Structural Fire Scope Field Quick Card

Phases 1–4: Pre-Entry Safety Sweep, Evidence Photography, Burn Pattern Analysis & Char Measurement

Structural Fire Damage Assessment Defined: Systematic evaluation of building assemblies to determine: (1) immediate structural safety, (2) extent & depth of thermal pyrolysis, (3) restoration vs. replacement feasibility, and (4) demolition & reconstruction boundaries. All assessment lines must be grounded in measurable indicators defensible to carriers, adjusters, and building officials.

PHASE 1: PRE-ENTRY SAFETY EVALUATION & HAZARD SWEEP

1. Structural Instability Perimeter Scan

Evaluate exterior perimeter before entry: wall lean or lateral displacement, roof line deflection/collapse, floor structure distress visible from crawl/basement, and foundation integrity at fire origin. If concentrated burn >30 min, advance only from points of least risk inward after verifying each zone.

2. Electrical & Gas Utility Isolation

• **Electrical:** Confirmed OFF at the meter (never just breaker; insulation damage creates energized conductors far from origin).
• **Gas:** Confirmed OFF at the street (never just meter/appliance). Requires utility coordination and documented sign-off before re-entry.

3. Pre-1981 Hazardous Materials Gate

Under EPA NESHAP (40 CFR Part 61) & OSHA 1926.1101, fire damage does not waive asbestos testing. Pre-1981 structures require bulk sampling of all disturbed materials before demolition. Lead paint baseline required under EPA RRP (40 CFR Part 745).

4. Thermal Imaging Hot-Spot Clearance

Scan wall cavities, attic insulation, and subfloor with thermal imaging camera. Residual smoldering pockets must receive targeted water application and ventilation before general assessment begins.

PHASE 2: DOCUMENTATION & PHOTOGRAPHY PROTOCOL

Systematic Inward Progression Sequence

Document strictly from exterior perimeter inward, then interior room-by-room moving from least damaged zone to most heavily damaged zone. Creates a spatial timeline supporting scope defensibility and origin verification.

Minimum Mandatory Photographic Suite

- **4 Exterior Elevations:** North, South, East, West full perspectives.
- **Room 4-Corner Context:** Wide-angle shot from all 4 room corners.
- **Assembly Close-ups:** Specific framing, drywall, electrical damage.
- **Material Transitions:** Where damaged assembly meets undamaged assembly (this exact line defines your reconstruction boundary).
- **Char Depth with Scale:** Pick/gauge measurement with physical ruler visible in the frame. Undated/unscaled photos lose evidentiary standing.
- **Pre-Existing Conditions:** Document prior settlement, rot, or water damage.

Video Walkthroughs & Spatial Metadata

Continuous video record establishes spatial relationships between damage zones. Large commercial losses require 3D reality capture (Matterport/Leica). Every asset must carry timestamp, GPS/location data, and room/zone designation.

PHASE 3: BURN PATTERN ANALYSIS & FIRE PROGRESSION MAPPING

V-Pattern Apex Analysis

V-shaped burn patterns on vertical surfaces indicate fire origin directly below the apex. Angle and height correlate with flame intensity and ventilation. Multiple distinct V-patterns from separate origins indicate multiple ignition points (forensic referral flag).

Low Burn Forensic Indicators

Charring at floor level, char on the undersides of furniture, or descending burn marks suggest accelerant involvement. *Restoration Role:* Document accurately with macro photos and refer immediately to origin-and-cause investigators (do not make arson findings).

Smoke Migration Mapping

Map combustion byproducts through HVAC duct runs, wall chases, and attic spaces. Smoke travels far past thermal fire zones; identify cold-surface thermal tracking and soot deposition in areas showing zero visible char.

PHASE 4: CHAR DEPTH MEASUREMENT & STRUCTURAL ADEQUACY THRESHOLDS

Pyrolysis & Measurement Technique

Wood exposed to heat undergoes pyrolysis, converting sound fiber into mechanically useless carbonized char. Drive a pick, probe, or calibrated depth gauge perpendicular to charred surface until encountering sound, uncharred wood. Take multi-point readings along member length and record separate depths for each exposed face.

The 10% Cross-Section Rule of Thumb

A structural wood member retains approximately **80% of its original load capacity** when char depth is limited to **≤10% of its original cross-sectional dimension**. Beyond 10%, capacity degrades rapidly.

Member (Nominal)	Actual Dimension	10% Char Depth Limit	Field Scope Action
2×4 Stud	1.5″ × 3.5″	**0.350″** (depth face)	Restore if ≤0.35″; Replace if >0.35″
2×6 Joist / Stud	1.5″ × 5.5″	**0.550″** (depth face)	Restore if ≤0.55″; Replace if >0.55″
2×8 Joist / Rafter	1.5″ × 7.25″	**0.725″** (depth face)	Restore if ≤0.725″; Replace if >0.725″
2×10 Joist / Beam	1.5″ × 9.25″	**0.925″** (depth face)	Restore if ≤0.925″; Replace if >0.925″
Engineered Lumber (LVL, I-Joist, TJI, PSL)	Web / Flange Assemblies	**0.000″ (Zero Tolerance)**	**AUTO-REFER TO STRUCTURAL ENGINEER**

Mandatory Licensed Engineer Referral Triggers: Any load-bearing element (walls, beams, columns, joists, rafters, trusses) with char >10%, visible cross-section loss, distortion/racking, or ANY fire exposure to engineered lumber webs/flanges must be referred to a licensed structural engineer before scoping restoration.

Current version — Oct 31, 2026. Update history: https://restorationintel.com/structural-fire-damage-assessment-scope-char-removal-reconstruction/

Structural Fire Scope Field Quick Card

Phases 5–7: Restore vs. Replace Matrix, Hazmat Regulations, Scope Assembly & Char Removal

PHASE 5: RESTORATION VS. REPLACEMENT DECISION FRAMEWORK

Building Assembly	Restore Protocol (Preserve & Remediate)	Replace Protocol (Demolish & Rebuild)	Governing Economic / Technical Rule
Structural Framing (Studs, Joists, Beams, Rafters)	Char depth ≤10% cross-section; member straight with no deflection/sag; char removed to sound wood and sealed with shellac primer.	Char depth >10%; visible racking/deflection; fire on engineered web/flange; or restoration labor exceeds 50–60% of replacement cost.	**50–60% Cost Rule:** If char removal, blasting, and sealing labor ≥50–60% of new lumber + framing labor, scope complete replacement.
Gypsum Wallboard (Drywall & Plaster Ceilings/Walls)	Non-direct fire zones with light/moderate soot deposition only; sponge/chemical wipe down where paper facing is 100% intact.	All direct fire zones; water saturation; paper separation from core; heavy soot where cleaning cost approaches replacement threshold.	**60–70% Drywall Rule:** Direct fire destroys thermal barrier and separates paper facing (auto-replace). Replace if soot cleaning ≥60–70% drywall cost.
Thermal & Acoustic Insulation (Fiberglass, Cellulose, Spray Foam)	Distant, verified undamaged attic/wall areas with zero smoke penetration may be sealed-in during reconstruction.	All insulation in direct fire, smoke exposure, or soot migration zones must be 100% removed and replaced.	**100% Replacement Rule:** Fiberglass batts permanently trap smoke odor; wet cellulose becomes mold substrate; pyrolyzed foam loses air barrier.
Flooring Assemblies (Hardwood, Carpet, Laminate, Tile)	Hardwood with superficial surface char and no subfloor damage may be sanded/refinished if odor can be sealed. Ceramic/stone tile if mortar sound.	Hardwood with deep char or subfloor burn; 100% of carpet and pad; 100% of laminate and engineered floating flooring in fire/soot zones.	**Subfloor & Odor Rule:** Porous floor coverings absorb heavy soot VOCs. Replaced carpet/pad and engineered wood cannot be remediated defensibly.
Interior Trim & Finishes (Baseboards, Casings, Crown, Doors)	Painted solid wood trim in secondary soot zones cleaned, deglossed, sealed, and repainted.	Thermal distortion, melted profiles, charred surfaces, or hollow-core doors with soot penetration into internal honeycomb core.	**Policy Like-Kind Matching:** Some carrier policies require continuous matching across adjacent rooms; scope replacement if matching fails.

PHASE 6: HAZARDOUS MATERIALS REGULATIONS

EPA NESHAP (40 CFR Part 61) — Asbestos Hold

Mandatory bulk sampling before disturbance in pre-1981 buildings. Common ACM targets: vinyl floor tile & black mastic adhesive, acoustical ceiling tiles, drywall joint compound (pre-1978), pipe/duct insulation, popcorn ceilings, and roofing felt. Confirmed ACM requires licensed abatement contractor before restoration work proceeds.

EPA RRP Rule (40 CFR Part 745) — Lead Paint

Applies to pre-1978 residential & child-occupied facilities (present in 87% of pre-1940 structures). Demolition generates regulated lead dust. Requires certified RRP firm, containment barriers, HEPA vacuuming, and baseline test documentation in the claim file.

CHAR REMOVAL STANDARDS & ODOR SEALING

Mechanical Removal: Wire brushing and scraping to sound wood. Heat discoloration deeper than char is normal. Requires N95/P100 respirators and HEPA vacuum extraction.

Soda Blasting (Sodium Bicarbonate): Removes char/soot without raising wood grain; leaves neutralizing alkaline film. Requires full containment and continuous HEPA negative air filtration.

Dry Ice Blasting (CO_2 Pellets): Pellets sublime on impact leaving zero media waste. Ideal for complex cavities and near electrical runs. Confined space oxygen displacement warning.

Mandatory Odor Sealing: Apply 100% coverage of shellac-based primer (Zinsser BIN / Kilz Original) to all accessible faces of remediated wood before drywall enclosure. Water-based primers fail on fire char.

PHASE 7: LINE-ITEM SCOPE OF LOSS DEVELOPMENT

6 Essential Anatomy Elements Per Scope Item:

1. **Location:** Room name, zone code, elevation/grid coordinate.
2. **Component:** Exact assembly and material specification.
3. **Quantity:** Measured SF, LF, or unit count (field-verified).
4. **Action:** Demolish, clean, remediate, restore, or rebuild.
5. **Estimating Code:** Standard Xactimate line item (e.g., CLN, DRY, FNC).
6. **Cost Drivers / Notes:** ACM presence, high access, engineering sign-off.

Boundary Extension Rule: Never stop scope at visible burn edge. Extend into smoke migration paths (wall chases, floor joist bays, attics). Under-scoping soot travel is the #1 cause of downstream odor callbacks.

HVAC ASSESSMENT & SCOPE REQUIREMENTS

Ductwork & Air Handling Scope (ANSI/IICRC S700 / NADCA ACR):

- **Immediate Lockout:** Tag out system; replace all filters to prevent soot circulation during restoration.
- **Video Inspection:** Document supply and return trunks for particulate deposition.
- **Mechanical Cleaning:** Negative air collection, mechanical agitation, and HEPA air washing per NADCA ACR standards.
- **Coil & Blower Decontamination:** Chemical clean evaporator coils and blower wheel.
- **Licensed HVAC Evaluation:** Equipment with direct heat exposure requires licensed contractor inspection before operation (heat exchanger crack = CO risk).

Current version — Oct 31, 2026. Update history: https://restorationintel.com/structural-fire-damage-assessment-scope-char-removal-reconstruction/