

# CUI program methodology

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# Agenda

- CUI program - Introduction
- CUI program Planning
- CUI program Implementation
- CUI Findings
- CUI program Budget & Duration



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# CUI Program - Introduction

The CUI program discussed here is an inspection program specifically designed to achieve the highest level of component coverage and minimize the amount of insulation removal and scaffolding cost associated with common CUI inspections.

This CUI program has been developed over 15 years and has been successfully implemented at over 30 oil and gas, petro chemical facilities

A unique CUI program for your facility that includes equipment and piping within API guidelines complete from beginning to end

A properly implemented CUI program will not only be compliant and complimentary to RBI and all other current best practices but in most cases will exceed those requirements



# CUI Program Planning

- **Where can CUI/CUF Occur?**
  - Cooling tower drift zones
  - Areas exposed to steam vents
  - Areas exposed to deluge systems
  - Intermittent/cyclic processes, dead legs, bypasses
  - API indicates carbon steel and low alloy systems operating <math><350^{\circ}\text{F}</math> (<math>176^{\circ}\text{C}</math>) are most susceptible
  - experience indicates potential CUI at even higher temperatures
  - Systems with unprotected steel under insulation
  - Systems with damaged weather jacket
  - CML's (inspection plug locations)
  - Steam traced piping systems with leaks
  - All insulated systems will allow moisture!
  - Data suggests 80% of piping leaks are due to CUI and high percentage is in systems 26+ years old



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# CUI Program Implementation

- Integrated inspection and NDE methods
  - Temperature survey
  - Moisture detection
  - Real Time Radiography
  - Guided wave Ultrasonics.
- CUI program work chart
- CUI work process
- Data Management and Reporting



# Integrated inspection and NDE methods

## Data Collection and Validation

P&ID/inspection isometrics would be collected and a physical walkdown in the field would be performed to verify that all CUI possible areas are included in the drawings and any gaps in coverage would be identified and new drawings created.

One of the biggest mistakes made when creating a CUI program at a facility is not insuring that all CUI susceptible areas have been covered.

Improper MOC practices have led to many CUI failures in facilities, this step will insure that inspection coverage is complete



## VISUAL AND TEMPERATURE SURVEY

A complete visual/temperature survey to identify the correct scope of the CUI inspection and identify problem areas is the most critical step in the CUI inspection process and is the first step in our program

The API CUI guidelines are not complete and do not offer a comprehensive enough program implementation process

**If you do not build a true scope of CUI susceptible areas and a related data management program**

**YOU WILL MISS CUI !!!!**



## MOISTURE DETECTION SURVEY

A Moisture detection survey using Neutron Backscatter to identify high moisture areas on piping and equipment where applicable . Although not applicable for all situations, in most normal operating scenarios this is an incredibly useful tool.

This easy to use screening tool can cover a great amount of piping and equipment and identify where moisture is being trapped under the insulation.





## Real Time Radiography

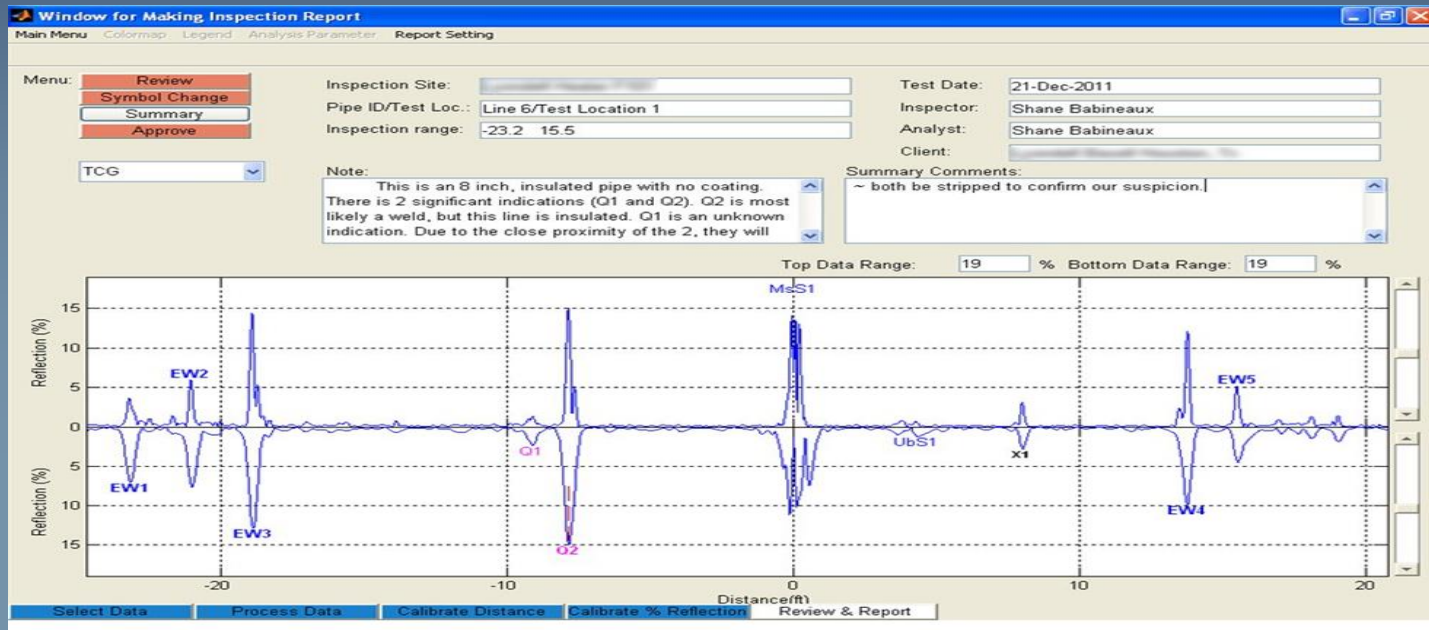
Real Time Radiography is used to inspect the areas of high moisture, all control loops, and problem areas identified visually to determine whether damage is present and whether insulation removal for further inspection is necessary

Real time radiography helps insure that we only remove insulation that needs to be removed at areas where damage has been verified to exist, thus saving cost



# Guided wave ultrasonic inspection

Guided wave ultrasonic inspection is used primarily for long straight runs of piping in the pipe racks where real time radiography cannot fit and on piping that goes up process columns that cannot be accessed with other NDT methods. Again, this screening tool allows for minimizing insulation removal and screens a lot of material in a short time

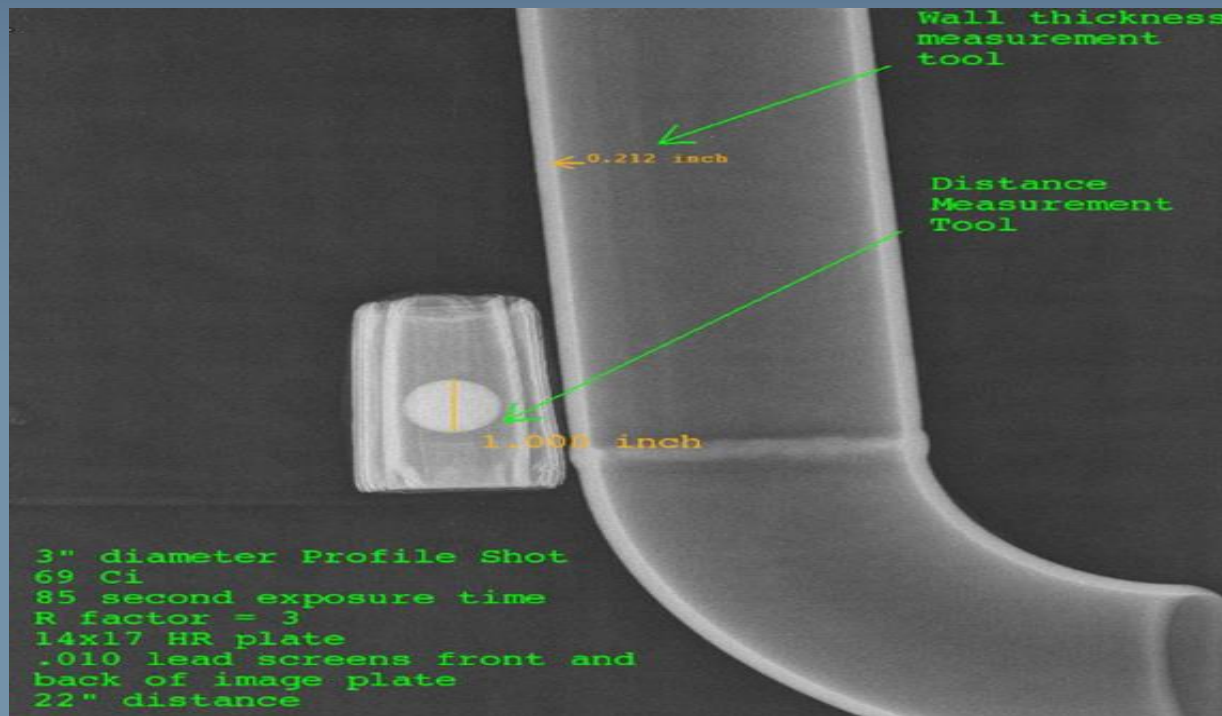


## Follow Up Inspections

Complete follow-up inspections, assessment of continued service and tracking of captured data.

Amerapex utilizes the most advanced CR/DR RT for follow up inspections.

Upon the completion of the project CUI management from here forward can be planned on a routine maintenance schedule

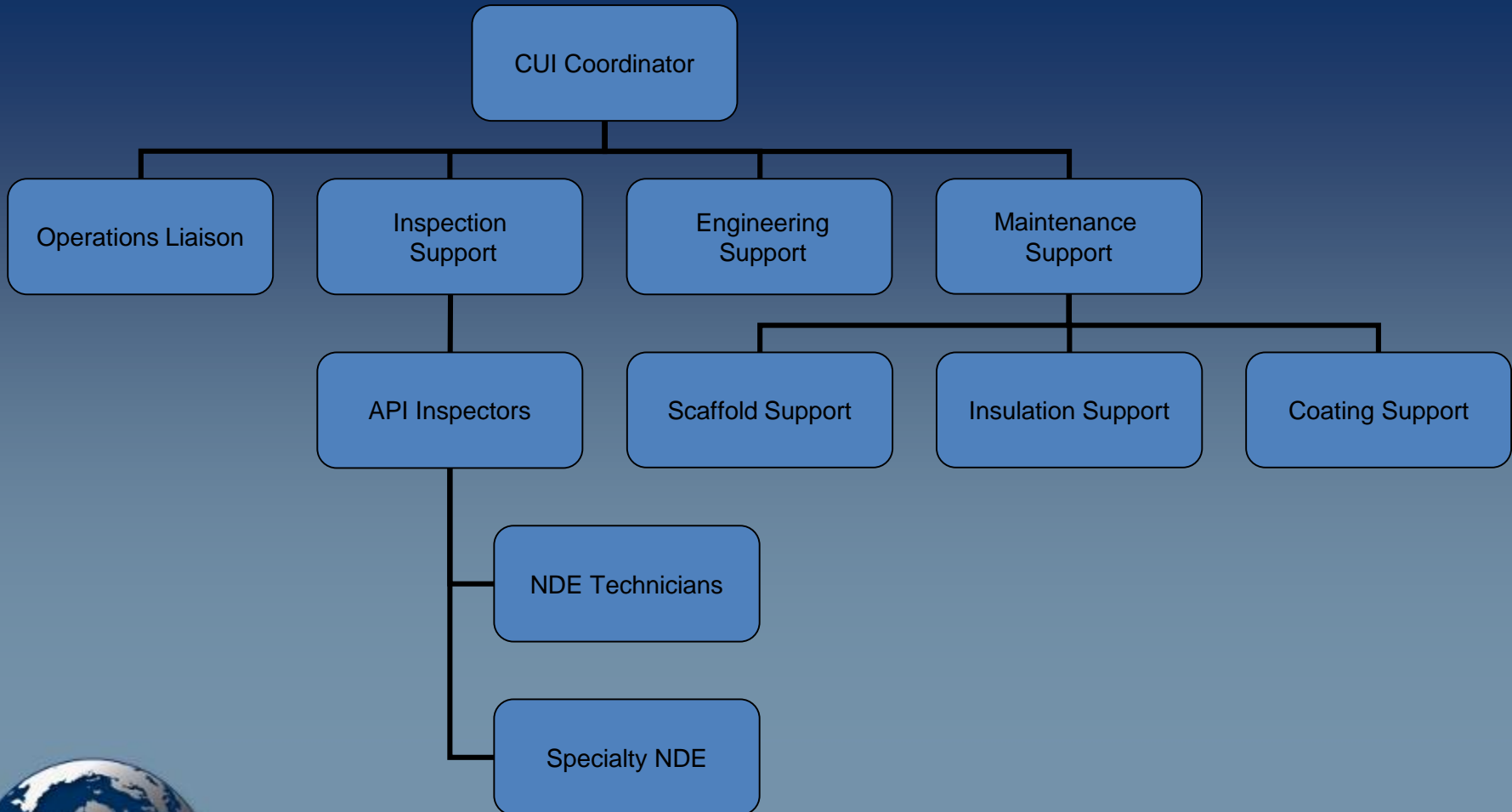


# Success Criteria

1. This CUI program using Advanced NDE methods offers a savings of nearly 70% over other CUI inspection methods in craft support alone
2. This CUI method has a 95% indication to relevant finding ratio
3. Moisture detection coupled with real time x-ray and guided wave ultrasonic methods offers the best CUI inspection coverage on the market
4. The CUI program is specifically designed to minimize the amount of scaffold and insulation cost associated with this type of inspection
5. The guided wave inspection techniques offer repeatable results with great distance of inspection and minimizes the need for scaffolding



# CUI Program Work Chart



# CUI Work Process

Data Collection & Validation

Insulated or fireproofed?

No

Not Susceptible

Yes

Exposed to 10° F-400° F

No

Intermittent Service?

No

Not Susceptible

Yes

Risk Assessment

Yes

Acceptable Risk?

Yes

Re-Asses Risk in 5 or 10 years per API External Inspection Interval

No

Determine Inspection Plan

Schedule Inspection

Execute Inspection

Evaluated Inspection Results

Re-coat and insulate?

Yes

No Longer in CUI program

No

Is Insulation Needed?

No

Damage Noted?

Yes

Perform FFS

Yes

Passes FFS

No

Repair or Replace

Yes

# Data Management and Reporting

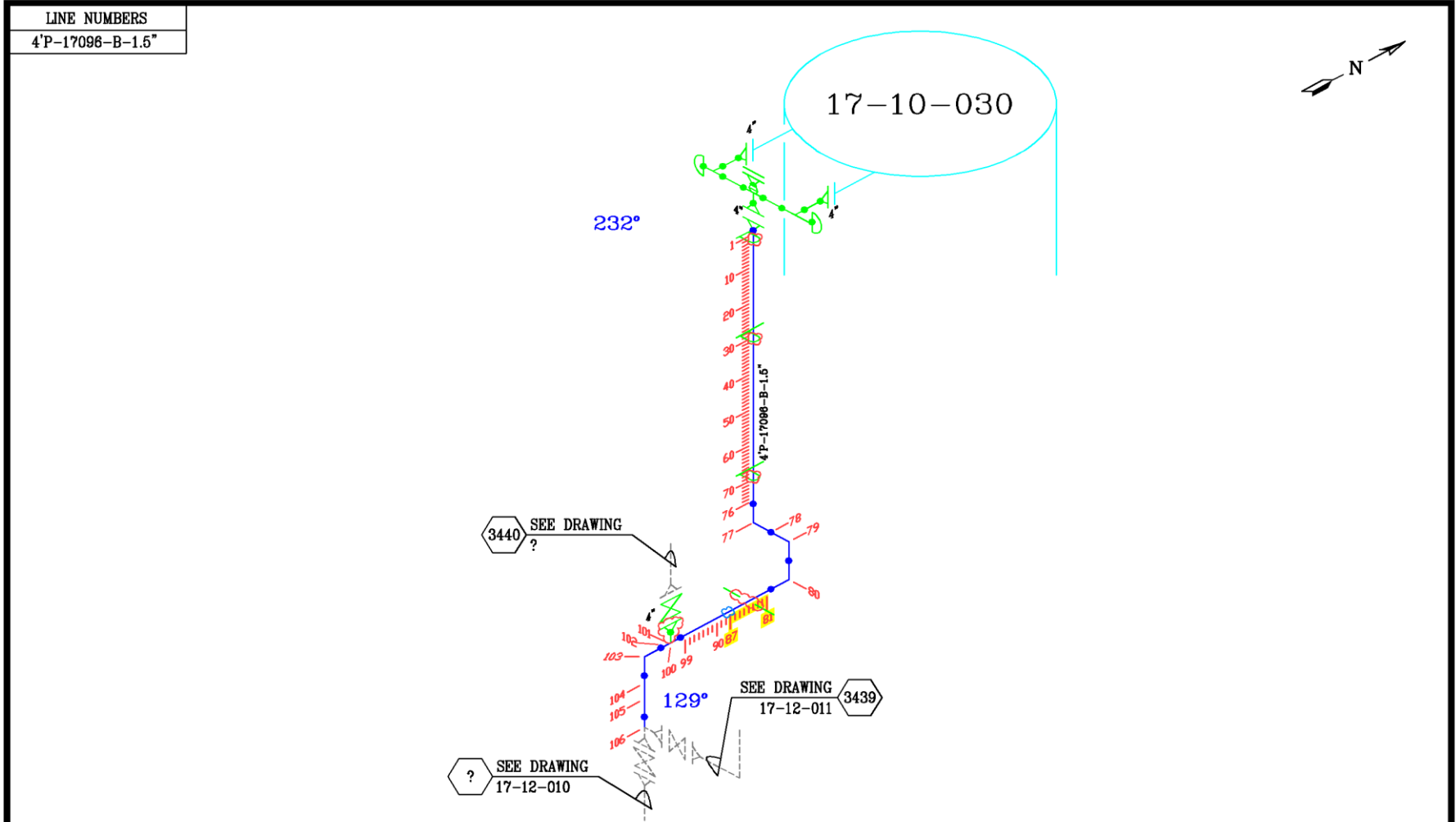
The Amerapex Corporation takes pride in being an industry leader in data implementation and tracking.

We can use any existing reporting format that your facility may be using such as PCMS, Meridian or Ultra pipe.

The goal is to make our findings and inspection data as accessible and useful to your facility and its personnel as possible.



# CUI Findings



1. PIPE FOOTAGE AMOUNTS UNDER 5 LF ARE NOT SHOWN ON THE ISOMETRICS BUT ARE ACCOUNTED FOR IN THE TOTAL FOOTAGE
2. ALL FLANGES 300# UNLESS NOTED ON THE ISOMETRIC.
3. SOCKET WELD AND THRD VALVES 3/4" 800# UNLESS NOTED.
4. ALL THRD MATERIAL SEAL WELDED UNLESS NOTED.

SERVICE: P	SPEC: B
AREA: 17 SATS GAS	570 CLASS: -
TOTAL FOOTAGE: 120 LF	Insulation (Y/N/P): Y
HEAT TRACE (Y/N): N	TYPE (E/S): NA
SERVICE LIMITS: - PSIG @ - °F	
P&ID: 1017-D-2070	
SKETCH BY: M. SCHWARTZ	DATE: Oct. 21, 2011
DRAWING. NO.:	17-12-012
REV. -	

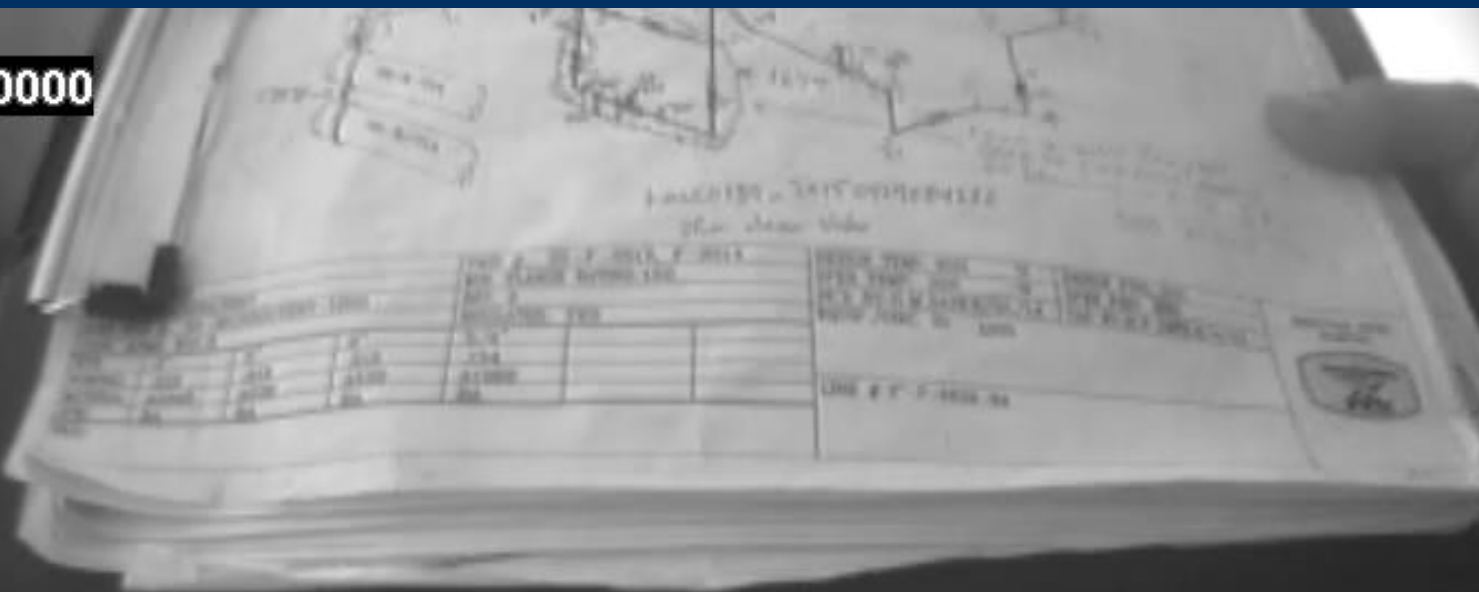


## Neutron Backscatter Reading Spreadsheet

<b>Name:</b>	Sam Sonnier/Brad Newman	<b>Line #</b>	P-17098-B-1.5
<b>Date:</b>	10/21/2011	<b>Unit #</b>	17
<b>BS Serial #</b>	20210	<b>Circuit</b>	12
<b>Contact</b>	John Doe	<b>Sketch</b>	12

Shot #	Location / Orientation	Moisture Readings	Component Size	Comments
76	E	1410	4"	
77	T	690	4" 90°	
78	T	1170	4"	
79	T	518	4" 90°	
80	B	1020	4" 90°	
81	T	4703	4"	
82	T	4320	4"	
83	T	4545	4"	
84	T	4170	4"	
85	T	3675	4"	
86	T	3758	4"	
87	T	2670	4"	damaged insulation
88	T	1433	4"	
89	T	1065	4"	
90	T	1058	4"	
91	T	1230	4"	top of support
92	T	1163	4"	
93	T	1410	4"	
94	T	1335	4"	
95	T	1245	4"	
96	T	1765	4"	
97	T	1613	4"	
98	T	1275	4"	
99	T	1523	4"	
100	B	1380	4" TEE	

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# Atypical CUI Findings



# Cost Savings 100% Coverage

100% coverage is cost effective from the standpoint that with minimal insulation removal and scaffold needs using our methods that funds appropriated for these inspections can be stretched much further. In short, spend your money on the inspection program and not craft support.



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# CUI Program Budget

- How much does a CUI Program Cost Annually?
- Cost depends on how aggressive the schedule!



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# CUI Program Duration

- How long will a CUI program take?
  - The program is “evergreen” but we have options:



- The first discovery phase of a CUI program is the most critical and can be completed on a time scale specific to your budgetary and time line constraints
- CUI programs can also be treated similar to a turn around. The scope can be identified and work completed in a short amount of time with the right amount of personnel

# CUI/CUF Program

Questions?

- Path Forward?
- Thank you for your attention!







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