SAND2021-2972R

Safety Assist Review, Deeper Dive into an Abrasive Blasting Incident at Lawrence Berkeley National Laboratory

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Sandia National Laboratories

ENVIRONMENT SAFETY & HEALTH

Briefing on February 25th, 2020

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This work was prepared and completed by William Gordon under DOE Contract Order No. 7566562 Modification 1 under DOE Contract No. DE-NA0003525, in connection with Lawrence Berkeley National Laboratory's Contract No. DE-AC02-05CH11231.

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Background on Presenter and Discussion of Scope

- 87 files/images reviewed, ~130 MB of data.

Abrasive Blasting Injury

February 12th, 2020

Wednesday

ENVIRONMENT
SAFETY & HEALTH

Abrasive Blasting Injury - Commentary

No Commentary – It is challenging to have timely ORPS categorization and notification, when the entry conditions involve multiple days of hospitalization.

Report Level	Timelines	Initial Notification	Final Report Approval	Causal Analysis and Corrective Actions
High (H)	Categorize: 2 hours Initial Notification: 2 hours Written Notification: COB 2 business days Update/Final Report: COB 60 calendar days	To Facility Representative or Designated DOE Representative	By Facility Representative or Designated DOE Representative	Per local procedures. Any identified causes and corrective actions must be included in the final report.
Low (L)	Categorize: 2 hours Initial Notification: 2 hours Written Notification/Final Report: 10 business days	To Facility Representative or Designated DOE Representative	Per local procedures	Per local procedures
Informational (I)	Categorize: 2 hours Initial Notification: COB next business day Written Notification/Final Report: 10 business days	To Facility Representative or Designated DOE Representative	Per local procedures	Per local procedures

This slide is identical to January 19th, 2020 Report, See SAND2021-0664 R for complete file. My opinion hasn't changed from the deeper analysis.

Abrasive Blasting Injury – Questions to expect

Anticipate many questions about contracts and subcontracts and whether the corrective actions would prevent another event.

Opinion, Medium priority:

From my review of the report, line of inquiries, and supplemental document, enough information was gathered that the actual cause(s) should be identified to prevent re-occurrence. I would recommend the same attention to detail be given when verification of actions takes place and when validation takes place.

This slide is identical to January 19th, 2020 Report, See SAND2021-0664 R for complete file. My opinion hasn't changed from the deeper analysis.

The Why

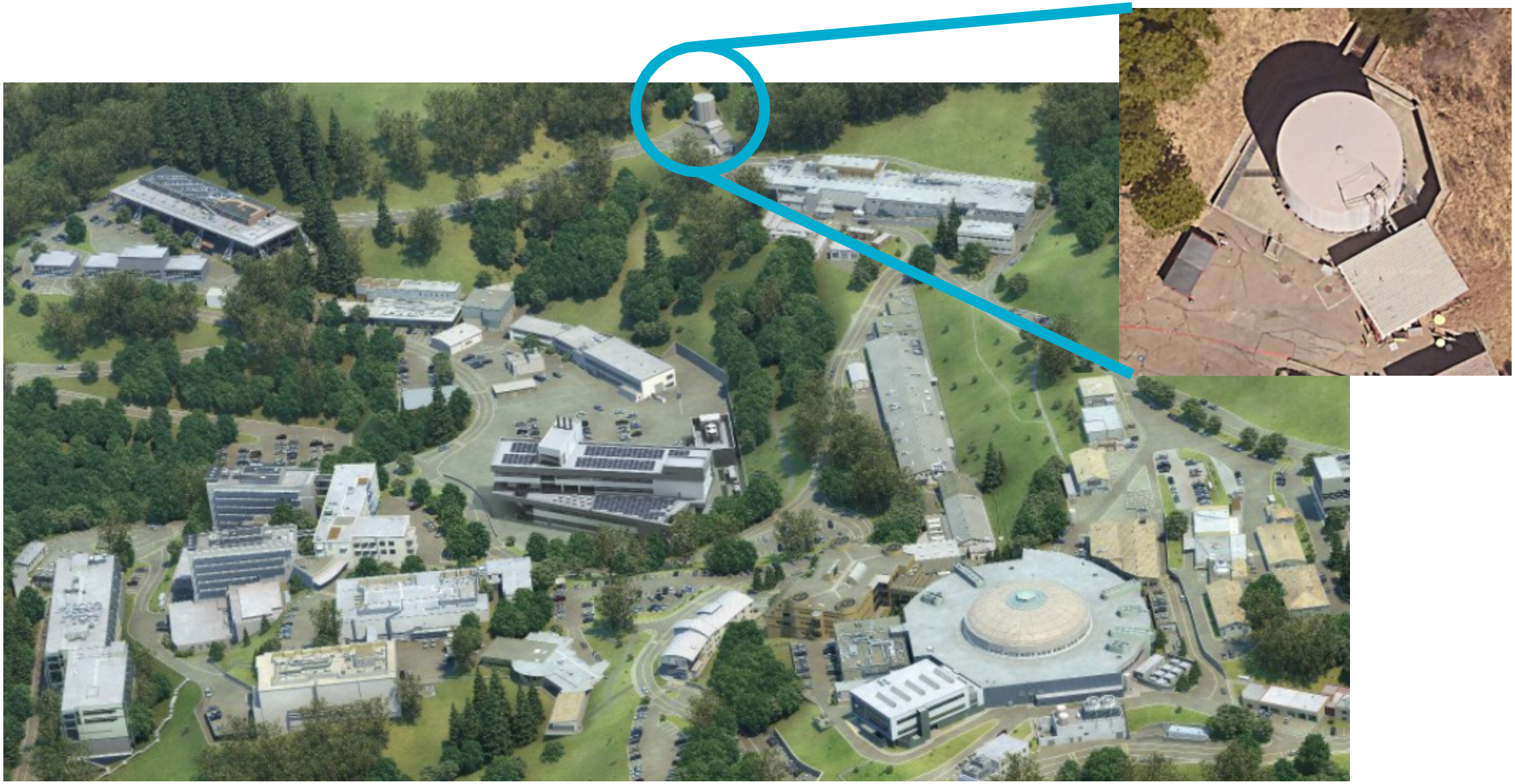
- California has fires and active fire seasons.
- Tank 82 holds water and is used to support water system and fire protection redundancy.
- Welded carbon steel water tanks corrode over time when exposed to water.
- This maintenance work was expected to extend the life of the water tank.
- Oxidation needs to be removed first before applying an epoxy coatings. (Two different epoxy coatings were planned to be applied inside the tank.)

The Who (and Some Relevant Standards)

- Contractor Superior Tank Solutions (STS) was hired to bring this tank up to both OSHA and AWWA standards.
  - This included installing a permanent fall restraint, replacing/relocating a new hatch to minimize tripping hazards, among other actions.
- Sub-Contractor Advanced Industrial Services Inc. (AIS) was contracted to do work, that included abrasive blasting of the inside of the water tank.

- The American Water Works Association sets relevant standards.
  - ANSI/AWWA D100-11, *Welded Carbon Steel Tanks for Water Storage*, is one of several standards they publish. Standards with series D are for water storage.
    - (Series C900 series is plastic pipe, E series are for pumps, F series for Plant Equipment, …)
    - The last two digits are the year of the standard. This standard was last revised in 2011.
  - ANSI/AWWA D102-17, *Coating Steel Water-Storage Tanks*, is also a relevant standard.

The Where



The What and The How

Compressed Air Generator (With Diesel Generator)

Moisture Removal Device

Abrasive Blasting Tank System

The What and The How

Junction Box allowing four “dead-man” switches.

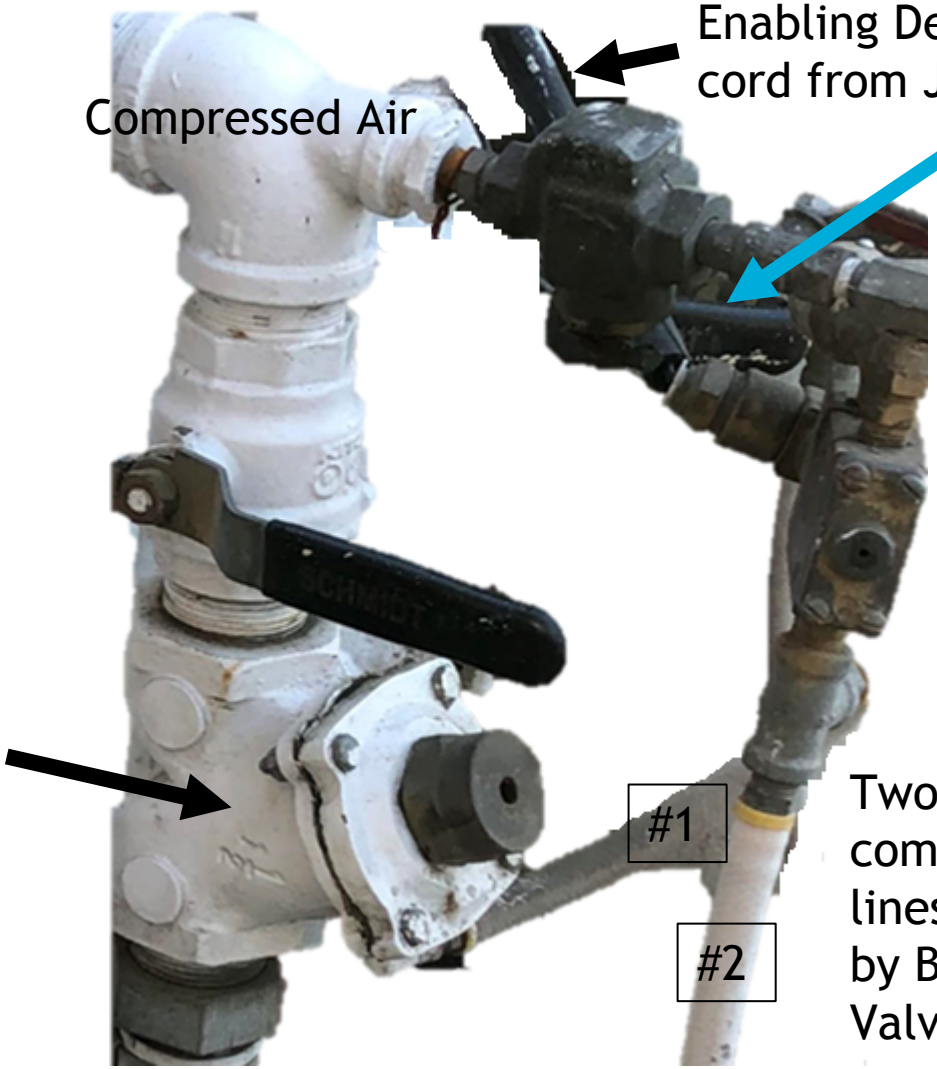
A better name is “enabling device”

Power to Junction Box

Cord from Junction Box to Blast Control Valve #12

Cord to enabling device of Abrasive Blaster

What the Enabling Device Switch Controls



Valve #10 (Energizes Air), fails closed (Fail Safe vs Fail Unsafe). Spring closure

From Root Cause Report

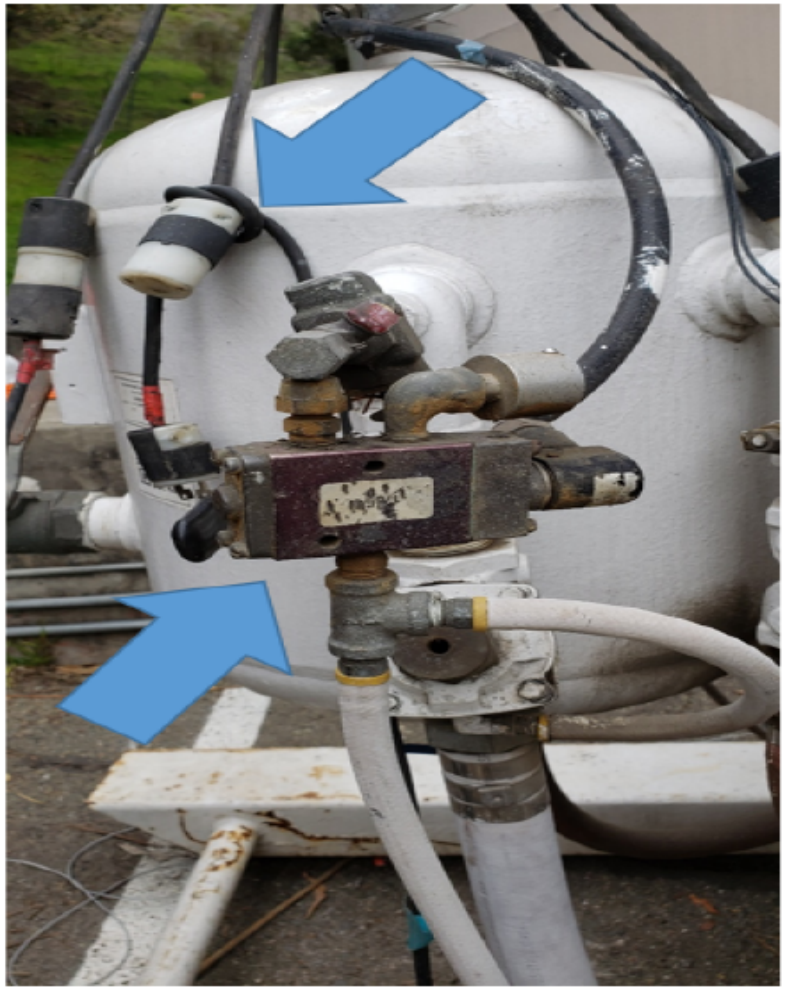


Figure #2 - Deadman Switch Cord Disconnect (top arrow)
Pneumatic System Plunger (bottom arrow)

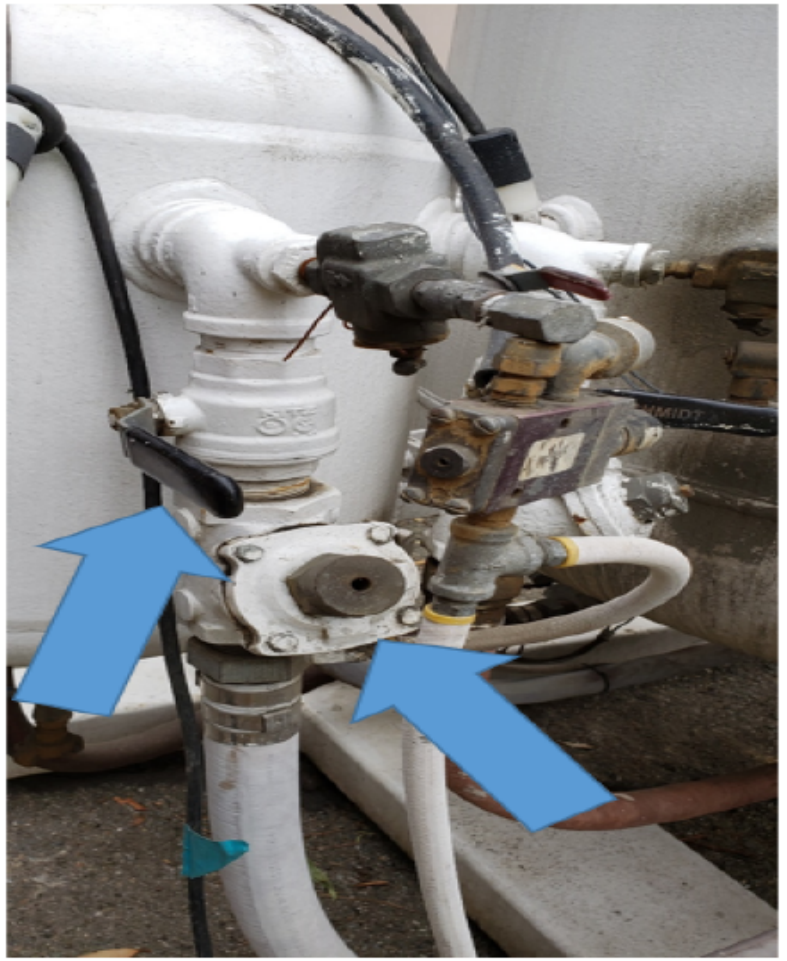


Figure #3 - Choke Valve (Compressed Air Manual Ball Valve) turned off (top arrow)
Automatic Air Valve (bottom arrow)

Surface Preparation Solutions and the Causal Report

Document 42.1_Surface Prep – Pressure Vessel-Blast Pot Inspection Report 20200320.pdf, does not use the word, “sticky,” in their written report.

1. **CF#1:** ***The deadman switch system for blast hose 2 malfunctioned as demonstrated by the system not shutting off when the deadman switch was released by the AIS Workers.***
   - The SPS onsite inspection validated that the piston inside the blast control valve on blast hose 2’s deadman system was “sticky”, which could result in the hose not shutting off. Blast hose 2’s malfunction created an off-normal work condition that disrupted the abrasive blasting operation on 2/12/20. This disruption created opportunities for the AIS Workers to make mistakes while responding to the blast hose’s malfunction or while resuming the blasting operation.

SPS
Surface Preparation Solutions

13900 Orange Avenue
Paramount, CA 90723
Phone: 310.637.3427 • Fax: 310.637.1198
Toll Free: 800.899.3872

Pressure Vessel-Blast Pot Inspection Report

Customer: ADVANCED INDUSTRIAL SERVICES
Address: LAWRENCE BERKELEY LABS
Machine: SCHMIDT 6 TON BULK POT
Serial#: 1824 Model: 1600 CFM Year: 2005
Dust Collector: N/A
Serial#:
Work Order: 165 7445
Inspector: [redacted]
Assistant:
Date: 7-20-2020

	OK	NOWK	N/A		OK	NOWK	N/A
ASME Vessel/Pot	☐	☒	☐	Ball Valves	☐	☐	☐
Blast Hose	☒	☐	☐	Air Pressure Regulator	☐	☐	☐
Hose Couplings	☒	☐	☐	Air Pressure Gauge	☐	☐	☐
Threaded Coupling				Piping	☐	☐	☐
Coupling Gaskets	☒	☐	☐	Other			
Blast Nozzle	☒	☐	☐				
Nozzle Holder	☒	☐	☐				
Nozzle Gasket	☒	☐	☐				
Deadman Control	☐	☒	☐				
Twin Air Line Hose	☐	☐	☒				
Electric Control Line	☐	☒	☐				
Pop-Up Valve	☐	☐	☒				
O-Ring/Seal	☐	☒	☐				
Hand Way-Gasket	☐	☒	☐				
Air Inlet Valve X4	☐	☒	☐				
Inlet Screen	☐	☐	☒				
Outlet Valve	☐	☐	☒				
Air Inlet/Outlet Valve Combo	☐	☐	☒				
Exhaust Pinch Hose	☐	☐	☒				
5-Way Valve	☐	☒	☐				
Check Valves	☐	☒	☐				
Abrasive Control Valve	☐	☒	☐				

Comments: PRESSURE VESSEL
1. CAM LOCKS FOR CLOSURE ARE WORKING BUT NEED TO BE SERVICED
2. SEAL FOR MANWAY IS OLD AND DRIED OUT
3. PRESSURE RELIEF VALVE HAS BEEN REPLACED WITH A BALL VALVE
4. GASKET FOR MANWAY IS OLD AND DRIED OUT
CONTROL VALVES
1. AUTO AIR VALVES – WAS CLEANED, INSPECTED AND TESTED
2. BREATHER FILTERS ON CONTROL VALVES HAVE BEEN REMOVED
3. ABRASIVE VALVES ARE AFTERMARKET MADE BLASTMASTER AND 1 IS MISSING ABOUT FOR THE BASE

Abrasive Agent Valve

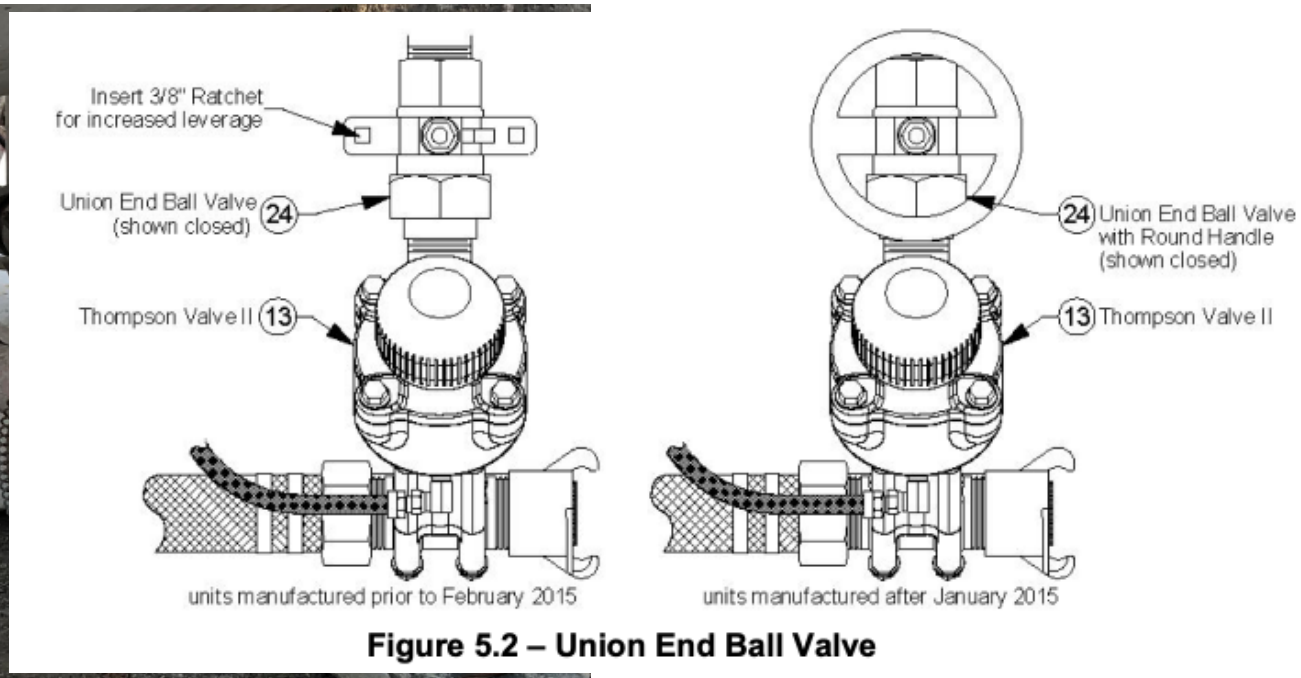


Figure 5.2 – Union End Ball Valve

Valve # 13 (Thompson Valve) (Introduces Abrasive Agent)
Normally closed, requires air to signal port to open.

Switches

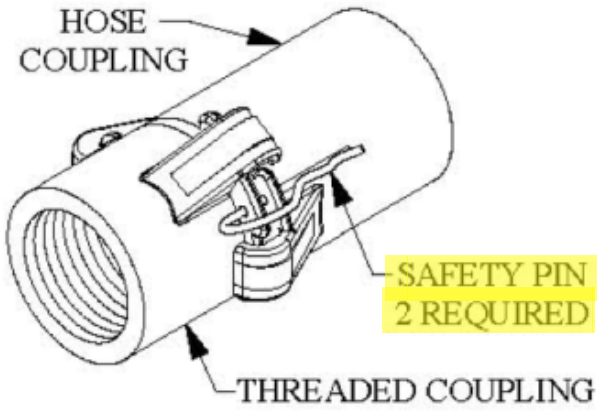
PPE

NOVA

I wanted to understand why tape was being used in conjunction with PPE.

The tape was covering up seems in the mask.

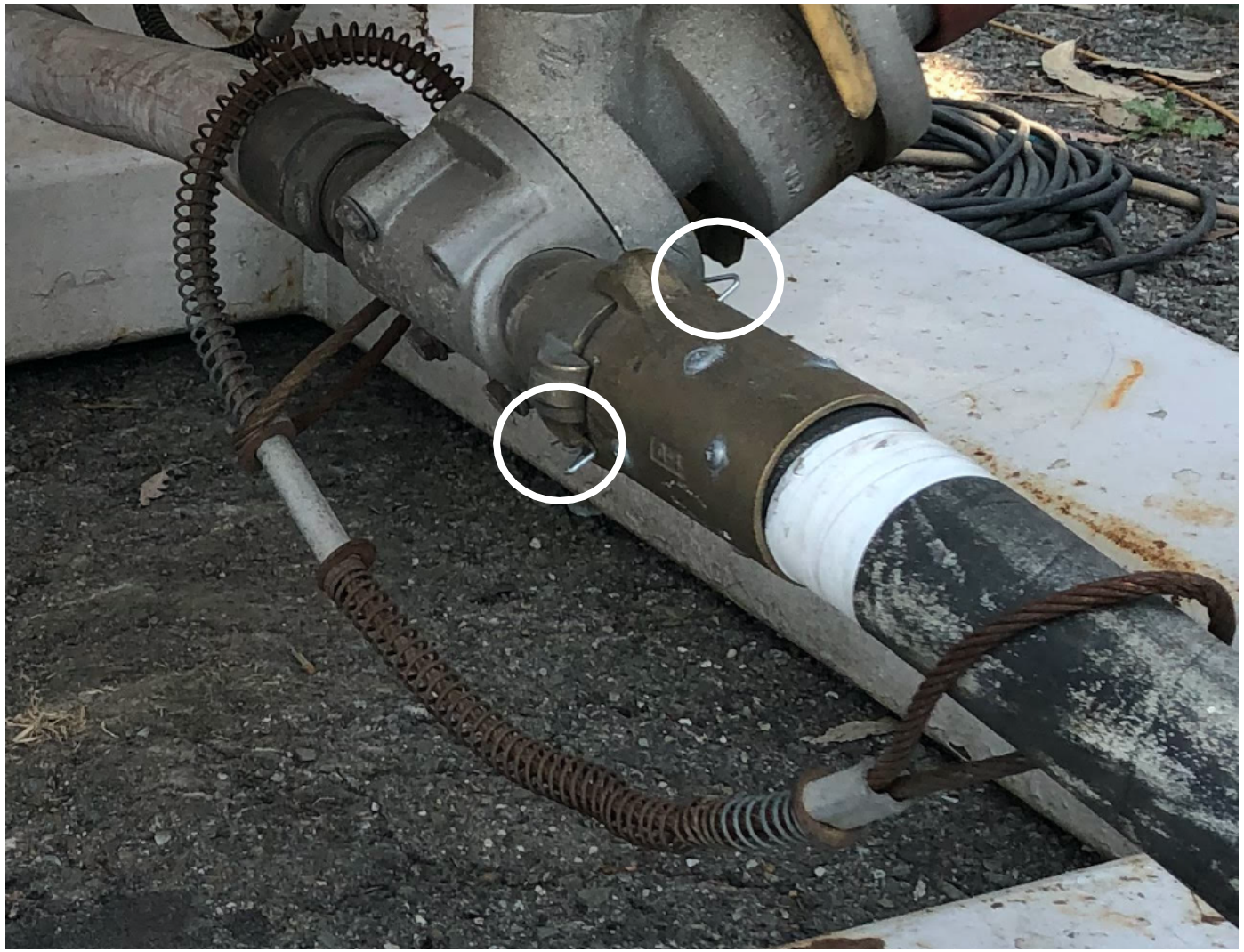
Operating Manual for Abrasive Blaster



HOSE WHIP CHECK NOT SHOWN
INSTALLED THE SAME AS THE
AIR HOSE CONNECTION

b) BLAST HOSE CONNECTION

Comment: I wanted to see if attention to detail was done when connecting the blast hose connections.



From the Causal

Overview of the Incident

On Wednesday, 2/12/20 at approximately 11:40am, AIS Worker 1, who has 17 years of work experience, was severely injured while performing abrasive blasting inside of the LBNL Tank 82. AIS Worker 1 was struck on his right forearm by abrasive material and compressed air from a pressurized blast hose. The injury included a laceration and tearing of his right forearm, near the elbow connection. The worker was wearing the approved PPE consisting of a cotton long sleeve shirt underneath standard long sleeve cotton coveralls, along with a full face supplied air hood, earplugs, wrist length leather gloves, and steel toe boots. The injured worker was hospitalized for six days requiring skin graft treatments.

Prior to the injury, AIS Worker 2's blast hose malfunctioned (blast hose 2). Per AIS Worker 1's written statement, he noticed that AIS Worker 2 was struggling with blast hose 2 so he went to check on AIS Worker 2. AIS Worker 2 handed blast hose 2 to AIS Worker 1, which AIS Worker 1 noticed that it would not shut off. AIS Worker 1 then began to press and release blast hose 2's deadman switch, but it would not shut off. He also noticed that no abrasive material was coming out of blast hose 2, only compressed air. AIS Worker 1 continued to hold on to blast hose 2 while AIS Worker 2 egressed from the tank. AIS Worker 2 signaled to AIS Worker 1 that he was going to give blast hose 2 a "choke".

Comments on the Causal Report

The AIS Workers' statements and the independent equipment inspection corroborated that blast hose 2 most likely malfunctioned, but it did not corroborate that AIS Worker 1 was struck on his right forearm by blast hose 2 because it suddenly became energized. Based on these facts, the Team concluded that it is not reasonable to believe that blast hose 2 suddenly became energized and caused AIS Worker 1's injury. Because the facts were inconsistent, the Team discussed other plausible scenarios such as:

1) AIS Worker 1 received a self-inflicted injury with blast hose 1; or
2) AIS Worker 4 inadvertently opened the choke valve or the abrasive valve, or both for blast hose 2.

Writing Style Comment: The Causal Report's inclusion of conjecture, even if true, did not further the quality of the report and instead weakened the report.

Example: If you had a staff member that you suspected of doing self-harm, while on the job, that was connected to a workplace injury, how would you document that suspicion vs. how this was documented in the causal report?

Comment on the Causal Report

- Causal Report was sufficiently detailed that corrective actions could be identified from the report.
- I would not have anticipated the level of detail that the corrective actions went into based on the content of the causal report.

Discussion: Diversity vs. Redundancy of safety systems

Comment about LBNL assistance to Conctractor

The LBNL Project EHS Point of Contact and Project Manager appeared to have made special effort to ensure that multiple rules and requirements were clearly communicated in writing.

I. PERFORMANCE GUARANTEES AND MANUFACTURERS' PRODUCT WARRANTIES

1. All work shall be guaranteed for a minimum of one (1) year from the date of acceptance against all defects in materials, equipment, and workmanship.
2. When required by individual Specification Sections, guarantees for specific items shall be for periods longer than one (1) year.
3. The Subcontractor shall submit performance guarantees and manufacturers' warranties prior to the date of final completion and prior to final application for payment. Provide [three (3)][___] original cop[y][ies].
4. The Subcontractor shall provide a hard copy of both performance guarantees and manufacturers' warranties in separate (guarantees vs. warranties) binders. At the beginning of each binder, either the date of substantial completion or, where applicable, the warranty start date indicated by manufacturers' warranty shall be indicated to reflect the start date of each guarantee and warranty period. The Subcontractor shall also provide electronic copies of all documents listed above in PDF searchable file format for each unique document.
5. Every hard copy and electronic copy manufacturer warranty shall identify the Assigned LBNL Asset Number for the equipment/asset it covers, and the location of each piece of covered equipment. If

All we need is the inspection reports and the one year guarantee on any exterior change order repairs. The guarantee can just be a letter stating when it starts and when it ends.

LBNL Facilities Master Specifications General Requirements 010000-8 Revised 01/26/2018

[redacted] Mar 12
Highlighted Text

[redacted] Apr 12
All we need is the inspection reports and the one year guarantee on any exterior change order repairs. The guarantee can just be a letter stating when it starts and when it ends.

PAGE 13 1

[redacted] Mar 12

General Provisions for Fixed Price Construction

Clause 11 – Environment, Safety, and Health

"The Subcontractor shall take all reasonable precautions in the performance of the work under this Subcontract to protect the health and safety of employees and members of the public, to minimize danger from all hazards to life and property, and to prevent injury to any of its employees or other persons; and shall comply with all applicable environmental, safety, health, and fire protection regulations and requirements, including those of the University and DOE (including reporting requirements). Such precautions shall include but shall not be limited to, all safeguards and warnings necessary to protect workers and others against any conditions on University or Government premises which could be dangerous and to prevent accidents of any kind whenever work is being performed in proximity to any moving or operating machinery, equipment, or facilities, whether such machinery, equipment, or facilities are property of or are being operated by the Subcontractor, its lower-tier subcontractors, the University, or other persons. The safety of all persons employed by the Subcontractor and its subcontractors on University or Government premises, or any other person who enters thereupon for reasons relating to this Subcontract, shall be the sole responsibility of the Subcontractor."

Key Point: In LBNL's prime contract is the DEAR Clause. Because of the thoroughness of the corrective actions, I do not believe that this event was taken lightly.

48 CFR § 970.5223-1 Integration of environment, safety, and health into work planning and execution.

(h) "Regardless of the performer of the work, the Contractor[LBNL] is responsible for compliance with ES&H requirements applicable to this contract. The Contractor is responsible for flowing down the ES&H requirements applicable to this contract to subcontracts at any tier to the extent necessary to ensure the Contractor's compliance with the requirements."

Observation – English as a Second Language

DOE assumes English as the primary language of any audience for safety posters.

Corrective Action 2 touches on multi-lingual presentations.

Codex for the Three(Four) Corrective Action Plans

NTS
CAP
1 Items

Corrective Action Plan signed May 27th and 28th
(17 Corrective Actions)

ORPS CAP
6 Items

Key Point: Actions didn't appear to get lost between the ORPS Report and the Corrective Action Plan that was signed.

Caution: Within the corrective actions for this event was a promise to develop an additional CAP. Auditors will ask for this.

Promised CAP to improve subcontractor Management

NTS Corrective Actions

1. Develop a corrective action plan – Develop a corrective action plan to address the root cause findings.

Target Due Date 04/24/2020

ORPS Corrective Action Plan

1. LBNL will develop and implement a project assurance matrix to validate prior to commencement of work that the general contractor and their subcontractors understand LBNL requirements and have flown down those requirements into the general and subcontractor policies, procedures, and daily PTHA/POD.

2. Refine the Construction Subcontractor Orientation with emphasis on roles and responsibilities, off-normal operating conditions, and the difference between pause versus stop work. The orientation should be multilingual, integrated with GERT, linked to access/gate pass.

3. LBNL will implement a risk-based equipment validation process performed by a qualified SME, to ensure safe equipment operations prior to commencing work.

4. LBNL will revise the General Requirements Specification to include a requirement for the general contractor and/or subcontractor to submit 1) equipment maintenance records, and 2) equipment training/certification records of personnel assigned to operate the equipment to the LBNL project manager for review by a qualified SME prior to equipment use.

5. LBNL will revise the SSSP and accompanying EHS procedures documentation (Chapter 10) to better define the roles and responsibilities of each specific option for an EHS Rep (e.g. Onsite Health and Safety Representative). Words and items to clarify include onsite, full time, and other assigned duties that are specified in the documents.

ORPS Corrective Action Plan

6. Revise the EHS Specification section 013529 to better clarify the roles and responsibilities of the defined/ assigned safety roles. If roles change from the start of the day, work must be paused and a follow up POD meeting held.

Key Point: Other than quotation marks missing from ORPS Corrective Action 5 for the terms being clarified, there is identical wording between the ORPS corrective actions and the corrective action plan report. There are identical due dates between the ORPS and the Corrective Action Plan.

Corrective Actions

Compensatory Action 1: The Laboratory will terminate the subcontract with STS.

CA 1: LBNL will develop and implement a project assurance matrix to validate prior to commencement of work that the general contractor and their subcontractors understand LBNL requirements and have flown down those requirements into the general and subcontractor policies, procedures, and daily PTHA/POD. The matrix will inform:

- roles and responsibilities
- hazards identifications
- stop work scenarios and restart plan
- field observations
- daily work execution lessons learned
- equipment maintenance
- integrated oversight approach by LBNL (PIMD, EHS, Facilities field inspections)

Comment: This corrective action is the creation of an operator aid to improve human performance.

Corrective Actions

CA 2: Refine the Construction Subcontractor Orientation with emphasis on roles and responsibilities, off-normal operating conditions, and the difference between pause versus stop work. The orientation should be multilingual, integrated with GERT, linked to access/gate pass, and also include:

- a measurement of the participant's comprehension of the learning objective;
- an automated method to validate completion of training;
- a hardhat sticker with an expiration date and color coded by calendar year.

Comment: This corrective action is to improve training.

CC CA 1.1: LBNL will implement a risk-based equipment validation process performed by a qualified SME, to ensure safe equipment operations prior to commencing work to include but not limiting to:

- identifying what equipment is essential for safety operation (e.g., air compressor) and not a common item/not routinely used at the Lab.
- verifying maintenance records
- validating personnel are trained to operate the equipment
- validating the equipment safe operations, including functional engineering controls

Comment: This corrective action appears to create an additional defense-in-depth process of auditing a sampling of equipment. This CA does not specify that it is for only LBNL, contractor, or subcontractor equipment.

Corrective Action

CC CA 1.2: LBNL will revise the General Requirements Specification to include a requirement for the general contractor and/or subcontractor to submit 1) equipment maintenance records, and 2) equipment training/certification records of personnel assigned to operate the equipment to the LBNL project manager for review by a qualified SME prior to equipment use.

Comment: This corrective action is a new requirement for contractors and subcontractors at LBNL. (Do you know if any other DOE site does this?)

CC CA 2: Addressed in RC#1 corrective actions pertaining to revision of the PTHA/POD as it relates to hazards identifications, and stop work scenarios and restart plan.

Caution: CA 1 did not state that the PTHA/PD would be revised, just that an operator aid would be created.

CC CA 3: LBNL will revise the SSSP and accompanying EHS procedures documentation (Chapter 10) to better define the roles and responsibilities of each specific option for an EHS Rep (e.g. Onsite Health and Safety Representative). Words and items to clarify include: “onsite”, “full time” and “other assigned duties” that are specified in the documents. The revisions will:

- Define onsite as being within the lab gates or at the specific jobsite, depending on which option.
- Define a process of how to transfer safety roles/responsibilities from one person to another during the work activity when needed.
- Require a badge for each role at the site to include the specific requirements on the back for ease in identification by subcontractor workers and LBNL personnel.

Comment: This corrective action seems out of place with the relevant contributing cause. See next slide.

3. ***CC#3: LBNL did not assure STS's understanding of the Onsite Health and Safety Representative roles and responsibilities, and other safety responsibilities for the abrasive blasting operation on 2/12/20.***
    - For the abrasive blasting operation, Option B of the EHS Specification 013529 was selected for this project. Option B requires the subcontractor to have a full-time Onsite Health and Safety Representative at all times during work activities. At the beginning of the project in July 2019, the person who was performing as the foreman on 2/12/20 was the Onsite Health and Safety Representative and the CSE Attendant. This was approved by the LBNL PM for the project, as long as there were no other activities going on outside of the tank. The implications of the approved dual safety role was not understood by the STS PM and AIS workers.
    - The LBNL Construction Manager (CM) for the project did not hold the STS PM accountable for ensuring that all AIS Workers viewed the Construction Subcontractor Orientation prior to starting work on the project.

Opinion, Low Priority:

1. Revise policy, if the policy was shown to be inadequate (non-compliant).
2. Train and Clarify policy if policy is confusing, but overall compliant.
    1. Operator Aids can help with complicated policy.
3. Reduce/Rewrite Policy if the policy is so burdensome, it is impossible to be compliant.

Additive vs. Reductionist Frameworks

- Discussion: Traditional thoughts on safety are that more controls are needed to make work safer. Usually this is more signs, more rules, more trainings, more …
- What if less controls made work safer and more compliant?
  - 24 second video below of traffic intersection.

https://www.youtube.com/watch?v=3Wte5-_gCDQ&feature=emb_title

Want Less Car Accidents? Remove Traffic Signals and Road Signs

Hans Monderman believed that societies could make roads safer by making drivers more uncertain, and therefore alert.

STEPHEN JOHNSON 31 August, 2017

WIRED BACKCHANNEL BUSINESS CULTURE GEAR IDEAS SCIENCE SECURITY SIGN IN

Get Unlimited Wired Access SUBSCRIBE

TOM MCNICHOL 12.01.2004 12:00 PM

Roads Gone Wild

No street signs. No crosswalks. No accidents. Surprise: Making driving seem more dangerous could make it safer.

Corrective Actions

MC 1: Revise the EHS Specification section 013529 to better clarify the roles and responsibilities of the defined/assigned safety roles. If roles change from the start of the day, work must be paused and a follow up POD meeting held.

Comment: I am not used to management concerns being fixed by mere policy revisions.

EOC CA 1.1: UCNL will perform a review of subcontractor injuries across the Laboratory for the last ten years to identify common themes and causes, and to make recommendations to improve the Laboratory's subcontractor management and oversight.

Comment: Good positive Safety Culture/Learning Organization behavior.

EOC CA 1.2: LBNL will develop and implement a CAP to improve subcontractor management and oversight. This CAP will be entered in CATS and tracked separately from this incident CAP, following the Issues Management Program requirements.

Caution: A promise for an additional CAP was made, and therefore can and most likely will be audited. The same rigor should be applied.

EOC CA 1.3: PIMD will develop and implement a comprehensive ongoing quality assurance oversight and assessment program for project management, including daily checklist inspections to formal project management functional area assessments. Incorporates CA 1 and EOC CA 2.4 corrective actions pertaining to the assurance matrix and metrics, respectively.

Comment: This corrective action appears to be starting up a new policy process instead of expanding the scope of an existing policy process.

Corrective Actions

EOC CA 2.1: Laboratory will revise its processes to integrate safety risk considerations to determine/select the contracting type (best value/low bid), This includes:

- If the scope of a project is determined to be of high safety risk, the contract award should use a best value evaluation if appropriate to mitigate that safety risk and select a supplier with a strong safety record. The supplier would be evaluated based on their EMR, OSHA Recordables, and past performance at the Lab and/or other similar projects, along with the price proposal.

Question: Would this corrective action, if perfectly carried out, prevent the selection of STS?
Question: What is the value of this action and would it have prevented this event?

EOC CA 2.2: The Laboratory will revise construction subcontract language and/or relevant sections of the solicitation documentation to require the general contractor to flow down to lower tier EMR and OSHA Recordable expectations and disclose to LBNL if they are over the minimums for an award based on lowest price. They must meet the same requirements as the prime subcontractor currently needs to meet.

Comment: This action flows well from 2.1.

Corrective Actions

EOC CA 2.3: Create an end of project survey for contracts involving design firms, subcontractors, and consultants where the assigned PD, PM, PC, CM, FAM and EHS personnel can grade the performance of those firms as part of the closeout process. This will become the basis for past performance at the Lab. This can also be used as an incentive for the contractors, if at the end of their project the score from the survey is below a certain level they will not be asked to bid in the future.

Note: Feedback and Improvement is an excellent activity to encourage. See DOE Policy 450.4A, *Integrated Safety Management Policy*, Core Functions for Integrated Safety Management, "Provide Feedback and Continuous Improvement. Feedback information on the adequacy of controls is gathered; opportunities for improving the definition and planning of work are identified and implemented."

EOC CA 2.4: As part of the EOC CA 1.3 corrective action, develop, implement and track a suite of QA metrics for all projects to demonstrate effective project management, and general contractor and subcontractor work planning and execution. This includes:

- alignment with hazards/risk levels
- incorporation into the PPG

Comment: I would not have expected a verification of corrective actions to have been an identified separate corrective action.

Corrective Actions

LL CA 1: Develop and disseminate a Lessons Learned Communication, as prescribed in the LBNL PUB 5519, Issues Management Program Manual.

Comment: Spreading the knowledge. Good example of a learning organization.

ER CA 1.1: Perform an Effectiveness Review of the implemented CAP corrective actions, as prescribed in LBNL/PUB 5519, Issues Management Program Manual.

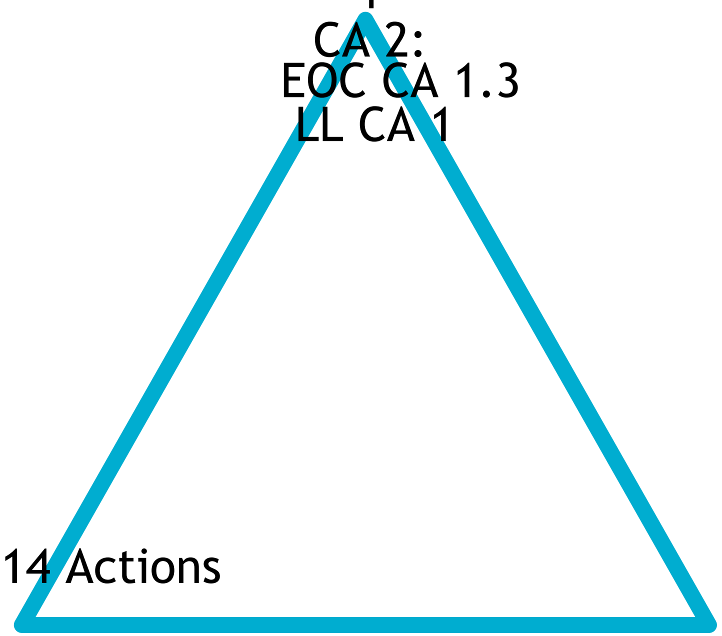
Question: Is it normal to call out effectiveness reviews as a separate item?

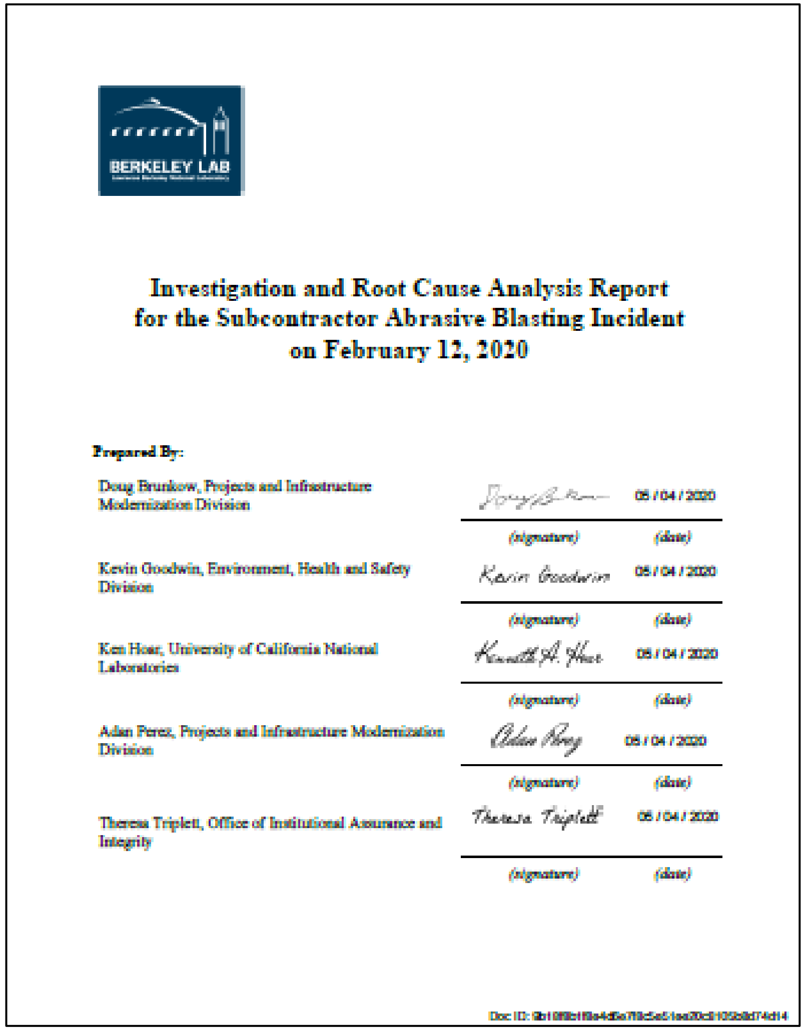
Abrasive Blasting Event – Corrective Action Types

- Corrective Actions were heavily biased to fixing paper.
  - Given that this event involved a contractor to LBNL and a lower tier contractor, I would not anticipate actions to fix facilities/equipment.

One useful reduction of corrective actions is to see which actions improve the people, the paper, or the physical facilities.

Similar examples exist in other disciplines, such as hazard elimination, substation, engineering controls, administrative controls, PPE.





BERKELEY LAB

Investigation and Root Cause Analysis Report
for the Subcontractor Abrasive Blasting Incident
on February 12, 2020

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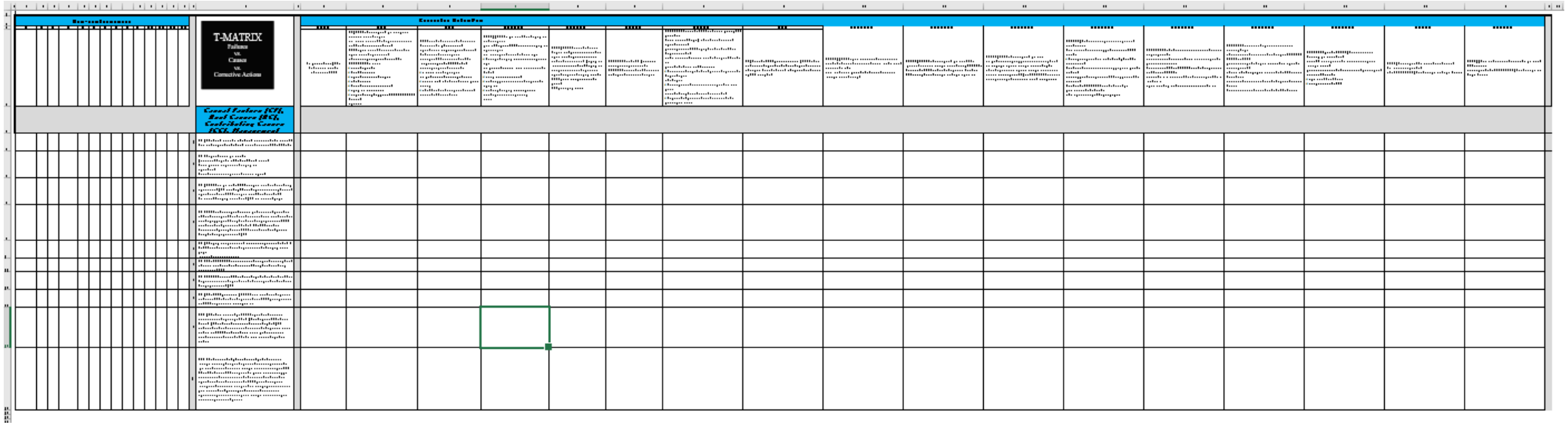
Analysis that didn’t pan out.

From the Blue Dragon Causal training course, The T-Matrix is a relatively useful tool to connect a string of non-conformances (Left side of T), with a vertical column of causal factors, with corrective actions (Right side of T).

This can usually show if a corrective action didn’t tie into a causal factor, since corrective actions are usually tied to individual non-conformances. This was not the case for this Root Cause Report and Corrective Action Plan.



Closing thoughts

1. The volume of corrective actions seems disproportionate with the identified non-conformances in the Root Cause Analysis. There is a risk, described below.
   a) Once a commitment is made and tied to an ORPS or NTS report, it is reasonably difficult to unmake the commitment., if the commitment is found through experience to have been a poor corrective action. If that has happened here, one process (that you would need buy-in from all key stakeholders) that could be used is, “after X time, re-evaluate the effectiveness and determine if the return was worth the increased time-cost of compliance.” For example, if five years later, there is any significant event involving a contractor or subcontractor, the root cause, the CAP, and even this PowerPoint Report could be investigated and if corrective actions were not maintained, there should be very clear and well articulated points in the relevant record systems for why the corrective actions were stopped.
2. There is no amount of Policy(Paper) that will prevent or stop an event from occurring. However, policy revision is the easiest corrective action to do, to demonstrate action was taken.
3. The corrective actions tied well to the causes.
4. Comment on Subcontracted work within the Department of Energy and recent safety events.