

MY CORROSIVE MANIFESTO

Recently, I discovered some green mold growing on the asbestos shingles on the north side of our tiny cottage in Cold Springs, NJ, which sits just across the Intercoastal Waterway Canal from Cape May Island. So I purchased a bottle of mold remover from the hardware store, screwed it on to my garden hose and sprayed it on the siding to kill the mold. Well, to make a long story short, I did not wear rubber gloves, so for the next couple of days, the long-gone corrosive material was still removing fine layers of skin from my fingertips.

The worst part was that I could not access my iPhone's Apple Pay or make Uber payments using my thumb print, which had been slowly wearing away, left behind in the hotel rooms and airplanes that I had occupied over the last few days. By the end of the week, I was required to type in the 5 digit password every time I wanted to access my phone, which by the way, caused me more than once to drop the phone. All of this only reminded me of how irritating it can be when trying to figure out how, when and where corrosive materials are regulated under the Department of Transportation, the Environmental Protection Agency and the Occupational Safety and Health Administration Regulations.

This is why I decided to compose "My Corrosive Manifesto." Now, I am not an anarchist or revolutionary. In fact I deplore and despise violence in any way, shape or form, regardless of whether it is physical or psychological. So don't get the wrong idea when I tell you that at the farm we do have a few small outbuildings, a shed row and a tool shed, that are off-line, into which I have retreated with my iPad for hours at a time to write and ruminate about the special interests, Federal, State or International departments, agencies, administrations, organizations and associations that battle for regulatory control over hazardous materials, hazardous waste, hazardous chemicals and hazardous substances. But I digress.

Let's find out what you already may know. Where, when and how many different times could the following three corrosive tests be consulted under the following four regulations? Don't rush, because it is not as straightforward as you may think. I will give you a hint; two of the regulations have only two definitions for corrosive, both use steel, one uses a pH test and the other uses animal testing, then the two remaining regulations could reference the use of all three.

THE CORROSIVE TESTS

- 1) **Animal testing**; full skin destruction in 4 hours or less;
- 2) **pH**; pH of 2 or less or a pH of 12.5 or greater;
- 3) **Metal**; severe corrosion on steel or aluminum

THE U.S. REGULATIONS

A) 49 CFR Sections 171.8 and 173.136 in the Department of Transportation **HAZARDOUS MATERIALS SHIPPING REGULATIONS**

B) 40 CFR Section 261.22 in the Environmental Protection Agency **HAZARDOUS WASTE MANAGEMENT REGULATIONS**

C) 29 CFR Section 1910.1200 Appendices A.2 and B.16 in the Occupational Safety and Health Administration GHS **HAZARDOUS CHEMICALS HAZARD COMMUNICATION REGULATIONS**

D) 29 CFR Paragraph 1910.120(a) in the HAZWOPER (**HAZARDOUS SUBSTANCES AT UNCONTROLLED HAZARDOUS WASTE SITE CLEAN-UPS, TREATMENT, STORAGE, DISPOSAL FACILITIES AND EMERGENCY RESPONSE OPERATIONS**) REGULATIONS

If you thought numbers 1 and 3 for products and 2 for waste shipments belong with letter A under the 49 CFR DOT for **hazardous materials** in transportation; numbers 2 and 3 for letter B under the 40 CFR EPA for **hazardous waste** when disposed; numbers 1 and 3 for letter C, **hazardous chemicals** under the 29 CFR OSHA GHS Hazard Communication; and letters 1, 2 and 3 for letter D under the OSHA HAZWOPER **hazardous substance** requirements, then you are correct.

Don't feel bad if you didn't know. Corrosive classification can be fickle, depending on whether you are shipping hazardous materials, disposing of hazardous waste or protecting your workers from hazardous chemicals and substances. It makes sense, when you realize DOT protects trucks, planes and choo-choo trains; EPA protects water, air and the polar bear; and OSHA protects the cook, the baker and the candlestick maker, that each would have different criteria and concerns for corrosive materials.

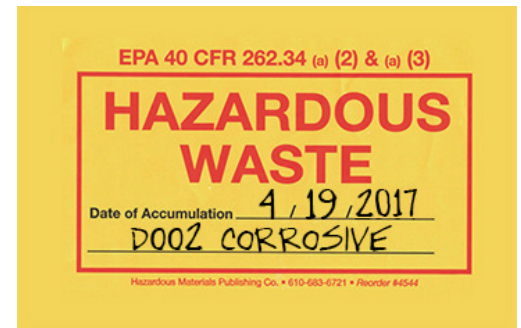
DOT CORROSIVE TRANSPORTATION

DOT defines Class 8 corrosive hazardous material products in two ways in 49 CFR 173.136; first, as materials in transportation that cause full skin destruction after 4 hours or less of exposure for Packing Groups I, II and III. Then there is a second test for severe corrosion rate on steel and aluminum, which would designate the corrosive only as a Packing Group III. Some shippers forget about the severe corrosion rate on steel and aluminum test; but considering steel drums and aluminum cargo tanks, it should not be a big surprise. Although both DOT and EPA share the severe corrosion rate on steel and aluminum tests, that is where they part ways. EPA wastes require pH testing in lieu of the DOT animal test for products. So this would mean under the 171.8 definitions of Hazardous Material and Hazardous Waste that all pH corrosive D002 hazardous waste would be a hazardous material when shipped for disposal.



EPA CORROSIVE DISPOSAL

However, EPA defines corrosive hazardous waste D002 in 40 CFR 261.22, as mentioned above, using pH - solid waste which has a pH of 2 or less or 12.5 or greater is a corrosive hazardous waste when discarded. But just like under DOT, EPA also includes the severe corrosion rate on steel and aluminum test, which again would make that material a D002 corrosive hazardous waste when discarded. However, EPA has never required animal testing for hazardous waste corrosive classification.



OSHA GHS

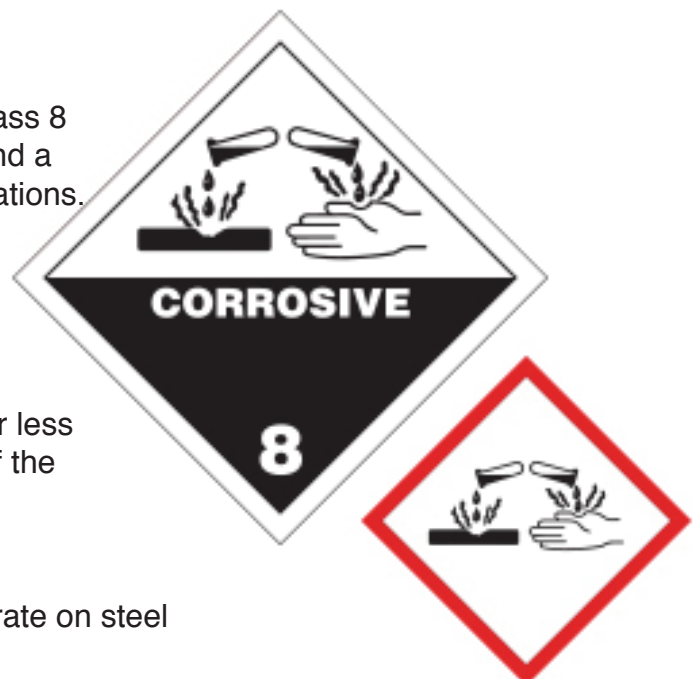
Finally, in the OSHA GHS Hazard Communication Standards in 1910.1200 Appendix A, Health Hazards, and Appendix B, Physical Hazards, for safety data sheets and container labels, hazardous chemicals use the same 2 tests as the DOT: 1) In Appendix A.2, the 4-hour animal test and 2) In Appendix B.16, the corrosion test on steel and aluminum under the physical hazards. I would be remiss not to mention that OSHA GHS has additional testing requirements for skin irritation in 1910.1200 Appendix A.2 in Category 2 and in Appendix A.3 for serious eye damage and irritation, which I am not including as being true corrosives.

OSHA HAZWOPER

Then just to confuse everyone, OSHA has the additional corrosive tests under the HAZWOPER Regulations in 1910.120(a), that protect workers from hazardous substances at uncontrolled EPA hazardous waste sites (in paragraphs b through o), Treatment, Storage & Disposal Facility employees (in paragraph p) and Hazmat teams (in paragraph q), which reference all three of the DOT and EPA corrosive tests: 1) animal testing on skin; 2) the pH test; and 3) severe corrosion rates on steel and aluminum.

DOT VERSUS EPA

Let's first look at the inconsistencies between a DOT Class 8 corrosive under the Hazardous Materials Regulations and a D002 corrosive under the EPA Hazardous Waste Regulations. EPA has two corrosive tests; one is the same as DOT, one is not. Just like DOT, EPA makes hazardous waste generators test their D002 corrosive hazardous waste for severe corrosion rate on steel and aluminum. But then EPA for waste, unlike DOT for product, has an additional test using pH. If a solid waste has a pH of 2 or less at the bottom of the scale or 12.5 or greater at the top of the pH scale, then the material, when discarded, is a D002 corrosive hazardous waste.



Even though EPA and DOT share the severe corrosion rate on steel

and aluminum test for both Class 8 and D002, as mentioned, DOT does not require “products” to be tested for the material’s pH. Only EPA requires this when classifying a hazardous waste that eventually must be shipped for disposal. This is ironic because they would always be hazardous materials, when disposed of as Federal EPA D002 corrosive hazardous waste, because all federal hazardous waste, once assigned an EPA waste code, becomes a DOT hazardous material when shipped for disposal.

DOT VERSUS OSHA GHS CATEGORIES 1A, 1B, AND 1C

That only covers some of the problems when classifying corrosive materials under EPA for disposal and DOT for shipping. Now let’s look at the DOT hazardous material shipping Class 8 corrosive definitions in 49 CFR Section 173.136, as they relate to the OSHA GHS Hazard Communication Safety Data Sheets and 6-part container labels in 29 CFR 1910.1200, where both DOT and OSHA GHS use 4-hour full skin destruction animal tests. DOT and OSHA further break down the 4-hour animal test for corrosive hazardous materials into Packing Groups I, II, and III in transportation and Categories 1A, 1B, and 1C for worker protection. OSHA Categories 1A, 1B and 1C corrosives are the same as DOT Packing Groups I, II, and III, and are based on full skin destruction, but be careful of the OSHA GHS Category 2 corrosives. As I previously mentioned, they meet no DOT hazardous material shipping definition. This is because Category 2 corrosives under OSHA only cause skin irritation, not full skin destruction, and are only regulated under GHS, because they present danger to workers.

TABLE A.2.1—SKIN CORROSION CATEGORY AND SUB-CATEGORIES

Category 1: corrosive	Corrosive sub-categories	Corrosive in ≥1 of 3 animals	
		Exposure	Observation
	1A	≤3 min	≤1 h.
	1B	>3 min ≤1 h	≤14 days.
	1C	>1 h ≤4 h	≤14 days.

A.2.2.2 IRRITATION

A.2.2.2.1 A single irritant category (Category 2) is presented in the Table A.2.2. The

major criterion for the irritant category is that at least 2 tested animals have a mean score of ≥2.3 ≤4.0.

TABLE A.2.2—SKIN IRRITATION CATEGORY

	Criteria
Irritant (Category 2)	<p>(1) Mean value of ≥2.3 ≤4.0 for erythema/eschar or for edema in at least 2 of 3 tested animals from gradings at 24, 48 and 72 hours after patch removal or, if reactions are delayed, from grades on 3 consecutive days after the onset of skin reactions; or</p> <p>(2) Inflammation that persists to the end of the observation period normally 14 days in at least 2 animals, particularly taking into account alopecia (limited area), hyperkeratosis, hyperplasia, and scaling; or</p> <p>(3) In some cases where there is pronounced variability of response among animals, with very definite positive effects related to chemical exposure in a single animal but less than the criteria above.</p>

DOT HMR PACKING GROUPS I, II, AND III

The DOT Hazardous Materials Regulations and OSHA GHS, as mentioned, when it comes to animal testing, break corrosive hazardous materials into 3 Packing Groups and 3 Categories, respectively. Packing Group I and Category 1A corrosives achieve full skin destruction after three minutes or less of exposure and 60 minutes of observation. Packing Group II and Category 1B corrosives cause full skin destruction after three minutes but before one hour of exposure, with a 14-day observation period. Then finally, Packing Group III and Category 1C corrosives cause full skin destruction after one hour of exposure but before four hours, with a 14-day observation period.

OSHA GHS CATEGORIES 1A, 1B, AND 1C

So that would mean under the animal tests, Packing Group I, Packing Group II and Packing Group III hazardous materials under DOT use the exact same criteria as OSHA GHS Hazard Communication Category 1A, Category 1B and Category 1C corrosive hazardous chemicals respectively. Now, stick with me because Corrosive hazardous materials tests in Packing Group I and Packing Group II are based solely on animal testing. However, DOT hazardous materials in Packing Group III, in addition to animal testing, include the severe corrosion rate on steel and aluminum test.

GHS APPENDIX A HEALTH HAZARDS

This is where I think the OSHA GHS Requirements and the DOT Requirements can get even more confusing, when it comes to corrosion on steel and aluminum. When you classify hazardous chemicals under GHS Hazard Communication, there are two Appendices used for classification, Appendix A Health Hazards and Appendix B Physical Hazards. Appendix A Health Hazards outlines hazardous chemical testing specific to protecting workers from materials like poisons; corrosives to eyes and skin; respiratory irritants; carcinogens; reproductive and specific target organ toxins; and aspiration hazards. Except for the acute toxicity (poisons) in Appendix A.1 and corrosives in A.2 (in categories 1A, 1B, 1C), every other health hazard listed in Appendix A will meet none of the hazard class definitions in the DOT Hazardous Materials Classifications System, as most of these would likely have little effect on highways, airports, runways and stop signs.

GHS APPENDIX B PHYSICAL HAZARDS

It is the Appendix B Physical Hazards in the OSHA GHS that aligns more closely with the 49 CFR 173.2 DOT hazardous material shipping classifications. For example, you will find that both OSHA in Appendix B and DOT in Part 173.2, regulate the same chemical hazards like: explosives; compressed gases; flammable liquids, gases and solids; self-reactive and corrosive on metals. Most of the DOT hazard class and OSHA Appendix B hazard class testing requirements in Category 1, 2 and 3 are identical and would certainly cause transportation calamities, but would not be considered as long term health hazards. It seems to me that DOT is worried about you dying right away, whereas OSHA is also worried about you dying from exposure to the same materials over a longer period of time.

DOT PG III = OSHA CATEGORY 1 ON STEEL

DOT and OSHA both use corrosion on steel, and even though the testing requirements for severe corrosion rate on steel are exactly the same under both DOT and OSHA, under OSHA GHS, the severe corrosion rate on steel test will always assign the corrosive hazardous chemical to a GHS corrosive in Category 1 in Appendix B.16. However, even though DOT uses the same severe corrosion rate on

steel test, GHS corrosive hazardous chemicals in Category 1 in Appendix B.16 will always be shipped as DOT Class 8, Packing Group III corrosives under 173.137.

The reason for this anomaly is that the severe corrosion rate on steel and aluminum test appears alone, as a single test for corrosives under Physical Hazards in Appendix B.16. Therefore, OSHA must have decided that, starting the category for a single corrosive test as a Category 3 would be inappropriate, based on the fact that there would be no Category 1 or 2 to precede it. So, for severe corrosion rate on steel or aluminum in the GHS Hazardous Chemical Regulations on Safety Data Sheets and 6-part container labels, the corrosion on steel and aluminum would always be classed as a OSHA Category 1, but must be shipped as a Packing Group III corrosive under DOT.

Category	Criteria
1	Corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm per year at a test temperature of 55 °C (131 °F) when tested on both materials.

NUMBER 1

The beauty of all of this information is that you do not have to understand it; just remember that Categories 1A, 1B, and 1C under OSHA GHS on the Safety Data Sheet in Section 2, Identification, must always be shipped as a Packing Group I when in Category 1A; Packing Group II when in Category 1B; and Packing Group III when in Category 1C and that all Category 1 corrosives in Appendix B.16 in the Physical Hazards, must be shipped as a DOT Packing Group III corrosive. That's the easy part.

NUMBER 2

The second thing to remember is when an OSHA GHS Safety Data Sheet's hazardous chemical is only an Appendix A Category 2 Skin Irritant, it will meet no DOT hazardous materials shipping definition. That's right, the Safety Data Sheet will classify your hazardous chemical as a Category 2 under Appendix A, but it will meet no DOT definition and must never be shipped under DOT as a Class 8 corrosive hazardous material. That is because the Category 2 skin irritants are OSHA corrosives that the DOT does not have the authority to regulate as hazardous materials because GHS Category 2 corrosives only cause irritation to skin, not full skin destruction.

NUMBER 3

Then the third thing to remember, which I have not mentioned, is a major inconsistency with the corrosives under DOT and GHS: the DOT Class 8 4x4 inch hazard class container labels and the OSHA GHS red bordered pictograms for Appendix A Category 1 Severe Eye Irritation that appear on the 6-part OSHA container labels.

GHS EYE DAMAGE/IRRITATION CATEGORY 1

Let me explain. As a general rule, when an SDS or GHS container label shows a corrosive pictogram corresponding to the DOT hazard class 8 corrosive label, that material will always meet a DOT definition when shipped, except for severe eye irritation in Category 1. That's because OSHA assigned Appendix A.3, Category 1, Severe Eye Irritation, a "DOT similar" pictogram, even though it meets no DOT definition. This is the exception to the rule; in almost every other case, non-DOT aligned GHS

pictograms in Appendix A display the “exploding chest” pictogram for non-DOT regulated GHS Health Hazards and Appendix B non-DOT aligned pictograms display the exclamation mark pictogram for Physical Hazards.

I don't know why every GHS pictogram aligns with its counterpart DOT hazard class label, at least for liquids and solids, except for Category 1 Severe Eye Irritation in Appendix A.3, which has a corrosive pictogram that corresponds with the DOT Class 8 corrosive hazard class label, even though it would never be allowed to be shipped under the DOT Class 8 corrosive definition. If OSHA had just assigned Category 1, Severe Eye Irritation, the “exploding chest” pictogram, like every other non-DOT regulated chemical in Appendix A Health Hazards that does not meet a hazardous material definition, then every single pictogram (except for some pyrophoric gases) under GHS would have aligned with the DOT hazard class labels.



DOT AND OSHA CORROSIVES

Alright, that takes care of the corrosive inconsistencies between the 49 CFR DOT Part 173 Hazardous Materials Regulations and the 40 CFR EPA Hazardous Waste Regulations and 29 CFR OSHA GHS Section 1910.1200 Hazard Communication Worker Protection Requirements. DOT uses animal testing and corrosion on steel and aluminum for transportation of hazardous materials products and pH for waste shipments. EPA uses pH and corrosion on steel and aluminum for identification of hazardous waste. Then, OSHA GHS uses animal testing and pH for protection of workers dealing with hazardous chemicals.

This would all be simple enough, until you realize that OSHA also regulates corrosive materials as hazardous substances under the 1910.120 HAZWOPER Regulations for protecting workers from hazardous substances at Uncontrolled Hazardous Waste Sites; Treatment, Storage & Disposal Facilities; and Emergency Response Clean-ups.

OSHA HAZARDOUS CHEMICALS AND SUBSTANCES

DOT has hazardous materials, EPA has hazardous waste, but OSHA has hazardous chemicals AND hazardous substances. In 29 CFR Section 1910.120(a), OSHA defines a corrosive hazardous substance under HAZWOPER as any corrosive hazardous material under DOT in 49 CFR and corrosive hazardous waste under EPA in 40 CFR. This means that a material would be a corrosive OSHA 1910.120 hazardous substance if it met any of the three corrosive tests: 1) animal testing for products under DOT; 2) pH for wastes tested under EPA; or 3) severe corrosion rate on steel and aluminum, for both products under DOT and wastes under EPA.

One more thing, I can not believe that anyone would be comfortable being forced to watch a test animal suffer over the two weeks, as the material slowly and painfully dissolves its skin. It is for this reason that some prefer to use the in-vitro, non-animal test, which basically uses an artificial material that replicates the properties of human skin. This non-animal test is not just authorized under the OSHA GHS and the Department of Transportation regulations, but also under the International Air Transport Association and International Maritime Organization.

Identifying and classifying corrosives is a three step process. First, you must understand what the

three different Agencies that regulate corrosives do; then the three different corrosive tests, and finally when and where they each apply. I hope this will guide you when classifying your corrosive materials under these three Federal Agencies for shipping, disposal and worker protection.

But if you're still having trouble, pre-order a copy of the 2017/2018 Hazardous Materials, Substances and Wastes Compliance Guide, which not only includes all of the latest DOT, EPA and OSHA Regulations, including EPA's Hazardous Waste Generator Improvements Rule and DOT's HM-215N, but also cross-references these confusing and conflicting regulatory requirements. Or get the newest copy of the Compliance Guide when you sign up for our seminar, when I come to town. Thank you for your readership, input and support.

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