POLAR BREEZE

THE HVAC FORENSICS AND CONSULTING SPECIALIST

WHY FIRE CODES ARE DEADLY SERIOUS

Wood Framing as Ductwork. Combustibles in Air Paths. Fire Science, Litigation & Contractor Liability

This is not a code checklist. This is the story of what happens when the codes' conditions are ignored — and who pays for it.

Prepared by Polar Breeze LLC | Orem, Utah · Based on: Utah Code Title 15A | 2021 I-Codes | NFPA | ACCA | Cited Case Law · May 2026, revised July 2026

Section 1 — The Problem in Plain Language

Across the United States — including right now in Utah — residential homes are being built with a dangerous practice: wood stud bays and joist cavities are used as return air pathways with **combustible material riding in the airstream** — cardboard panning, PEX plumbing, standard electrical wiring (Romex/NM-B), spray foam, and construction debris.

> *"A stud bay stuffed with Romex, PEX, and airflow is not a return duct. It is a chimney full of fuel with a fan helping it burn."*

Here is the precise legal picture — because precision is what survives cross-examination. The 2021 IRC (M1601.1.1, item 7) **permits** a stud-wall or solid-joist cavity to serve as a **return** plenum, but only under strict conditions: return use only (never supply), materials meeting the code's flame-spread requirements (IRC Table M1601.1.1), isolation from adjacent concealed spaces, no fire-resistance-rated assemblies, and stud cavities limited to a single floor. IMC §602.3 imposes similar limits in IMC-governed buildings, and NFPA 90A restricts combustible materials in air-handling spaces. NEC 300.22(C) restricts wiring in spaces used for environmental air, with a limited exception for cables passing through joist/stud return spaces in dwellings.

> The installs we document in the field are not the permitted kind. Cardboard in the air path fails the material requirements. PEX and Romex bundles routed *along* the cavity (not merely passing through) fail the conditions. Missing isolation and missing fireblocking fail the conditions. **When the conditions fail, the installation is a code violation — and every one of those materials is fuel sitting inside a pathway that, the moment fire enters it, acts as a vertical and horizontal highway for flames, hot gases, and toxic smoke.**

Why It Keeps Happening

Building cavities as unrestricted return air paths were tolerated — sometimes standard practice — for decades. Modern codes (IRC M1601.1.1, IMC 602.3, NEC 300.22) have progressively narrowed that tolerance to a tightly conditioned exception, but the enforcement gap is wide. Inspectors don't always catch it. Walls get closed. The problem gets sheetrocked over. Nobody knows until a fire.

- The DOE's Building America program states flatly: "Do not use building cavities as part of a forced air supply or return system."
- InterNACHI's home-inspection training identifies wood cavities used as ducts as a deficiency because "building materials such as wood products do not meet the flame and smoke spread criteria of approved duct materials."
- ACCA's Manual D — referenced by Utah's adopted IRC — requires duct systems to be designed, sealed, and sized. An open stud bay with debris in the airstream cannot be Manual D-compliant.

Section 2 — What Fire Actually Does to These Structures

Modern Homes Burn Faster — Measured, Not Opinion

UL's Fire Safety Research Institute (FSRI) and NFPA have conducted extensive research comparing fire behavior in legacy rooms versus modern rooms. The findings are stark:

- In legacy furnishings and construction, occupants historically had on the order of **17 minutes** of escape time from ignition to flashover in a typical room test.
- In modern room tests that window has collapsed to as little as **3–4 minutes** — driven primarily by modern synthetic furnishings and contents, compounded by lightweight construction. (Source: UL FSRI legacy-vs-modern room burn research.)
- Structural failure (floor or roof collapse) can occur in lightweight wood-frame construction within minutes of fire contact with the assembly — engineered I-joists and metal-plate-connected trusses have far higher surface-area-to-mass ratios than solid sawn lumber, so they ignite faster and lose structural integrity faster (UL FSRI structural research; fire-service training literature).

When the HVAC return system uses those same members as air pathways, the system feeds oxygen directly to the burning structure from the inside.

The Chimney Effect: When Your Return System Becomes a Flame Highway

In fire investigation science, the "chimney effect" describes how hot gases and flames travel rapidly through vertical and horizontal voids in a building. Stud bays run floor to ceiling. Joist bays run the full width of a house. When those spaces are open and connected — which they are when used as unisolated return air paths — fire travels through them at speeds that are impossible once walls are closed and firestopping is in place.

> When a return air path runs through stud bays from the first floor to the second floor — violating the single-floor condition of the residential code and IMC 602.3's limits — fire can travel from the basement to the attic through concealed spaces before any smoke detector triggers in a living space.

ICC firestopping guidance identifies unsealed penetrations and incomplete fireblocking as among the most common and dangerous code violations in residential construction — precisely because they allow fire to bypass fire-resistance-rated assemblies and spread through the concealed structure.

Long-Term, Low-Temperature Ignition: The Hidden Danger

Fire-investigation literature describes a phenomenon called Long-Term, Low-Temperature Ignition of Wood (LTLTIW): wood repeatedly exposed to temperatures in roughly the 150–212°F range over months or years undergoes pyrolysis — its chemical structure changes and its ignition temperature drops progressively, until it can ignite at temperatures far below the several-hundred-degree range normally required for sound wood (piloted ignition of wood is generally cited in the 480–570°F range; the pop-culture "451°F" figure is a paper value, not a wood constant). Expert testimony on this mechanism has been offered in fire litigation; its admissibility is contested and decided case by case under *Daubert* — some courts have admitted it, others have excluded it.

This is directly relevant to HVAC systems: furnace flue proximity, duct leakage heating wood members, and wiring running hot inside cavities can all pre-condition wood framing. The fire starts inside the wall — invisible, slow, and catastrophic when it finally breaks through.

What PEX and Romex Add to the Fire

Standard cross-linked polyethylene (PEX) tubing has a flame-spread index that exceeds the 25/50 threshold required for plenum materials under ASTM E84. When PEX burns, it releases toxic fumes and contributes significant BTUs to the fire load inside the cavity. Standard Romex (NM-B) cable jacketing is combustible and rated for dry, protected locations — not for air-handling spaces (NEC 300.22(C)'s dwelling exception covers cables *passing through* such spaces, not cable runs living in them). When energized wiring in an enclosed cavity develops a fault, it introduces both an ignition source and additional fuel in the same location.

Section 3 — Real Cases, Real Courts, Real Money

The following are documented cases, verdicts, settlements, and enforcement actions where fire, building codes, HVAC systems, and construction defects intersected. Each entry carries its citation — every claim in this section survives "how do you know that?"

Cases Directly Tied to Utah

Rosser v. Elite Craft Homes, LLC, 2026 UT App 16 (Utah Ct. App., Feb. 5, 2026)
A June 2021 construction-site fire on a developer's property spread to a neighboring residence, destroying the home and killing the family's pets. The district court had dismissed all claims; the Utah Court of Appeals reversed in substantial part, holding that a builder who creates a potentially dangerous condition — such as a highly flammable construction site — owes a **duty of care to neighboring property owners** regarding foreseeable fire hazards (negligence, negligent infliction of emotional distress, and nuisance claims reinstated; negligent trespass rejected as a Utah cause of action). This is published, citable Utah appellate precedent: a contractor, subcontractor, or developer who creates fire conditions — including improper HVAC installations in combustible construction — owes a legal duty to those whose property or safety could foreseeably be affected. (Published opinion; see also the court's later opinion in the same matter, 2026 UT App 66.)

Utah DOPL Enforcement: ~$130,000 in Contractor Citations in One Sweep
In a coordinated enforcement effort with the National Association of State Contractors Licensing Agencies (NASCLA), Utah's Division of Professional Licensing issued 77 administrative citations with potential fines of $129,990 and referred three criminal filings, across 871 site checks. These administrative penalties are in addition to any civil liability — and a contractor with a DOPL enforcement record faces worse outcomes in civil litigation. (Source: Utah Dept. of Commerce / DOPL news release, "DOPL issues nearly $130K in fines.")

Winn Ridge Homeowners v. Builder — Nephi, Utah (filed 2026)
Twenty-two families in the Winn Ridge community of Nephi sued the construction company, real-estate firms, and the geotechnical engineer over serious structural defects in homes built 2022–2023 — cracked drywall and slabs, sloping floors, and basement fissures alleged to admit dangerous radon levels. Claims include fraud and negligence, centered on soil-preparation requirements from the geotechnical report that the suit alleges were not followed or disclosed. While this case involves structural defects rather than fire, it demonstrates that Utah homeowners and courts are fully prepared to hold builders accountable for defective residential construction. (Source: ABC4 Utah and Fox 13 investigative reporting, 2026.)

National Fire and HVAC Litigation: Named Cases and Amounts

Case / Event	Location	Amount	Key Facts
Grandview condominium fire-code defect verdict — condo association v. K. Hovnanian entity & architect (2017)	New Jersey	$10,000,000	Six-story building designed with combustible plywood subflooring inconsistent with its fire-resistive construction classification; reclassification was never approved. Jury found for the association: $3M trebled to $9M under the NJ Consumer Fraud Act against the developer's parent, plus $1M against the architect. Establishes that fire-code construction classification defects support major verdicts. (Reported by Becker & Poliakoff, counsel of record, and Building Design+Construction, 2017.)
Da Vinci Apartments fire — City of Los Angeles v. developer (suit filed 2016)	Los Angeles, CA	$20,000,000 sought	The 2014 fire destroyed the wood-frame Da Vinci complex under construction; the City sued the developer alleging negligence and code violations, including inadequate fire protection for combustible framing, claiming over $80M in city damages. The fire's ignition was arson — the City's theory was that code failures let it spread. (LA City Attorney complaint; ABC7/LAist reporting, 2016.)

Stamford "Christmas Day fire" contractor settlement (2014)	Stamford, CT	$5,000,000 settlement	The 2011 fire killed three children and their grandparents. The contractor renovating the home settled the father's lawsuit for $5M; the suit alleged months of substandard construction had left the house a firetrap, and the fire started from fireplace ashes left in the mudroom during the renovation. The city separately paid an estimated $6.65M. (CBS New York / NBC New York reporting, Dec. 2014.)
Emerson Electric Co. v. Johnson (Tex. 2021)	Texas	$15,000,000 verdict upheld	The Texas Supreme Court upheld a $15M products-liability verdict for an HVAC technician engulfed in flames when a compressor terminal vented and ignited; the manufacturer had continued using an older terminal design significantly more susceptible to catastrophic failure. Establishes that HVAC-related fire injuries carry massive exposure — here against the equipment manufacturer. (Tex. Sup. Ct., Apr. 16, 2021; Law360/Bloomberg Law coverage.)

PEX Litigation: A Warning Signal

PEX plumbing manufacturers have already faced enormous litigation — not for fire, but for product defects causing water damage. These cases show how fast and large PEX litigation can grow, and they provide the legal template for fire-related PEX claims if that connection is ever established in a fire investigation:

- **In re NIBCO PEX litigation (D.N.J.):** $43.5 million nationwide class settlement over defective PEX tubing, fittings, and clamps causing property damage.
- **In re Zurn Pex Plumbing Products Liability Litigation, 644 F.3d 604 (8th Cir. 2011):** class certification upheld over allegedly defective brass fittings prone to stress-corrosion cracking — demonstrating appellate willingness to certify large plumbing-system class actions.

> If a fire investigation ever concludes that PEX inside a wood-cavity return contributed to fire spread or ignition — the litigation templates are already built. Plaintiffs' attorneys know exactly how to run that case.

Section 4 — How Contractors Get Sued: The Legal Theories

When a house fire occurs and code violations are present, attorneys don't have to prove the violation caused every inch of damage. They have to prove the violation contributed to the fire's origin or spread. Here is how the legal theories work.

Theory 1: Negligence Per Se

In Utah and most states, violating a safety statute or code can constitute negligence per se — the violation itself is treated as evidence of breach of duty. For this theory to apply, three things must be true:

- The defendant violated a code or statute (e.g., the conditions of IRC M1601.1.1, NEC 300.22, IMC 602.3);
- The plaintiff is in the class of people the code was designed to protect (homeowners, occupants);
- The harm that occurred is the type the code was designed to prevent (fire, injury, death).

> A wood-cavity return stuffed with cardboard, Romex, and PEX in a Utah residence fails the code's conditions under the IRC, IMC, and NEC simultaneously. The moment a fire occurs and a forensic investigator documents that configuration, the contractor is exposed on all three elements.

Theory 2: Construction Defect

Even without a fire, a non-compliant duct configuration is a construction defect. Utah allows homeowners to pursue defect claims for conditions that create unreasonable risk, whether or not damage has occurred yet. A documented wood-cavity return that fails the code's conditions is a defect that can support demands for remediation, repair costs, and diminution in property value.

Theory 3: Contribution to Fire Spread

Even if the contractor didn't start the fire, if the code-violating HVAC configuration allowed a small fire to spread faster, farther, or hotter than it would have in a code-compliant installation, the contractor can be held liable for the additional damages caused by that accelerated spread. This is the contribution theory — and it is how fire attorneys approach cases where multiple parties share fault.

Theory 4: Negligence in Installation (HVAC-Specific)

HVAC firms have been held liable directly for fires caused by improper installation, failure to follow manufacturer instructions, and failure to comply with codes. Verdicts like the $15M Texas compressor case show that juries award large damages when HVAC work and fire intersect.

Who Else Gets Named Besides the HVAC Contractor

Party	Why They Get Sued
General Contractor / Builder	Responsible for the overall construction and code compliance of the structure. Even if the HVAC sub did the work, the GC is liable for allowing it.
HVAC Subcontractor	Directly installed the noncompliant duct system. Responsible for knowing and following IRC M1601, IMC 602, NEC 300.22, ACCA Manual D.
Framing Contractor	May have created or encouraged use of framing cavities as air paths.
Electrician	Ran standard NM-B cable along a space functioning as a return air path — beyond what NEC 300.22(C)'s dwelling pass-through exception allows. Shares liability for the combined-fuel condition.
Plumber	Routed PEX through an air-handling space without plenum-rated materials.
Building Inspector / AHJ	If the system was inspected and passed, governmental immunity may protect the inspector, but it is sometimes challenged when violations are obvious.
Home Seller / Developer	In resale situations, failure to disclose known defects adds fraud exposure on top of negligence. In Utah, consumer protection statutes apply.

Section 5 — What the Fire Investigator Finds — and What It Means

When a house burns and there is any question of construction defect or contractor negligence, a certified fire investigator is hired by the insurance carrier, the plaintiff's attorney, or both. Here is what they look for — and what they will find in a non-compliant wood-cavity return configuration.

Evidence the Investigator Documents

- **Burn patterns in framing cavities:** V-patterns, pour patterns, and travel patterns that show fire moving through concealed spaces — consistent with chimney-effect spread through open stud or joist bays.
- **Absence of fireblocking and isolation:** the residential code's cavity-return conditions and IMC 602.3 require isolation of cavity plenums from adjacent concealed spaces. When it's missing, the investigator documents it as a code violation that contributed to fire spread.
- **Melted PEX and wire insulation in the return cavity:** physical evidence that combustible materials were present in the air-handling path.
- **Lack of sealed ductwork:** unsealed joints mean fire and smoke travel freely between the air distribution system and the structure.
- **ACCA Manual D non-compliance:** measured duct sizes, return configurations, and system design that don't match Manual D calculations — evidence of improper installation.

What Expert Witnesses Testify To

- Whether the as-built HVAC configuration complied with the IRC, IMC, and NEC — including the specific conditions that make a cavity return legal;
- Whether the fire would have spread as far or as fast in a code-compliant system;
- The flame-spread and smoke-development properties of the materials found in the cavity;
- Long-term low-temperature ignition as a potential ignition mechanism (admissibility contested; decided case by case under *Daubert*);

- The delta in damages attributable to the noncompliant configuration.

Courts routinely admit expert testimony grounded in ASTM E84 flame-spread data, published NFPA and UL FSRI fire-behavior research, and ACCA Manual D standards when the expert is qualified — that is the bar this document is written to meet.

The Insurance Subrogation Problem

Even if the homeowner doesn't sue, the insurance company will. When an insurer pays a fire claim, it acquires the homeowner's right to sue whoever caused the damage — this is called subrogation. Insurance companies employ large subrogation departments specifically to recover claim payments from negligent contractors.

A contractor who builds a noncompliant HVAC system may settle a homeowner claim for thousands, only to face a subrogation action from the insurer for hundreds of thousands. Subrogation cases are pursued aggressively because insurers have the resources and motivation that individual homeowners often lack.

> The statute of limitations in subrogation cases often runs from the insurer's payment date — not the fire date. A contractor can receive a subrogation suit years after the job is complete and long after they've moved on.

Section 6 — The Right Way: Approved Materials and Methods

The fix is not complicated. The materials exist, the costs are manageable, and the protection they provide — both for the homeowner and for the contractor — is enormous. Here is what the codes actually require.

Approved Duct Materials Under IRC M1601.1.1

Material	Approved For	Fire Properties
Galvanized sheet steel (26-gauge or heavier)	Supply and return ducts, all locations	Noncombustible. Does not contribute fuel. Industry standard.
Aluminum duct (0.018" minimum)	Supply and return ducts	Noncombustible. Lightweight. Listed for residential use.
Fiberglass duct board (factory fabricated)	Supply and return, listed systems only	Must be listed and labeled; meets 25/50 ASTM E84 requirements.
Listed flexible duct (insulated)	Short connections to diffusers; flexible air connectors limited to 14-ft runs (IMC 603.6.2)	Must be UL 181B listed. Cannot replace trunk ductwork.
Sheet metal with liner or wrap insulation	Supply and return in unconditioned spaces	Metal core is noncombustible. Insulation must meet R-8, ASTM E84 25/50.

Return Air Systems: How to Do It Right

Option 1 — Fully Ducted Returns (Best Practice, Manual D Compliant): dedicated sheet metal or duct board return trunks from each room or zone to the air handler; each bedroom has its own ducted return or a properly sized transfer grille with a hard-ducted path back to the central return; system can be properly sized, measured, and tested per ACCA Manual D; no combustible materials in the air-handling path.

Option 2 — Central Return with Transfer Grilles: single central return connected to a sealed, properly sized metal duct trunk; interior doors undercut minimum 1" or fitted with transfer grilles to allow the return path; acceptable under the IRC if the pressure differential between rooms stays within limits.

Option 3 — Dedicated Return Air Pathway (Framed Chase with Metal Liner): if a framed chase must be used, line it with sheet metal on all sides; fireblock all penetrations into the chase per IRC R302.11 / IMC 602.3; no PEX, Romex, or other combustibles inside the lined chase. Done this way — and only this way — a framed pathway satisfies the code's conditions for using framing structure as part of a return system.

Wiring in Mechanical Spaces: The NEC 300.22 Solution

- Run wiring through EMT conduit in any space used for return air or environmental air handling.
- Use CMP-rated (plenum) cable where conduit is not practical — CMP cable is specifically listed for air-handling spaces.

- Do not route NM-B (Romex) runs through a cavity that functions as a return air path — the dwelling exception in NEC 300.22(C) covers cables passing perpendicularly through joist/stud return spaces, not cable runs installed along them.

PEX and Plumbing in Mechanical Spaces

- PEX is not inherently prohibited from being near HVAC equipment — it is prohibited from being inside an air-handling space.
- Route PEX outside the return cavity, through separate chases, or in conditioned spaces not used for air distribution.
- Where plumbing must pass through an air-handling space, use metallic pipe or ensure the cavity is not functioning as an active return air path.

Section 7 — The Polar Breeze Standard: Our Commitment to Getting It Right

Polar Breeze LLC (Licensed in Utah · DOPL #14260229-5501) operates in Utah under the same laws and the same codes as every contractor in this state. We do the work — service, installation, design, consults, and second opinions — and we teach while we do it: **measurement drives the diagnosis, never the sale.** On audits and second opinions our judgment is independent — findings never bend toward whoever pays — and that discipline is exactly why this document exists.

> *"We don't put wood cavities in the airstream of our designs. We don't spec Romex through return paths. We don't skip Manual J because it's inconvenient. Because we know what happens when somebody does."*

What We Do on Every Design and Audit

- Perform a full ACCA Manual J load calculation before any equipment is selected.
- Design duct systems to ACCA Manual D — with actual friction-rate calculations and return air paths sized and documented.
- Specify only approved duct materials — sheet metal, listed flex, listed duct board — and verify at commissioning that they were used.
- Verify that no Romex or standard PEX is routed through any return air path.
- Verify appliance clearances to combustibles per nameplate and IFGC Section 303.
- Verify combustion air provisions for every gas appliance per IFGC Chapter 3.
- Verify all duct joints are sealed with mastic or listed tape per IRC M1601.4.1.
- Document every audit and every commissioning for our records and the customer's file.

What We Tell Our Customers and Other Contractors

When we find a non-compliant wood-cavity return in an existing system or in a new-construction job we're engaged to audit, we document it in writing. We tell the homeowner what it is, why it matters, and what the code's conditions actually say. We give them a path to fix it. We don't look the other way because "the last guy did it that way."

> Knowingly leaving a documented fire-code violation in place — or failing to disclose one you found — is not just an ethical problem. It is a potential contributing act to any fire that occurs afterward. If that fire results in injury or death, silence is not protection.

The Bottom Line

The codes are not bureaucratic paperwork. They are the distilled result of every fire, every death, every investigation, and every lawsuit that came before. IRC M1601 and its conditions. IMC 602. NEC 300.22. IFGC 303. ACCA Manual D. These sections exist because people died in buildings where someone cut corners. Every time a contractor stuffs a stud-bay return with cardboard, Romex, and PEX, they are betting their license, their company, and potentially someone's life that there won't be a fire. That is not a bet Polar Breeze is willing to make — or to stay quiet about.