American Glovebox Society
ENCLOSURE
Summer 2018

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AGS Annual Conference
July 16-18, 2018

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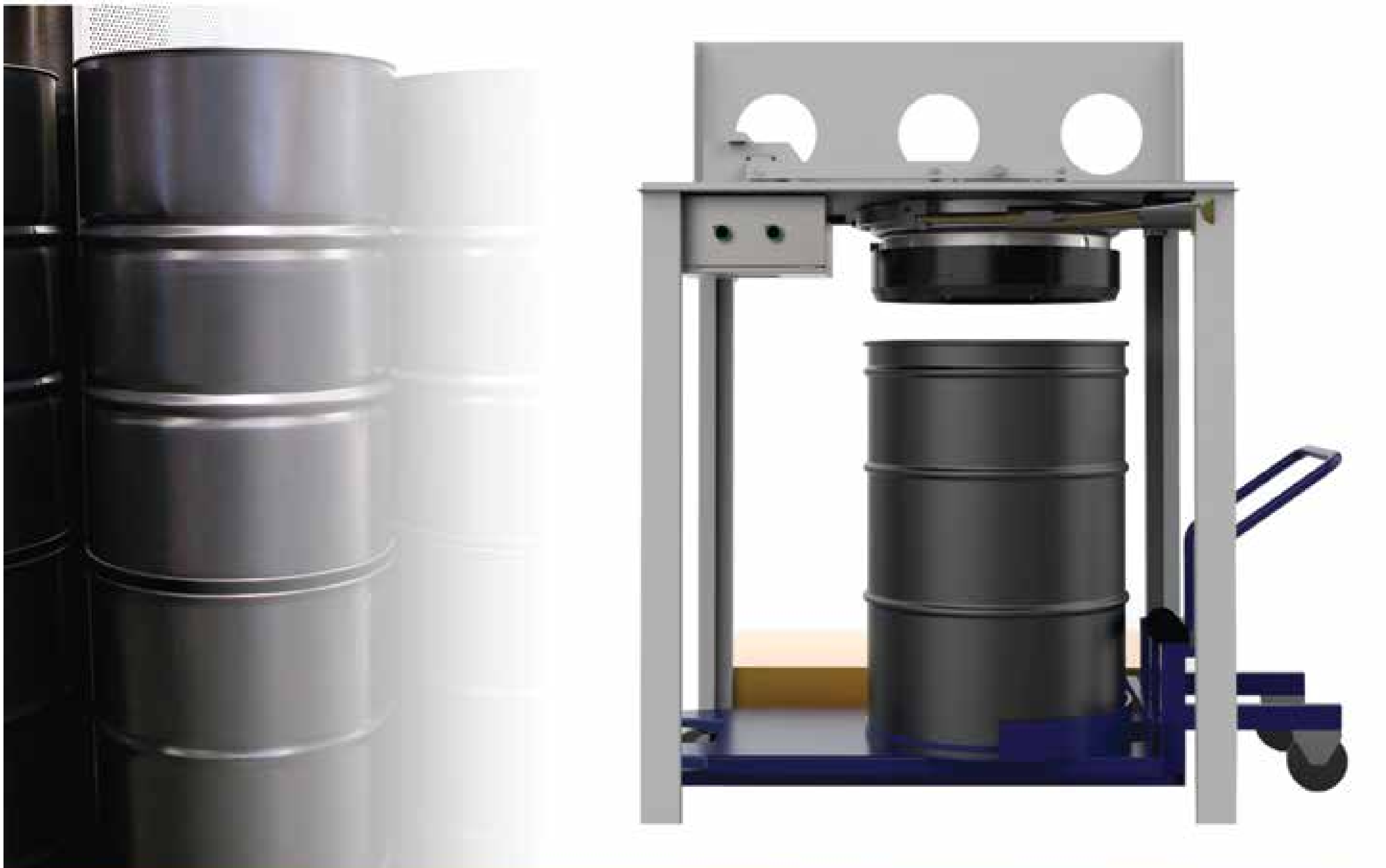

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President's Message

By: Nate Levene, P.E.

Some of us get dragged into new technology kicking and screaming while others embrace it. The AGS has tended to be in the former camp, but this year we're making a concerted effort to move to the latter. This approach has become more of necessity than a luxury to survive in today's world. As our membership inevitably skews younger, we believe that it is vital to appeal to the next generation.

The effort to embrace technology all started with our conference theme last year: Containment Innovation and Technology. We heard fascinating presentations on augmented and virtual reality, innovative glovebox fabrication techniques, and ergonomic simulation among other topics. I believe innovation will be a common theme at our conferences for the foreseeable future.

The board of directors made it a priority to determine how technological improvements could be applied to our conference and society as a whole. We concluded that the conference experience would benefit from the use of a mobile app, so we are excited to announce that we will be launching one for this year's conference in San Francisco. The app will allow us to make all the resources currently available on the program (speakers, schedule, map, etc.) in the palm of your hands along with other benefits such as speaker profiles, social media, games, attendee list, vendor information, and more! We will also be able to make schedule changes on the fly which should help the conference run smoothly. The app will be especially beneficial to those of us who tend to misplace their program (your current president being one of them). The app will be available all year long for those who attend the conference to allow for easy reference to attendee and vendor contact information. I believe the app will be a major enhancement to our conference.

We are also excited to announce an upcoming update to our website. The goals of the update are to make the website easier to navigate from phones and tablets since those devices are primarily how the next generation will view our site and to streamline the site to make it easier to access the information that you are looking for. We will also have more content available to promote our mission of disseminating industry information.

Lastly, we will continue to emphasize the use of social media (which was an initiative from my first term) to improve communication throughout the industry by utilizing our Twitter, Facebook, and LinkedIn pages. We've made incremental progress over the years, but we definitely have room for improvement. My vision is that social media will be the source for industry news and developments, along with a means for allowing our membership to maintain a network of contacts vital in today's business environment. So as the often used saying goes "join the conversation."

Hopefully these technological enhancements will encourage even some of us old dogs to learn some new tricks and improve the overall experience of our membership at our conferences and throughout the year.

Hope to see you in San Francisco!

Regards,
Nate Levene
AGS President

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Editor
Justin Dexter
j.dexter@mbraunusa.com

Advertising Manager
Crissy Willson

Design and Production
Tony Monaco

Publisher
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American Glovebox Society
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Tel.: (800) 530-1022 or (707) 527-0444
Fax: (707) 578-4406
E-mail: ags@gloveboxsociety.org
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Neutron Radiation Shielding Strategies for Glovebox Applications

By: Craig Dees, Idaho National Laboratory

A great deal of information is available in the nuclear industry on the subject of neutrons and the manipulation of neutrons for nuclear applications. Only a small portion of this information is applicable to neutron shielding applications where the designer is typically only concerned with moderating (slowing down) energetic neutrons and perhaps capturing low energy (thermalized) neutrons in order to reduce neutron emission exposure to the worker. The operation and geometry of most glovebox applications limit the shielding thickness to only a few inches at most. An understanding of the nature of neutron emissions and common neutron shielding materials will lead to effective neutron shielding strategies for most glovebox applications.

Nature of Neutron Emission

Neutron emission is generally categorized by the speed or energy level of the neutron particles: this energy level is recorded in units of electron volts (eV) in most literature. High energy neutrons have considerable velocity and associate with energy levels on the order of mega electron volts. These energetic neutron particles have no net electric charge and tend to penetrate materials much deeper than other radiological particle emissions such as alpha and beta emission.

The term thermal neutrons is commonly used to refer to neutrons having an energy level of about 1eV or less. In this region the neutron has very little velocity and the energy of the neutron no longer depends upon its kinetic energy, but rather is primarily determined by the temperature, hence the term thermal or thermalized neutron. (Chart 1)

The distinction of the energetic versus thermal neutrons becomes important when selecting glovebox shielding materials and shielding strategies are typically developed based on the anticipated neutron particle energy spectrum.

It is important to determine the anticipated neutron energy spectrum and neutron attenuation goals early in the design process in order to effectively use the available space. Glovebox shielding is typically limited to perhaps 2 to 3 inches in thickness. Thicker shielding can be considered, but it becomes an ergonomic challenge to reach and see through thicker shielding. Also recognize that the gloves and gloveports are inevitably the areas with the least neutron shielding. From a practical standpoint, if the shielding designer cannot meet their neutron attenuation goals with a few inches of shielding then they are often pushed to a hot cell rather than a glovebox.

With an understanding of the anticipated neutron energy spectrum and attenuation goals, the glovebox shielding designer considers, and tries to balance, the two fundamental considerations of moderating energetic neutrons and the capture of low energy thermal neutrons.

Neutron Moderation Materials

Neutron moderation is the process of reducing the kinetic energy, or speed, of neutron emissions to lower energies. From a personnel exposure perspective, it is generally accepted that the higher the energy or speed of the neutron, the more penetrating and potentially damaging (2). The primary goal here is to reduce the energy level of the neutrons as much as possible with the limited thickness the designer has to work with.

Neutron moderation is accomplished by collision with other atoms. Although neutron-electron interaction do occur, it is highly improbable and negligible compared to neutron-nucleus interaction (Formula 2). Neutron collisions with heavy nuclei are very elastic and offer virtually no help at slowing down energetic neutrons. A common analogy is to imagine a ping-pong ball thrown into a bowling ball, the much lighter ping-pong ball exits the engagement at nearly the same velocity that it entered. For this reason lead, or other heavy nuclei materials, which are effective for gamma shielding, are essentially useless for neutron shielding.

Neutron collisions with light nuclei are far more effective at moderating the neutron particles. An analogy may be to consider the game of marbles. As one marble is shot into a group of idle marbles one or more collisions occur ultimately slowing the incoming marble.

One way to quantify neutron moderation is to consider the logarithmic energy decrement, which is derived from conservation of momentum and energy laws. It is useful in understanding which materials, or atomic weights, will be most effective at moderation of neutron particles. In its classical form the logarithmic energy decrement (Ɛ) is only a function of the atomic mass (A) of the target nucleus and the neutron (1 amu), and can be expressed in the following formula and chart 1:

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$$\varepsilon = 1 + \frac{(A-1)^2}{2A} \ln \frac{A-1}{A+1}$$

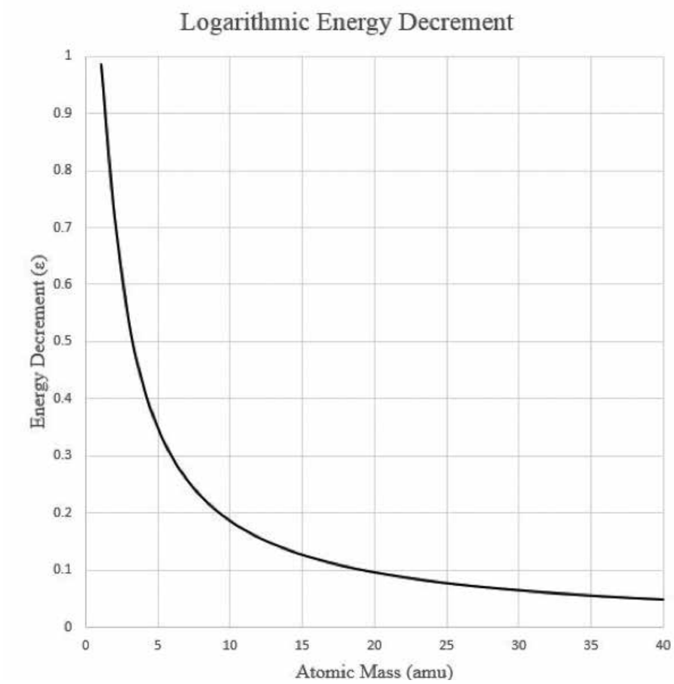

Chart 1, Logarithmic Energy Decrement

It can be seen that a logarithmic energy decrement near unity is associated with low atomic mass elements and is favorable to potentially transferring kinetic energy to the target nucleus upon collision. Logarithmic energy decrement for compounds or molecules have been studied and documented for common materials, for example water has a logarithmic energy decrement of about 0.93 at room temperature (Table 3).

Another useful quantity to consider is the number of collisions (N) needed to reduce the energy of a neutron to thermal energies.

$$N = \frac{\ln E_{high} - \ln E_{low}}{\varepsilon}$$ Formula 2

For example, the number of collisions needed to reduce neutron emissions from 2MeV to thermal energies (<1eV) for some selected materials is given in the table below.

Element	ε	Number of Collisions (N)
Hydrogen	1	15
Helium	.425	34
Water	.93	16
Carbon	.16	91

Table 3

From the logarithmic energy decrement (Ɛ) and collisions (N) relationships presented we can see that effective neutron moderation materials will be low atomic weight elements. More specifically, high densities of low atomic weights are needed. Compounds with high hydrogen content are considered ideal for neutron shielding, and are readily available and inexpensive. For these reasons water, polyethylene, and polycarbonate are used extensively for glovebox neutron shielding.

A shielding designer will no doubt encounter literature regarding the use of other neutron shield materials such as concrete or earth. However, this bulk material is generally used for significant facility structures or hot cell applications where the shield thickness may be several feet in thickness and is rarely viable for glovebox neutron shielding.

It seems important to note here that most of the shielding material in a glovebox application will likely be committed to neutron moderation, with very little material devoted to neutron capture. Some designers may choose not to include any capture material at all, particularly if the neutron attenuation goals are met by modest amount of plastic shielding. The discussion of neutron capture is still pertinent, it just seems important to remind ourselves that glovebox shielding design is often a balance of the best use of the limited space. The designer should review the ergonomic implications of additional shielding thickness before just piling it on.

Neutron Capture

The shielding discussion up to this point has been focused on neutron moderation, with no consideration of neutron capture. Neutron particle speed has a dramatic effect on the potential to capture the neutron. Generally speaking, neutrons must be moderated to a reasonable speed or thermal energies before neutron capture is effective. It may be useful for designers to consider neutron capture material as a supplemental rather than primary material.

A great deal of information is available in the nuclear industry regarding neutron capture. Fortunately for glovebox shielding purposes there are only a small handful of materials which can logically be used for neutron capture in glovebox shielding applications, the two most common being boron and lithium.

Borated materials are common and generally have well documented neutron shielding and capture characteristics. The shielding designer should consider the potential for secondary gamma emission as a result of the neutron capture. However, it is often the case that the secondary gamma emission is small or negligible. If the secondary gamma emission from borated materials is unacceptable then materials doped with lithium will yield a low probability of low energy secondary gamma emission. The neutron capture cross section of lithium is smaller than boron, and

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lithium is considerably more costly, it is often difficult to justify the cost of lithium when the lower cost of boron doped materials is adequate.

If water is selected as the shielding material, the water does offer some neutron capture capability although the neutron capture cross section is comparatively small. Water may be chemically treated to improve neutron capture performance, by adding small amounts of boric acid for example.

The cost of borated or other materials doped for neutron capture can be significant. The glovebox shielding designer should consider the overall cost and benefit of the capture material when implementing a glovebox shielding strategy. For most practical glovebox applications the conclusion of the cost benefit analysis drive most of the shielding material to neutron moderation and comparatively little to neutron capture.

Shielding Materials and Understanding Datasheets

Neutron shielding material is available from a number of commercial suppliers. The hydrogen density is of particular interest to the designer for neutron moderation performance and is generally listed on the datasheets. From a practical design standpoint the higher the density of hydrogen the more effective the neutron shield will be. Some manufacturers offer neutron attenuation and capture information directly on the data sheet in the form of 1/10 thickness. This is interpreted as the thickness of material needed to reduce the neutron emission by a factor of 10 (4). The 1/10 thickness for neutron moderation is listed separately from the 1/10 thickness for thermal neutron capture. The designer should carefully review data sheets for both energetic and thermal neutron performance. This neutron attenuation information simplifies the design process and the shielding designer may compare and select shielding materials with no need for more detailed moderation and capture calculations.

Water can be used for neutron shielding in many applications and offers high hydrogen density and excellent neutron moderation. The cost of the water as a shield material is typically negligible compared to the structural, sealing, and maintenance involved in containing water. The designer who is considering water as the primary neutron shielding material should address the implications to maintaining water seals and water chemistry. The overall ease of maintaining the water shielding system often directly correlates to user satisfaction.

INL Examples

Idaho National Laboratory has implemented neutron emission shielding on a number of gloveboxes. The first example is of neutron shielding around the body of the glovebox, a shielding strategy of 2-in polyethylene covered by a single layer of 1/8-in Shieldwerx™ SWX-238 Flexi-Boron shielding, is shown in figures 1 and 2. This material combination creates both good neutron moderation and capture.

Figure 1. Shielded Glovebox

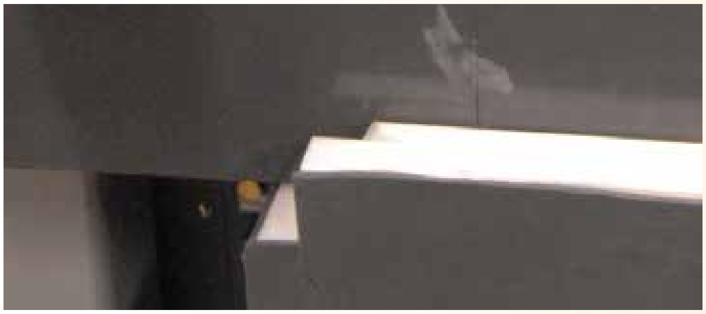

Figure 2. Polyethylene and SW-238 shielding

Windows or viewing areas can be challenging to shield as the visibility and clarity of the shield material are a concern. The Idaho National Laboratory has successfully used polycarbonate and water filled windows as shown in figures 3 and 4. It is difficult to beat the optical clarity of water, but it comes at a cost of maintaining a water shielding system.

Conclusions

The operation and geometry of most glovebox applications limit the shielding thickness to only a few inches. Most practical neutron shields for glovebox applications can be fabricated from polymer materials, such as polyethylene and polycarbonate, due to their high hydrogen content and ease of fabrication. Water may also be used for shielding purposes and offers excellent neutron moderation if the shield designer is willing to accept the enclosure and maintenance cost of a water system. Polyethylene, polycarbonate, Shieldwerx™ SW-238, and water have been used successfully at Idaho National Laboratory for neutron shielding in glovebox applications.

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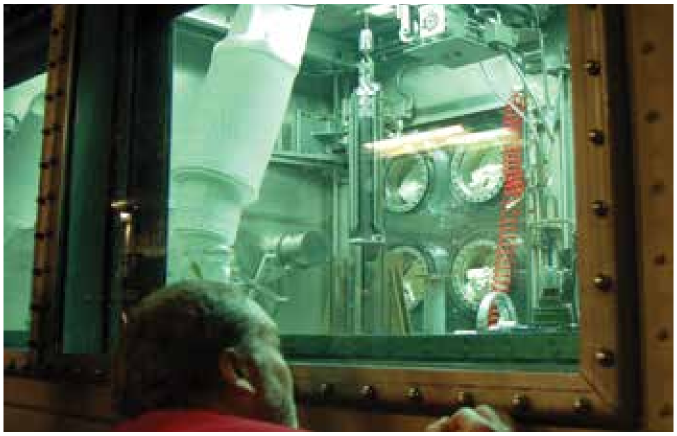

Figure 3. Water filled viewing window

Figure 4. Polycarbonate shielded viewing window

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The Importance of Developing, Implementing, and Maintaining a Sharps Program

By: Wendy Conley, TA-55 Glovebox Safety Program Manager, LANL
LA-UR-17-23942

Los Alamos National Laboratory's primary responsibility is assuring the safety and reliability of the nation's nuclear deterrent. Though the world is rapidly changing, this essential responsibility remains the core mission.

The Laboratory was established in 1943 as Site Y of the Manhattan Project for a single purpose: to design and build the atomic bomb. The Laboratory consists of many technical areas (TA's) within its boundaries of which TA-55 is part.

TA-55 is the nation's most modern plutonium science and manufacturing facility and it is the only operational, full-capability plutonium facility in the country. As such, TA-55 supports a wide range of national security programs that include stockpile stewardship, plutonium processing, nuclear materials stabilization, materials disposition, nuclear forensics, nuclear counter-terrorism, and nuclear energy.

TA-55 has been operational since 1978, with approximately 450 gloveboxes, dating back to the 1960's. In order to ensure worker's safety and health, TA-55 maintains a glovebox safety program to protect the worker from hazards including chemical, biological, ionizing radiation, mechanical, thermal, and ergonomic hazards. Preserving the integrity of the gloveboxes is at the center of this program.

So why a glovebox sharps program? Sharp tools have the potential to create glovebox glove punctures/breaches, which can expose personnel to contamination and uptakes. The glovebox sharps program focuses on identifying potential hazards, implementing controls, tracking glove breaches, and sharing Lessons Learned.

Pu-238 – 7.40e-4 Rem/dpm
Pu-239 – 8.15e-4 Rem/dpm

Therefore to calculate the amount of activity from Pu-239 to deliver 5 Rem to the whole body:

$$5\ Rem * \frac{dpm}{8.15e-4\ Rem} = 6.13e3\ dpm\ (\sim 6000\ dpm)$$

Developing a Sharps program, several elements must be incorporated when developing a sharps program.

- Need to identify what tools that may introduce a sharps risk vs created sharp that will be associated with the work.
  - The workers need to be involved in the selection, storage, and use of sharps that may introduce a sharps hazard into the glovebox.
- Need to consider the sharps hazards and puncture hazards that may include but not limited to the use of hand tools and portable power tools.
- Need to consider that secondary hazards may be created when choosing tools and how the tool will be used.

Identification and marking glovebox sharps. Workers are the most knowledgeable about their processes and need to be included in the selection, storage, and use of sharps that could introduce a sharps hazard into the glovebox.

As a best practice, identify sharps within gloveboxes by:

- Wrapping handles with red tape
- Dipping handles in red paint
- Identifying sharp tools in working papers/procedures.

Continued on page 14

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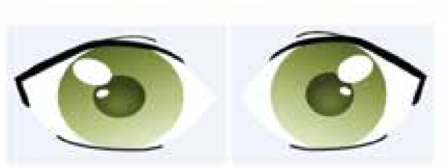
Sharps storage and general handling, store sharps in metal containers that have been labeled "SHARPS." Place sharps in a safe configuration such as storing sharp tools so that the point or edge does not pose a retrieval hazard. Do not overload sharps containers; use appropriate guarding, covers, and shielding or both to protect the workers as well as the tools.

Handling Incidental Sharps and Shards, be aware of incidental sharps/shards hazards such as broken glass, metal burrs, sharp edges, and circuit boards as these items may all present handling hazards. Take time to observe the inside of the glovebox before putting hands in the gloves. Look for potential risks and have a plan as to how to mitigate these hazards. Not all sharps and shards are readily visible. One way to discover incidental sharps/shards is to swipe the inside of the glovebox with cheesecloth or Maslin. The sharps/shards will snag the cheesecloth/Maslin, helping identify the potential threat. Inspect surfaces before installation or use of equipment and remove those that pose a threat. Have a clear visual path to the work performed at that time. Do not perform blind reaches – ***keep eyes on hands.***



Lessons Learned, understanding the "line-of-fire", defined as the path a sharp object will travel. This is of utmost importance in the event of the sudden release of force after the sharp object is placed under compression. The hand that is in the line-of-fire is the hand requiring additional personal protective equipment (PPE). One also needs to understand that commonly used items can pose a danger.

ORPS NA-LASO-LANL-TA55-2007-0002, Glovebox Glove Breach Resulting in One Employee Receiving Skin and Wound Contamination

While donning a cotton glove over a glovebox glove the employee's hand slipped and his forearm struck a lathe cutting tool resulting in the glove being punctured, skin contamination and the intake of radioactive material.

PSM LL 2009-40, "Twin Tip Sharpie," Contributes to GB Glove Breach

Sharps are not always obvious or visible and GB workers should continue to be conscious of their work environments.

A worker was performing routine GB operations in a room in the 200 area and had just completed a task and was labeling some samples with a "Twin Top Sharpie" brand permanent marker (see photo). The worker uncapped the marker on one end to label the samples, once the worker was done labeling, the worker attempted to re-cap the marker when he felt the marker poke his palm. The worker immediately took a look at the palm area of the GB glove and noticed the top of the marker lodged in the GB glove (see photo). The worker did not feel that the tip broke through his skin.

Housekeeping, poor housekeeping invites hidden hazards that could threaten glovebox and glove integrity, and worker safety. Management needs to set expectations and workers need to organize and store sharps in a safe configuration. Keep the glovebox free from clutter by removing rags and excess equipment and other items that can hide sharp objects. Leave gloveboxes organized and clean when work is complete and dispose of sharp waste by following applicable procedures/work documents.

Defining and Screening Sharps, before new activities start, part of your sharps program should consist of a sharps walk down consisting of workers who will be performing the activity/work, management responsible for the activity, Industrial Hygienist, Health Physicist (as applicable), Training and Subject Mater Experts. A formal checklist should be used to ensure consistency in the walk downs and documents whether the activity screens "in" or "out" of the sharps program. If the activity screens "in" the formal checklist aids in ensuring the proper controls have been identified, documented and put in place.

Example: (top next page)

Challenges – Size Reduction, The age of TA-55's glovebox program poses unique operational and maintenance concerns. Equipment within some of these gloveboxes no longer works, is no longer needed, is outdated, and needs to be removed. Some of the old boxes are being replaced with new ones and pushing the old boxes out the door is not a choice, introducing a completely new sharps concern.

To cut items this big, you need some powerful tools! Some tools that are used during this size reduction activity are band saws, Sawzall-reciprocating saws, Nibblers, shears, and Dremel, to name a few.

It is always best to introduce and practice (mock-up) with the new tool(s) in a clean environment cutting "like" material of like sizes with the tools to be used before introducing the tool(s) into a glovebox line. Here again, you need to consult workers who will be performing the activity/work, management responsible for the activity, Industrial Hygienist, Health Physicist, Training, and Subject Matter Experts.

Developing a procedure/work authorizing document is pertinent to the activities that identify the hazards that may be encountered and the controls to mitigate the risks is crucial. Another useful tool is video recording the practice activities. This practice allows all parties to review later in which they can look for issues/concerns that may have been missed during the live testing. This video can be shared with others and use as a training aide.

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PA-RD-01015-FM1, R2 — *TA-55 PF-4, RLUOB and CMR Glovebox Safety Program* — Page 1 of 2

Attachment A, Defining and Screening Sharps/Shards Operations
Page 1 of 2

NOTE Obtain derivative classifier/reviewing official review of completed form prior to routing for approvals.

Operation:	IWD or Procedure Number(s):
FLM/PIC/ORS:	Room and Glovebox:

Defining and Screening Sharps/Shards Operations
CHECK ALL APPLICABLE BOXES

Tools

Check all tools that will be used for this cutting/breaking/size reduction activity.
Selecting the correct tool for the task is essential to the operator's safety and key to the cutting/downsizing process. Using the incorrect tool as well as not following the manufacture's recommendations for proper use could lead to damaged tools or PPE, contamination, and injury to the worker.

☐ Reciprocating saw ☐ Jig Saw ☐ Band Saw ☐ Nibbler ☐ Sheet Metal Shear ☐Grinder	☐ Dremel ☐ Can Opener ☐ Other List	☐ Knife ☐ Screwdriver ☐ Tweezer/forceps ☐ File ☐ Allen Wrench ☐ Hammer ☐ Other, List

Material to be cut/broken

☐Steel	☐ Aluminum	☐Cast Iron	☐Hard Plastic	☐Graphite
☐Tin	☐ Stainless Steel	☐ceramic crucibles	☐ ceramic Filter Boats	☐Metal hemi's (Swiss Cheese)
☐ Quartz/Glass	☐Foundry Materials	☐metal plutonium/uranium	☐ Other	

Human Performance

Has the operator performed cutting/size reduction activities within a glovebox before? ☐ Yes ☐ No	Is a subject-matter-expert (SME) required to oversee the activity? ☐ Yes ☐ No SMEs 1. ____ 2. ____ 3. ____

Is it recommended to perform practice cuts (mock-up) in a cold lab with like materials and tools to be used before introducing the tool(s) into the glovebox line?

☐ Yes ☐ No

Controls

What controls will be used to protect the glovebox gloves and worker(s) from sharp edges (razor edge, burrs, streamers, points, etc.)?

☐Use Racks/Holders/vise Grips	☐appropriate guarding/covers, and/or shielding	☐Tape edges	☐Place items in cut resistant bags

PA-RD-01015-FM1, R2 — *TA-55 PF-4, RLUOB and CMR Glovebox Safety Program* — Page 2 of 2

Attachment A, Defining and Screening Sharps/Shards Operations
Page 2 of 2

Glovebox Gloves

What gloves are currently on the box?	☐ 30 ml lead	☐ 30 ml	☐ 15 ml	☐ Ambidextrous
Will gloves be changed out for size reduction activities?	☐ Yes ☐ No	Change glovebox glove to: ____ Changes approved by RP: ☐ Yes ☐ No RP Representative Signature/Z#/Date		

Personal Protective Equipment

Is it recommended to wear over-gloves at any point of the operation to mitigate the chance of a glove breach?

☐Yes
☐No

☐HexArmor HOG glove

☐Soft cut resistant glove

☐Other:

Comments:

List below any further comments/Lessons Learned:

Pictures required ☐ Yes ☐ No

Signatures

Signing indicates that the walk down has been performed and each representative agrees with the technique/process/PPE to be used for the sharps/shards or size reduction activity.

Name/Z#/Date	Name/Z#/Date
1.(IH)	5. (worker)
2.(Rad Con)	6.(worker)
3.(GB Owner)	7.(other)
4.(PIC)	8.(other)

Approval for Full Operation Release

Group Leader:	Z#	Date
Division Leader:	Z#	Date
Glovebox Safety Program Manager:	Z#	Date
TA-55 FOD:	Z#	Date

Provide a copy of the completed form to the GSP Manager gbs@lanl.gov or MS E583

Importance of Personal Protective Equipment (PPE), personal protective equipment is worn to protect the glovebox glove and the worker from being punctured/cut by sharps/latent shards. Finding the balance of protection lends its challenges. By adding too much, PPE can hamper the worker from being able to perform their job and therefore the worker is less likely to wear the PPE, leaving themselves vulnerable to injury. Finding the right PPE that has good dexterity, is cut resistant, puncture resistant, and can fit over a 30 ml glovebox glove is a challenge.

As you begin to look for new PPE, there are many factors to take into consideration. Will the PPE perform as intended once in the box, are there any waste concerns when trying to disposed of used/worn PPE, compatibility issues with processes/chemicals, will it conflict with any other requirements such as combustible loading, criticality safety. Once you understand that, it is time to purchase samples of PPE and begin testing in a controlled environment. Even while testing the PPE, you need to consider what sharps/latent shards could pose a hazard. Utilizing dedicated safety watches during the testing of PPE is critical. Engaging the workers who will be using the PPE is necessary since they will be the end user. If they like the PPE and how it performs, they are more likely to wear it. ❖

Hearing protection, safety glasses, cut resistant gloves, vise grips

AGS Order Form	AGS Member Price	Non-Member Price	Quantity	Total
GUIDELINE FOR GLOVEBOXES THIRD EDITION (AGS-G001-2007) Contains over 160 pages of established and proven practices compiled by experienced industry professionals. Covers areas of glovebox technology from conception to installation, operations, and maintenance.	$245	$320		
GUIDELINE FOR GLOVEBOX ERGONOMICS (AGS-G013-2011) Recommendations for the application of sound ergonomic principles to the design, operation, and maintenance of gloveboxes, glovebox appurtenances, and glovebox ancillary equipment.	$125	$200		
STANDARD OF PRACTICE FOR LEAK TEST METHODOLOGIES FOR GLOVEBOXES AND OTHER ENCLOSURES AGS-G004-2014 Establishes requirements for leak testing gloveboxes and other enclosures and their appurtenances.	$195	$270		
STANDARD OF PRACTICE FOR GLOVEBOX FIRE PROTECTION (AGS-G010-2011) Establishes fire protection requirements for the design, operation, and maintenance of gloveboxes, isolators, and their appurtenances serving as barriers to protect the worker, the ambient environment, and/or the product.	$125	$200		
STANDARD OF PRACTICE FOR GLOVEBOX INERT GAS RECIRCULATION PURIFICATION SYSTEMS (AGS-G015-2015) Establishes requirements and considerations for the design, procurement, receiving, and installation, test, and operation and maintenance of glovebox inert gas recirculating purification systems and related components.	$125	$200		
UPDATED – NEW RELEASE! **STANDARD OF PRACTICE FOR THE DESIGN & FABRICATION OF NUCLEAR APPLICATION GLOVEBOXES, SECOND EDITION (AGS-G006-2017)** Establishes requirements for the design and fabrication of nuclear application, negative-pressure gloveboxes used for the operations that involve radioactive materials that emit low-penetrating ionizing radiation.	$125	$200		
STANDARD OF PRACTICE FOR THE SPECIFICATIONS OF GLOVES FOR GLOVEBOXES SECOND EDITION (AGS-G005-2014) Establishes requirements for procuring gloves to be used on gloveboxes.	$125	$200		
STANDARD OF PRACTICE FOR THE DESIGN AND FABRICATION OF GLOVEBAGS (AGS-G002-1998) A standard of practice establishing standards for the design and fabrication of glovebag components.	$50	$125		
STANDARD OF PRACTICE FOR THE APPLICATION OF LININGS TO GLOVEBOXES (AGS-G003-1998) A standard of practice that establishes the technical requirements for the materials, installation, testing, and quality assurance of corrosion resistant linings for gloveboxes and similar containment enclosures.	$50	$125		
A GUIDE FOR PERSONNEL QUALIFICATION AND CERTIFICATION IN GLOVEBOX/ISOLATOR OPERATIONS (2014) Provides recommendation for the establishment of an employer-based qualification and certification program.	$25	$75		

- Member prices are only available to members of the American Glovebox Society.
- Quantity discounts available. Contact AGS for more information.
- No refunds, returns, or exchanges.

Submit completed form to:
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526 South E Street, Santa Rosa, CA 95404
Fax: (707) 578-4406

Online Ordering Available at: GloveboxSociety.org

SHIPPING INFORMATION (PHYSICAL ADDRESS REQUIRED)

Name ______________________

Company ______________________

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City, State, Zip ______________________

Phone ______________________

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Charges included if ordered in the US

Outside US FEDEX account number # Required:
Account Number:

TOTAL:

Payment Method:

❐ Check (payable to AGS)
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AGS Glovebox & Isolator
Annual Conference & Expo 2018

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Conference Registration

	By June 14th	After June 14th	
❑ **CONFERENCE REGISTRATION**	$ 845.00	895.00	$ ________
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By: John T. Newman, P.E.

To the Letter of the Code

When you say "Code" it can mean several things, computer code, access code, secret code/cipher, and code blue. The one that I want to discuss here today has the official meaning "A systematic collection of regulations or rules of procedure or conduct", i.e. Building Code, Welding Code, Pressure Vessel Code, Fire Code, Electrical Code. I guess, I could say codes and standards or regulations and most people would know what I am talking about. Our industry has a great many codes and regulations that we must follow and/or use to guide us in the creation and the use of our products. In the glovebox world, typically the main purpose is to promote worker and public safety when our products are utilized out in the world.

These days, there sure seems to be a lot of them. I think there are codes and/or standards out there for just about anything and everything that we do. They cover the detailed requirements for how we design, how we purchase, the materials we use, how we weld things, how we polish, how it is wired, how we test it, how we protect it, how we ship, and how we use it. Absolutely nothing is left to the imagination. Some of these codes and standards are very detailed and complicated, consisting of many volumes of text, diagrams, calculations, sections and sub-sections, appendices, and references to even more codes and standards. None of which are free, costing from hundreds to thousands of dollars. They are continually being updated and revised, and just like everything else in our consumerism society, we are forced to buy the newest and latest version. Just keeping up and understanding the implications from all of this can be quite a daunting task and the associated brain damage can be very severe.

I wonder how we ever got by without them. Now that I'm an old guy and I look back at what I like to call the old days, I'm pretty sure that there wasn't quite as many as what we have today. I don't know, perhaps my Memorex is failing, but I don't remember all this. Although, I think I could argue that the equipment that we built back then was every bit as good and as good quality as what we are building today, and perhaps it was even better. Pretty sure it certainly cost less. Without a code that dictated everything for us, we did have to use our brains. We made decisions and acted, based on common sense and experience. Never did we intentionally try to make anything sub-par and low quality, we always did the best that we could and safety was always top priority.

> "Misapplied codes can have an extreme affect on the outcome of a project. Often this has a direct influence on the cost as well."

Misapplied codes can have an extreme affect on the outcome of a project. Often this has a direct influence on the cost as well. Because of what capitalism teaches us, everything is done for the profit and nothing for the good of mankind. Corners were often cut, sub-par materials were used, accidents happened, and people died. In our infinite wisdom to solve this problem, we decided to write a code and then by implementing and enforcing it, we could make sure that these terrible things would never happen again. Next thing you know, down the rabbit hole we go, and little by little, here we are today with a code/standard for everything thing in our lives.

Don't get me wrong, codes are definitely a good thing. Just think about all the boilers that won't explode now because of the Boiler and Pressure Vessel Code, all the fires prevented because of the Fire Codes, the bridges that don't collapse from sub standard welding because of the Welding Codes and all the buildings that won't fall over because of Building Codes. But yet, it does still happen, bridges still collapse, and buildings still burn down, although I can probably say, a bit less than they used to, before the codes.

Having spent some time working on the AGS Standards Development Committee, I got the opportunity to experience a behind the scenes look at how some codes and standards are

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created. To my surprise, I discovered that codes and standards are written by people, not decreed by the gods. These people usually consist of a group of industry "experts" that volunteer their time to write a code/standard for the purpose of benefitting mankind in the betterment of our future world in the subjects of the intended code. The intent is good and the code writers try to do the best they can to write a code that covers the subject as thoroughly as possible. They try to think of every conceivable scenario that can be related to the subject code in order to make it as accurate and ethical as possible. Public safety is the primary concern, but the content is directly influenced by the particular personnel that are involved. But, here's the rub, they are people and as we all know, we as people are not capable of a perfect anything. No matter how hard you try, you can't cover every possible situation and scenario in a code. Even after a code has been in use for many years, it is continually being updated to add or delete content to counter for things that were missing or didn't work as originally envisioned by the people who wrote it.

With that said, when we use or apply a code to a particular project or application, we can't just blindly apply it without, first of all, thoroughly understanding the content, and most importantly, the intended purpose of such code. When I was young, early in my career, I had the opportunity to work for an engineering firm. Part of my duties involved the generation of project specifications to be used for the procurement of gloveboxes and equipment for the project at hand. My boss instructed me to search for every conceivable code out in the world that could even remotely apply to the project and write it in. Being young and somewhat naïve, I did exactly as I was told. It wasn't until later in life did I realize how wrong that was. I had specified the application of all those codes without understanding any of the implications that they may have had on the outcome of the project. It was almost a cover your ass kind of thing. As long as we apply the code, then everything will work and be guaranteed safe and we wouldn't have to take responsibility for what was actually written in our specification. This may be partially true, but in reality, not a good way to properly specify a project.

Misapplied codes can have an extreme affect on the outcome of a project. Often this has a direct influence on the cost as well. I have witnessed this phenomenon many times over the years and sometimes it seems to be getting worse as time goes on. Countless hours and dollars are spent in the process of satisfying the requirements of particular codes. I have seen the misapplication of fastener specifications that can cause the price of a simple ¼-20 bolt jump from five dollars for a box of fifty to five dollars each. Another time, we were forced to place a 1/8″ fillet weld around the base of a #10 (3/16″ dia) weld stud, as that was the smallest size weld allowed by the code. Needless to say, it destroyed the stud. Many a glovebox has been completely warped out of shape by over welding, all to meet the requirements of a code written for the structural welding of buildings and bridges. Many procedures and work instruction have been developed for manufacturing processes including even the most trivial tasks; all required for meeting code requirements. I could go on all day.

Then try keeping up with all of it. Being in custom equipment manufacturing, we get bombarded with a different set of codes and standards on every project. There are the main industry codes from all the big boys, like ASME, ASTM, AWS, AGS, NFPA, and NEC which everybody over time learns to understand. But there are also many very specific industry codes that must be purchased, read, and understood. Then try doing business outside the US, where every country has their same but different version. The cost for all this can be astounding. And to a manufacturer that doesn't understand every facet of these codes; they become land mines that can go off unexpectedly at anytime, causing huge unforeseen financial catastrophes'. Just when you think things are going well, the code subject matter expert jumps out from behind the door, and screams "stop that shipment, you haven't met section 2, sub section 4.27, article c, in appendix A of code XYZ!". Ugggg!

So now you are thinking, is there a point to all of this ranting? And sorry, I don't mean to be writing a rant column. But I do think we can all use a little common sense to make this situation at least just a little bit better, and that's really my point in all this.

Codes and standards are critically important to the success of our containment projects and they have a huge affect on worker and public safety. But, just blindly specifying blanket conformance to a particular code or standard without all parties fully understanding the implications is bad practice and can be a recipe for disaster. The specifier needs to fully understand the code content and more importantly, the intent/scope of said code. General use of codes as a CYA is also not good. Perhaps, instead of listing every code known to mankind, a better process would be to extract the specifics from the code and write the requirements that are important for the project in the body of the specification. That way, it will be clear to all parties and there will be minimal misunderstanding. Also, we as responsible professionals and engineers should be able to realize that there are situations when a code cannot dictate all. It's time we stop doing the stupid things, just because the code rules state that we shall do, to the letter of the code. If we can rein it back just a little, it would help everyone, and perhaps it might even lower the cost. Just a few thoughts from Newman… ❖

Make it Personal

By: Stanley Trujillo, Lessons Learned Sub-Committee Chair

Over the years, I have had the privilege of being a member of the American Glovebox Society. I have been working with the AGS and have been attending conferences since 2005.

In 2016, I was asked to write an article for the winter edition of Enclosure, titled "Why Lessons Learned?" That article discussed the importance of incorporating Lessons Learned and Best Practices into the AGS conference process and agenda proceedings, focusing on the partnership between the AGS and OPEXShare.

The summer 2017 AGS conference was the first time there was a dedicated segment during the conference to summarize Lessons Learned and Best Practices that AGS members had shared. What a way to wrap up the conference: highlighting and summarizing important operational experience!

As you may already know, the AGS brings together representatives from pharmaceutical and private industry and Department of Energy contractors from across the county to share stories, ideas and best practice advice.

I was asked at the conference if I would be interested in leading a Lessons Learned sub-committee for the AGS. It was a big honor and very humbling for me. Raising awareness about disseminating operational experiences so that others may benefit from what we're doing right and what we're doing wrong is incredibly important to me personally. If sharing these experiences benefits even one operation, one location, or one person, it is more than worth the effort.

My mantra for Lessons Learned is a simple one: make it personal.

As an Operating Experience Coordinator at Los Alamos National Laboratory, I always hear that it's difficult to put together a Lessons Learned or Best Practice statement. It can seem like a daunting task for anyone who's new to the process and doesn't know what to say.

To those people, I always tell them, "make it personal." Think about what you'd like someone to tell you or a co-worker to make your workplace safer and to keep people out of harm's way.

During the conference last year, I happened to catch a representative from the DOE's Savannah River Site speaking with a representative from the Atomic Weapons Establishment, the United Kingdom's equivalent to the DOE. Just like everyone else at the conference, they were sharing ideas.

Their discussion involved a lesson shared on OPEXShare, "Savannah River Site Employees Repair Cracked Glovebox." Even people from "across the pond" feel it important to make sure workers they've never met—and may never meet—stay safe in their work environments. It was a great example of how we can "make it personal."

And that's just one of many.

Just like we have families that we belong to and care for, we are also part of bigger families, ones that extend to our friends, co-workers and colleagues. Keeping them well informed and, above all, safe, is about as personal as it gets.

I ask you, humbly, to "make it personal." Let's watch out for one another by sharing your glovebox/isolator Lessons Learned and Best Practices with your AGS family and by posting them in OPEXShare.

And finally, contact me if you'd like to know more about the sub-committee and how you can be involved.

I look forward to seeing all of you at the next conference.

Stanley Trujillo
AGS Lessons Learned Sub-Committee Chair ❖