San Jose Incident Investigation Report

SAFETY AND ENFORCEMENT DIVISION

GAS SAFETY AND RELIABILITY BRANCH

May 23, 2024

Final Report

Report Date:	May 23, 2024
Investigators:	Hengyao Chen
Incident Number:	G20230608-3539
Date incident reported to CPUC	June 8, 2023
Utility:	Pacific Gas and Electric Company (PG&E)
Date and Time of the Incident:	June 8, 2023 at 0300 hours
Location of the Incident:	[redacted] Alum Rock Ave San Jose, CA, Santa Clara County

California Public Utilities Commission

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Executive Summary

Summary of Incident

On June 8, 2023, at approximately 1530 hours, PG&E incident on-duty personnel confirmed that a release of gas from a pipeline resulted in an injury necessitating in-patient hospitalization. The PG&E employee was admitted to the hospital, was under observation after suffering facial injuries, and is in stable position. The injuries occurred while working on a 4-inch steel distribution main and involved the dislodgment of a plug during a scheduled leak repair. Local fire and police department personnel responded, and the employee was transported for treatment in an ambulance. This incident was reported to the Department of Transportation (DOT) and the Safety and Enforcement Division (SED) of the California Public Utilities Commission (CPUC).

PG&E's internal Apparent Cause Evaluation (ACE) report indicated that on June 7, 2023, PG&E crews responded to a Grade 3 leak at [redacted] Alum Rock Ave. in San Jose. As part of the leak repair process, two 4" Mueller line stopper fittings were successfully installed, and leak repairs were performed. Upon completion of the leak repairs, workers were in the process of installing and tightening two completion plugs with a wrench when a failure of the pressure boundary was experienced.

At approximately 0300am on June 8th, the final completion plug had been installed and was being tightened with a wrench when it inadvertently blew out of the fitting and exposed two coworkers to a direct stream of gas at distribution pressure. This resulted in an uncontrolled release of gas without ignition causing injuries to one coworker in the form of metal shavings lodged in their face and eyes. The injured coworker was also potentially struck in the head with either a tightening wrench or the completion plug when the completion plug became dislodged.

Two coworkers working in the trench were evacuated and the crews were moved a safe distance from the gas stream. Emergency responders arrived and the injured coworker was transported to a local hospital for treatment.

The Cause Evaluation (CE) Team conducted interviews with the injured coworker (ICW) along with other coworkers (CW1, CW2) who were at the work site at the time of incident. The CE Team completed a hazard barrier analysis of the expected controls around the work task to determine human performance precursors that may have contributed to the event. After reviewing the collected information, documentation and related factors, the direct cause for this incident is inadequate thread engagement due to debris. This is based on the Subject Matter Expert (SME) evaluation of the equipment post incident where minimal thread damage is present, and the equipment performed as designed.

SED investigated the incident and concluded that PG&E committed probable violations of General Order (G.O.) 112-F, Reference Title 49 Code of Federal Regulations (CFR), Part 192, Sections 192. 605(a) and 192.605(b)(1).

Incident Investigation

Summary of Incident and Investigation

On June 8, 2023, an unplanned release of gas from a distribution gas main without ignition resulted in an injury necessitating in-patient hospitalization during a scheduled leak repair due to dislodgment of a Mueller 4-inch completion plug from a 4-inch steel Mueller line stopper (M2) fitting, which was caused by PG&E field personnel's improper operation. The responding PG&E field crew remediated the issue and ensured the pipeline was returned to service safely on the same day.

SED found PG&E in violation of Title 49 CFR, Part 192, §192.605(a) for failing to follow Utility Procedure TD-4150P-202. PG&E is also in violation of Title 49 CFR, Part 192, §192.605(b)(1) for failing to provide adequate written instructions in its Utility Procedure TD-4150P-202 for the use of PPE when its employees encountered an abnormal operating condition (AOC) while exposed to leaking gas and the potential for completion plug failure.

Fatalities / Injuries

One injury was reported.

Property Damage

$8,588 (including $4,538 estimated cost of operator's property damage and repairs and $4,050 estimated cost of emergency response)

Utility Facilities Involved

PG&E San Jose Division, gas main pipeline.

Pipe Material = Steel Pipe Size = 4 (inches)

MAOP = 60 (psig) Operating Pressure = 54 (psig)

Investigators

Name	Title
1. Hengyao Chen	SED, Utilities Engineer

Documents Reviewed

See Appendix B.

SED Investigation

On June 8, 2023, at approximately 1530 hours, PG&E incident on-duty personnel confirmed a release of gas from a pipeline resulted in an injury necessitating in-patient hospitalization in San Jose. The PG&E employee was admitted to the hospital, was under observation after suffering facial injuries, and is in stable position. The injuries occurred while working on a 4-inch steel distribution gas main and involved the dislodgment of a completion plug during a scheduled leak repair. Later, the responding PG&E field crew arrived at the incident site and removed all defective components and reinstalled a new fitting to remediate the issue on the same day. Local fire and police department personnel responded, and the injured employee was transported for further treatment. There were no reports of fatalities, or customer impact regarding this incident. There was no presence of media on site. This incident was reported to the DOT and CPUC due to a release of gas resulting in an injury requiring hospital admission and at least one overnight stay.

Per PG&E's data request responses, Gas Control Center (GCC) Event Log, and Apparent Cause Evaluation (ACE) Report, SED noted the following:

On June 7, 2023, PG&E assigned gas crew (includes foreman/injured coworker (ICW), utility worker/coworker#1 (CW1), and coworker#3 (CW3)) began their workday at approximately 0700 hours and responded to a scheduled Grade 3 below ground leak (PM#44948405), which the gas crew determined as Grade 1 below ground leak later, at [redacted] Alum Rock Ave. in San Jose. The gas mechanic/coworker#2 (CW2) began his workday at approximately 0700 hours at another jobsite, and then joined the assigned crew to replace CW3 at 1430 hours. All three individuals (ICW, CW1, & CW2) continued work until the time of the incident on June 8, 2023.

After locating and excavating the highest leak reading area(s), the crew discovered three additional Grade 1 leaks that were on buried threaded valves/fittings. The crew contacted their superintendent and GCC as well as attempted to use the Trident Seal to stop/repair the leaks, but it was unsuccessful. At that time, the onsite PG&E supervisor decided to remove the leaking fittings from the 4-inch steel distribution gas main. At 1608 hours, the superintendent requested an emergency clearance work document (EWCD# 80229415) for Grade 1 leak repair. It was created at 1650 hours and was approved at 1711 hours. During the leak repair process, the crew successfully installed two 4-inch Mueller line stopper (M2) fittings and performed the leak repairs.

On June 8, 2023, two PG&E employees (CW2 & ICW) were in the process of installing and tightening two completion plugs inside a bell hole prior to the incident. At approximately 0300 hours, ICW was tightening the final completion plug with a wrench while it inadvertently blew out from the fitting and exposed both employees to a direct stream of gas at distribution pressure (54 PSIG). This resulted in an uncontrolled release of gas without ignition causing injuries to one employee (ICW) in the form of metal shavings

lodged in his face and eyes. ICW was also potentially struck in the head with either a tightening wrench and or the completion plug when the plug became dislodged.

The two employees were evacuated from the bell hole and were moved to a safe area. Emergency responders arrived and ICW was transported to a local hospital for treatment. At 1442 hours, ICW was sent for a drug and alcohol testing, and the result disposition as negative on June 9, 2023.

After the incident, PG&E took the following immediate corrective actions (ICA) to ensure the safety of its employees:

1) ICA#1: Grade 1 leak repaired; work area made safe. (Completed: 6/8/2023)

   The responding PG&E gas crew arrived at the incident scene and performed the following to remediate the Grade 1 leak issue:

   1. Re-installed the pancake valve to control the release of the gas utilizing their Flush Suits to protect the public, property, and environment at the failure site.
   2. Took measures to shut in the gas release, then proceeded to determine an upstream location to install an M2 fitting. This fitting was installed to perform the cut out of the fitting where the gas release occurred to ensure the pipeline was returned to service safely.

2) ICA#2: Communication "Interim Controls to reduce Line of Fire hazard during installation of Completion Plug" distributed to Gas Operations, M&C / Leak Survey, GC, and Contract Partners. (Completed: 6/20/2023 via email).
3) ICA#3: Worker operator qualifications (OQ) pulled. (Completed: 6/8/2023)
4) ICA#4: Add 5 Minute Meeting or tailboard as interim control. Topics to include mandatory requirement for the use of Personal Protective Equipment (PPE) when encountering an AOC. The intent is to implement before completion of Corrective Action 3 (CA-3).

Furthermore, PG&E also contacted the third-party laboratory, Methods and Procedures (M&P) pressure control group, to assist/support the investigation. M&P personnel were onsite to witness the removal of the pipe containing the fitting and took custody of the section of pipe, the fitting, and its components as well as of the pressure control equipment used to perform the operations involved in this incident. All defective components and equipment were sent to the M&P's Dublin facility for testing on June 8, 2023.

Based on the inspections and equipment evaluation, the M&P group concluded that no material failures could be identified or replicated, and all equipment was in serviceable condition (see Appendix D).

On June 12, 2023, ICW was released from the hospital and was sent home for recovery.

On June 28,2023, PG&E's Cause Evaluation (CE) Team conducted an internal interview with the ICW along with CW1 and CW2 who were at the work site at the time of incident. SED team also participated in the interview.

On October 23, 2023, SED visited PG&E San Jose Division's main office and took photos of the equipment involved in the incident (See Appendix E).

For further investigation, the CE team collected the 4" Mueller line stopper fitting, and the equipment used to perform the operations involved in an incident, as well as consulted with subject matter experts (SME) on the use of Mueller machines and fittings. The CE Team also completed a hazard barrier analysis of the expected controls around the work task, as well as utilized the Human Factor Analysis and Classification System (HFACS) to determine human performance precursors that may have contributed to the incident.

Per PG&E's ACE Report, there were multiple conditions that led to dislodgement of the completion plug:

(1) Direct Cause: Debris in the thread surfaces between completion plug and Mueller 4-inch line stopper fitting caused by inadequate thread engagement.

(2) Apparent Cause #1: Employees (CW2 & ICW) were qualified but not proficient in the use of the Mueller machine.

   (a) Work is infrequently performed by crews due to reduced use of Mueller machine. Per CE team interview, employees stated there may be lack of proficiency since they were performing less work with the Mueller machine than in the past which created an error prone situation. Per CE team barrier analysis, no gaps in training or qualifications were identified. However, all employees expressed a desire to gain additional training and experience using the Mueller machine as this is an activity that has been performed infrequently.

   (b) Failure to physically check and visually confirm thread engagement after the first few turns per Utility procedure TD-4150P-202, section 7 "Inserting Completion Plug", step 7.14 and 7.15:

      "7.14 Apply downward pressure on boring bar, AND rotate ratchet handle clockwise approximately 1 full turn until initial completion plug thread engagement is felt.

      7.15 Attempt to raise boring bar to confirm completion plug engagement.

      1. IF completion plug thread is not engaged, THEN repeat Step 7.13 and Step 7.14."

   (c) Employees were not proficient with the Mueller Line Stopper process contained in Utility Procedure TD-4150P-202 "Mueller Line Stopper (M2) H-17190 and H-

17191 2-Inch Through 4-Inch Operation Using D-Series Drilling Machine". Per CE team interview, the employees stated that the leaking gas was normal while the Utility Procedure TD-4150P-202 specifies a leak as an abnormal operating condition (AOC) and requires work stoppage. Employees may have been confused about the differences between 2-inch and 4-inch plugs, as only the 4-inch has a spring loaded equalization plug that may sound like leaking gas bypassing O-ring.

As corrective action, PG&E planned to provide its employees with virtual refresher training sessions on the Mueller Line Stopper process to reinforce the use of Personal Protective Equipment (PPE) in the event of an AOC. These videos will be profiled annually along with the Operator Qualification (OQ) written examination.

(3) Apparent Cause #2: Less than adequate (LTA) job preparation (job plan/instructions) provided to employees.

(a) Job Site Safety Analysis (JSSA) for tailboard briefing and interview records indicated that the pre-job briefings adequately covered most applicable jobsite safety topics; however, the AOCs and stop work criteria specifies in Utility Procedure:TD-4150P-202 were not covered or discussed before starting work. This led the employees (CW2 & ICW) to fail to identify that leaking gas was an AOC while they were removing the spring-loaded insert extractor of the Mueller D5 machine.

(b) The workers also failed to properly address the AOC under TD-4150P-202 step 7.22:

"7.22 Open bleeder valve(s) on machine adapter nipple AND drilling machine, if applicable.

1. IF gas pressure does not exhaust after opening bypass/relief valve or bleeder valve(s) AND number of turns listed in Table 15 did not occur, THEN discontinue this procedure, install additional fitting(s) to isolate the AOC, AND remove equipment to inspect and/or remove defective fitting."

Per CE team interview, it concluded that workers were unsure how to proceed when leaking gas was present and took incorrect action of further tightening the completion plug instead of stopping work and taking additional measures per TD-4150P-202 step 7.22 which resulted in dislodgment of the completion plug and injury personnel.

As corrective action, PG&E planned to roll out Streams application videos from Methods and Practices for proper use of Mueller devices as it pertains to applicable standards. This may be accomplished via a 5 Minute Meeting email directed to users of Mueller equipment.

(4) Apparent Cause #3: Utility Procedure TD-4150P-202, step 7.22 does not have a mandatory requirement for the use of PPE when encountering an AOC.

Per CE team barrier analysis, it identified that the Utility Procedure steps are safe and able to be performed as written; however, the procedure only recommends employees to "*Consider using additional levels of PPE such as face shields and flash suits when encountering an abnormal operating condition (AOC)*." This should be mandatory when workers are exposed to leaking gas and the potential for completion plug failure as standard PPE safety glasses are not sufficient to protect against metal shaving when AOC is present.

As corrective action, PG&E planned to revise the PPE Matrix for Tapping and Plugging to require the use of appropriate PPE upon identification of an AOC. PG&E confirmed that a new revision of the matrix is expected to be implemented by May 30, 2024.

Findings and Corrective Actions

SED's Findings

Based on the information gathered, SED noted the following findings:

1) **G.O. 112-F Referenced Title 49 CFR, Part 192, Section 192.605(a) Procedural manual for operations, maintenance, and emergencies.**

§192.605(a) Procedural manual for operations, maintenance, and emergencies states:

Each operator shall prepare and follow for each pipeline, a manual of written procedures for conducting operations and maintenance activities and for emergency response. For transmission lines, the manual must also include procedures for handling abnormal operations. This manual must be reviewed and updated by the operator at intervals not exceeding 15 months, but at least once each calendar year. This manual must be prepared before operations of a pipeline system commence. Appropriate parts of the manual must be kept at locations where operations and maintenance activities are conducted.

PG&E's Utility Procedure TD-4150-202, section 7 "Inserting Completion Plug" required employees to physically check and visually confirm thread engagement after the first few turns. However, the employees did not check and confirm thread engagement. The employee acknowledged that there was leaking gas but failed to recognize that the Abnormal Operating Condition (AOC) required work stoppage.

Therefore, PG&E is in probable violation of G.O. 112-F, Reference Title 49 CFR, Part 192, §192.605(a) for failing to follow Utility Procedure TD-4150P-202.

2) **G.O. 112-F Referenced Title 49 CFR, Part 192, Section 192.605(b)(1) Maintenance and normal operations.**

§192.605(b)(1) Maintenance and normal operations states:

The manual required by paragraph (a) of this section must include procedures for the following, if applicable, to provide safety during maintenance and operations.

> *(1) Operating, maintaining, and repairing the pipeline in accordance with each of the requirements of this subpart and subpart M of this part.*

PG&E's CE team identified that the Utility Procedure TD-4150P-202 only recommends employees to "*Consider using additional levels of PPE such as face shields and flash suits when encountering an abnormal operating condition (AOC).*" This should be mandatory when workers are exposed to leaking gas and the potential for completion plug failure as standard PPE safety glasses are not sufficient to protect against metal shavings when an AOC is present.

Therefore, PG&E is in probable violation of G.O. 112-F, Reference Title 49 CFR, Part 192, §192.605(b)(1) for failing to provide adequate written procedures or instructions for the use of PPE when its employees encounter an AOC while operating a Mueller machine.

SED's Recommendations

1. PG&E should take the appropriate steps to address SED Finding #1
2. PG&E should take the appropriate steps to address SED Finding #2

Conclusion

Based on the records, interviews, and the ACE report that SED reviewed during this investigation, SED concluded that PG&E committed probable violations of General Order (G.O.) 112-F, Reference Title 49 Code of Federal Regulations (CFR), Part 192, Sections 192.605(a), and 192.605(b)(1).

PG&E's failure to follow Utility Procedure TD-4150-202 by not recognizing the AOC and physically checking and visually confirming thread engagement is a probable violation of 49 CFR Part 192, Section 192.605(a).

Additionally, PG&E's failure to provide adequate written procedures or instructions for the use of PPE when its employees encounter an AOC while operating a Muller machine is a probable violation of 49 CFR Part 192, Section 192.605(b)(1).

Appendices

Appendix A: Glossary of terms

ACRONYM/ABBREVIATION	DEFINITION
ACE	Apparent Cause Evaluation
AOC	Abnormal Operating Condition
CE	Cause Evaluation
CFR	Code of Federal Regulation
HFACS	Human Factor Analysis and Classification System
GCC	Gas Control Center
GO	General Order
GSRB	Gas Safety and Reliability Branch
JSSA	Job Site Safety Analysis
M&P	Methods and Procedures
OQ	Operator Qualification
PG&E	Pacific Gas and Electric Company
PHMSA	Pipeline & Hazardous Materials Safety Administration
PPE	Personal Protective Equipment
RCE	Root Cause Evaluation
SED	Safety and Enforcement Division

Appendix B: Documents Reviewed

1.	PG&E's 420 Report – Initial and Final
2.	PG&E's PHMSA Form 7100.1
3.	PG&E's Apparent Cause Evaluation (ACE) Report
4.	PG&E's Post-Incident Photos: (a) & (b)
5.	SED's Post-Incident Photos: (c)
6.	PG&E's Operator Qualifications: (a), (b), (c), & (d)
7.	PG&E's USA Ticket# 2023053101505
8.	PG&E's Work Clearence Documents (WCD#80229415)
9.	PG&E's Gas Control Center (GCC) Event Log
10.	PG&E's JSSA: (a) & (b)
11.	PG&E's Gas Operational Change Notice (OCN)
12.	PG&E's Leak Survey_202104
13.	PG&E's Leak Repair Form (A-Form): (a) & (b)
14.	PG&E's Chain of Custody (COC) Form
15.	PG&E's Drug & Alcohol Test_GVR8 (ICW)
16.	PG&E's Utility Procedure: TD-4110P-09, "Leak Grading and Response"
17.	PG&E's Utility Procedure: TD-4150P-202, "Mueller Line Stopper (M2) H-17190 and H-17191 2-Inch Through 4-Inch Operation Using D-Series Drilling Machine"
18.	PG&E's Utility Procedure:TD-4413P-04, "Drug and Alcohol Testing for Gas Incidents"
19.	PG&E's Gas Crew Interview Statements
20.	PG&E's Utility Procedure: SAFE-1004S, "Safety Incident Notification & Response Management
21.	PG&E's Utility Procedure: SAFE-2015S, "PG&E Fatigue Management Standard"
22.	PG&E's Injured Coworker Time Card (20230509 - 2023608)

Appendix C: Muller Line Stopper & Utility Procedure TD-4150P-202

Mueller Line Stopper

Mueller line stoppers are used for various applications in pipeline systems to temporarily halt the flow of liquids or gases within the pipeline. Common uses for line stoppers include maintenance and repair, system modifications, and emergency responses. It is often necessary to isolate a specific section of a pipeline without shutting down the entire system. Line stoppers allow for localized isolation, enabling technicians to work on the designated area while maintaining flow in other parts of the pipeline.

Figure 1. Mueller Line Stopper Fitting Weld TPYE-250 psig

Figure 2. Post Incident photo – 4" Mueller Line Stopper with cap on (top view)

Figure 3. Post Incident Photo- 4" Mueller Line Stopper without installed cap and completion plug (side view)

Figure 4. Post Incident Photo- 4" Mueller Line Stopper with damage completion plug but no cap on (top view)

Utility Procedure TD-4150P-202

Utility Procedure TD-4150P-202 states, in part:

In emergency situations, such as pipeline leaks or ruptures, line stoppers can be deployed to quickly isolate the affected area and allow repairs. Section 7 of TD-4150P-202, "Inserting the Completion Plug", provides guidance on the process the workers were engaged in at the time of incident (see below).

7 Inserting the Completion Plug
7.1 Attach machine adapter nipple to body of drilling machine, ensuring body gasket is in place,
AND tighten using smooth-faced wrench. (See Table 13 for part numbers.)
* For a complete listing of all tools and equipment, refer to GDS C-16.3.
7.2 Close bleeder valve(s) on machine adapter nipple AND drilling machine, if applicable.
7.3 Assemble inserting tool and boring bar adapter. (See Table 14 for part numbers.)
Table 14. Inserting Tool Part Numbers Tools and Equipment*
* For a complete listing of all tools and equipment, refer to GDS C-16.3.
7.4 Attach inserting assembly to boring bar on drilling machine AND tighten using smooth-faced
wrench.
7.5 Attach completion plug to inserting tool until threads bottom out.
NOTE: It may be necessary to rotate completion plug counterclockwise to align locking fork with
completion plug.
7.6 Engage locking forks on the inserting tool into the completion plug. (See Figure 12.)

Figure 12. Inserting Tool and Completion Plug

2-Inch and 3-Inch Inserting Tool *4-Inch Inserting Tool*

7.7 Lubricate O-ring on completion plug by using Mueller rubber stopper lubricant (part number 580657).
7.8 Retract boring bar to its uppermost position.
7.9 Attach assembled drilling machine to control valve by simultaneously rotating drilling machine AND boring bar clockwise; tighten assembly by using smooth-faced wrench.
7.10 Retract boring bar to its uppermost position AND hold in place.
WARNING: Bodily injury or equipment damage may occur if upward motion of boring bar is not controlled.

1. IF using slide gate valve, THEN place bypass/relief valve in bypass position, if applicable.
7.11 Fully open control valve.
7.12 Attach ratchet handle to top of boring bar, AND place operating pin in clockwise position.
7.13 Advance boring bar until completion plug contacts threads in fitting.
7.14 Apply downward pressure on boring bar, AND rotate ratchet handle clockwise approximately 1 full turn until initial completion plug thread engagement is felt.
WARNING: Bodily injury or equipment damage may occur if upward motion of boring bar is not controlled.
7.15 Attempt to raise boring bar to confirm completion plug engagement.
1. IF completion plug thread is not engaged, THEN repeat Step 7.13 and Step 7.14.
7.16 Count number of full turns while rotating boring bar clockwise until completion plug comes to a positive stop.
7.17 Compare number of turns, including initial completion plug thread engagement, to number of turns required to fully insert completion plug. (See Table 15 for required number of turns.)
Table 15. Turns Required When Inserting Completion Plug
7.16 Release inserting tool as follows:
1. Place operating pin on ratchet handle in counterclockwise position.
2. Strike ratchet handle with a sharp blow by hand in a counterclockwise direction.
3. Rotate boring bar counterclockwise until disengaged from completion plug.
7.19 Retract boring bar to its uppermost position AND hold in place.
7.20 Remove ratchet handle from boring bar.
NOTE: A momentary flow of gas will exhaust from bypass/relief or bleeder valve.
7.21 IF using a slide gate valve, THEN place bypass/relief valve in relief position, if applicable.
7.22 Open bleeder valve(s) on machine adapter nipple AND drilling machine, if applicable.
1. IF gas pressure does not exhaust after opening bypass/relief valve or bleeder valve(s) AND number of turns listed in Table 15 did not occur,
THEN discontinue this procedure, install additional fitting(s) to isolate the AOC, AND remove equipment to inspect and/or remove defective fitting.
2. IF gas pressure does not exhaust after opening bypass/relief valve or bleeder valve(s) AND number of turns listed in Table 15 did occur,
THEN perform one of the following:
Discontinue this procedure, install additional fitting(s) to isolate the AOC, AND remove equipment to inspect and/or remove defective fitting.
OR
Assess/evaluate area for potential hazardous/gaseous atmosphere, AND perform the following steps:
(1) Identify which safety equipment and PPE are needed.
(2) Follow Step 7.23 through Step 7.28 to prepare fitting for completion plug extraction.
(3) Go to Section 2, “Extracting,” AND follow Step 2.4 through Step 2.25 to remove and repair completion plug.
(4) Go to the beginning of Section 7, “Inserting Completion Plug,” to insert completion plug.

Appendix D: M&P Laboratory Evaluation Report (Partial/Highlighted)

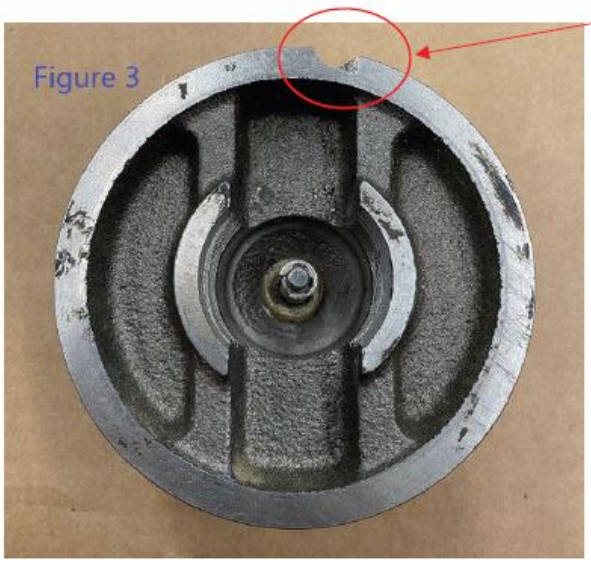
Equipment Evaluation

On June 8, 2023, the M&P pressure control group was called to investigate the mechanical integrity of the failed 4" Mueller line stopper fitting, and the equipment used to perform the operations involved in this incident. M&P personnel were on site to witness the removal of pipe containing the fitting and took custody of the section of pipe, the fitting, and its components as well as all of the pressure control equipment utilized during the pressure control operations.

The pipe with fitting and all the pressure control equipment were brought to the Dublin facility where the fitting, its components, and the equipment were inspected for damage, defects, and operability. It was concluded by the M&P group that no material failures could be identified or replicated, and all equipment was in serviceable condition.

The following are highlights from the evaluation report:

Examination of Damaged Completion Plug: Completion plug damage was noted measuring 0.41" wide and .18" deep at approximately 12 o'clock position (12 o'clock position was determined as closest linear point near damage; see Figure 3). Noted minor deformation on leading thread from 3 o'clock position extending to 5:30 position (see Figure 4).



NOTE: Completion Plug damage determined to have no bearing on worker inability to properly install.

Examination of Mueller H-17190 4" M2 Fitting: Minor damage noted on leading internal completion plug thread between 12 o'clock and 2 o'clock positions (see Figure 5).

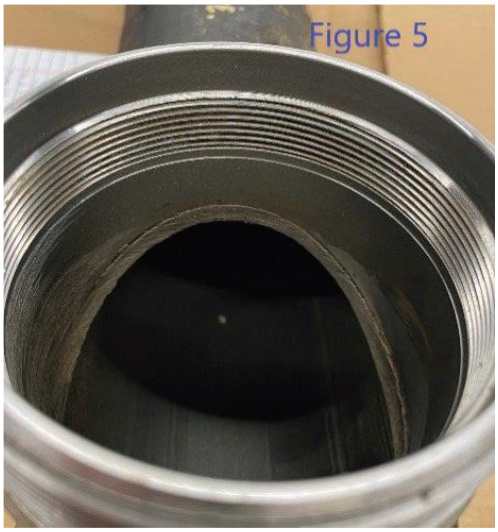


Figure 5

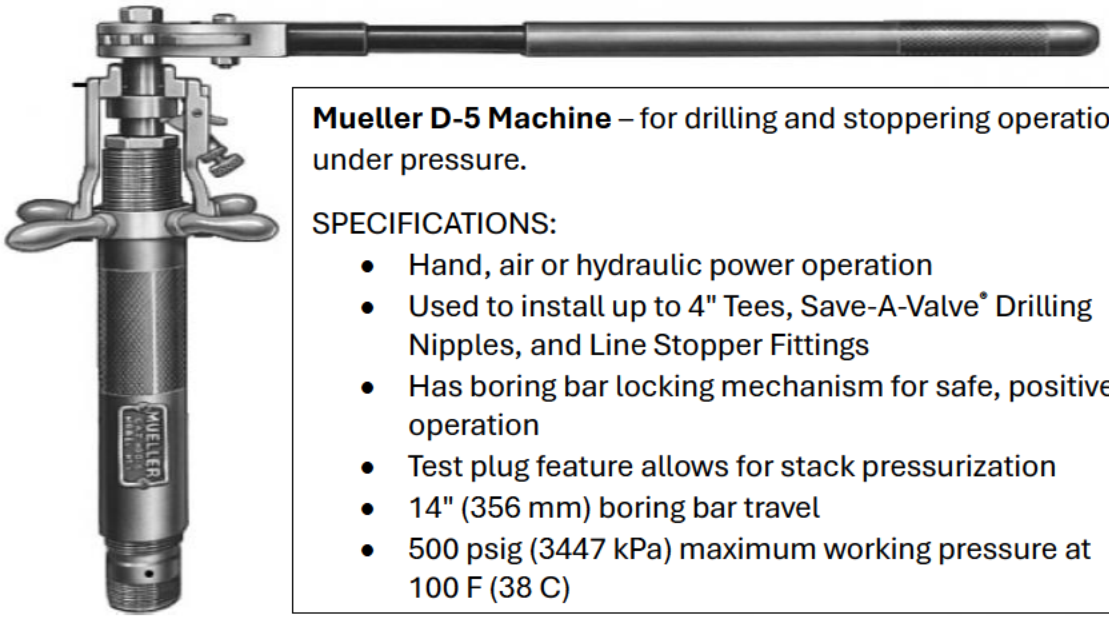
Inspection of D-5 Machine: Inspected all components, no issues found.

Insertion of Completion Plug Under No Pressure: O-ring from replacement completion plug that was installed in M2 fitting was used in place of missing O-ring from damaged completion plug. Inserting equipment and damaged completion plug was installed onto D-5 drilling machine to perform insertion of completion plug.

One full turn was completed, and boring bar was lifted, and thread engagement was confirmed. Ratchet handle was turned clockwise for 6 ½ additional turns equaling a total of 7 ½ turns falling into the 6 to 8 total turns needed to fully insert completion plug per table 15 (of Utility Procedure TD-4150P-202).

Conclusion: After extensive visual inspection and hands on operation of all equipment and fitting, following all applicable technical documents, the M&P group was unable to duplicate the incident that occurred in the field. The M&P group found the Mueller fitting and its components as well as the equipment utilized to perform the pressure control operations to be in satisfactory condition and suitable to safely perform this work.

Appendix E: Post Incident Photos – Involved Equipment



Mueller D-5 Machine – for drilling and stoppering operations under pressure.

SPECIFICATIONS:

- Hand, air or hydraulic power operation
- Used to install up to 4" Tees, Save-A-Valve® Drilling Nipples, and Line Stopper Fittings
- Has boring bar locking mechanism for safe, positive operation
- Test plug feature allows for stack pressurization
- 14" (356 mm) boring bar travel
- 500 psig (3447 kPa) maximum working pressure at 100 F (38 C)

Figure 1. Mueller D-5 machine involved in the incident.

Figure 2. Mueller D-5 machine and inserting tool involved in the incident.