

Asbestos and Hazmat Abatement: Scope 3 Emissions Mapping and Calculation Guide

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Asbestos and hazmat abatement generates the highest emissions per unit of material removed of any restoration job type. The combination of specialized transportation to licensed disposal facilities, extreme PPE consumption, and high-emissions disposal methods (including incineration for some regulated materials) produces an emissions profile that is fundamentally different from standard C&D work. This guide provides the emission factors, calculation methodology, and a worked example for a commercial ACM abatement project.

Regulated Materials: Classification Before Calculating

REGULATED MATERIAL	COMMON LOCATION IN COMMERCIAL BUILDINGS	DISPOSAL CLASSIFICATION	EMISSION FACTOR PREMIUM VS. STANDARD C&D
Asbestos-containing		Licensed hazmat landfill	2.4× standard C&D

materials (ACM) — friable	Pipe insulation, ceiling tiles (older), spray fireproofing		
ACM — non-friable	Floor tiles, roofing materials, joint compound	Licensed C&D landfill with ACM cell	1.8× standard C&D
Lead-based paint debris	Pre-1978 painted surfaces — all types	Licensed hazmat landfill or TCLP-based classification	2.2× standard C&D
PCB-containing materials	Caulk (pre-1978), fluorescent light ballasts, transformers	Licensed hazmat incineration (50 ppm+ PCB)	11.6× standard C&D (incineration)
Mercury- containing equipment	Fluorescent lamps, thermostats, switches	Mercury recycler or licensed hazmat	1.5× standard C&D + recycling credit

Category 4: Transportation Emission Factors

Hazmat abatement transportation has two components with fundamentally different emission profiles: crew and equipment mobilization (standard restoration factors) and regulated waste transportation (elevated factors due to distance to licensed facilities and loaded vehicle weight).

VEHICLE TYPE	KG CO ₂ E PER MILE	USE
Crew vehicles (light truck, van)	0.503	Daily crew transport
Decontamination unit (trailer-mounted)	1.084	Mobilization and demobilization

Negative air pressure / HEPA equipment trailer	1.084	Equipment mobilization
Licensed hazmat waste hauler (ACM, lead)	3.20	Regulated C&D to licensed landfill — loaded
Licensed hazmat waste hauler (PCB, mercury)	3.80	High-hazard regulated waste — specialty vehicle

Licensed disposal facility distance note: Licensed hazmat landfills capable of receiving friable ACM are significantly less common than standard C&D landfills. Average transport distance to a licensed ACM facility is 45–90 miles in most US metro areas, compared to 10–25 miles for standard C&D. Use actual haul distances from your waste manifests. If unavailable, use 60 miles as the default for ACM waste and 80 miles for PCB/high-hazard waste.

Category 1: Materials Emission Factors

MATERIAL	UNIT	KG CO ₂ E PER UNIT	NOTES
Level C PPE kit (Tyvek, gloves, boot covers, goggles)	Kit per entry	1.8	Full replacement required each decon exit
Level B PPE (supplied air + full encapsulating suit)	Kit per entry	4.2	Higher-grade suit + air supply equipment
Half-face respirator, P100 + OV cartridges (pair)	Pair	0.8	EPA EEIO — medical equipment
Full-face respirator cartridges (pair)	Pair	1.2	EPA EEIO — medical equipment

HEPA filter (negative air machine)	Each	3.2	EPA EEIO — industrial machinery
Wetting agent / amended water (surfactant)	Liter	1.4	EPA EEIO — chemical manufacturing (applied during ACM removal to suppress fibers)
6-mil poly sheeting (containment, double-layer required)	m ²	1.10	Double-layer = 2× standard poly factor
Glove bags (for pipe insulation removal)	Each	0.85	EPA EEIO — plastics product manufacturing
Negative air pressure machine HEPA filters	Each	3.2	Changed more frequently under hazmat conditions — typically every 8–12 hours
Disposal bags (6-mil, ACM-labeled)	Each (33 gallon)	0.55	EPA EEIO — plastics manufacturing

PPE consumption rate for hazmat abatement: Unlike standard restoration where PPE may last a full shift, hazmat abatement requires full PPE replacement each time a worker exits the work area through the decontamination unit. A standard 8-hour ACM abatement shift with 3 exits per worker produces 3 complete PPE kit replacements per worker. For crew of 4: 4 workers × 3 exits × 1.8 kg/kit = 21.6 kg CO₂e in PPE alone per day.

Category 5: Waste Emission Factors

WASTE TYPE	DISPOSAL METHOD	TCO ₂ E PER TON	SOURCE
		0.42	

Friable ACM (pipe insulation, fireproofing)	Licensed hazmat landfill		EPA WARM + licensed facility transport premium
Non-friable ACM (floor tiles, roofing)	Licensed C&D landfill, ACM cell	0.28	EPA WARM + regulated C&D transport
Lead paint debris (TCLP-classified hazardous)	Licensed hazmat landfill	0.38	EPA WARM + hazmat transport
PCB-containing materials ≥ 50 ppm	Licensed PCB incineration	1.85	EPA hazardous waste incineration emission factors
PCB-containing materials < 50 ppm (non-hazardous PCB)	Licensed landfill	0.22	EPA WARM + transport premium
Mercury-containing lamps	Mercury recycler	0.15	EPA WARM — recycling credit partially offsets
Mercury-containing thermostats/switches	Mercury recycler	0.12	Similar to lamps
Decontamination wastewater	Municipal wastewater (if non-hazardous) or permitted facility	0.000272 per liter	EPA WARM — wastewater treatment
Spent PPE (hazmat grade)	Licensed hazmat landfill	0.30	Higher than standard PPE due to contamination classification

Complete Worked Example: Pre-1970 Commercial Office Building, Floor Tile and Ceiling Tile ACM Abatement

Job profile: 5,000 sq ft floor tile removal (non-friable ACM, 9" floor tiles) and 5,000 sq ft suspended ceiling tile replacement (non-friable ACM) in a 1967 office building being renovated. No pipe insulation abatement in scope. Crew: 4 abatement technicians, 8-day project. Air monitoring by third-party IH (not in contractor scope). Facility: 28 miles from job site. Licensed C&D landfill with ACM cell: 54 miles from job site.

Category 4 — Transportation

Crew vehicles: 2 light trucks $\times$ 56 mi RT $\times$ 9 trips (8 work days + equipment pickup) = 504 mi $\times$ 0.503 = **254 kg CO₂e**

Decontamination unit (trailer): 1 $\times$ 56 mi $\times$ 2 trips = 112 mi $\times$ 1.084 = **121 kg CO₂e**

Negative air / HEPA equipment trailer: 1 $\times$ 56 mi $\times$ 2 trips = 112 mi $\times$ 1.084 = **121 kg CO₂e**

ACM waste haul (non-friable floor + ceiling tiles, 2 loads): 2 $\times$ 108 mi RT to licensed facility $\times$ 3.20 kg/mi = **691 kg CO₂e**

Category 4 total: 1,187 kg CO₂e = 1.19 tCO₂e

Category 1 — Materials

PPE (Level C, 4 workers $\times$ 8 days $\times$ 3 exits/day = 96 kit replacements): 96 $\times$ 1.8 kg = **173 kg CO₂e**

P100 respirator cartridges: 4 workers $\times$ 8 days $\times$ 1 replacement/day = 32 pairs $\times$ 0.8 = **26 kg CO₂e**

6-mil poly sheeting (double-layer containment, 500 sq ft decon area + staging):
 $200 \text{ m}^2 \times 1.10 \text{ kg/m}^2 = \mathbf{220 \text{ kg CO}_2\text{e}}$

HEPA filters (4 negative air machines $\times$ 2 changes/day $\times$ 8 days = 64 filters): $64 \times 3.2 = \mathbf{205 \text{ kg CO}_2\text{e}}$

Wetting agent for tile removal (applied to floor tiles before removal): $5,000 \text{ sq ft} \times 0.003 \text{ L/sq ft} = 15 \text{ liters} \times 1.4 = \mathbf{21 \text{ kg CO}_2\text{e}}$

ACM disposal bags (33-gallon, for ceiling tile bagging): estimated 80 bags $\times$ 0.55 = **44 kg CO₂e**

Category 1 total: 689 kg CO₂e = 0.69 tCO₂e

Category 5 — Waste

Floor tiles (non-friable ACM, $5,000 \text{ sq ft} \times 4 \text{ lbs/sq ft} = 10 \text{ tons}$): $10 \times 0.28 = \mathbf{2.80 \text{ tCO}_2\text{e}}$

Ceiling tiles (non-friable ACM, $5,000 \text{ sq ft} \times 1.5 \text{ lbs/sq ft} = 3.75 \text{ tons}$): $3.75 \times 0.28 = \mathbf{1.05 \text{ tCO}_2\text{e}}$

Spent PPE (hazmat-grade, 96 kit replacements + misc): estimated $0.8 \text{ tons} \times 0.30 = \mathbf{0.24 \text{ tCO}_2\text{e}}$

Decontamination wastewater (~800 liters over 8 days): $800 \times 0.000272 = \mathbf{0.22 \text{ kg CO}_2\text{e}}$ (negligible)

Category 5 total: 4.09 tCO₂e

Category 12 — Demolished Hazardous Building Materials

For ACM floor and ceiling tiles, the material itself is the hazardous waste — it flows to Category 5 disposal accounting. Category 12 is not separately calculated for ACM materials that are classified as hazardous waste upon removal, since the disposal emissions are already captured in Category 5. This is a key distinction from standard demolition: ACM materials do not generate both Category 5 and Category 12 emissions — they generate Category 5 only.

Category 12 total: 0 tCO₂e (ACM materials classified as regulated waste at removal — captured in Category 5)

Job Total

CATEGORY	TCO ₂ E	% OF TOTAL
Category 4 — Transportation	1.19	20%
Category 1 — Materials	0.69	12%
Category 5 — Waste disposal (regulated)	4.09	68%
Category 12 — Demolished materials	0.00	0%
Total	5.97 tCO₂e	100%

Key observation: For hazmat abatement, Category 5 waste disposal is the dominant emission source at 68% of total — confirming that reduction strategies for this job type should focus on waste minimization (reducing the volume of regulated material requiring licensed disposal) rather than fleet or materials optimization. In practice, this means accurate pre-abatement survey to confirm

material quantities precisely, minimizing unnecessary demolition scope, and pursuing licensed recycling options for non-friable ACM where available.

Why are Category 12 emissions zero for ACM materials in this example?

When building materials are classified as hazardous waste at the point of removal, their disposal emissions are captured entirely in Category 5 (Waste Generated in Operations) using the hazmat disposal emission factors. Counting them in both Category 5 and Category 12 would be double-counting. The RCP applies the more specific category (5, with hazmat factors) and zeros out Category 12 for regulated materials.

What if only some floor tiles test positive for ACM — how do I split the waste calculation?

Apply ACM disposal emission factors (0.28 tCO₂e/ton) only to the confirmed ACM material quantity. Apply standard C&D disposal factors (0.16 tCO₂e/ton) to confirmed non-ACM material. If testing was not performed and the building construction date is pre-1980, use ACM factors for all suspect materials and document the assumption in your data quality notes.

How do I handle a job where PCB-containing caulk is discovered mid-project?

Document the discovery date and quantity. If PCB caulk removal was not in your original scope, calculate those emissions separately as a scope addition and note in the RCP report that PCB materials were encountered. Apply the PCB incineration emission factor (1.85 tCO₂e/ton) to all PCB-classified material — the difference from standard C&D factors is significant enough to materially affect the job total and should be clearly identified.

Asbestos-Containing Materials in Landfill: Zero Methane — A Critical Correction

The emission factors for ACM disposal in the Category 5 table include a transport premium over EPA WARM but implicitly apply WARM's underlying methane generation assumptions. For asbestos-containing materials, this is incorrect.

Asbestos is a mineral silicate — it is inorganic and will not biodegrade in a landfill under any conditions. ACM disposal generates zero landfill methane.

The applicable emission factors for ACM disposal are therefore limited to:

- **Transportation** to the licensed facility (Category 4, already calculated separately)
- **Landfill equipment operation** at the disposal site (negligible, accounted for in WARM's non-biodegradable material factors)

The corrected disposal emission factors for ACM, based on inert material treatment rather than C&D composite factors:

ACM TYPE	PREVIOUS FACTOR	CORRECTED FACTOR	BASIS
Friable ACM (pipe insulation, fireproofing)	0.42 tCO ₂ e/ton	~0.018 tCO₂e/ton	Transport + inert landfill equipment only (no methane)
Non-friable ACM (floor tile, roofing)	0.28 tCO ₂ e/ton	~0.018 tCO₂e/ton	Transport + inert landfill equipment only (no methane)

The transport factor of ~0.018 tCO₂e/ton is derived from EPA's assumed 1.8 gallons diesel per short ton for C&D haul transport (10.21 kg CO₂e/gallon × 1.8 = 18.4 kg CO₂ = 0.018 tCO₂e/ton). Actual transport emissions should be calculated from documented haul distances. The significantly lower disposal factor reflects

the correct classification of asbestos as an inert material rather than a decomposable C&D composite.

NESHAP thresholds for regulatory reference: EPA NESHAP (40 CFR 61.145) requires notification when a demolition or renovation project disturbs **160 square feet, 260 linear feet, or 35 cubic feet** of Regulated Asbestos-Containing Material (RACM). Below these thresholds, disposal may proceed without NESHAP notification. ACM waste carries DOT Class 9 designation, UN ID #2212, regardless of quantity.



Lead-Based Paint Waste: Residential RCRA Exemption Clarified

The Category 5 table applies a uniform hazardous waste disposal factor for lead paint debris. This overstates emissions for the most common lead abatement scenario in restoration work.

Residential lead-based paint waste is exempt from RCRA hazardous waste classification regardless of lead concentration, under the RCRA household waste exemption (42 U.S.C. §6901; EPA Final Rule, 68 FR 36487, June 18, 2003). This applies to all renovation, repair, and painting work in residential structures, including investment properties and apartments. Lead paint chips, dust, and blasting waste from residential work go to **standard C&D or MSW landfills** at standard disposal emission factors — not licensed hazardous waste facilities.

Non-residential lead abatement requires TCLP testing. The RCRA hazardous waste threshold for lead is 5.0 mg/L (D008 waste code). Paint chips and blasting waste from commercial structures frequently exceed this threshold and require licensed hazardous waste disposal at approximately **250–600 kg fossil CO₂ per tonne** (Zero Waste Europe, hazardous waste incineration range). Whole-building

demolition debris with LBP attached to substrates may pass TCLP if lead is diluted in the substrate mass.

Corrected lead waste emission factors by context:

CONTEXT	RCRA CLASSIFICATION	DISPOSAL METHOD	TCO ₂ E PER TON
Residential LBP abatement (any concentration)	RCRA-exempt	Standard C&D landfill	0.16 (WARM v16 C&D)
Non-residential LBP, TCLP <5.0 mg/L	Non-hazardous	Standard C&D landfill	0.16 (WARM v16 C&D)
Non-residential LBP, TCLP ≥5.0 mg/L	D008 hazardous	Licensed hazmat disposal	0.28–0.55 (incineration range)

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Decontamination Shower Water: Quantified

OSHA 29 CFR 1926.1101(j) mandates a three-stage decontamination unit (Equipment Room → Shower Room → Clean Room) for all regulated asbestos abatement work. Decontamination shower water represents a measurable but typically minor wastewater emission source.

At standard shower flow rates of 2.0–2.5 GPM with 3–5 minute showers, each decontamination cycle consumes approximately **7.5–12.5 gallons per worker per cycle**. Workers shower at lunch and end-of-shift, producing **15–25 gallons**

per worker per day. A 4-person crew over a 5-day project generates approximately **300–500 gallons** of decontamination shower water.

Decon water from non-hazardous LBP projects discharges to municipal sewer after filtration through ≥ 5.0 micron filtration (required in NY, PA, CT). At the wastewater treatment energy factor of 0.00074 kg CO₂e per gallon, 400 gallons of decon water produces approximately **0.30 kg CO₂e** — negligible in the context of total job emissions but documented here for methodological completeness. For PCB or mercury decontamination water, specialized treatment or drumming for permitted disposal may be required.



PPE Weight and Consumption Data: Corrected

The Category 1 table uses kit-level EPA EEIO estimates for PPE. More precise data is now available for the primary components.

DuPont Tyvek 400 coveralls (the standard for asbestos and lead abatement work) weigh approximately **180 grams** per suit (HDPE flash-spun fabric at 1.2 oz/sq-yd). Workers typically use two suits per day during active abatement — one changed at lunch, one at end-of-shift. A 4-person crew over a 5-day project consumes **40–80 Tyvek suits** (7.2–14.4 kg of HDPE). At an HDPE production factor of 1.8–3.5 kg CO₂e/kg, coveralls alone contribute **13–50 kg CO₂e per project**. This is substantially lower than the EPA EEIO apparel manufacturing proxy of 1.2 kg CO₂e per suit implied by the current table.

Nitrile gloves: 0.0277 kg CO₂e per glove (Top Glove 2024 SATRA-verified LCA). Per pair: 0.055 kg CO₂e. This is lower than the 0.3 kg CO₂e/pair EPA EEIO proxy by approximately 82%.

N95 respirators: 0.05 kg CO₂e per unit (Springer Environmental Chemistry Letters, 2022). This is lower than the EPA EEIO medical equipment proxy values in current use.

Use these LCA-sourced per-unit values in place of the EPA EEIO kit factors for contractors seeking to maximize data quality for SBTi-committed or CSRD-exposed clients.

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- [Fire and Smoke Restoration: Scope 3 Guide](#)
- [Biohazard and Trauma Scene Cleanup: Scope 3 Guide](#)
- [Water Damage Restoration: Scope 3 Guide](#)

SEE ALSO

- [RCP Emission Factor Reference Table](#)
- [RCP Audit Readiness Guide](#)
- [RCP Proxy Estimation Guide](#)

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