

Biohazard and Trauma Scene Cleanup: Scope 3 Emissions Mapping and Calculation Guide

THE AGENCY *PLAYBOOK*

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Biohazard and trauma scene cleanup is the fifth core restoration job type covered under the Restoration Carbon Protocol. Its Scope 3 emissions profile is distinct from the other four categories in one critical way: virtually all waste generated is classified as regulated medical or biohazardous waste, triggering disposal emission factors that are 3–5× higher than standard C&D waste. Combined with intensive PPE requirements and specialized treatment chemicals, biohazard cleanup generates significant emissions from a relatively small affected area.

Job Classification

JOB TYPE	PRIMARY WASTE CLASSIFICATION	DOMINANT EMISSION CATEGORY	TYPICAL RANGE PER SCENE
Unattended death / decomposition		Cat 5 (biohazard disposal) + Cat 12	0.8–3.0 tCO2e

	Regulated medical waste + affected porous materials	(demolished materials)	
Trauma scene (blood/bodily fluids, limited area)	Regulated medical waste, minimal structure affected	Cat 5 dominant	0.3–1.2 tCO ₂ e
Crime scene with structural damage	Regulated medical waste + C&D debris	Cat 5 + Cat 12	1.0–4.0 tCO ₂ e
Sharps/drug paraphernalia scenes	Sharps waste (regulated) + affected surfaces	Cat 5 (sharps disposal) dominant	0.4–1.5 tCO ₂ e
Hoarding remediation with biohazard component	Mixed solid waste + biohazard materials	Cat 4 (volume transport) + Cat 5	1.5–6.0 tCO ₂ e

Category 4: Transportation

VEHICLE TYPE	KG CO ₂ E PER MILE	USE
Biohazard response vehicle (dedicated, sealed)	0.503–1.084	Crew and initial materials transport (van or truck)
Medical waste hauler (regulated)	2.80	Regulated biohazardous waste to licensed medical waste facility
Dump truck (standard C&D, non-biohazard portion)	2.25 loaded	Non-regulated demolition debris for hoarding jobs

Medical waste facility distance: Licensed medical waste treatment facilities (autoclaves, incinerators) are less common than standard landfills. Average

distance from job site to licensed biohazard disposal facility is 40–80 miles in most US markets. Use actual manifest distances; apply 60 miles as default where manifests are unavailable.

Category 1: Materials

MATERIAL	UNIT	KG CO2E PER UNIT	NOTES
Hospital-grade disinfectant (quaternary ammonium, EPA-registered)	Liter	2.8	EPA EEIO — chemical manufacturing
Enzyme treatment / biological digester	Liter	1.6	EPA EEIO — specialty chemical
Ozone generator treatment (odor/pathogen)	Day-unit	0.35	Equipment embodied carbon amortized
Hydroxyl generator treatment	Day-unit	0.40	Equipment embodied carbon amortized
Level B PPE full kit (Tyvek + face shield + supplied air)	Kit	4.2	Required for decomposition / unattended death
Level C PPE kit (Tyvek + half-face P100/OV)	Kit	1.8	Trauma scenes with active biohazard
6-mil poly sheeting (containment + floor protection)	m ²	0.55	EPA EEIO — plastics manufacturing
Biohazard bags (red, 33-gallon)	Each	0.65	Medical-grade polyethylene, red-colored
	Each	0.35	

Sharps disposal container (1-gallon)

EPA EEIO — plastics/medical equipment

Category 5: Waste — Biohazard Disposal

WASTE TYPE	DISPOSAL METHOD	TCO ₂ E PER TON	SOURCE
Regulated medical waste (soft tissue, bodily fluids, porous materials)	Autoclave + landfill	0.55	EPA medical waste incineration / autoclave factors
Regulated medical waste — high pathogen risk	High-temperature incineration	0.85	EPA hazardous waste incineration factors
Sharps waste (needles, glass)	Sharps autoclave or incineration	0.65	EPA medical waste — sharps category
Contaminated porous building materials (drywall, carpet, subfloor)	Licensed medical waste landfill or standard landfill (jurisdiction-dependent)	0.38–0.55	Apply higher factor when facility requires medical waste classification
Non-biohazard C&D debris (hoarding, structural)	Standard landfill	0.16	EPA WARM v16 — standard C&D
Spent PPE (biohazard-contaminated)	Licensed medical waste facility	0.55	Same as regulated medical waste stream

Jurisdiction note on porous material classification: Whether mold-contaminated porous building materials from biohazard scenes must be disposed of as regulated medical waste (vs. standard C&D waste) varies by state

and local regulation. Check with your licensed waste hauler for the applicable classification in your jurisdiction. Apply the higher emission factor (0.55) in conservative calculations or when disposal classification is uncertain.

Category 12: Demolished Building Materials

Biohazard scenes frequently require demolition of affected porous materials — flooring, subfloor, drywall — that absorbed biological contamination and cannot be cleaned to restoration standards. When these materials are classified as regulated medical waste at removal, their disposal emissions are captured in Category 5 (same as ACM materials in hazmat abatement). When they are classified as standard C&D waste at the jurisdiction level, use Category 12 EPA WARM factors (same as water damage demolition materials).

Apply Category 12 factors to demolished materials only when they flow to standard C&D landfill rather than medical waste disposal. When in doubt, apply medical waste disposal factors and capture in Category 5.

Worked Example: Unattended Death, Single Apartment Unit

Job profile: Unattended death in a 650 sq ft apartment, discovered after 10 days. Affected area: 400 sq ft (bedroom and hallway). Scope: removal of all porous materials in affected area (carpet, subfloor, drywall to 24" height), disinfection of all surfaces, odor treatment. Duration: 2 days. Crew: 2 technicians in Level B PPE. Facility: 15 miles from job site. Licensed medical waste facility: 58 miles from job site.

Category 4 — Transportation

Crew vehicle: 1 van $\times$ 30 mi RT $\times$ 3 trips = 90 mi $\times$ 0.503 = **45 kg**

Medical waste hauler: 1 $\times$ 116 mi RT $\times$ 2.80 = **325 kg**

Category 4 total: 370 kg = 0.37 tCO₂e

Category 1 — Materials

Hospital-grade disinfectant (400 sq ft $\times$ 0.025 L/sq ft $\times$ 2 applications): 20 L $\times$ 2.8 = **56 kg**

Enzyme treatment: 8 L $\times$ 1.6 = **13 kg**

Ozone generator: 2 day-units $\times$ 0.40 = **1 kg**

Level B PPE (2 workers $\times$ 2 days $\times$ 3 exits/day = 12 kit replacements): 12 $\times$ 4.2 = **50 kg**

Biohazard bags (20 bags): 20 $\times$ 0.65 = **13 kg**

Poly sheeting (floor protection + containment): 80 m² $\times$ 0.55 = **44 kg**

Category 1 total: 177 kg = 0.18 tCO₂e

Category 5 — Waste

Regulated medical waste (soft materials, porous materials, PPE): estimated 0.6 tons $\times$ 0.55 = **0.33 tCO₂e**

Non-hazard debris (drywall, not in medical waste stream): 0.25 tons $\times$ 0.16 = **0.04 tCO₂e**

Category 5 total: 0.37 tCO₂e

Category 12

Carpet/pad (400 sq ft): 0.55 tons $\times$ 0.33 = **0.18 tCO₂e**

Subfloor (400 sq ft plywood): 0.40 tons $\times$ -0.05 = **-0.02 tCO₂e**

Category 12 total: 0.16 tCO₂e

CATEGORY	TCO2E
Category 4 — Transportation	0.37
Category 1 — Materials	0.18
Category 5 — Waste (regulated medical)	0.37
Category 12 — Demolished materials	0.16
Total	1.08 tCO2e

Is biohazard cleanup typically covered by commercial property insurance?

Yes — biohazard cleanup at commercial properties is typically covered under property insurance. The emissions data from an RCP biohazard calculation should be provided to the commercial property manager for their Scope 3 inventory in the same format as other restoration job types.

How do you handle hoarding remediation with both biohazard and standard C&D waste streams?

Split the waste into its classified streams: regulated biohazardous material (apply medical waste disposal factors), standard C&D debris (apply WARM factors), and any hazardous materials encountered (apply hazmat factors). Document each stream separately in the Category 5 breakdown. The mixed nature of hoarding jobs makes them the most complex biohazard calculation scenario.

Does the RCP apply to crime scenes where law enforcement is involved?

Yes. The RCP calculation is based on the remediation contractor's scope of work regardless of the cause of the biohazard condition. The emissions calculation is performed after the scene is released to the contractor and is based on the actual

materials used, waste generated, and transportation involved in the cleanup — independent of the legal context of the event.

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Disposal Method Differentiation: Autoclave vs. Incineration Creates a 5–10× Emission Difference

The biohazard guide currently uses a single disposal factor of 0.88 tCO₂e per short ton for all regulated medical/biohazardous waste. This figure is methodologically sound as a default, but the actual emission factor depends entirely on which treatment pathway your waste hauler uses. The difference is not marginal — it is 5 to 10 times.

The following lifecycle emission data comes from a peer-reviewed GHG Comparison Assessment conducted by Carbon Action Consultants (2022, reviewed by Dr. Tahsin Choudhury) commissioned by Envetec, covering 72 metric tonnes of biohazardous waste across treatment pathways:

TREATMENT PATHWAY	TCO ₂ E PER METRIC TONNE	VS. DIRECT INCINERATION
Onsite disinfection and shredding (where permitted)	0.057	93% lower
Autoclave → standard landfill (no incineration)	0.46	44% lower
Direct high-temperature incineration → landfill	0.82	Baseline
Autoclave → incineration → landfill (dual treatment)	0.90	+10% above direct incineration

Source: Envetec GHG Comparison Assessment, 2022. Validation: UK NHS hospital waste study (Journal of Cleaner Production, 2020) measured high-temperature incineration at 1,074 kg CO₂e per tonne (0.97 tCO₂e/short ton), consistent with the incineration-pathway figure above.

The current RCP default of 0.88 tCO₂e/short ton (equivalent to approximately 0.97 tCO₂e/metric tonne) reflects the dual-treatment or incineration-dominant pathway. It is a conservative and defensible default. However, for contractors whose waste haulers use autoclave-only treatment, the actual figure may be **nearly half the default**.

How to document: Ask your regulated waste hauler which treatment method they use. Record the answer in the data_quality.notes field of your RCP Job Carbon Report. If the hauler uses autoclave-only, apply 0.46 tCO₂e/metric tonne (0.42 tCO₂e/short ton) and flag it as hauler-confirmed primary data. If unknown, apply the default 0.88 tCO₂e/short ton and flag as proxy.



Autoclave Energy Intensity

For contractors or facilities operating onsite autoclave treatment, the energy intensity data is available from peer-reviewed hospital operations research. A study published in PubMed (PMID 27075773), tracking 304 days and 2,173 autoclave cycles, measured:

- Energy intensity: **1.9 kWh per kg of waste sterilized**
- Water consumption: **58 liters per kg of waste**

At the national grid emission factor (0.3499 kg CO₂e/kWh), autoclave treatment of one short ton (907 kg) of biohazardous waste consumes approximately **1,723**

kWh of electricity, generating **603 kg CO₂e** from energy alone — consistent with the peer-reviewed lifecycle figure of 0.46 tCO₂e/tonne when hauling and residual landfill are included.

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Odor Neutralization Chemistry: What Has Emission Data and What Doesn't

Trauma and biohazard cleanup frequently involves odor neutralization as a final step after biological contamination is removed. The emission factors for these chemicals are poorly documented.

Peracetic acid (PAA) is the best-documented odor treatment and disinfectant in restoration applications. The Envetec lifecycle study assigns **0.61 kg CO₂e per kg of PAA active ingredient**, making it one of the lower-footprint chemical treatments available. PAA breaks down rapidly to acetic acid and water — no persistent residue, no downstream emission concerns.

Chlorine dioxide (ClO₂) is the dominant chemistry for trauma scene odor elimination. Products using sodium chlorite activated with citric acid (Biocide Systems Room Shocker, ProKure1) are self-generating chemistry requiring no electricity for treatment delivery. No published production emission factor exists for ClO₂ generator products specifically. The RCP treats ClO₂ odor treatment as a **data gap**. Apply the EPA EEIO chemical manufacturing proxy (2.8 kg CO₂e/kg of active chemical) and flag as estimated.

Enzyme-based neutralizers similarly lack published LCA data. Treat as a data gap and apply the EEIO proxy.

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ATP Testing: Emissions-Negligible but Methodologically Required

ATP bioluminescence testing (ANSI/IICRC S540 requires minimum two rounds per scene — pre-remediation and clearance) is a consumable source. Hygiena UltraSnap ATP swabs weigh approximately 5–10g each (polypropylene housing, pre-moistened fiber tip, luciferin/luciferase reagent). Estimated carbon footprint: **20–50g CO₂e per swab** using generic small medical plastic device lifecycle data. A typical trauma scene requiring 10–30 swabs generates **0.2–1.5 kg CO₂e** from ATP testing.

This is below 0.1% of total job emissions on all but the smallest trauma scene jobs. ATP testing is documented here for methodological completeness — include it in Category 1 if your job tracking captures swab consumption, but it is acceptable to omit and note the exclusion as immaterial in the data_quality section.

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Sources and References — Biohazard Technical Additions

- Envetec / Carbon Action Consultants. GHG Comparison Assessment for Biohazardous Waste Treatment Pathways. 2022. envetec.com
- PubMed PMID 27075773. “Steam sterilisation’s energy and water footprint.” Journal of Hospital Infection. 2016.
- Springer Environmental Chemistry Letters. “Impact of waste of COVID-19 protective equipment on the environment.” 2022.
- Top Glove. Life Cycle Assessment Results for Nitrile Gloves. SATRA-verified. 2024.
- ANSI/IICRC S540. Standard for Professional Biohazard Remediation. Current edition.

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CONTINUE READING

- [Asbestos and Hazmat Abatement: Scope 3 Guide](#)
- [Mold Remediation: Scope 3 Guide](#)
- [Water Damage Restoration: Scope 3 Guide](#)

SEE ALSO

- [RCP Emission Factor Reference Table](#)
- [RCP Audit Readiness Guide](#)
- [RCP Carbon Avoidance Framework](#)

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