answer or a new query:

AI responses may include mistakes. [Learn more](#)

- thyssenkrupp Materials (UK)
Melting Point of Aluminium - thyssenkrupp Materials (UK)

The melting point of pure aluminum is approximately 660 degrees Celsius or 1220 degrees Fahrenheit. However, the melting point of ...

- Wikipedia
Aluminium - Wikipedia
Table_content: | Aluminium | | | --- | --- | | Physical properties | | | Phase at STP | solid | | Melting point | 933.47 K (660.3...

-  Solitaire Overseas
Melting Point of Aluminum & Alloys | Temperature Guide
The inclusion of alloying elements, e.g. silicon, copper or magnesium, tends to decrease the melting temperature than pure aluminu...



Show all

what is the steel and the glass melting temperature?

The melting point of steel is **1,370 °C to 1,540 °C** (2,500 °F to 2,800 °F), while glass does not have a single melting point but softens into a workable liquid between **1,400 °C and 1,600 °C** (2,550 °F to 2,900 °F). [[1](#), [2](#), [3](#), [4](#), [5](#)]

Comparison of Melting Temperatures

Material Melting / Softening Range (Celsius) Melting / Softening Range (Fahrenheit)

Steel	1,370 °C to 1,540 °C	2,500 °F to 2,800 °F
Glass	1,400 °C to 1,600 °C	2,550 °F to 2,900 °F

Key Differences

Steel

- **Composition variation:** Carbon steel melts at higher temperatures (1,425 °C to 1,540 °C), while stainless steel melts at slightly lower temperatures (1,370 °C to 1,510 °C) due to chromium and nickel additives.
- **Crystalline transition:** It goes quickly from a rigid solid to a distinct liquid phase. [[1](#), [2](#), [3](#), [4](#), [5](#)]

Glass

- **Amorphous structure:** It lacks a rigid crystal structure, meaning it transitions slowly through a "glass transition phase."
- **Softening point:** It starts bending around 500 °C to 600 °C before fully liquefying at high industrial kiln heat. [[1](#), [2](#), [3](#), [4](#)]

✓Summary of Values

The melting range for steel spans from 1,370 °C to 1,540 °C depending on alloy type, and the processing fluid temperature for typical commercial glass spans from 1,400 °C to 1,600 °C. [[1](#), [2](#), [3](#)]

If you want to look into specific projects, please share:

- ☐ The **type of steel** (e.g., carbon steel, structural steel, stainless steel)
- ☐ The **type of glass** (e.g., borosilicate, soda-lime, quartz glass)
- ☐ Your **intended project** or application (e.g., forging, casting, glassblowing)

AI responses may include mistakes. [Learn more](#)



Buy a Beam

Everything You Need to Know About the Melting Point of Steel

24 Oct 2022 — What Is The Melting Point Of Steel? As steel is an alloy of many different metals, which comes in many different types, there is n...



Kloeckner Metals Corporation

What is Stainless Steel Melting Point?

29 Nov 2021 — At what temperature does steel melt? The melting point of steel ranges from 2500-2800°F or 1371-1540°C.



MO SCI

Glass 101: Glass Furnace Types

18 Dec 2019 — Types of glass furnaces The melting point of most glasses lies around 1,400-1,600°C, depending on its composition. As a result, gl...



Show all

what is the temperature at which green grass, a bush and a conifer tree burn?

The temperatures at which green grass, a bush, and a conifer tree catch fire and burn depend heavily on their moisture content and volatile oils. When dealing with living plants, they must first dry out (dehydrate) locally before they can sustain an open flame. [[1](#), [2](#), [3](#), [4](#)]

The standard **piloted ignition temperatures** (when an open flame or spark touches them) and the **temperatures at which they burn** during a wildfire are detailed below: [[1](#), [2](#)]

1. Green Grass

- **Ignition Temperature: 260 °C to 315 °C** (500 °F to 600 °F).
- **Wildfire Burning Temperature: 100 °C to 600 °C** (212 °F to 1,112 °F).
- **The Process:** Living green grass has a high moisture content, which acts as a built-in heat sink. A heat source must first boil away the internal water at 100 °C. Once the grass blades dry out, the underlying plant tissue instantly ignites. Because grass blades are very thin (high surface-area-to-mass ratio), they ignite instantly once dry and produce fast, flashy, but relatively low-temperature flames. [[1](#), [2](#), [3](#), [4](#), [5](#), [6](#)]

2. A Bush / Shrub

- **Ignition Temperature: 280 °C to 350 °C** (536 °F to 662 °F).

- **Wildfire Burning Temperature: 600 °C to 800 °C** (1,112 °F to 1,472 °F).
- **The Process:** Bushes contain a mix of green leaves and coarser woody stems. The woody twigs require sustained heat to char and release flammable gases (pyrolysis). Once ignited, bushes burn significantly hotter and longer than grass because the denser wood provides a steady supply of fuel. [[1](#), [2](#), [3](#), [4](#), [5](#)]

3. A Conifer Tree (e.g., Pine, Fir, Spruce)

- **Ignition Temperature: 200 °C to 350 °C** (392 °F to 662 °F).
- **Wildfire Burning Temperature: 800 °C to 1,300 °C** (1,472 °F to 2,372 °F).
- **The Process:** Conifers are highly flammable softwoods. Their green needles and sap contain volatile resins and terpenes (essential oils) that vaporize and ignite at incredibly low temperatures (~200 °C / 400 °F). When a fire moves from the forest floor into the tree crown, these exploding resinous gases generate intense, roaring crown fires that can reach temperatures upwards of 1,300 °C. [[1](#), [2](#), [3](#), [4](#), [5](#)]

Summary Comparison

Vegetation Type	Piloted Ignition Temperature	Active Wildfire Burning Temp
☐ Green Grass	260 °C – 315 °C (500 °F – 600 °F)	100 °C – 600 °C (212 °F – 1,112 °F)
☐ Bush / Shrub	280 °C – 350 °C (536 °F – 662 °F)	600 °C – 800 °C (1,112 °F – 1,472 °F)
☐ Conifer Tree	200 °C – 350 °C (392 °F – 662 °F)	800 °C – 1,300 °C (1,472 °F – 2,372 °F)

To help tailor more specific data for you, please let me know:

- ☐ Are you looking for the **auto-ignition point** (spontaneous combustion without a flame spark)?
- ☐ Is this for **wildfire safety planning**, agricultural **prescribed burns**, or material science?
- ☐ Do you need info on a specific tree species (like **Douglas fir**, **Scotch pine**, etc.)?

AI responses may include mistakes. [Learn more](#)

- ResearchGate
Fire temperatures in grass, shrub and aspen forest ...
Temperatures above 800°C were recorded in snowberry and aspen and a more protracted cooling phase was noted because of the coarser...
- Citizens Information
Burning waste and vegetation - Citizens Information
29 Feb 2024 — Can I burn waste at home? Burning waste in your home or garden is illegal, as it can release harmful chemicals into the air. It is...
- Brainly.in
At what temperature does grass catch fire - Brainly.in
7 Jun 2024 — Answer. ... Explanation: Average surface temperatures for grassfires was between 102°C and 388°C (215°F and 730°F). Steward et al.

Show all

What is the highest temperature forest vegetation can burn at, during a fire?

During an intense wildfire, forest vegetation can burn at maximum temperatures exceeding **1,200 °C to 1,300 °C** (2,192 °F to 2,372 °F), with the chemical reaction zone at the absolute core of the flames occasionally peaking near **1,600 °C** (2,912 °F) under extreme conditions. [1, 2, 3]

Temperature Breakdown by Fire Type

- **Crown Fires (Highest Temperatures):** When fires sweep through the upper canopies of highly resinous trees (like pines or firs), they reach **1,000 °C to 1,300 °C**. The combination of massive oxygen intake from high winds and volatile essential oils creates a blowtorch effect. [1, 2, 3, 4, 5]
- **Surface Fires (Moderate Temperatures):** Fires consuming grass, shrubs, and fallen logs on the forest floor typically burn between **500 °C and 800 °C** (932 °F to 1,472 °F). [1, 2, 3]
- **Ground Fires (Lowest Temperatures):** Smoldering roots, peat, and deep organic matter below the surface burn slowly without oxygen, usually staying around **100 °C to 300 °C** (212 °F to 572 °F). [1, 2, 3]

Why Forest Vegetation Can Burn So Hot

- **Volatile Terpenes:** Conifer trees release flammable gases when heated, supercharging the combustion cycle. [1]
- **Massive Oxygen Flow:** Intense wildfires create their own localized wind systems (convection columns), feeding massive amounts of oxygen into the flame front. [1, 2, 3, 4, 5]
- **Fuel Density:** Packed, dry, woody debris creates a deep bed of coals that radiates immense heat outward, preventing the fire from cooling down quickly. [1]

To explore how these extreme temperatures affect surroundings, tell me if you want to know about:

- ☐ The impact on **soil nutrients** or **rock cracking**
- ☐ How **different wood types** (hardwood vs. softwood) behave under this heat
- ☐ The limits of modern **firefighting equipment** against crown fires

AI responses may include mistakes. [Learn more](#)

-

CSIRO

Bushfire in Australia: understanding 'hell on Earth' - CSIRO

17 Dec 2015 — Bushfires can be extremely hot, with temperatures reaching: * **Reaction zone** 1600°C * **Flames** Maximum temperature at the bas...

-

University College Cork

The science of wildfires - University College Cork

7 Apr 2021 — ... 2020) which can be assessed by a variation of co-polarised backscattering coefficients (Imperatore et al., 2017). The Sentinel...

-

Flash Wildfire Services

Wildfire Heat: Range, Factors, & Impacts Explained

Surface Fires: These fires, which consume low-lying vegetation like grasses, shrubs, and leaf litter, typically reach temperatures...

Show all

what is the temperature at which concrete turns to dust?

Concrete begins to structurally disintegrate and can be easily crushed to dust when it reaches temperatures between **450 °C and 600 °C** (842 °F to 1,112 °F). Complete loss of structural load

capacity and total failure typically occurs by **800 °C to 1,000 °C** (1,472 °F to 1,832 °F). [1, 2, 3, 4]

Because concrete is a mixture rather than a single compound, it does not melt all at once; instead, it undergoes irreversible chemical breakdown (thermal degradation) in stages: [1, 2, 3, 4, 5]

Concrete's Breakdown Timeline

- **100 °C (212 °F) — Dehydration:** Absorbed moisture evaporates. If the temperature rises too rapidly, trapped water vaporizes into steam and can cause explosive "spalling," blowing chunks off the concrete. [1, 2]
 - **300 °C (572 °F) — Initial Weakening:** The concrete shifts to a distinct pinkish or reddish tint due to chemical changes in the aggregates. Micro-cracking begins. [1, 2, 3, 4, 5]
 - **450 °C to 550 °C (842 °F to 1,022 °F) — De-hydroxylation:** The cement paste's primary binding agent (calcium hydroxide) chemically decomposes into calcium oxide (quicklime) and water vapor. **At this point, the glue holding the concrete together fails, causing it to lose its strength and crumble into a pile of dust and loose gravel.** [1, 2, 3, 4, 5]
 - **600 °C (1,112 °F) — Calcination:** Any limestone or calcium carbonate present in the aggregate stone splits into calcium oxide and carbon dioxide gas, entirely ruining the structural aggregate framework. [1, 2]
 - **800 °C to 1,000 °C+ (1,472 °F to 1,832 °F) — Total Disintegration:** The concrete turns a pale yellow-gray or brown, holds zero load capacity, and collapses entirely into an ash heap. [1, 2, 3]
- The "Delayed Dusting" Paradox**

Interestingly, even if a fire dies down before the concrete completely crumbles, a unique chemical reaction can finish the job. The calcium oxide (quicklime) left behind will absorb moisture from the surrounding air as it cools. This hydration process causes the material to expand drastically in volume, shattering whatever remaining structural integrity it had left and causing it to flake and turn to powder over the next few days. [1, 2, 3]

Let me know if you would like me to look further into:

- ☐ How engineers evaluate building safety after a **major structural fire**
- ☐ Fire-retardant **additives or aggregates** used to make concrete heat-resistant
- ☐ The difference between standard concrete and **refractory (kiln) concrete**

AI responses may include mistakes. [Learn more](#)

- Nevada Ready Mix
Dusting Concrete Surfaces — What, why, & how? – Nevada ...
If the humidity is relatively high, water will condense on the freshly placed concrete, which, if troweled into the surface, will ...
- Wikipedia
Concrete degradation - Wikipedia
At 450-550 °C the cement hydrate decomposes, yielding calcium oxide. Calcium carbonate decomposes at about 600 °C. Rehydration of ...
- National Institutes of Health (NIH) | (.gov)
Performance of Different Concrete Types Exposed to Elevated ...

In this paper, an extensive review was conducted and focused on the effect of concrete constituents on the overall behavior of con...

Show all

Can you make a single table with the burning/ melting points for both the vegetation and the other materials mentioned?

Here is the unified table comparing the melting, softening, or burning temperatures of all the vegetation and materials we have discussed, ordered from lowest to highest critical temperature.

Material Thermal Breakdown Comparison

Material	Critical Temperature Range (Celsius)	Critical Temperature Range (Fahrenheit)	Type of Thermal Reaction
☐ Green Grass	260 °C – 315 °C	500 °F – 600 °F	Ignition / Burning (Boils off water, then flashes)
☐ Bush / Shrub	280 °C – 350 °C	536 °F – 662 °F	Ignition / Burning (Stems char and release gas)
☐ Conifer Tree	200 °C – 350 °C	392 °F – 662 °F	Ignition / Burning (Resins gasify rapidly)
☐ Concrete	450 °C – 600 °C	842 °F – 1,112 °F	Decomposition (Cement glue turns to dust)
☐ Pure Aluminum	660.32 °C	1,220.58 °F	Melting Point (Sharp solid-to-liquid shift)
☐ Wildfire Crown	1,000 °C – 1,300 °C	1,832 °F – 2,372 °F	Peak Fire (Extreme wind-fed vegetation burn)
☐ Steel	1,370 °C – 1,540 °C	2,500 °F – 2,800 °F	Melting Range (Varies by carbon/alloy mix)
☐ Glass	1,400 °C – 1,600 °C	2,550 °F – 2,900 °F	Softening Range (Amorphous fluid state)

If you want to keep expanding this comparative list, I can find information on:

- ☐ The ignition thresholds for specific structural building timbers like **Oak** or **Pine lumber**
- ☐ High-heat plastics and polymers like **PVC**, **Nylon**, or **Teflon**
- ☐ Natural geological materials like **Granite** or **Basalt lava** melting points

AI responses may include mistakes. [Learn more](#)

What are the normal temperatures of fires for the tree crowns during a forest fire (not wild fire)? The normal temperature of an active crown fire in a forest averages between **800 °C and 1,000 °C** (1,472 °F to 1,832 °F), with extreme flame front peaks frequently reaching **1,200 °C to 1,300 °C** (2,192 °F to 2,372 °F). [\[1, 2\]](#)

(Note: In professional forestry and fire science, "forest fire," "wildland fire," and "wildfire" are used interchangeably to describe unplanned vegetation fires. They all share the same combustion physics and thermal dynamics.) [\[1, 2, 3\]](#)

Temperature Distribution in a Forest Crown Fire

- **Average Canopy Flames: 800 °C to 1,000 °C.** This is the consistent temperature sustained by the steady burning of foliage, twigs, and branches once the canopy has fully ignited. [\[1, 2, 3, 4\]](#)
- **Peak Heat Flash Points: 1,200 °C to 1,325 °C.** These spikes occur at the absolute leading edge of the flame front when explosive volatile resins (terpenes) in conifer needles rapidly gasify and supercharge the local oxygen supply. [\[1, 2, 3\]](#)

- **Convective Heat Columns: 300 °C to 600 °C** (572 °F to 1,112 °F). This is the temperature of the rising air and superheated gasses traveling *ahead* of the actual flames, which acts to dry out and pre-heat the next line of tree crowns before they even touch an open spark. [1, 2, 3]

Why Tree Crowns Burn Hotter Than the Forest Floor

1. **The Chimney Effect:** A crown fire acts like an industrial furnace. Rising heat draws in massive rushes of fresh oxygen from below, fanning the canopy flames into a high-intensity blowtorch. [1]
2. **Surface-to-Volume Ratio:** Tree crowns are made up of millions of thin needles and tiny twigs. Because they have a massive surface area exposed to the air compared to a solid log, they combust completely and rapidly, releasing immense thermal energy all at once. [1, 2, 3, 4]
Depending on your project, let me know if you want to look into:

- ☐ How **wind speed** changes the shape and temperature of canopy flames
 - ☐ The specific differences between **hardwood crowns** (e.g., Oak) vs. **softwood crowns** (e.g., Pine)
 - ☐ Forest management techniques like **thinning** used to stop fires from reaching the canopy
- AI responses may include mistakes. [Learn more](#)

-

GFZ

Coniferous forests: Climate effects of forest fires last for decades

10 Jan 2025 — After a forest fire, the air exchange can be less, as tree crowns are no longer present or are not yet fully developed again. As a...

-

ScienceDirect.com

Fire Intensity - an overview | ScienceDirect Topics

Although temperature extremes are an integral part of any fire, temperature itself is not a good indicator of fire intensity. Wood...

-

ResearchGate

Full-scale crown fire experiment. Timedependent temperature ...

This suggests that charcoal produced in a muffle furnace may be representative of the inner maximum temperatures for vegetation fi...

Show all

Once the bark is burning, will the crown of the tree be affected also?¹

Yes, once the bark is burning, the tree crown is almost always heavily affected, though the exact mechanism depends on the type of fire. [1, 2]

The crown is impacted through two distinct pathways: **thermal injury** from below or the fire **climbing** directly into the canopy.

¹ @HuckleberryRattler

2 days ago

My dad was a wildland firefighter. It doesn't matter if a tree is mostly H2O. The heat is so intense that water in the tree can boil and it will literally explode. Things aren't adding up, and it's fishy af that the exact location of the Spokane fires is where data center propositions were halted because of public backlash. Look it up.

1. Thermal Crown Scorch (Death from Heat)

Even if the flames never physically reach the leaves or needles, burning bark usually creates enough rising heat to kill the crown.

- **The Process:** Intense heat from the burning trunk creates a column of superheated air (convection). If this air reaches **60 °C (140 °F)** or higher when it hits the canopy, it instantly kills the living tissue in the leaves or needles. [1]
- **The Result:** The crown turns completely brown within days or weeks. While it does not physically combust, the tree cannot photosynthesize and will likely die. [1, 2, 3]

2. Fuel Laddering (Direct Combustion)

If the bark is actively burning, it provides a physical pathway for the fire to transition from a surface fire into a devastating crown fire.

- **The Process:** Rough, shaggy, or resinous bark acts as a vertical fuse. As the bark burns up the trunk, the flames encounter "ladder fuels"—low-hanging dead branches, moss, or lichens attached to the trunk. [1, 2]
- **The Result:** These materials bridge the gap between the ground and the canopy, allowing the fire to climb directly into the tree crown and ignite a high-temperature canopy fire. [1, 2]

The Exception: Thick Bark Defense

Some tree species have evolved specific defenses against this transition: [1]

- **Fire-Resistant Bark:** Species like mature **Ponderosa Pine**, **Douglas-fir**, and **Giant Sequoia** possess exceptionally thick, corky bark that contains very little flammable resin. [1, 2, 3, 4, 5]
- **The Shielding Effect:** This bark can burn on the outside or char without transferring the lethal heat inward to the tree's living vascular system (the cambium), and its smooth or flaky nature prevents flames from easily climbing up to the crown. [1]

If you are evaluating forest health or fire behavior, let me know if you want to explore:

- ☐ The difference between **crown scorch** (browning) and **crown consumption** (burning)
- ☐ How to calculate if a tree will survive based on the **height of the bark char**
- ☐ Which specific tree species have the **highest survival rates** after a trunk fire

All responses may include mistakes. [Learn more](#)



- Chelan County

Fire Injury to Trees

In general, trees are killed outright by crown fires and high intensity fires. Lower intensity fires may leave damaged strands or ...



- Ebben Nurseries

Trees also need sunscreen | Tree Nursery Ebben

As soon as the secondary growth of the tree takes place (mid-September) or when the sap rises in the following year, you can slow...





ResearchGate

Heat is transferred to living tissues of trees during fire (top panel),...

Heat is transferred to living tissues of trees during fire (top panel), resulting in injuries to different parts of trees after fi...



Show all

what happens with a tree bark or crown if ambers are landing on it?

When burning embers (also called firebrands) land on a tree's bark or crown, they trigger an **ignition assessment process** determined by moisture, physics, and tree anatomy. [\[1, 2, 3, 4\]](#)

A single isolated ember rarely explodes a living tree into flames; instead, it depends on whether the ember can find trapped debris or fuel to sustain its heat. [\[1, 2\]](#)

What Happens on the Tree Bark?

When embers hit the trunk, the outcome depends entirely on the **texture of the bark**:

- **Smooth or Flaky Bark (Low Risk):** If an ember hits smooth bark (like a birch or young maple), it usually bounces off and falls to the forest floor. [\[1, 2\]](#)
- **Shaggy or Fissured Bark (High Risk):** Deeply grooved or peeling bark (like cedar, eucalyptus, or mature cypress) acts as an "ember trap". The wind wedges the glowing ember into a tight pocket. [\[1, 3\]](#)
- **Smoldering to Flaming Transition:** Once trapped, the ember transfers its heat to the dry, dead outer layers of the bark. If the wood is dry enough, it begins to smolder. If wind gusts fan this smolder, it supplies oxygen and can transition into an active flame that begins crawling up the trunk. [\[1, 2, 3, 4\]](#)

What Happens in the Tree Crown?

The crown consists of highly flammable fine fuels (leaves, needles, and twigs). When embers land there, the reaction depends on the tree type: [\[1, 2\]](#)

- **Conifer Crowns (High Vulnerability):** Pines, firs, and spruces are highly vulnerable. Their needles are coated in volatile, oil-based resins. If an ember gets caught in a cluster of dry needles or dead twigs inside the canopy, the resin can vaporize instantly. This creates localized flash-ignitions (torching) that can easily pull the entire crown into active combustion. [\[1, 2, 3, 4, 5, 6\]](#)
- **Deciduous/Hardwood Crowns (Lower Vulnerability):** Broadleaf trees (like oaks or maples) have leaves with a much higher water content and lower oil content. An ember landing on a

green leaf usually just burns a small hole through the leaf and goes out, failing to ignite the rest of the canopy unless the tree is severely dead or suffering from an intense drought. [1, 2]

The Real Danger: Cumulative "Ember Attacks"

While a single stray ember might burn itself out, wildfires produce millions of them at once—a phenomenon known as **an ember attack**. [1, 2]

1. **Debris Ignition:** Embers land on the forest floor or get caught in the "crotches" where branches meet the trunk.
2. **Nest Building:** These areas naturally collect dry fallen needles, dead leaves, and bird nests.
3. **The Ladder Effect:** The embers ignite this accumulated dead debris first. This micro-fire generates an actual flame sustained by ground fuel, which then uses the bark and lower limbs as a ladder to climb up and swallow the crown. [1, 2, 3]

To explore how trees protect themselves or how fires spread via embers, let me know if you want to know about:

- ☐ How far **wind** can carry burning embers ahead of a fire front
- ☐ The chemistry of **terpenes** that cause conifer needles to ignite so fast
- ☐ How to prune trees to create a **defensible space** around buildings

Are houses in America being built usually using anti fire materials for roofs, walls, insulation etc?

No, houses in America are **not usually built using advanced, entirely non-combustible materials** like steel or concrete for their core structures. Instead, the vast majority of American single-family homes are built using **wood-frame construction** (specifically "Type V" construction under building codes), which relies heavily on combustible wood studs and sheathing. [1, 2, 3, 4]

However, building regulations heavily mandate **fire-resistant coatings and barrier strategies** rather than fully non-combustible building materials to contain fires and slow their spread. [1, 2]

The specific fire-resistance landscape for typical modern U.S. home construction is detailed below:

1. Roofs (The Most Fire-Resistant Element)

Roofs receive the highest level of fire engineering due to the threat of falling embers. [1, 2]

- **The Standard:** Most U.S. codes require homes to have a **Class A fire-rated roof assembly** (the highest rating under UL 790 standards). [1, 2]
- **Common Materials:** **Asphalt fiberglass composite shingles** are the most popular roofing choice across America. While asphalt itself melts, the fiberglass matting and top mineral granules are engineered to resist catching fire from embers. [1, 2]
- **Premium Options:** Metal roofing, concrete tiles, and natural slate are highly favored in wildfire-prone areas because they are entirely non-combustible. [1]

2. Walls & Siding (A Split Between Wood and Composites)

While the hidden framing inside the walls is almost always wood, the exterior cladding varies greatly by region and budget. [1, 2]

- **Fiber Cement Siding:** Materials like [James Hardie fiber cement panels](#) (made of cement, sand, and wood pulp) have a Class A fire rating and have become highly popular across new American builds because they will not ignite or melt. [1]
- **Stucco and Brick:** Common in the Southwest and East Coast respectively, these materials provide excellent, natural non-combustible shields against external fires. [1, 2, 3]
- **Vinyl and Wood Siding:** Vinyl is incredibly common due to low costs, but it will quickly melt when exposed to radiant fire heat. Wood siding remains heavily utilized in forested or traditional regions but is highly combustible unless treated with chemical fire retardants. [1, 2, 3, 4, 5]

3. Insulation (Chemically Protected)

Insulation materials are strictly regulated based on their flame spread and smoke indexes. [1]

- **Fiberglass Batt:** The most common insulation in the U.S. relies on naturally non-combustible glass fibers. However, the paper facing (vapor barrier) attached to it is highly flammable and must be sealed behind drywall.
- **Spray Foam and Rigid Foam (EPS/XPS):** Plastic-based foam insulations are popular for energy efficiency but are inherently flammable. By law, they must be manufactured with **fire-retardant chemical additives** and must be covered by a 15-minute thermal barrier (usually 1/2-inch drywall) so they cannot easily contact a flame.
- **Mineral Wool (Rockwool):** Growing in popularity, this stone-derived insulation is completely non-combustible and can withstand temperatures over 1,000 °C, but it carries a premium price tag. [1, 2, 3, 4, 5]

4. Interior Walls (The Gypsum Shield)

The true unsung hero of fire resistance in American homes is **Gypsum Board (Drywall)**. [1]

- **Endothermic Protection:** Gypsum contains chemically bound water. When a house fire hits drywall, it undergoes an endothermic reaction, releasing that water as steam to actively cool down the wall assembly and delay fire from reaching the wooden studs behind it.
 - Type X drywall (5/8-inch thick) is legally mandated on garage walls sharing a border with the main house to offer a strict 1-hour fire separation barrier. [1, 2, 3, 4, 5]
- ☐ **The Wildfire Exception: WUI Codes**

In states heavily plagued by climate-driven wildfires (like California and Colorado), local jurisdictions enforce strict **Wildland-Urban Interface (WUI) building codes**. In these specific zones, utilizing fire-hardened exterior components—such as ember-resistant mesh vents, tempered dual-pane glass windows, and non-combustible decks—is legally mandatory for all new construction. [1, 2, 3, 4, 5]

If you would like to look deeper into American building design, let me know if you want to know about:

- ☐ The direct cost difference between building a **wood-frame home** versus a **steel-frame home**
- ☐ How **Fire-Retardant-Treated Wood (FRTW)** is chemically manufactured
- ☐ Specific regulations detailing how **townhomes or apartments** handle shared firewall boundaries

could embers set on fire a locked standing car on the road?

Yes, burning embers absolutely can set a locked, stationary car on fire. [1, 2]

While Hollywood movies often show cars exploding from dramatic flame fronts, real-world fire forensics show that **airborne embers (firebrands) are the primary cause of vehicle ignitions during a wildfire.** [1, 2]

Because a modern car is completely sealed by steel, aluminum, and glass on the outside, an ember cannot burn directly through the metal body panels. Instead, a car catches fire when **embers exploit specific vulnerability traps.** [1, 2]

1. The Windscreen Wiper Channel (Most Common Entry)

- **The Vulnerability:** The recessed area at the base of the windscreen (the cowl) naturally collects dry leaves, twigs, and pine needles over time.
- **The Ignition:** When flying embers land in this channel, they ignite the trapped organic debris. [1, 2]
- **The Spread:** Directly beneath this cowl sits the plastic cabin air intake vent. Once the debris catches fire, the flames melt right through the plastic intake and enter the interior dashboard, setting the highly combustible foam seats, carpets, and plastics on fire. [1]

2. Undercarriage and Engine Bays

- **The Vulnerability:** The underside of a car is not a solid sheet of metal; it is open to allow airflow to the engine. The engine bay contains various flammable fluids like engine oil, brake fluid, and fuel lines. [1]
- **The Ignition:** If the car is parked on or near dry roadside grass, embers will ignite the grass beneath the vehicle. [1, 2]
- **The Spread:** The radiant heat from the burning grass or trapped embers in the undercarriage will quickly melt plastic fuel lines or rubber hoses under the bonnet, causing a high-intensity fluid fire. [1, 2]

3. External Plastic and Rubber Trim

- **The Vulnerability:** External trim pieces such as plastic grilles, side mirrors, rubber window seals, and rubber tyres are exposed to the elements.
- **The Ignition:** While a single ember might just scar a tire, a heavy shower of embers blown by high winds creates a continuous application of heat.
- **The Spread:** If an ember lodges tightly between a rubber window seal and the glass, or inside a plastic bumper assembly, it can burn through the barrier, breaking the window seal and dropping burning material directly onto the car's interior fabric. [1]

4. Open External Vents

- All vehicles have pressure relief vents hidden behind the rear bumper panels to prevent pressure buildup when you close the doors. If embers swirl underneath the rear bumper, they can enter these uncovered plastic flaps and directly ignite the trunk liners and interior materials. [1, 2, 3]

□ Myth vs. Reality: Exploding Fuel Tanks

Despite the danger of a car catching fire, **the fuel tank will not spontaneously explode like a bomb.** Modern fuel tanks (even plastic ones) are highly engineered. When exposed to external fire, pressure-relief valves built into the fuel cap or EVAP system allow fuel vapors to vent out safely, which prevents the pressure buildup required to cause a violent explosion. The fuel will burn intensely, but it will not detonate. [1, 2, 3, 4]

what is the temperature at which tempered glass for cars is melting?

Because tempered glass for cars (typically used for side and rear passenger windows) is an amorphous solid made from [soda-lime silica glass](#), it does not have a single exact melting point. Instead, it softens into a fully workable liquid between **1,400 °C and 1,600 °C (2,550 °F to 2,900 °F)**. [\[1, 2, 3, 4, 5\]](#)

However, when considering a car fire or heat exposure, the glass will **destructively fail, lose its temper, or deform at much lower temperatures**. [\[1, 2, 3\]](#)

The Temperature Breakdown for Car Glass

- **250 °C to 300 °C (482 °F to 572 °F) — Initial Thermal Failure Threshold:** Tempered glass is engineered to survive significant uniform heat, but it cannot handle large temperature imbalances (thermal shock). If one edge of the window frame is heated by localized fire while the rest stays cooler, the thermal expansion creates immense stress and causes the window to **spontaneously shatter into tiny, safe pebbles**. [\[1, 2, 3, 4, 5\]](#)
- **564 °C (1,047 °F) — The Glass Transition Temperature:** At this point, the glass physically transitions from a rigid, brittle state to a plastic, semi-elastic state. [\[1, 2\]](#)
- **600 °C to 650 °C (1,112 °F to 1,202 °F) — De-tempering & Softening Point:** This matches the original furnace temperature used to create the glass. At this stage, the built-in structural tension collapses. If the window has not already shattered from thermal shock, it **loses its "tempered" safety properties entirely** and begins to sag, warp, and droop under its own weight. [\[1, 2, 3, 4, 5\]](#)
- **1,400 °C to 1,600 °C (2,550 °F to 2,900 °F) — True Liquid Melting:** The chemical bonds completely yield, and the glass turns into a glowing, free-flowing liquid pool. [\[1, 2, 3, 4, 5\]](#)

Laminated Windscreen Exception

Note that your car's **front windscreen** behaves differently. Windscreens are made of *laminated glass*—two layers of glass sandwiching a flexible polyvinyl butyral (PVB) plastic interlayer. The plastic interlayer will melt and bubble away rapidly at roughly **150 °C to 200 °C (302 °F to 392 °F)**, leaving behind weak, non-tempered glass layers that sag inward long before the side windows warp. [\[1, 2, 3\]](#)

Depending on your interest in vehicle fires or materials, let me know if you want to explore:

- ☐ The chemical difference between **windscreen glass** vs. **side window glass**
- ☐ How investigators use **melted vehicle glass** to determine where a fire started
- ☐ What happens when **water from a fire hose** hits a hot car window

what is the temperature at which ceramic is melted?

The melting point of traditional ceramic materials generally ranges from **1,600 °C to over 3,000 °C** (2,912 °F to over 5,432 °F). [1]

Because "ceramic" is a broad category encompassing everything from kitchen plates to space shuttle heat shields, there is no single melting point. Instead, the melting temperature depends entirely on the specific chemical composition of the ceramic material: [1, 2, 3, 4]

1. Traditional Ceramics (Clay & Pottery)

These are made from natural minerals like clay, silica, and feldspar. [1, 2, 3, 4]

- **Melting Range: 1,600 °C to 2,000 °C** (2,912 °F to 3,632 °F).
- **Industrial Context:** While pottery is fired in a kiln between 1,000 °C and 1,300 °C to harden it, it requires significantly higher temperatures to break its crystalline bonds and melt into a liquid pool. [1, 2]

2. Oxide Engineering Ceramics (Advanced Ceramics)

These are pure, synthetically processed metal oxides used in electrical insulators, cutting tools, and aerospace engineering. [1, 2]

- **Alumina (Aluminum Oxide - Al_2O_3)**: Melts at **2,072 °C** (3,762 °F). It is widely used in high-temperature laboratory equipment.
- **Zirconia (Zirconium Dioxide - ZrO_2)**: Melts at **2,715 °C** (4,919 °F). It is prized for its extreme thermal barrier coatings. [1, 2, 3, 4, 5]

3. Non-Oxide Ceramics (Ultra-High-Temperature Ceramics)

These are advanced synthetic compounds used for high-stress applications like rocket nozzles and hypersonic vehicle nose cones. [1, 2]

- **Silicon Carbide (SiC)**: Does not melt at normal pressures; instead, it undergoes sublimation (turns directly from a solid into a gas) at roughly **2,730 °C** (4,946 °F). [1, 2, 3, 4, 5]
- **Hafnium Carbide (HfC)**: Melts at an astonishing **3,900 °C** (7,052 °F), making it one of the most heat-resistant synthetic materials known to science. [1, 2]

Comparison table

Ceramic Category	Key Example Compound	Melting / Sublimation Temperature
☐ Earthenware / Porcelain	Silica / Clay Base	~1,650 °C to 1,750 °C (3,002 °F to 3,182 °F)
✂ Alumina	Al_2O_3	2,072 °C (3,762 °F)
☐ Zirconia	ZrO_2	2,715 °C (4,919 °F)
☐ Silicon Carbide	SiC	2,730 °C (4,946 °F) (Sublimation)
☐ Hafnium Carbide	HfC	3,900 °C (7,052 °F)

✓Summary of Values

Traditional pottery and industrial porcelain ceramics begin to degrade and liquefy around 1,600 °C to 2,000 °C, whereas advanced structural engineering ceramics are specifically designed to withstand temperatures ranging from 2,000 °C to well over 3,000 °C before melting. [\[1\]](#)

To narrow down this information for your specific interest, please let me know:

- ☐ Are you looking at traditional arts like **pottery kiln firings** and glazes?
- ☐ Are you researching advanced industrial uses like **spacecraft heat shields** or engine parts?
- ☐ Do you need me to add these ceramic values into the **master material comparison table** we built earlier?

what wildfires have been recorded to destroy completely houses like in Lahaina, for ex?

Wildfires that transition into "urban conflagrations"—completely wiping entire neighborhoods or whole towns off the map similar to the [2023 Lahaina fire](#)—have occurred multiple times in history. When extreme winds mix with dense housing and highly combustible materials, the result is a catastrophic urban firestorm. [\[1, 2, 3\]](#)

The most prominent historical and modern examples where wildfires completely leveled thousands of houses and entire communities include:

1. The Camp Fire (2018) – Paradise, California

- **The Devastation:** This stands as the **most destructive wildfire in California's history**.
- **The Outcome:** Driven by intense wind gusts, the fire swept through the mountain community of Paradise, **destroying roughly 18,000 structures** and resulting in 88 fatalities. Like Lahaina, the speed of the fire trap left residents with almost no time to evacuate, reducing entire residential grids to nothing but concrete foundations and burned car shells. [\[1, 2, 3, 4, 5\]](#)

2. The Eaton and Palisades Fires (January 2025) – Los Angeles County, California

- **The Devastation:** These fast-moving, wind-driven winter fires tore directly through coastal and canyon neighborhoods in the Los Angeles area. [\[1, 2, 3, 4, 5\]](#)
- **The Outcome:** The twin fires **completely destroyed over 16,200 structures**, forcing the evacuation of over 200,000 people. Entire blocks of dense housing were entirely flattened. [\[1, 2, 3, 4\]](#)

3. The Spokane County Wildfires (August 2026) – Washington State

- **The Devastation:** Triggered by severe drought and record-breaking heat, an extraordinary fire season culminated in massive blazes around Washington's second-largest city. [\[1, 2\]](#)
- **The Outcome:** Emergency alerts forced over 60,000 residents to evacuate as the flames consumed entire neighborhoods. Over **600 to 700 homes were completely leveled**, leaving only blackened foundations. [\[1, 2\]](#)

4. The Marshall Fire (December 2021) – Boulder County, Colorado

- **The Devastation:** An unusual winter wildfire driven by historic, straight-line winds exceeding 100 mph hit suburban neighborhoods.
- **The Outcome:** Rather than burning a deep forest, the fire skipped through manicured lawns and hopped from roof to roof with terrifying speed. It **completely destroyed 1,080 homes** and multi-family complexes in less than 24 hours. [\[1, 2\]](#)

5. The Almeda Drive Fire (September 2020) – Rogue Valley, Oregon

- **The Devastation:** A down-canyon windstorm pushed a small brush fire directly into a ribbon of dense residential communities along a highway corridor.
- **The Outcome:** It systematically **wiped out over 3,000 structures**, primarily tearing through mobile home parks and affordable housing complexes, completely leveling the towns of Phoenix and Talent, Oregon. [[1](#), [2](#)]

6. The Fort McMurray Wildfire (2016) – Alberta, Canada

- **The Devastation:** Known widely across Canada as "The Beast," this massive boreal forest fire swept directly into the oil-sands boomtown of Fort McMurray.
- **The Outcome:** It forced the largest evacuation in Alberta's history (88,000 people) and **burned approximately 2,400 homes and buildings to the ground**, entirely erasing multiple sub-neighborhoods. [[1](#), [2](#), [3](#), [4](#), [5](#)]

Summary Comparison of Structural Loss

Wildfire Event	Location	Key Communities Affected	Structures Completely Destroyed
☐ Camp Fire (2018)	California, USA	Paradise, Magalia	~18,000 structures
☐ Palisades & Eaton (2025)	California, USA	LA Neighborhoods, Topanga	~16,200 structures
☐ Almeda Drive Fire (2020)	Oregon, USA	Phoenix, Talent	~3,000 structures
☐ Lahaina Fire (2023)	Hawaii, USA	Lahaina, Maui	~2,200 structures
☐ Marshall Fire (2021)	Colorado, USA	Superior, Louisville	~1,080 structures
☐ Spokane Fires (2026)	Washington, USA	Medical Lake, Spokane suburbs	~700 structures

If you want to investigate how communities bounce back or change after these events, let me know if you'd like to look at:

- ☐ The **years-long rebuilding challenges** currently facing areas like Lahaina or Los Angeles
- ☐ Changes to **zoning laws and insurance policies** following major urban firestorms
- ☐ How **invasive plant species** (like the grasses in Hawaii) alter fire risks