

Failure Investigation

49 CFR 192.617

§192.617

Each operator shall establish procedures for analyzing accidents and failures, including the selection of samples of the failed facility or equipment for laboratory examination, where appropriate, for the purpose of determining the causes of the failure and minimizing the possibility of a recurrence.

What is a FAILURE?

- **breakdown of something:** a breakdown or decline in the performance of something, or an occasion when something stops working or stops working adequately
- **something less than that required:** something that falls short of what is required or expected

So, What is a Failure?

- Whenever the carried product comes out of the carrier *unintentionally*
 - A Leak
 - An Incident
- When there is a leak in the pipeline system, the operator **MUST** follow the requirements of 192.617 by investigating the “failure”

Investigation

- **examination:** an examination or inquiry into something, especially a detailed one that is undertaken officially, or the act of undertaking an examination
- **Examination**
 - **inspection:** the process of looking at and considering something carefully with the idea of learning something

Why Investigate?

- 49 CFR 192.617 requires it
- Lives of people living and working around our facilities deserve it
- It's the right thing to do

What to Investigate

- What events and actions lead to the failure or incident/accident
- Why did they occur
- How did they occur
- When did they occur
- Where did they occur
- Who was involved/identified the failure
- How much could have been prevented

How to Investigate

- Always make sure the scene is safe
- Take a forensic approach to investigating a failure, accident, or incident (PSI instead of CSI)

Pipeline Scene Investigation

Pipeline Scene Investigation

1. Follow the Basic Rules
2. Photograph and Diagram the Scene
3. Conduct a Migration Survey
4. Interview Witnesses
5. Test the Facility in Place
6. The Very Last – Retrieve or Dig up the Facility
7. Follow Chain-of-Custody

1. Follow the Basic Rules

- Document only the facts and never opinions
- Don't jump to conclusions
- Allow the evidence to direct the investigation
- Construct a time line of the events
- Document surface conditions at point of failure
- Document environmental conditions at time of failure, 24 hours before and after as available
- Use an investigation form to help prompt and remind you what to collect

Survey the scene

- Is there evidence of recent soil disturbance
- Is the site a call back from previous maintenance
- Is there evidence of natural forces that may have disturbed the area
 - Washout
 - Settlement
 - Movement
 - Vandalism

Photos/Video



Photos of the Scene

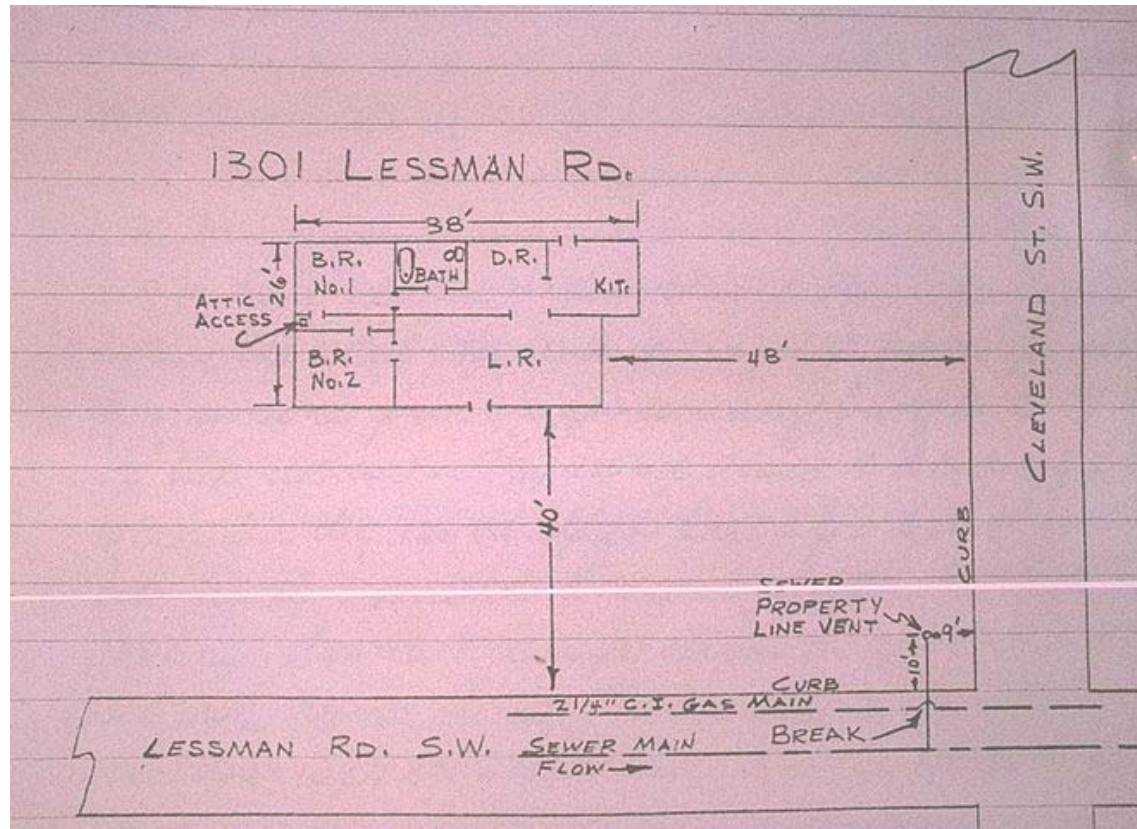
- Photographs from all 4 sides of structure
- Photographs from all 4 corners of a structure
 - Photos are important throughout the procedure
 - Used to identify as found conditions
 - Preserve a chronology of actions
 - Identify as left conditions
 - Use measuring devices to establish perspective and dimension

Video

- Video without the mic on
- Helps document actions taken by all parties



Diagram the Site

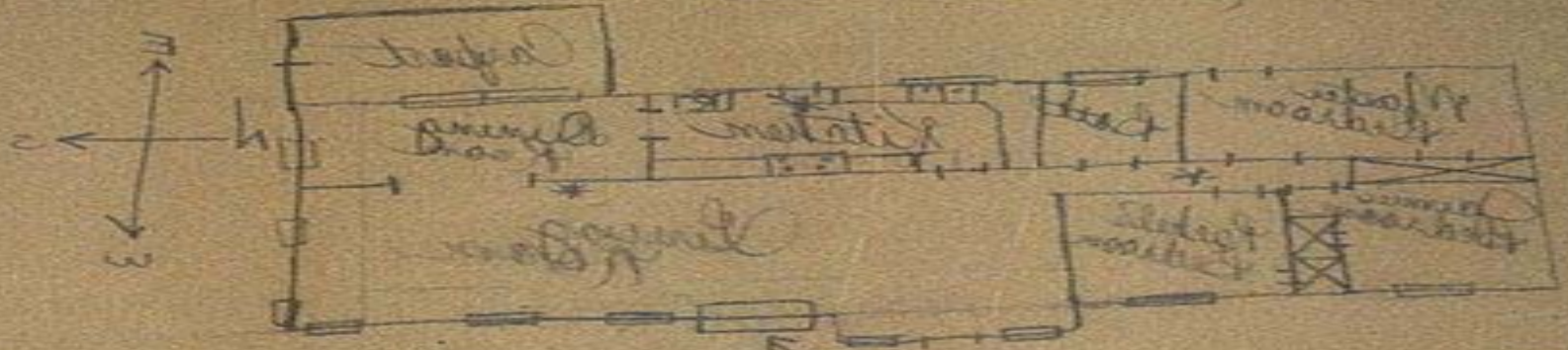


- Photographs from all 4 sides of structure
- Photographs from all 4 corners of a structure



DATE _____
 NO. _____
 YEAR _____
 1/1/1911

Plan to build



Supplies



*1/1/1911
 Total 1/1/1911
 Supplies taken*

DIAGRAMS

- I. Are Essential
- II. Add Order to Confusion
- III. Help Prevent Overlooking Important Details by Bringing Focus to Your Fact Finding

Diagrams

- Are essential
- Add order to confusion
- Help prevent overlooking important details by bringing focus to the fact finding
- Some must be dimensional
- Need to have layers of detail
 - Overview
 - Local areas
 - Specific areas

Migration Survey

- Determines where the gas came from and where it went to.
- Confirms that there are no existing hazardous areas to be concerned about (i.e. gas up against an adjacent house)

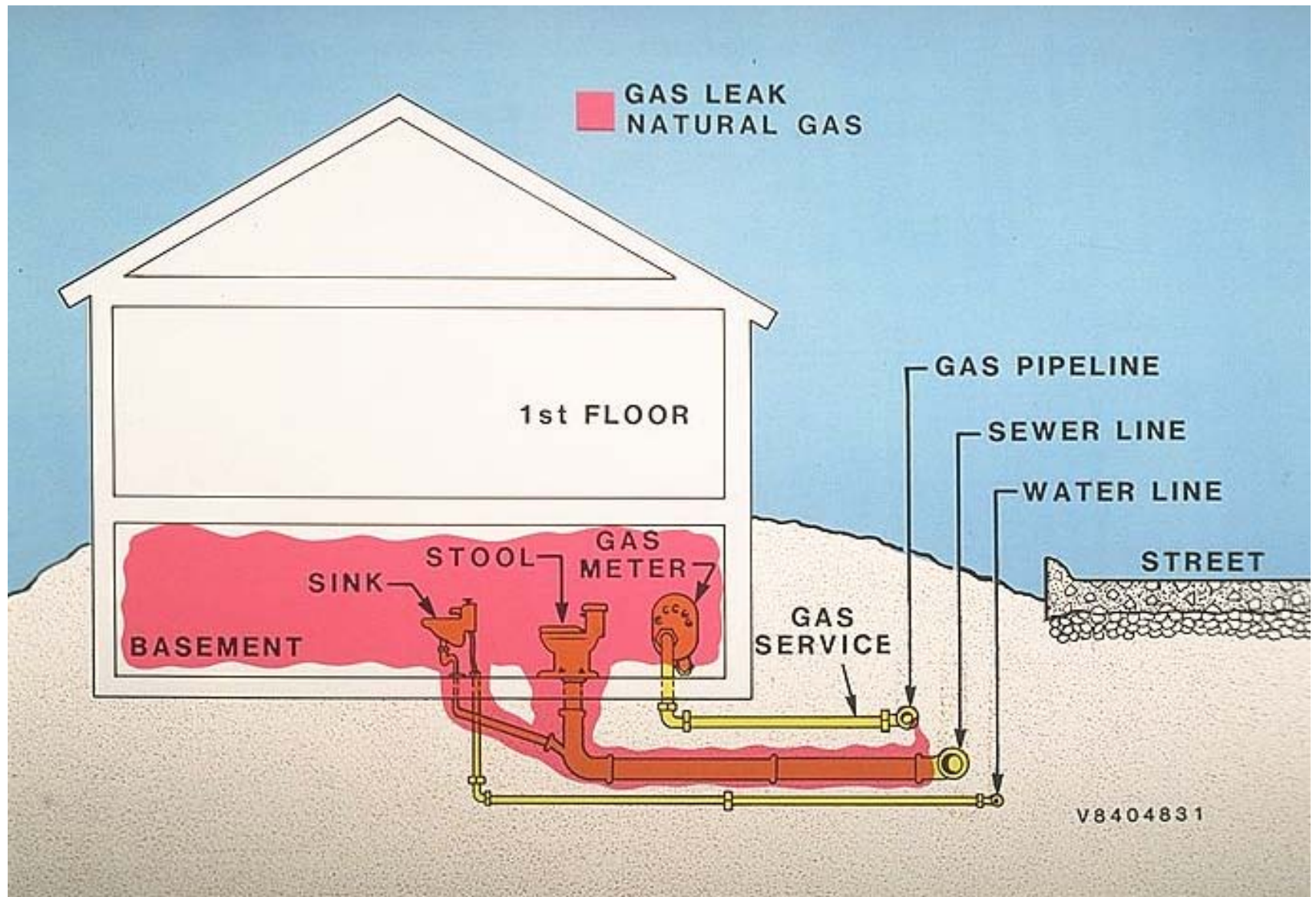
Leak Survey of adjacent properties & immediate area



Need to be sure you understand the properties of the gas

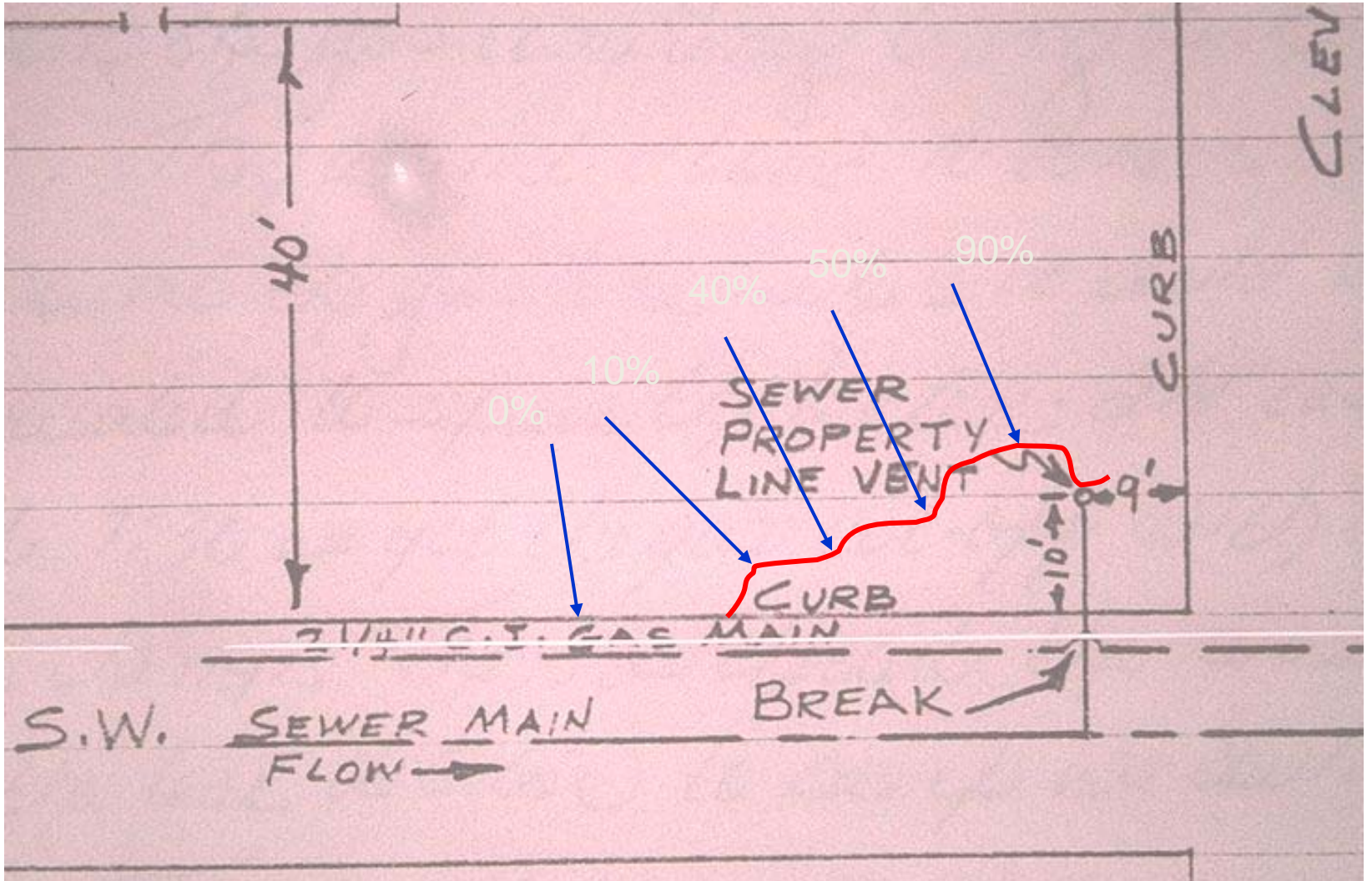
- Natural Gas
 - Lighter than Air
 - Flammability ranges from 5% TO 15%

- Propane
 - Heavier than air
 - Flammability ranges from 3% TO 9%



Checking all available paths of least resistance to understand where the gas came from

Plot Any Gas Migration



Pressure Testing



Testing

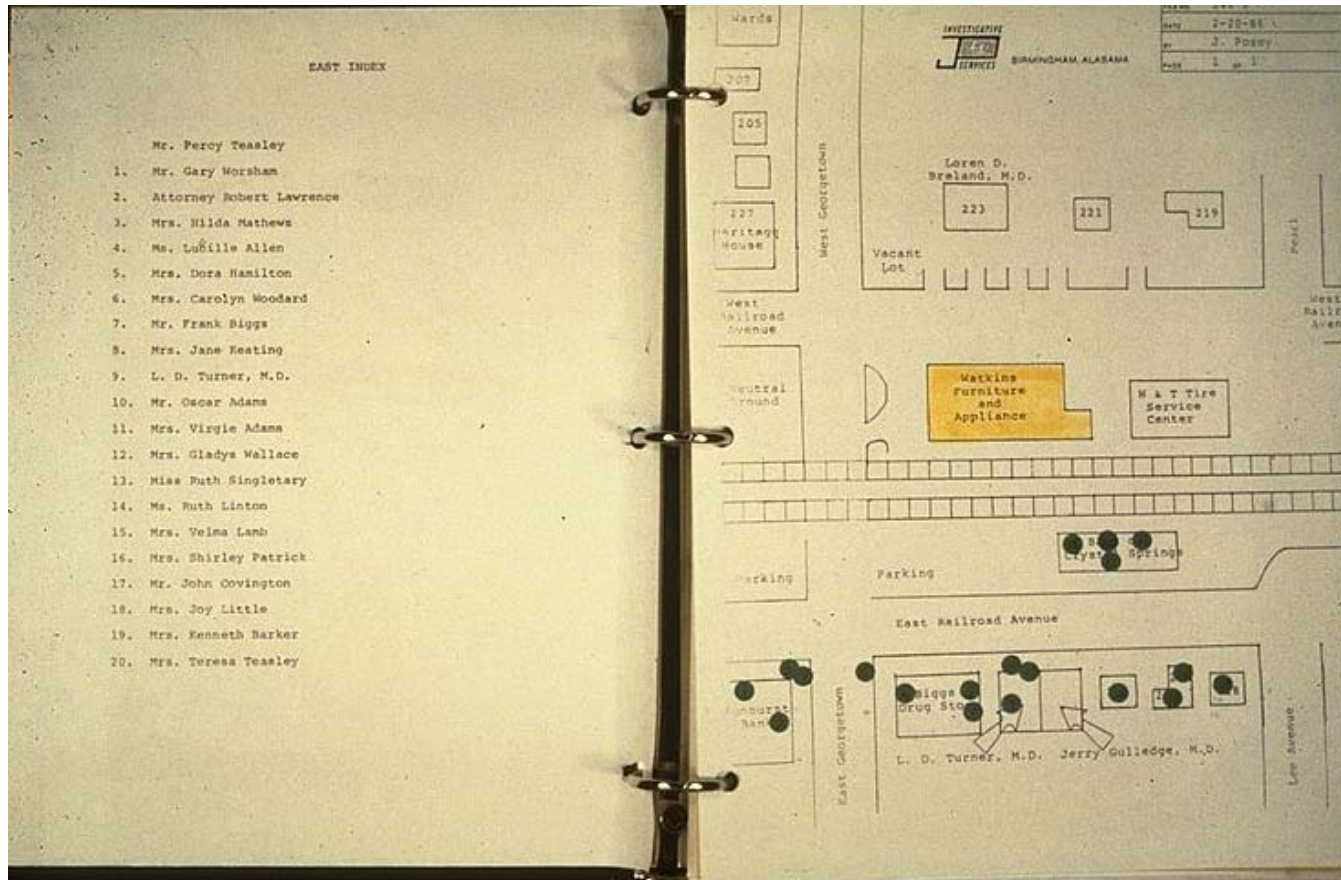
- Pressure test only at the operating pressure at the time of the failure.
- Ensure that the equipment is calibrated.

Witness Interviews

- Company personnel
- Contractor personnel
- Emergency response personnel
- Public
- Media



Plot location of Witnesses



- Plotting where the witnesses were located can help you determine if they had line of site of the failure scene

Recovery of the failed facility

- Preserve any and all evidence
 - Excavation surrounding any failure can destroy evidence if not done properly
 - Hand dig only
 - Repair processes can destroy point of failure evidence
 - Cleaning of failed surfaces can destroy evidence
- Document with photos and diagrams

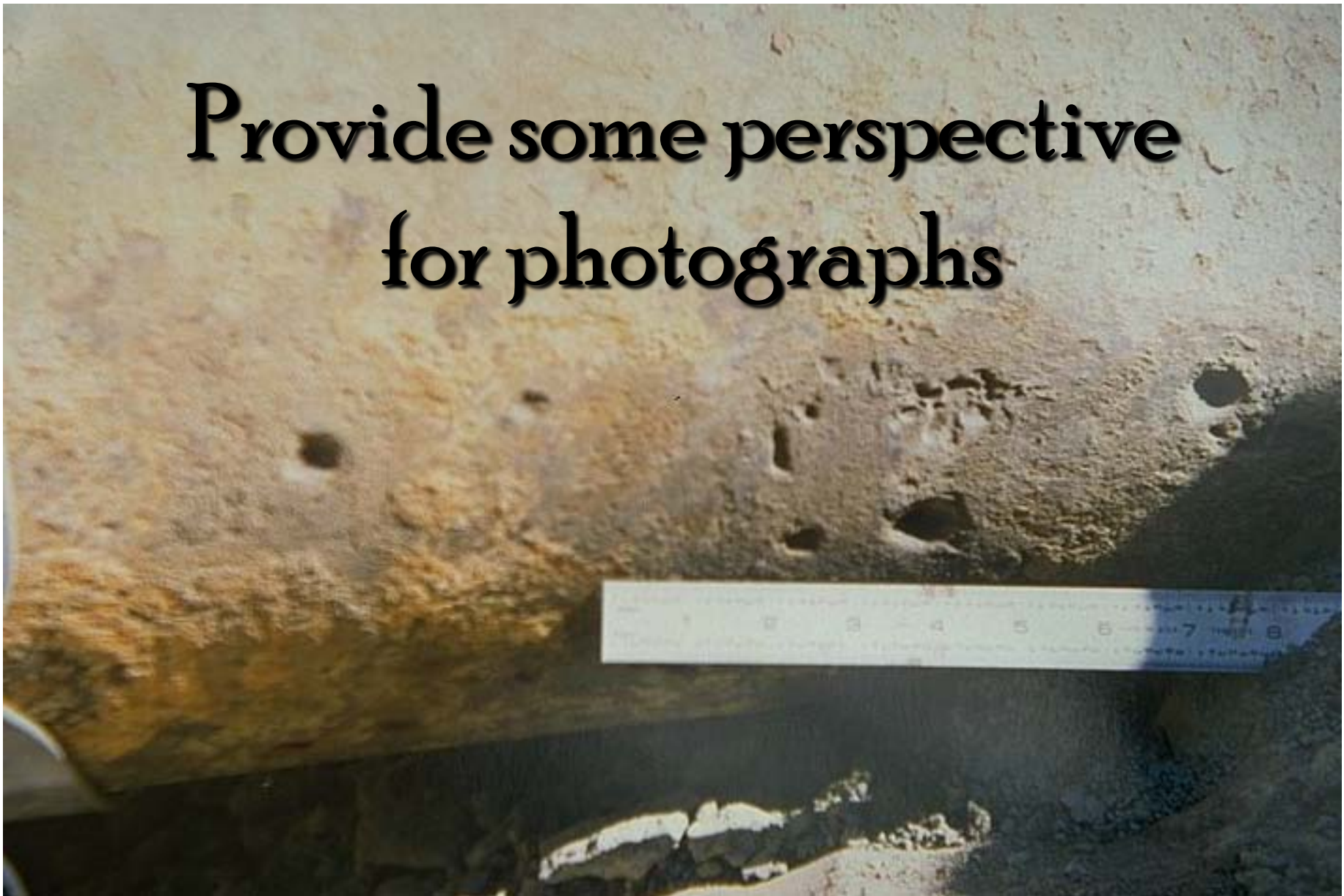
Treat as an “Archeological Dig”







**Provide some perspective
for photographs**





- Don't touch fracture surfaces
- Don't clean fracture surfaces
- Wrap in bubble-wrap or similar product
- Secure in shipping container



Information for Lab Analysis

- Historical data
 - Date of installation
 - Installation method
 - Normal operating pressure
 - Operating pressure at time of failure
 - Copies of photos of excavation
 - Soil samples
 - Cathodic protection data
 - Gas samples

CHAIN OF CUSTODY

- All evidence must be documented
 - photographed in place if possible
 - Preserved
 - Execute a chain of custody

Mechanical Component Failures

- Take measurements to establish proper make-up and assembly
- Document the condition of the exterior surfaces of all areas of the failed components, pipe, fittings, etc.
 - Visual indications should be detailed

Depending on Type of Pipe Material

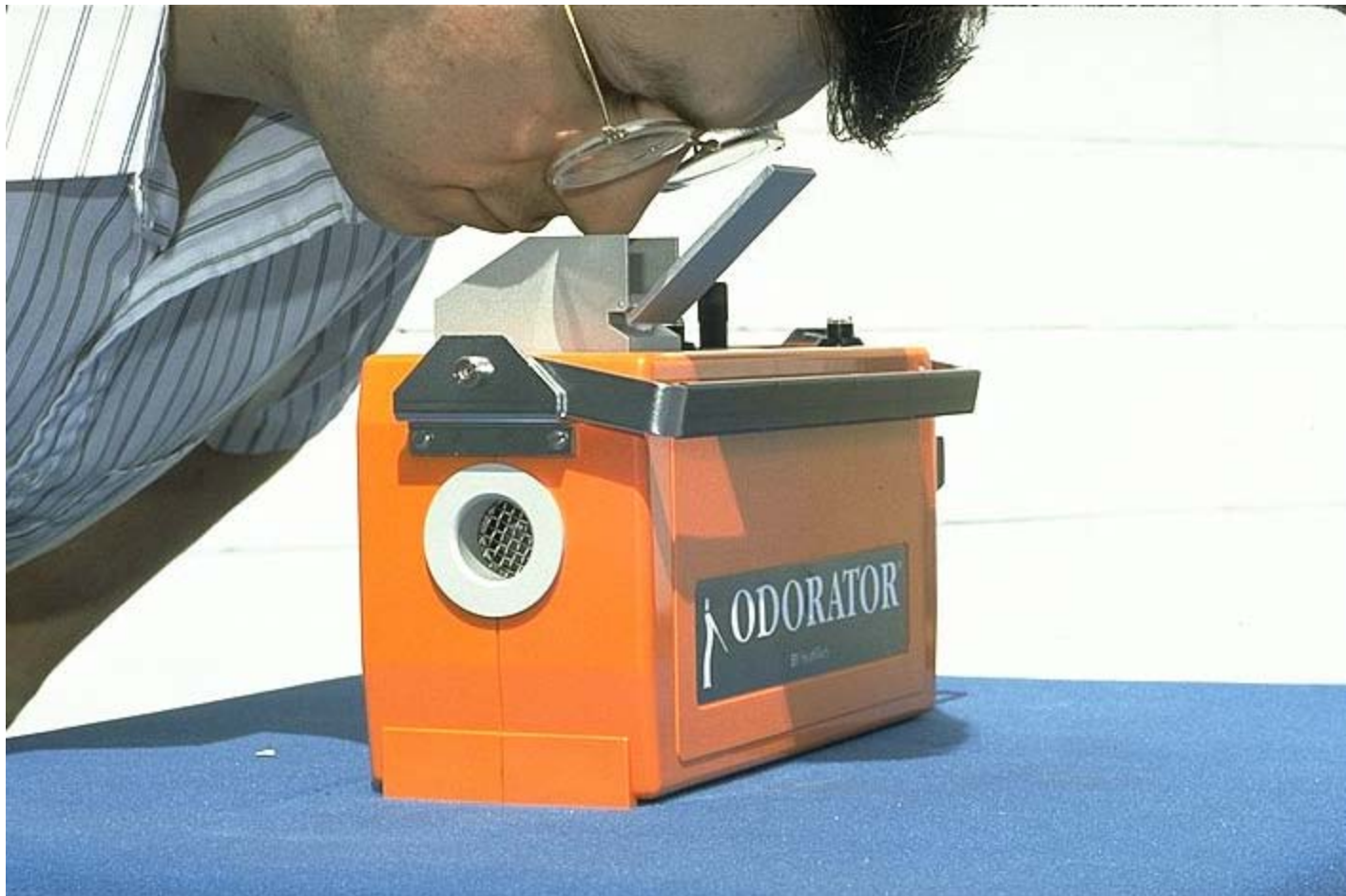
- Indicate if there is evidence of external corrosion
- Take and record CP readings at grade and at pipe elevation before and after repairs
- Visually indicate the type and condition of any coating, if known
- Indicate if the pipe and components are above or below ground/water/surface

Repairs

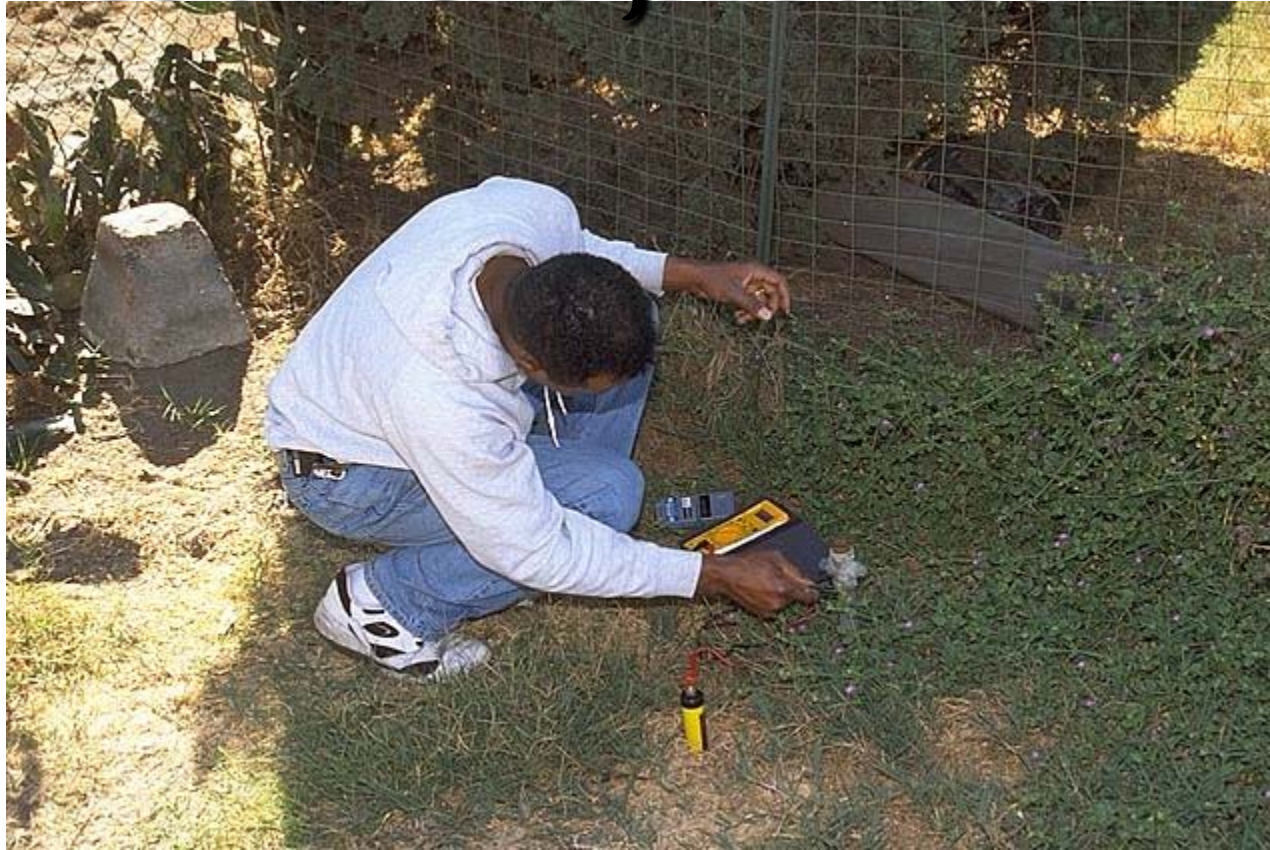
- Document what repairs were done
 - Why that particular repair was used
 - What testing was done to ensure the integrity of the system before returning it to service
 - Identify other areas of the facilities that may be affected by the conditions of this failure/incident/accident

Additional Information to Collect

Odorant Concentration Verification



Verify adequacy of cathodic protection



Procedure Review

- Emergency response procedures
- Activities that may have contributed to the incident



Root Cause Analysis

Rarely there is only one Root Cause
to a Failure!!

OPS Accident Inspection Form

www.phmsa.dot.gov