TECHNICAL WHITE PAPER

Conductive Flooring for Ammunition & Explosives Areas

Passing DoDM 4145.26-M Inspection the First Time

November 2026

Designing, testing and maintaining conductive floors that meet both the electrostatic-discharge and electrocution-protection limits for ammunition and explosives areas.

PumaCRETE Corp.

68 Harrison Avenue, Ste 605 #77920 · Boston, MA 02111

857-226-8247 · www.pumacrete.net

> **Most conductive floors that fail DoDM 4145.26-M inspection fail because of grounding, test method or system selection — not because the product is poor. Floors that measure 20k–100k Ω to ground, are grounded every 1,000–2,000 sq ft, and sit on GFCI-protected circuits pass consistently.**

Executive Summary

Ammunition and explosives (A&E) facilities governed by **DoD Manual 4145.26-M** must control electrostatic discharge (ESD) and protect personnel from electrocution at the same time. Those two goals pull floor resistance in opposite directions, and getting the balance wrong is the leading cause of failed inspections.

Failures rarely trace back to a bad product. They trace back to too few ground points, the wrong test instrument, a coating whose resistance drifts, or missing records. Each of these is preventable.

This paper sets out a standards-aligned approach built on four parts:

1. **System selection** — a carbon-filled conductive epoxy or urethane that holds 10k–100k Ω for the life of the floor.
2. **Grounding design** — copper strips bonded to the building ground at every 1,000–2,000 sq ft.
3. **Correct testing** — calibrated megohmmeters, 5-lb electrodes and readings taken across the whole room.
4. **GFCI protection and records** — satisfying the shock-protection limit on highly conductive floors, and documenting it for five years.

Done together, these steps deliver consistent first-time compliance, safer operations and lower lifecycle cost.

The Problem: Good Floors That Fail Inspection

Conductive floors frequently fail DoD inspection even when they appear technically adequate. ESD flooring practice grew up in electronics manufacturing, where static dissipation was the only concern. A&E facilities add a second one — personnel shock protection — and many installations are never designed for both.

Field experience points to five recurring causes:

- **Weak grounding networks** — too few ground points or poor bonding to building ground.
- **Wrong test methods** — low-voltage surface meters instead of calibrated megohmmeters.
- **Non-uniform conductivity** — floors that pass near a ground point and fail in a far corner.
- **Environmental influences** — humidity, dust, waxes and sealers.
- **Degradation over time** — especially static-dissipative coatings, whose resistance drifts upward.

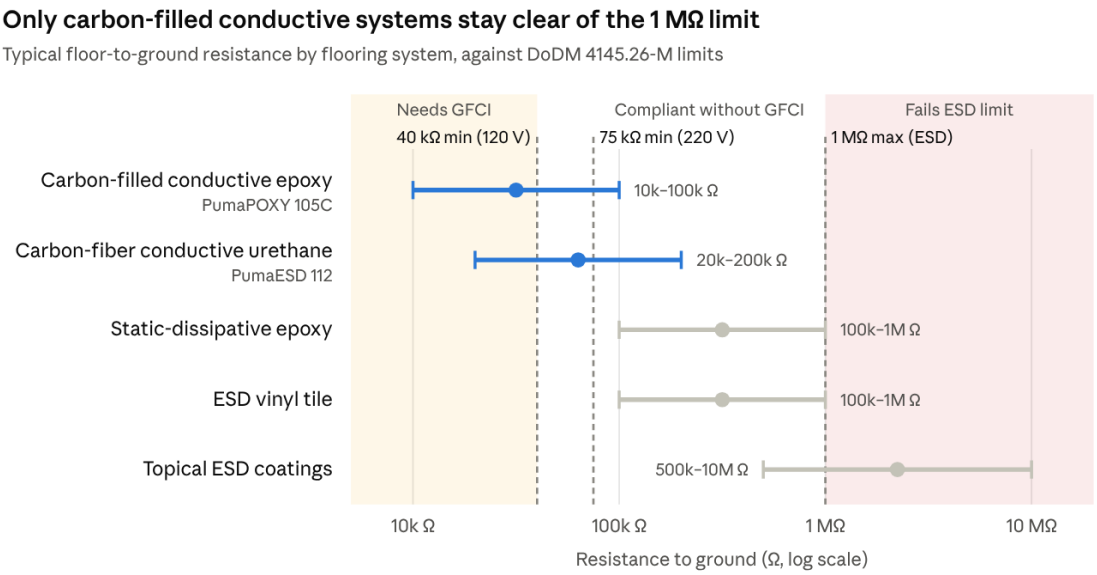
The numbers show the gap. Compliant floors typically read **10k–100k Ω**; failing floors often read **above 1 MΩ**. The result is failed inspections, operational delays, safety exposure and higher lifecycle cost.

The Dual Requirement in DoDM 4145.26-M

DoDM 4145.26-M sets two limits that must be met at the same time: a **maximum** resistance for ESD control and a **minimum** resistance for shock protection. The floor must be conductive enough to drain static, yet resistive enough that a person touching a live circuit is not electrocuted.

Requirement	Purpose	Limit	Measured as
Maximum resistance	ESD control	**≤ 1,000,000 Ω**	Person + footwear + floor to ground
Minimum resistance, 110–120 V service	Shock protection	**> 40,000 Ω**	Floor to ground
Minimum resistance, 220–240 V service	Shock protection	**> 75,000 Ω**	Floor to ground

The standard resolves the tension with one allowance: **GFCI protection satisfies the minimum-resistance requirement.** It never substitutes for the 1 MΩ ESD limit. That allowance is what lets facilities choose highly conductive floors without trading away shock safety.



Typical ranges from PumaCRETE field data · limits per DoDM 4145.26-M

Carbon-filled conductive systems sit well under the 1 MΩ ceiling for their whole range; where they dip below 40k Ω, GFCI protection closes the gap.

Selecting the Right Flooring System

The flooring technology largely decides whether a floor passes. Systems with conductivity built through the full thickness hold steady; systems that rely on surface chemistry drift out of range.

Flooring system	Typical resistance to ground	Inspection reliability	PumaCRETE system
Carbon-filled conductive epoxy	10,000 – 100,000 Ω	Very reliable	PumaPOXY 105C
Carbon-fiber conductive urethane	20,000 – 200,000 Ω	Reliable	PumaESD 112
Static-dissipative epoxy	100,000 – 1,000,000 Ω	Borderline	—
ESD vinyl tile	100,000 – 1,000,000 Ω	Variable	—
Topical ESD coatings	500,000 – 10,000,000 Ω	Often fail	—

Why carbon-filled conductive systems pass

Carbon particles are distributed through the entire resin body, not just the surface. That gives:

- Stable conductivity for the life of the floor
- Uniform resistance across large areas
- Low sensitivity to humidity

Typical readings are **10k–50k Ω** floor-to-ground and **100k–300k Ω** person + footwear + floor. Readings below the 40k Ω minimum are acceptable when GFCI protection is installed.

Why static-dissipative systems cause problems

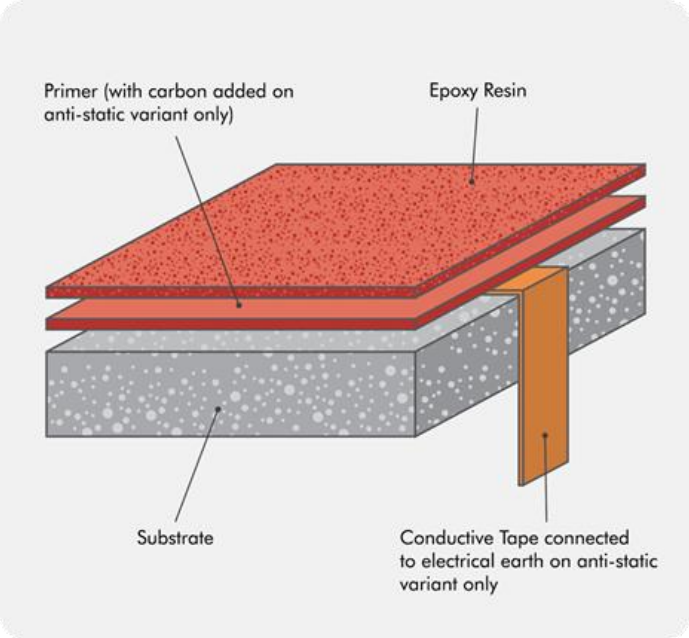
Static-dissipative epoxies rely on ionic conduction and conductive additives. Their resistance drifts upward with age:

Floor condition	Typical reading
New	200k – 500k Ω
After aging	1 M – 10 MΩ

Once the system path exceeds 1,000,000 Ω the floor fails the ESD requirement. Static-dissipative floors meet many electronics standards, but DoD installations favor fully conductive systems because they hold low resistance over time, pass the person + footwear test more easily, and dissipate charge faster.

Designing the Grounding Network

Too few ground points is the **single most common cause** of failed conductive floors. A conductive floor is only as good as its path to earth ground.



Typical conductive floor build-up: the copper tape runs beneath the primer and resin and is bonded to the facility's electrical earth.

What inspectors expect

- Copper grounding strips installed beneath the coating
- A ground connection every **1,000–2,000 sq ft**
- Direct bond to the building grounding electrode system through mechanical or compression lugs
- Near-zero resistance from strip to facility ground

Common installation mistakes

- Ground plates spaced too far apart, or a single ground connection for the whole room
- Poor bond between the copper strip and the coating
- Strip never connected to building earth
- A moisture barrier that isolates the ground path

The failure signature

Poor distribution shows up as readings that climb with distance from the ground point:

Measurement point	Reading
Near ground point	30 kΩ
Far corner of room	5 MΩ

Inspectors read this pattern as inadequate grounding distribution. The fix is more ground points, not a different coating.

Test Methods Inspectors Use

DoDM 4145.26-M requires a **megohmmeter capable of applying a DC test voltage**. Because the manual references ESD industry methods, inspectors generally follow procedures consistent with **ANSI/ESD STM7.1**. Lower-voltage surface resistance meters can produce artificially low readings that do not hold up at inspection.

Equipment

Item	Specification
Megohmmeter	500 V DC for floor-to-ground; ≤ 100 V DC for person + footwear + floor
Floor electrode	5 lb, 2.5 in (≈ 65 mm) conductive rubber base — simulates a shoe's contact area
Ground lead	Connected to a verified point on the facility grounding system
Calibration	Traceable certificate, typically within the past 12 months
Common meters	UMI DMEG3 / UEi IRT803 (100/500 V), Megger MIT series, Trek / Prostat

Floor-to-ground test

1. Place the 5-lb electrode on the floor surface.
2. Connect one megohmmeter lead to the electrode and the other to verified building ground.
3. Apply **500 V DC** and record the resistance.
4. Repeat across the room — inspectors often take **5–10 readings per area**.

Person + footwear + floor test

This test verifies the complete discharge path: hand → body → footwear → floor → ground.

1. A worker stands on the floor wearing facility footwear (footwear itself < 100 kΩ).
2. The worker holds a hand electrode connected to the meter.
3. The meter applies **≤ 100 V DC** and measures resistance to ground.
4. The result must be **≤ 1,000,000 Ω**.

Where readings are taken

Readings are taken near each grounding point, at midpoints between strips, in room corners, and at high-traffic workstations. This confirms the floor is uniformly conductive, not just compliant beside a ground lug.

Location	Typical reading, compliant A&E floor
Near ground strip	10k – 20k Ω
Center of room	20k – 80k Ω
Far corner	50k – 120k Ω

A well-installed floor reads **10k–100k Ω** floor-to-ground and **100k–500k Ω** person + footwear + floor. Large spreads between locations point to too few ground connections.

Using GFCI Protection

The GFCI allowance is what makes highly conductive floors workable. DoDM 4145.26-M, Chapter 6, C6.4.7.5.2 (Minimum Resistance) states:

> *"To protect against electrocution, the minimum resistance of the floor to the ground system and the minimum resistance of the tabletop to the ground system shall exceed 40,000 ohms in areas with 110 volts service and 75,000 ohms in areas with 220 volts service. A ground fault interrupt circuit also meets this requirement."*

How inspectors apply it

The clause applies **only to the minimum (shock-protection) limit**. Many conductive epoxy floors measure 10k–30k Ω — excellent for static control but below the electrocution threshold. Rather than forcing a higher-resistance floor, which would weaken ESD control, the facility can protect the circuits instead.

Inspectors typically expect:

- **All receptacle circuits** in the conductive-floor area GFCI-protected, by GFCI breaker or GFCI receptacle
- Coverage of bench outlets, maintenance outlets, portable tool circuits and any equipment personnel can touch
- A trip level of approximately **5 mA** differential current
- GFCI test logs kept alongside floor resistance records

GFCI protection does **not** relax the ESD limit. Person + footwear + floor must still read ≤ 1,000,000 Ω, and inspectors still run both tests.

Worked example

Test	Result	Verdict
Floor-to-ground	18,000 Ω	Below 40k Ω minimum — shock protection not met by the floor
Person + footwear + floor	250,000 Ω	Pass — well under 1 MΩ

Accepted solution: install GFCI protection on the area's circuits and maintain the test records. With that in place, the installation is typically considered compliant with DoDM 4145.26-M.

Environment, Maintenance and Recordkeeping

A floor that passes on day one must keep passing. Environment and housekeeping move readings; carbon-filled systems are the least sensitive to all of them.

Factor	Effect on resistance
Low humidity	Increases
High humidity	Decreases
Moisture in slab	Sometimes lowers
Dust accumulation	Insulates the surface — increases
Wax or sealers	Blocks conductivity — increases sharply

Maintenance protocol

- Test floor resistance at installation and **at least annually**.
- Inspect routinely for wear, cracks exposing substrate, contamination and coating degradation.
- Never apply waxes, sealers or finishes not approved for conductive floors.

Records to keep

Record	Frequency	Retention
Installation test report	Once, at installation	≥ 5 years
Floor resistance test	Annually	≥ 5 years
GFCI function test (if used)	Monthly or quarterly	≥ 5 years
Megohmmeter calibration certificate	Every 12 months	Current certificate on hand at inspection
Grounding location drawings and product data sheets	On change	Life of floor

Inspection Readiness Checklist

The manual sets requirements rather than a formal checklist, but DoD safety inspectors and ammunition facility engineers follow a structured verification much like this one. Work through it before the inspector arrives.

- ☐ **Documentation** — product data sheets, grounding location drawings, current calibration certificate and prior test records on hand
- ☐ **Grounding continuity** — copper strips beneath the coating, lugged to facility ground, reading near 0 Ω strip-to-ground
- ☐ **Floor-to-ground** — 500 V DC, 5-lb electrode, > 40k Ω (120 V) or > 75k Ω (220 V), or GFCI in place
- ☐ **Person + footwear + floor** — ≤ 100 V DC, ≤ 1,000,000 Ω with facility footwear

- ☐ **Uniformity** — readings near ground, center, corners and workstations all within limits
- ☐ **GFCI coverage** — every receptacle and personnel-accessible circuit protected, ≈ 5 mA trip, test log current
- ☐ **Instrument calibration** — traceable certificate dated within 12 months
- ☐ **Periodic testing program** — annual floor tests and GFCI tests documented, records ≥ 5 years
- ☐ **Visual condition** — no wear-through, wax, sealer, contamination or cracks exposing substrate

Top five reasons floors are rejected

1. Insufficient grounding points
2. Improper testing method
3. System resistance above 1 MΩ
4. Poor documentation
5. Meter calibration not current

Conclusion

Conductive flooring compliance under DoDM 4145.26-M is a **system-level challenge**, not a product purchase. Materials, grounding, testing and maintenance all have to be right, and most failures come from preventable gaps in one of them.

The installations that pass consistently share the same profile: a carbon-filled conductive system reading **20k–100k Ω**, grounded every 1,000–2,000 sq ft, tested with calibrated megohmmeters, and backed by GFCI protection where readings fall below the minimum. That profile delivers reliable ESD protection, compliance with both resistance limits, lower inspection risk and long-term operational safety.

Next step: a compliance review

To avoid a costly failed inspection, PumaCRETE recommends:

- An audit of your current flooring system against both DoDM 4145.26-M limits
- A review of your grounding network design and existing test data
- Confirmation of your test instruments, procedures and calibration records

PumaCRETE designs, installs and tests conductive flooring systems for A&E, energetics and propellant facilities. To schedule a site evaluation, visit pumacrete.net/contact or call **857-226-8247**.

About PumaCRETE Corp. PumaCRETE is an industrial flooring manufacturer and installer specializing in conductive and ESD flooring, urethane cement systems, and high-performance floors for defense, aerospace and industrial facilities.

PumaCRETE Corp. · 68 Harrison Avenue, Ste 605 #77920, Boston, MA 02111 · 857-226-8247 · www.pumacrete.net

References

- **DoD Manual 4145.26, *DoD Contractors' Safety Manual for Ammunition and Explosives*** (March 13, 2008, incl. Change 2, August 31, 2018), Chapter 6, Electrical Safety Requirements for A&E Facilities — WBDG copy
- **ANSI/ESD STM7.1** — Resistive characterization of floor materials; the basis for the 5-lb electrode method.
- **ANSI/ESD STM97.1** — Measures the resistance of the person + footwear + floor system. A person in ESD footwear stands on the floor holding an electrode connected to a resistance meter. ANSI/ESD S20.20 sets the related system limit at $< 3.5 \times 10^7$ Ω (35 MΩ) for electronics work — far looser than the 1 MΩ DoD limit for A&E areas.
- **ANSI/ESD STM97.2** — Measures walking body voltage, the peak charge generated on a person walking the floor. Electronics programs typically require < 100 V.

Together, STM97.1 and STM97.2 qualify a floor-and-footwear system as a safe, controlled electrostatic path. For A&E facilities, the DoDM 4145.26-M limits govern.