

Guidance Note No.3: Handling soot and smoke affected historic surfaces after fire

This is a brief guidance note for those who have to take 'first response' action to minimise damage to cultural heritage surfaces following a fire.

Soot is the black oily and solid residue of a fire, with high carbon content. Fire residues are abrasive, acidic and contain substances harmful to people AND objects. So extreme sensitivity is needed when handling soot-covered and burnt objects.

- **High oxygen fires** result in drier residues, which are easier to remove.
- **Smouldering (low oxygen) fires** result in wet, smoky residues, which are difficult to remove.
- Urgent response is needed, as soot becomes increasingly bonded to surfaces and more difficult to remove over time, leading to secondary damage.

General Handling Guidelines:

- Use of personal protective equipment is very important (hard hat, boots, mask/respirator, gloves, safety goggles or similar).
- Triage (assess, sort and prioritise) is based on type and sensitivity of objects – prioritise those objects which are structurally damaged, weakened, or that have porous surfaces with the heaviest soot layers.
- Handle soot-covered, wet, burnt surfaces very carefully. **Avoid touching**, as this will compress soot particles and break them into even tinier pieces, pushing them into surfaces.
- Soot removal is most successful when **DRY** artifacts have been **vacuumed BEFORE touching or moving them**. (NB: they must be allowed to air dry first if damp/wet).

Initial Soot Removal Steps:

1. **Vacuum clean** - ideally use a variable speed HEPA¹-filtered vacuum cleaner. Clean outer surfaces first, then crevices or folds. Use the vacuum cleaner nozzle directly, **without contacting the surface of the object** - screens and brush attachments can smear or embed the soot. If concerned about small losses, vacuum through a screen (see Fig. 1 below) - it should not touch the sooty surface. Soot particles may be blown away from surfaces carefully, using a low setting on the vacuum or using a small puffer.
2. **After vacuuming** soot-affected objects, do not tightly wrap or stack them – this will compact soot particles and hinder reduction of burnt smoky odour.
3. **Avoid cross-contaminating or re-contaminating** – soot is easily dispersed by movement of air, people and objects. **If you MUST move sooty objects**, protect the floor along the walking route and nearby surfaces (e.g. using old carpets). Also, keep the work surfaces clean, change contaminated gloves and tools regularly, and store cleaned objects in a clean, dry space.

NOTE: FURTHER CLEANING TREATMENTS SHOULD ONLY BE CARRIED OUT BY A QUALIFIED CONSERVATOR. (treatment may involve specialist 'dry', and possibly 'wet', solvent cleaning methods).

¹ HEPA filters = high-efficiency particulate air filters. Common standards require that a HEPA air filter must remove—from the air that passes through—at least 99.95% ([ISO](#), European Standard).

Smoke Odour Reduction:

Options to reduce smoke odour depend upon the scale of damage and availability of resources.

- **Large, heavy or unmovable objects**, such as a wallpaintings or iconostases: 'air clean' by ventilation and air circulation, flushing the building with large volumes of fresh air. Fans can be used to help air circulation. Much of the smoke odour will disappear over time.
- **Smaller, movable objects**: store in a clean space with ventilation/air circulation. For very small or particularly fragile objects, an 'odour-absorbing chamber' can be created –examples include:
 - sealing the object in a plastic bag or greaseproof paper, then placing in a refrigerator until the odour disappears;
 - sealing the object in a bag with one of the following materials: carbon; baking soda; unscented clay cat litter; zeolites (commercial powder adsorbents). *Ensure the object does not come into direct contact with the substance, as this may cause damage.*

Note: the use of professional cleaners to treat smoke odour after a fire is **not recommended** as they simply substitute another 'more pleasant' odour for the smell of smoke. Also **not recommended** are commercial treatments such as 'ozone chambers' and 'thermal deoderisation', which uses high temperatures. These methods can be damaging to heritage objects, particularly organic materials.

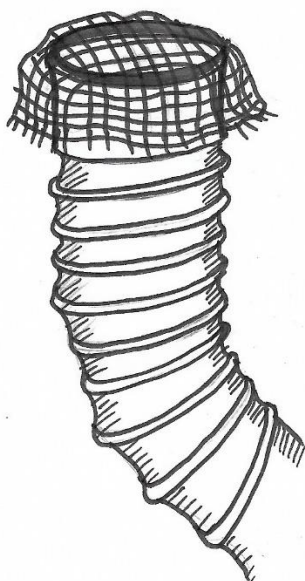


Fig. 1: protective screen over vacuum cleaner hose (note: a gauze screen can be folded down over the end of hose, and edges taped down/held in place using a rubber band).

PRIMARY REFERENCES

Baril, P. (1998) *Museum Fires and Losses*. CCI Notes N2/7. Ottawa: Canadian Conservation Institute.

Duhl, S. (2014) *Disaster Recovery: Fire and Soot Damage*. Available at: <https://truve.com/2014/11/disaster-recovery-fire-and-soot-damage/> (Accessed: 28 April 2022).

Spafford-Ricci, S. and Graham, F. (2000) *The Fire at the Royal Saskatchewan Museum Part 2: Removal of Soot from Artifacts and Recovery of the Building*. Available at: <https://researchgate.net/publication/272307022> (Accessed: 28 April 2022).

State Library of NSW Collection Preservation Branch, *Smoke and Odour Removal* (2009). Available at: <https://www.sl.nsw.gov.au/research-and-collections/building-our-collections/caring-librarys-collections/smoke-and-odour> (Accessed: 28 April 2022).

Compiled by members of a working group organised through Icon, Institute of Conservation www.icon.org.uk, with grateful acknowledgement to conservation and fire specialist colleagues from the UK, Norway, Netherlands, and US.

Version 1: 23 May 2022. Any changes made to materials, standards or legislation after the version date of this guidance note will not have been considered.

© May 2022. This work is licensed under [Creative Commons - Attribution-NonCommercial 4.0 International — CC BY-NC 4.0](https://creativecommons.org/licenses/by-nc/4.0/)

