



SAFETY GUIDE

The Hazards of Slag Blasting (and Safer Alternatives)

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In the best-case scenario, managing onsite safety is like walking a tightrope. But when your contractors are blasting with waste slags, that careful balance between "risk" and "safety" can quickly skew in the wrong direction. Dust. Disposal. Daunting OSHA and EPA regulations. No matter how you look at it, waste slags are anything but a safe bet.

Abrasive blasting has long been considered the standard for on-site surface preparation. You can't eliminate the practice altogether. But you can choose an abrasive that poses less risk to your people and your plant. Whether you're a safety manager, a hygienist or fulfilling both roles, consider this your deep dive into the hazards of waste slags—and your introduction to alternatives that dial down your exposure to risk.



Heavy metals, heavy risk

Because slags are the waste product of burning coal and/or producing metals, they inherently include metals. Depending on the slag, an abrasive could include traces of anything from arsenic and chromium to nickel and vanadium.

These heavy metals are highly toxic, and some of them put operations in the territory of EPA violations. But in a sea of red flags, arsenic and chromium are the tip of the iceberg. The much bigger challenge is beryllium.

HEAVY METALS CHART

GMA Garnet™	●									
Waste Slag*		●	●	●	●	●	●	●	●	●
Silica Sand										
Metallic Abrasives	●									
Aluminum Oxide	●									
Crushed Glass	●									
	Trace Metals**	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Vanadium

*Heavy metal content will vary depending on the type of slag abrasives, i.e. Copper, Coal, Nickel.

**All blast abrasives do contain some levels of metals. Garnet, metallic abrasives, and crushed glass have minuscule amounts of metals and significantly below OSHA limits. This is unlike other waste slag abrasives which may contain substantial amount of heavy metals well above EPA and OSHA limits.

***Naturally mined minerals contain (trace, small amount, miniscule) amounts of silica as well as some slags and other manufactured abrasives.

Beryllium's Health Risks

Heralded for being both lightweight and strong, beryllium is classified as a strategic and critical material by the US Department of Defense. Beryllium is used widely in industries ranging from aerospace to electronics. But it's also a known carcinogen, which has made it the spotlight of OSHA efforts since at least 1975.

OSHA's decades-long campaign to protect American workers from beryllium exposure culminated in 2017 with the release of updated guidelines.



OSHA's Beryllium Limits

- 0.2 $\mu\text{g}/\text{m}^3$ of air, averaged over eight hours
- A short-term exposure limit (STEL) of 2.0 $\mu\text{g}/\text{m}^3$ over a 15-minute period

Beryllium's Health Risks

- International Agency for Research on Cancer (IARC) Class 1 Carcinogen
- National Toxicology Program (NTP) Known Carcinogen
- Exposure linked to both lung cancer and Chronic Beryllium Disease (CBD)

The Beryllium Rule Protects Workers

Copper and coal slags can be

6X

OSHA beryllium exposure limit thresholds.

Backed by robust research, the beryllium rule's standards put waste slags directly in the line of fire. It has also triggered major implications for safety managers and hygienists, who are tasked with regulating and monitoring abrasives for their site's surface preparation.

Recent research

GMA Garnet™ conducted on a range of industrial blasting abrasives indicate copper and coal slags can be still six times above OSHA beryllium exposure limit thresholds.

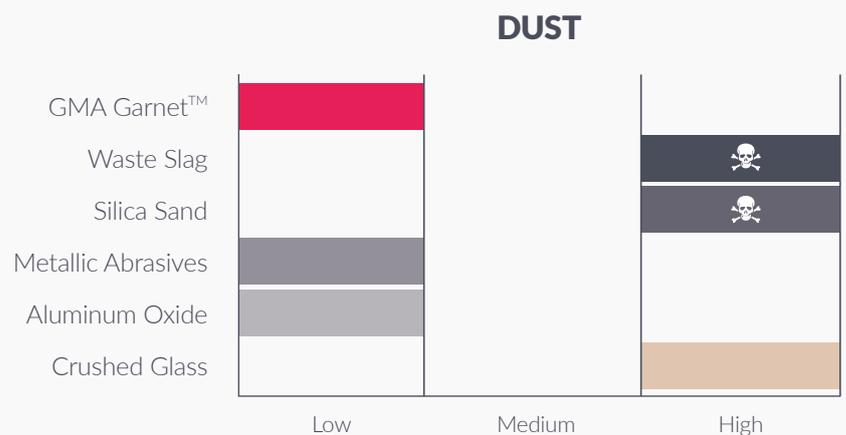
Blasting can pose a serious risk to human health. From arsenic to beryllium, the heavy metals in waste slags are well-documented and well-known. However, how these risks play out during an abrasive blasting job are anything but simple. Between dust and disposal, it's impossible to gauge the full risk of waste slags simply by what's coming out of the bag.

For hygienists conducting testing and safety managers monitoring products, that makes the stakes all that much higher.

Dust is the No.1 Problem of Abrasive Blasting

Every day, safety managers put their name on the line. They regulate and monitor products used onsite. They ensure proper PPE. They take ownership of every risk to their people and their plant. To do the job right, it requires a crystal clear picture of onsite conditions and the risks they pose. With waste slag abrasives, beryllium dust quickly clouds that visibility. And unfortunately, the dust doesn't stop at the truck.

Recent independent tests measuring respirable dust levels show that the dustiest slag abrasives contained up to 10 times higher dust levels than GMA Garnet™.



 Possibility of exceeding respirable and hazardous limits.



Waste slags often contain traces of beryllium up to 0.1% by weight or higher. But because they shatter on impact during blasting, the amount of beryllium released into the air can greatly exceed the highest legal levels. In some cases, waste slag abrasives can produce up to 10 times the beryllium exposure levels that OSHA permits.

The cost of protecting workers



Beryllium is the only heavy metal that, when at levels of 0.01 mg/m³ or higher, requires workers to wear full self-contained breathing equipment.

If you've ever had a waste slag blasting job on your site, you already know that the dust gets everywhere. This quickly reduces operator visibility, which is a significant hazard on its own. The bigger risk, though, comes from exposure to the beryllium in that dust storm.

It's typical for blasters to wear blast hoods. But even if your blasters are equipped with the proper PPE, that doesn't do a thing to safeguard the other workers exposed to beryllium dust. The workers 20 feet away with only bandannas over their mouths. The guys who keep getting hit with the dust every time they run a test. The security guard standing at the gate. With waste slag abrasives, the blasters are just the beginning.

On some sites, blasters' helpers are at risk for beryllium exposure. However, wearing a full blast hood causes major logistical issues for helpers trying to get the job done. And then there are those employees doing regular monitoring on the line, and that security guard at the gate. Although their tasks might seem unrelated to blasting, dust can — and does — contaminate other work areas. Providing the required level of PPE for everyone onsite is costly. But the other side of the coin is foregoing protective gear at the expense of workers' health.



Navigating the NIOSH rulings

Recent rulings from NIOSH complicate matters even further. These regulations outline the required PPE for exposure levels to various hazardous materials. Beryllium is the only heavy metal that, when at levels of 0.01 mg/m³ or higher, requires workers to wear full self-contained breathing equipment. This gear provides far more protection than blast hoods, but it also increases costs and poses significant productivity challenges.

Between OSHA and NIOSH, worksites have no choice but to get serious about beryllium exposure. But whether your workers wear monitors constantly or only periodically, there's no underestimating the ongoing impact of beryllium dust exposure. This risk quickly spreads to every part of a plant, from the blasting area itself to the path that pickup trucks take when they haul the waste slag away.

Dangerous disposal



By merely switching your blasting abrasive, you could go from being just under the EPA's legal disposal limit to a couple hundred times lower.

Waste slags produce the required finish based on particle size, and they require notoriously high consumption to get the job done. It's not uncommon to see blasters pumping through more waste slag to tackle high build coatings and hard-to-clean surfaces.

Where does this leave maintenance teams? With more dust, more disposal and more risk of EPA violations.

Copper slag's arsenic levels are often so high that they violate the EPA's disposal limit. But in most cases, safety managers have found workarounds that allow them to dispose of waste slags within EPA guidelines. Rather than eliminate the risk, this mentality — "As long as I can dispose of it, I'm fine" — is a Band-Aid at best.

Any time there's abrasive blasting on your site, there will be dust, disposal and some risk of exposure. But by merely switching your blasting abrasive, you could go from being just under the EPA's legal disposal limit to a couple hundred times lower. That's exactly why many managers are leaving behind waste slags — and making a safe bet with garnet.



Dangers of Environmental Contamination

Blasting with slag abrasives without containment not only poses serious risks to human health but also threatens the environment. If not properly managed and contained, slags pose a high risk of contaminating soil and water bodies, including those that supply drinking water.



THE EPA AND CALIFORNIA STATE ALLOWABLE HEAVY METALS LIMITS

	US Coal Slag Brand A	US Coal Slag Brand B	US Coal Slag Brand C	US Copper Slag Brand	US Nickel Slag Brand	GMA Garnet™
Arsenic	☠	✓	☠	☠	✓	✓
Barium	☠	☠	✓	☠	✓	✓
Beryllium*	☠	☠	✓	✓	✓	✓
Chromium	☠	☠	☠	☠	☠	✓
Lead	☠	✓	✓	✓	✓	✓
Copper*	✓	✓	☠	☠	✓	✓
Nickel*	✓	✓	✓	✓	☠	✓



Below EPA and CAM Allowable Limits



Above EPA and CAM Allowable Limits

Source: Industrial Hygiene Abrasive Products Assessment Report - HSE Solutions, 2019.

Note: Further heavy metals covered by EPA RCRA 8 and CAM 17 regulations are not included in the above table as all products were within the allowable limits thresholds.

*Beryllium, Copper and Nickel limits reference CAM 17 regulations. If more information is required, refer to CAM 17.

For more information on RCRA 8 and the allowable limits of Be, CU and Ni, please refer to the Environmental Protection Agency (EPA) website on www.epa.gov.au

The cleaner, safer alternative to waste slag

Industrial environments are far from static. A single decision, product or event can have a significant impact on the safety of your plant and people. During surface preparation, the abrasive you choose can either minimize risk or increase it. As OSHA and EPA regulations shift the HSE landscape, safety managers are using garnet to tip the scale toward safety.

To help reduce your exposure risks to potential hazards, GMA Garnet™ has laid the groundwork by performing comprehensive risk assessment research on potential respirable and environmental contamination.

PRODUCT HEALTH RISK ANALYSIS



Source: Industrial Hygiene Abrasive Products Assessment Report – HSE Solutions, 2019.

Average overall health risk assessment has been analysed using both respirable and heavy metals data analysis for 17 commonly available abrasive blasting products.

Independent HSE consultants have confirmed that GMA Garnet™ is **2.5x** safer than waste slag abrasives.





No more heavy metals

Because garnet isn't a byproduct of burning coal and/or producing metals, it doesn't contain the highly toxic metals prevalent in waste slags. Monitors could detect trace amounts of beryllium when blasting with garnet.

However, these are well below the new OSHA limits. And because garnet outperforms waste slag in terms of speed, surface cleanliness and overall cost, safety managers can reduce risk while keeping maintenance managers and blasting contractors satisfied.



The closest thing to dustless blasting

Garnet has low friability, which means it produces considerably less dust than waste slag. Heavy, tough garnet also requires less pressure to blast. What does that mean for safety managers?

It's easier to control what dust is produced, which can eliminate facility-wide contamination. Garnet is the closest thing to dustless blasting, and the little dust it does create contains beryllium levels well below the OSHA limits.



Less consumption, easier disposal

Garnet requires 30% to 50% less consumption than waste slag. Less waste means less disposal — and less time trying to find a workaround for EPA regulations.

With garnet, you can be confident that what you're disposing of isn't just below the legal limits, but well below them. Unlike waste slags, garnet can also be recycled to reduce environmental impact even further.



The true cost of waste slag abrasives

For decades, waste slags have been the status quo for industrial surface preparation. But as health and safety regulations catch up to science, it's no longer possible to ignore the red flags. Between beryllium dust and hazardous disposal, waste slags are jeopardizing the safety of industrial sites across North America. More safety managers than ever are taking notice – and taking action to leave waste slags in the dust.

Your contractor's blasting abrasive is critical to the safety of your plant and everyone who works there. With garnet, you can significantly reduce exposure to beryllium and other heavy metals, reduce visibility issues and minimize contamination – for the benefit of all the personnel at your site. Maintenance teams around the globe trust GMA

Garnet™ to get the job done faster, better and more safely. And that's something that everyone from your blasting contractor to your maintenance manager can get behind.

The trusted global leader in industrial garnet for more than 35 years, GMA is the only partner that owns the complete supply chain, delivering unmatched quality, efficiency, safety and support from mine to customer.

Visit www.gmagarnet.com to get in touch with our team and learn more about our superior range of abrasive blasting solutions.





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