

**DEBRIS OPERATIONAL GUIDANCE:
DAMAGED CONCRETE AT WILDLAND URBAN INTERFACE FIRES
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Background

The purpose of this debris removal guidance is to assist field operational decisions under a CalRecycle structural debris removal program in removing impacted concrete. Working around concrete structures in areas impacted by ash and debris requires significant careful and deliberate effort with equipment and hand labor to remove contaminants or the contractor risks leaving contaminants behind. There is an additional risk that hard scape and other aspects of the site could be damaged by the removal efforts. Generally, all materials, including concrete in areas directly impacted by the fire and subsequent ash and debris, shall be removed.

As with all construction work, a number of field decisions must be made by qualified individuals to complete debris removal. This guidance is designed to operate in accordance with the Standardized Emergency Management System (SEMS) by using the Incident Command System (ICS) for field response. All field personnel will use this Damaged Concrete Guidance to ensure consistent safe practices are followed. Common issues are addressed below; if questions arise about a concrete structure/wall/pad in the field, please refer to the next level of command for further guidance. Field training is always available to assist in decision making. CalRecycle utilizes the following concrete operating procedures relative to situations encountered during debris removal from residences following catastrophic wild fires.

Discussion

The average house fire burns at a temperature of about 1,100 degrees Fahrenheit (°F) but can reach in upwards of 1,300°F depending on certain conditions such as wind and building construction. The longer concrete is exposed to heat, such as that generated by a large-scale wildland, urban interface fire where little to no structural firefighting suppression occurs, the more damage the concrete sustains.

Basic behavior of concrete at high temperatures is well established in textbooks and discussed in the literature. Important factors in assessing the damage to concrete are the rate of heating and the duration of exposure to high temperatures. At slightly above 212°F, free water in concrete begins to evaporate rapidly. When concrete reaches about 350°F, a significant amount of chemically bound water is released. When concrete temperatures reach above 750°F, the residual compressive strength typically drops by 50 to 60% and the concrete is considered fully damaged.

While some professionals use color changes and hammer tests to assess residential, heat-damaged concrete and others use mechanical compression and shear testing, California Department of Resources Recycling and Recovery (CalRecycle) considers all

structural foundations to be destroyed by the heat from an unsuppressed structure fire. These slabs and foundations are no longer structurally sound and now considered debris. Additionally, with the known amounts of carcinogens, heavy metals and asbestos, structural slabs will need to be removed to assess the former building sites for residual ash contamination. Should the owner wish to keep a structural foundation, the owner should not enter this public program and instead, contract with a private contractor to remove debris in accordance with local government requirements. The owner should be advised that barrier layers under the slab and anchor bolts are also destroyed by the heat.

Overall Guidance

1. General Discussion

- a. All concrete or asphalt within the structural ash footprint will be removed. A distance of five feet from structural ash is used as a guideline. All concrete left in place will be made safe by cutting rebar flush or fencing retaining walls and/or pools. Generally speaking, if confirmation samples will be collected, then the concrete shall be removed. While cutting or breaking concrete, the contractor shall wear personal protective equipment (PPE), including eye and respiratory protection.

2. Structural Slabs and Foundations

- a. Required removal: Includes homes, cabins, mobile home slabs, barns, sheds, garages, other living structures and any concrete pad that was designed to hold a structural load. If the slab or pad was used to store vehicles or other commercial materials such as tires, building products, roofing tiles, etc., the impacted slab must be removed.
- b. Exception: Well slabs or pads. To protect the well casing and the integrity of the well, remove only ash and debris by hand and leave concrete pad around the well casing. Protect well with temporary construction fencing. Use PPE.
- c. Exception: Former slabs or pads that only held firewood or other inert material will be left in place. These slabs may be from a previous structure that was removed and/or not damaged by a fire.

3. Driveways

- a. Undamaged driveways shall be preserved to the extent practicable. The goal is to provide a stabilized construction entrance for reconstruction.
- b. If the driveway is damaged or contaminated (e.g. burned vehicles) by debris removal equipment or haul trucks to the extent that the driveway is unsafe, the driveway will be removed to the extent necessary. Remove the driveway to the nearest concrete joint or five feet if asphalt outside the contamination or damage. All driveway cuts will be made using a concrete saw. Use PPE.

4. Chimneys

- a. Required removal: See asbestos survey requirements.
- b. Exception: Patio fireplaces will not be removed unless deemed unsafe due to fire related damage.

5. *Patio or other backyard features (such as waterfalls, sports courts, etc.)*
 - a. Leave in place unless feature poses a physical hazard from fire related damage or impacted by ash and debris.
6. *Pools*
 - a. Leave in place. Pools will not be removed or drained. Contractor will place metal fencing completely around the pool where feasible and notify the homeowner.
 - b. Exception: Above grounds may be removed if the property owner wants the above ground removed. Pool water may be use as dust control if feasible.
7. *Walkways and private sidewalks*
 - a. Leave in place.
 - b. Exception: Unless necessary to remove for equipment access, covered in ash and debris, or damaged by equipment so that it is unsafe to walk on.
8. *Retaining Walls Less Than Four Feet*
 - a. Leave in place unless covered in ash and debris or remove if the property owner wants the wall removed.
 - b. Exception: If handwork cannot successfully remove the ash, remove wall and cut slope back to 2:1.
9. *Structural Retaining Walls Greater Than Four Feet*
 - a. Leave in place. If connected to slab, make a cut with a concrete saw approximately 24 inches away from the wall. Notify owner that retaining wall is being left in place for erosion control and that the incident management team (IMT) has *not* evaluated the wall for structural integrity. Inform the local government the wall shall be evaluated by a licensed civil or structural engineer before reusing.
 - b. Exception: If wall is unsafe and may collapse, remove wall and cut slope back to 2:1.
10. *Basements and Wine Caverns*
 - a. Required to be removed. Once basements and caverns are removed, the Contractor will cut the slopes back to 2:1 and fence with temporary construction fencing.
11. *Footings*
 - a. Required to be removed. Footings under the foundation will be removed.
 - b. Exception: If footings are horizontal piers or other structural support below the slab, the concrete and/or steel will be cut/broken at the interface and rendered safe from tripping hazards.
12. *Piers, Pilings, or Horizontal Structural Piers Under the Slab*
 - a. Leave in place. Remove slab to grade minus 3/10 and cut rebar and other metal supports to the base of the concrete/steel piers/pilings.