Manhole Rehabilitation

First Step:
Condition Assessment

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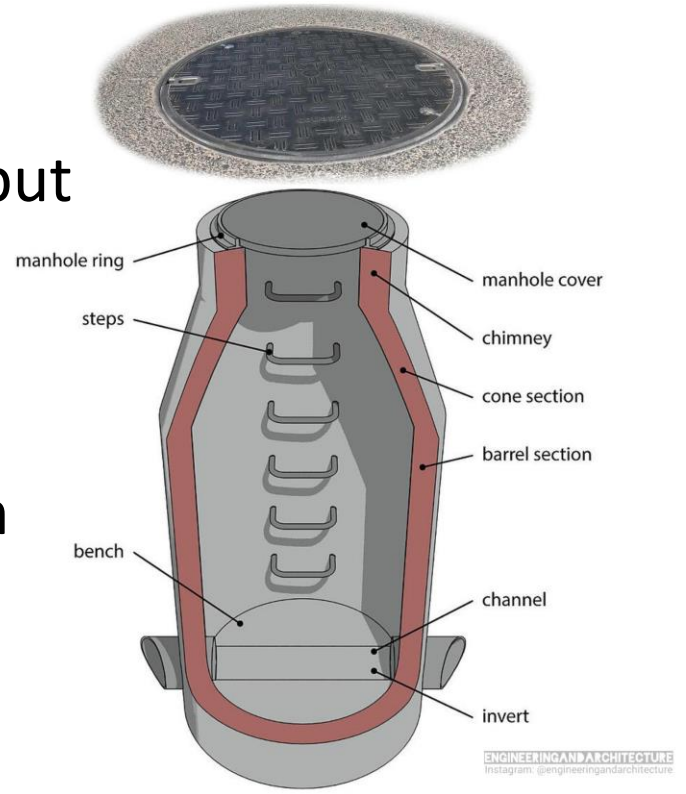
- 45 years in sanitary sewer condition assessment industry
- NASSCO PACP Certified Trainer
- Co-Chair NASSCO Asset Management Committee
- On Board of Directors of Buried Asset Management Institute-International (BAMI-I)

JACOBS®

What makes manholes unique?

- Designed to prevent accidental or unauthorized entry but allow for authorized entry
- Primary means of access to pipelines for maintenance, inspection and renovation
- Designed to handle weather, traffic and various loads
- Must be structurally watertight and resist deterioration including H_2S corrosion
- But is subject to both rain runoff and groundwater conditions
- Consists of several materials and shapes
- Has openings allowing for pipes (cantilevered) to enter and leave



8 Questions for Asset Management

1. WHAT do we have?
2. WHERE is it located?
3. WHAT is its condition?
4. WHAT is it worth?
5. WHAT Action is required?
6. WHEN is Action Required
7. HOW much will it Cost?
8. HOW will it be funded?

BY CONDITION ASSESSMENT

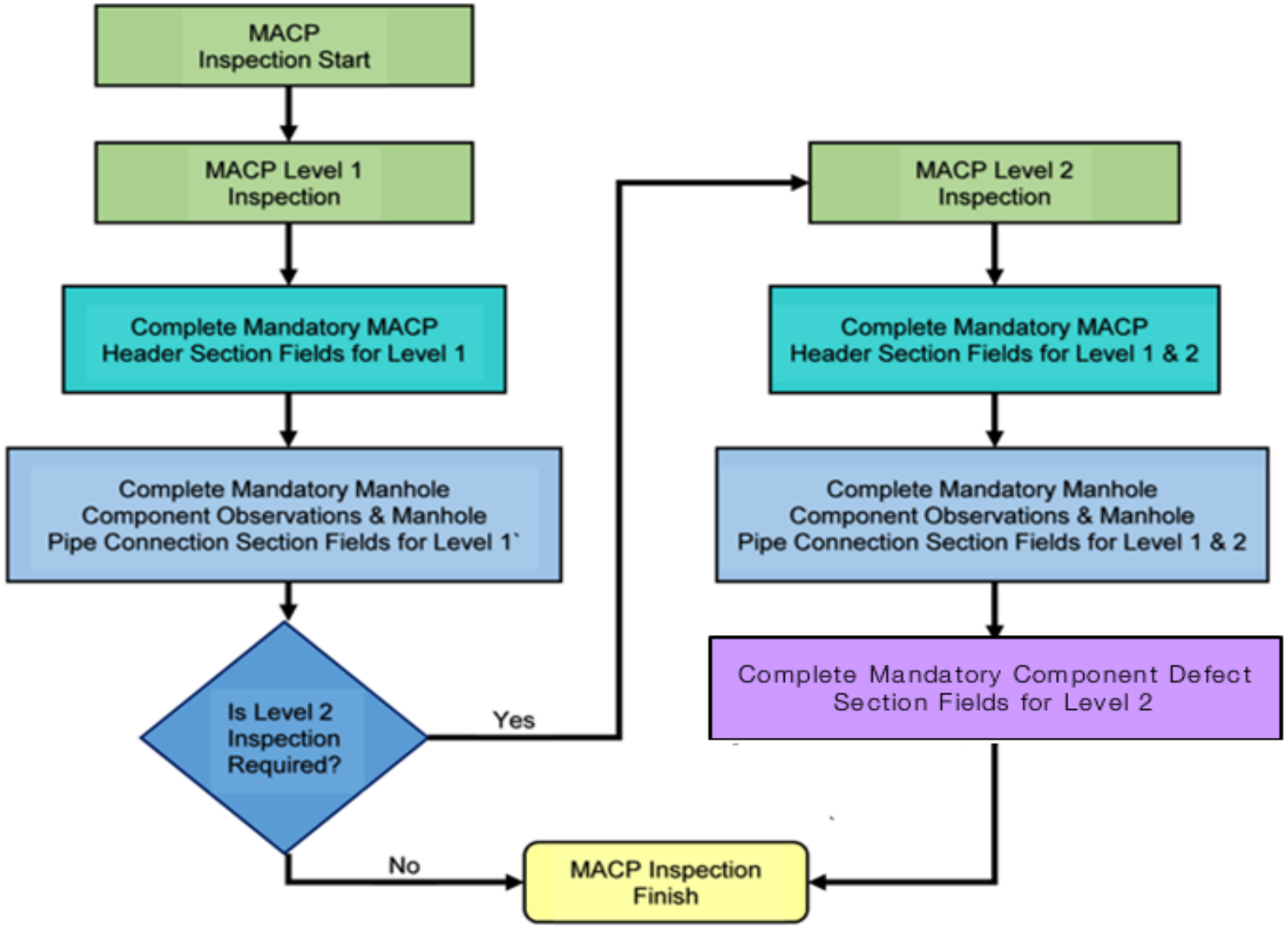
RESULTING FROM CONDITION ASSESSMENT

Level of Inspection Needed

LEVEL 1 – Above Ground

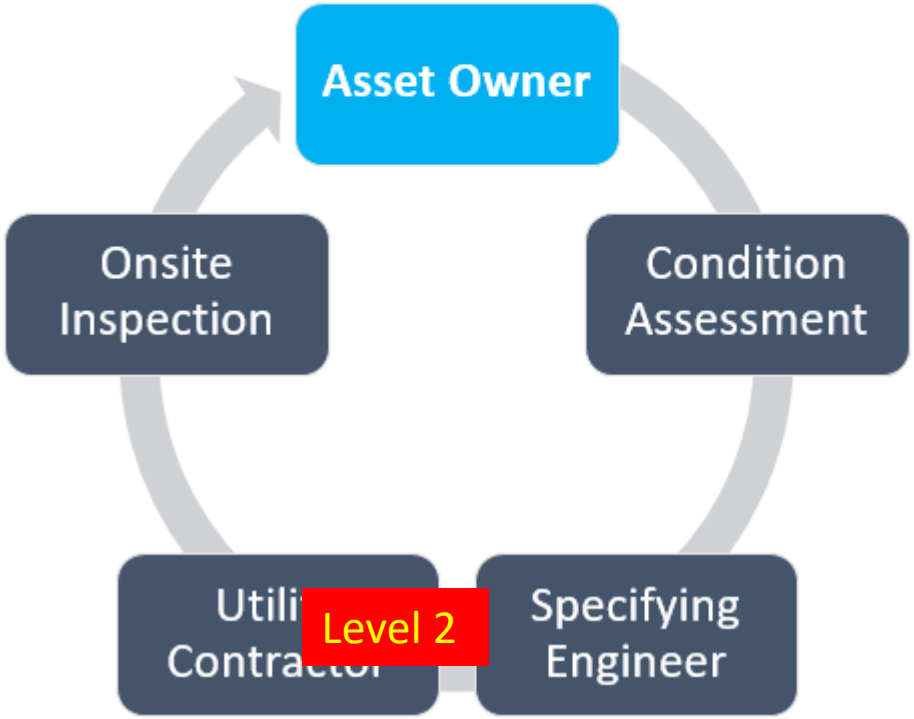
LEVEL 2 – Specialized Camera or Manned Entry

NASSCO OPTION

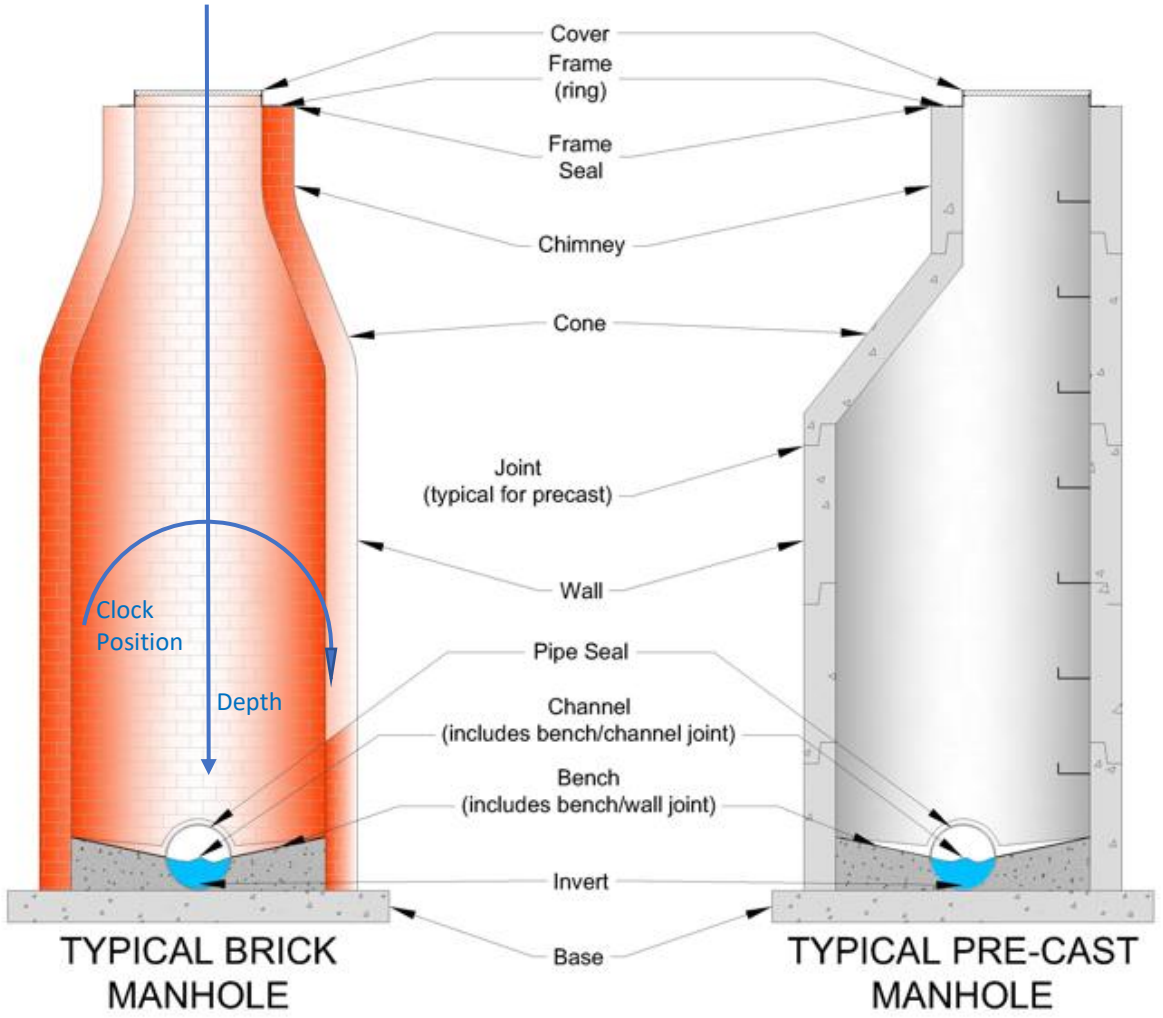


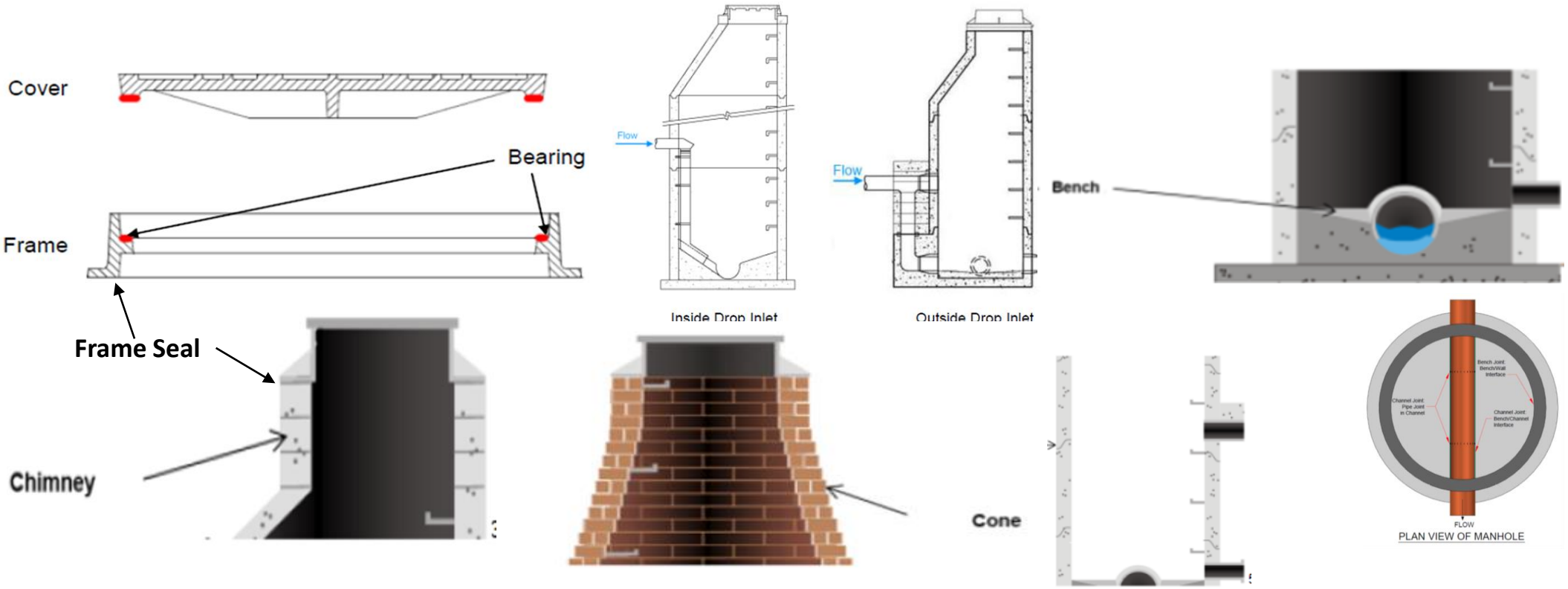
UNDERGROUND CONSTRUCTION TECHNOLOGY
The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN

Manhole Rehab is a Team Sport

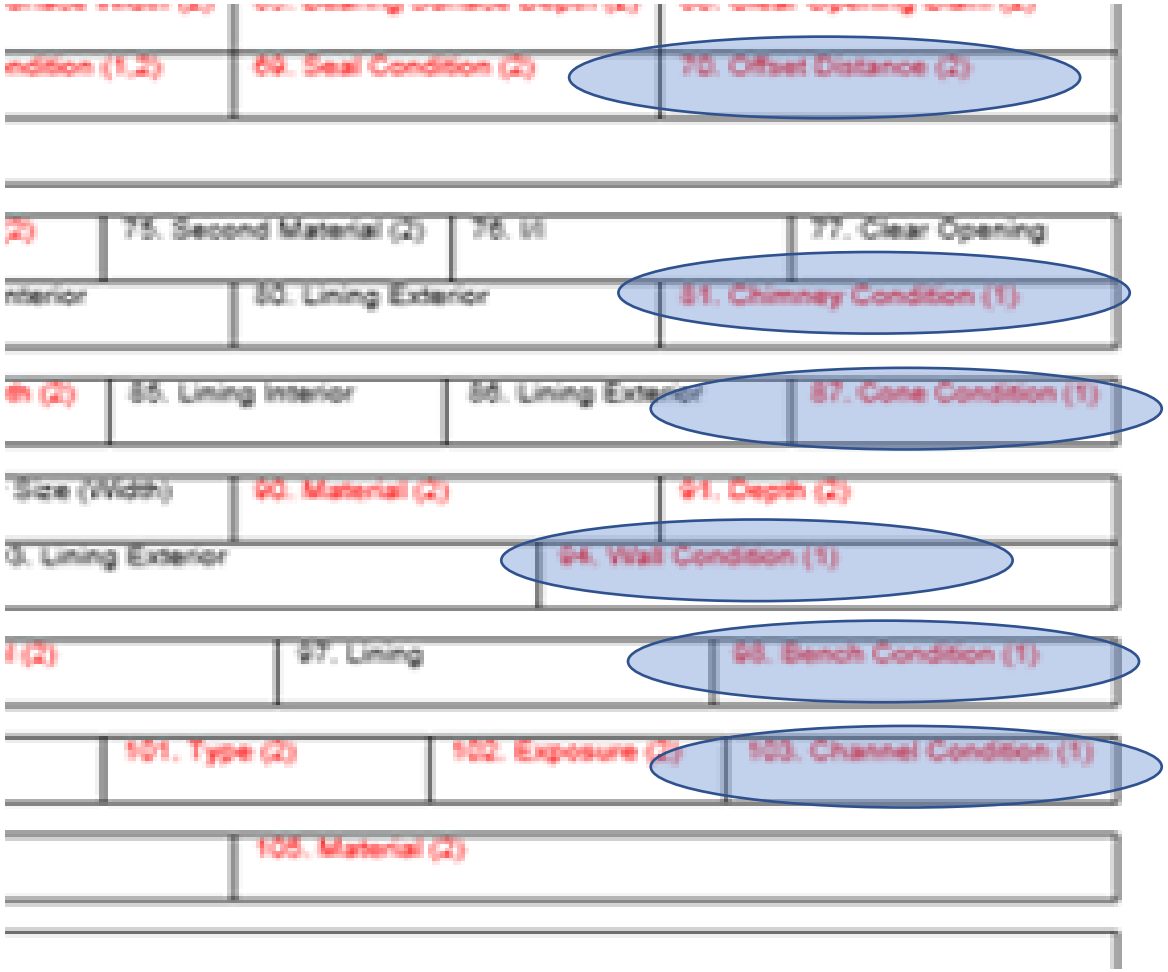


MANHOLES CAN BE CONSIDERED SHORT VERTICAL PIPES



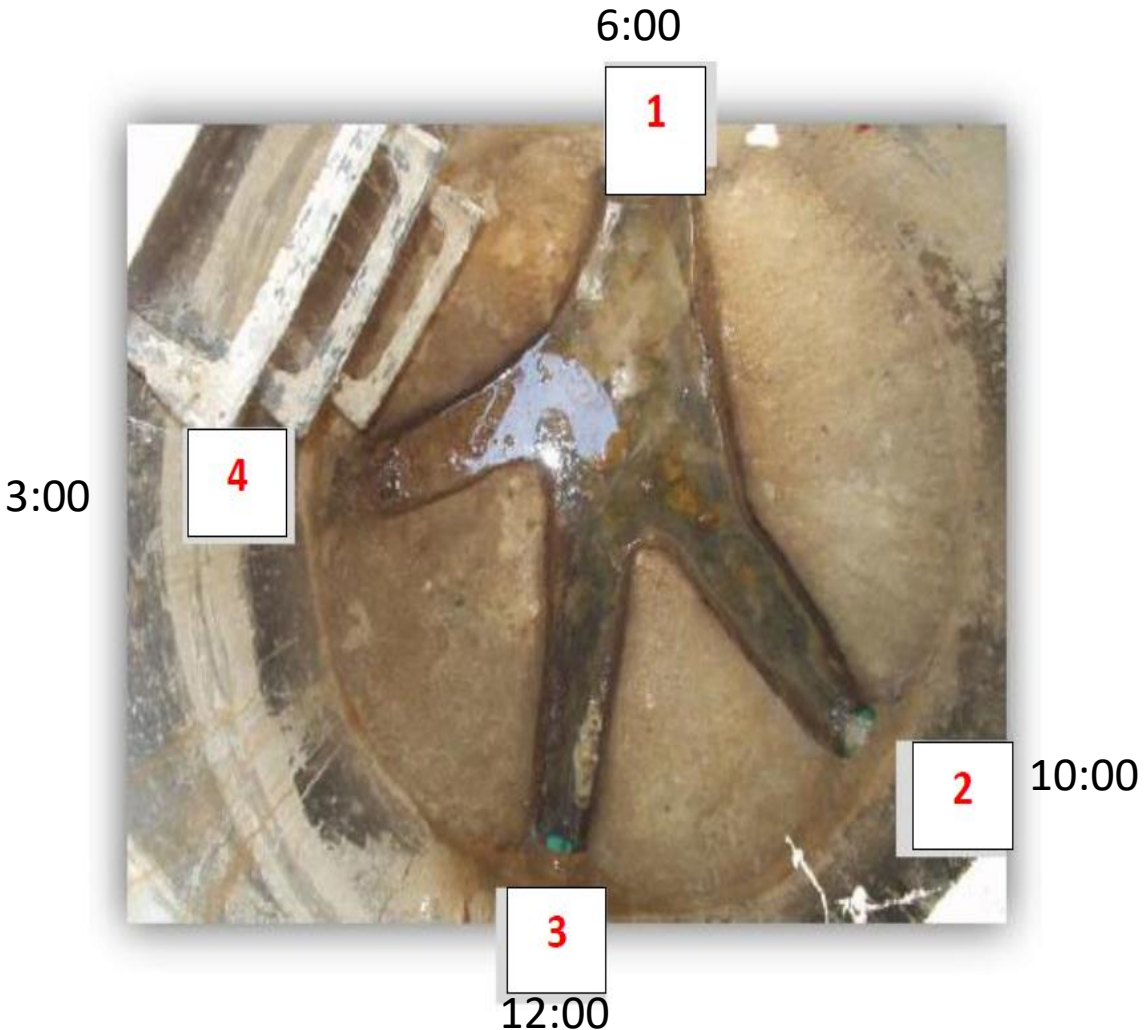

Cover
Bearing
Frame
Frame Seal
Chimney
Flow
Inside Drop Inlet
Flow
Outside Drop Inlet
Bench
Cone
FLOW
PLAN VIEW OF MANHOLE

CONDITION OBSERVATIONS - LEVEL 1



WHAT IS BASIC CONDITION OF MH COMPONENTS? Plus a few basic measurements.

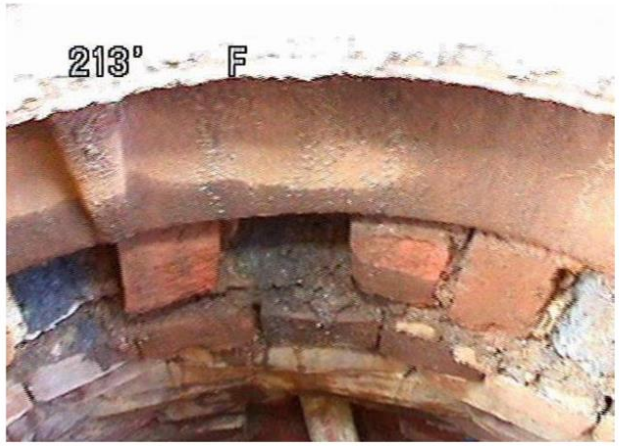
LEVEL 2- LOCATING OBSERVATIONS



CME	–	Chimney Exterior
CMI	–	Chimney Interior
COE	–	Cone Exterior
COI	–	Cone Interior
WE	–	Wall Exterior
WI	–	Wall Interior
B	–	Bench
C	–	Channel

CONDITION OBSERVATIONS - LEVEL 2

Chimney Interior (CMI) – Missing Brick (MB)



Depth (feet) (meter)	Video Ref	Component	Code	Continuous Defect	Value			Joint	Step	Circumferential Location		Img Ref	Remarks
			Group Descriptor Modifier		Dimension		%			At/ From	To		
					1st	2nd							
0.5		CMI	MB							10	01		

Cone Exterior (COE) – Fracture Multiple (FM)

Depth (feet) (meter)	Video Ref	Component	Code	Continuous Defect	Value			Joint	Step	Circumferential Location		Img Ref	Remarks
			Group Descriptor Modifier		Dimension		%			At/ From	To		
					1st	2nd							
0.5		COE	FM	S01						04	07		
2.1		COE	FM	F01						04	07		

CONDITION OBSERVATIONS - LEVEL 2

Wall Interior (WI) - Fracture Longitudinal (FL)

Depth (feet) (meters)	Video Ref	Component	Code	Continuous Defect	Value				Joint	Step	Circumferential Location		Img Ref	Remarks
			Group Descriptor Modifier		S/M/L	Dimension 1st	Dimension 2nd	%			At/ From	To		
13.3		**WI**	**FL**	**S01**							12			
18.0		**WI**	**FL**	**F01**							12			

Bench (B) – Root Ball (RB)

Depth (feet) (meter)	Video Ref	Component	Code	Continuous Defect	Value			Joint	Step	Circumferential Location		Img Ref	Remarks
			Group Descriptor Modifier		Dimension 1st	Dimension 2nd	%			At/ From	To		
4.5		**WI**	**RBB**	**S01**			55			10	05		
6.0		**WI**	**RBB**	**F01**			55			10	05		
6.0		**B**	**RBJ**				55	J		10	05		

Likelihood of Failure-- LOF

RISK = LoF * CoF

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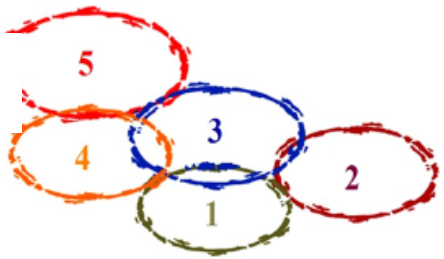
Condition Grades:

Condition grades are assigned for two defect categories:

- Structural
- O&M



- Grades and definitions are listed below:

5 - Most severe defects
4 – Significant defects
3 – Moderate defects
2 – Minor to moderate defects
1 – Minor defect

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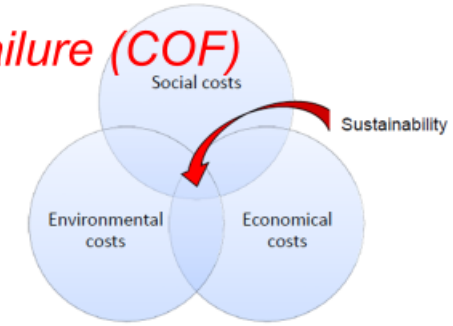
Consequence of Failure (COF)



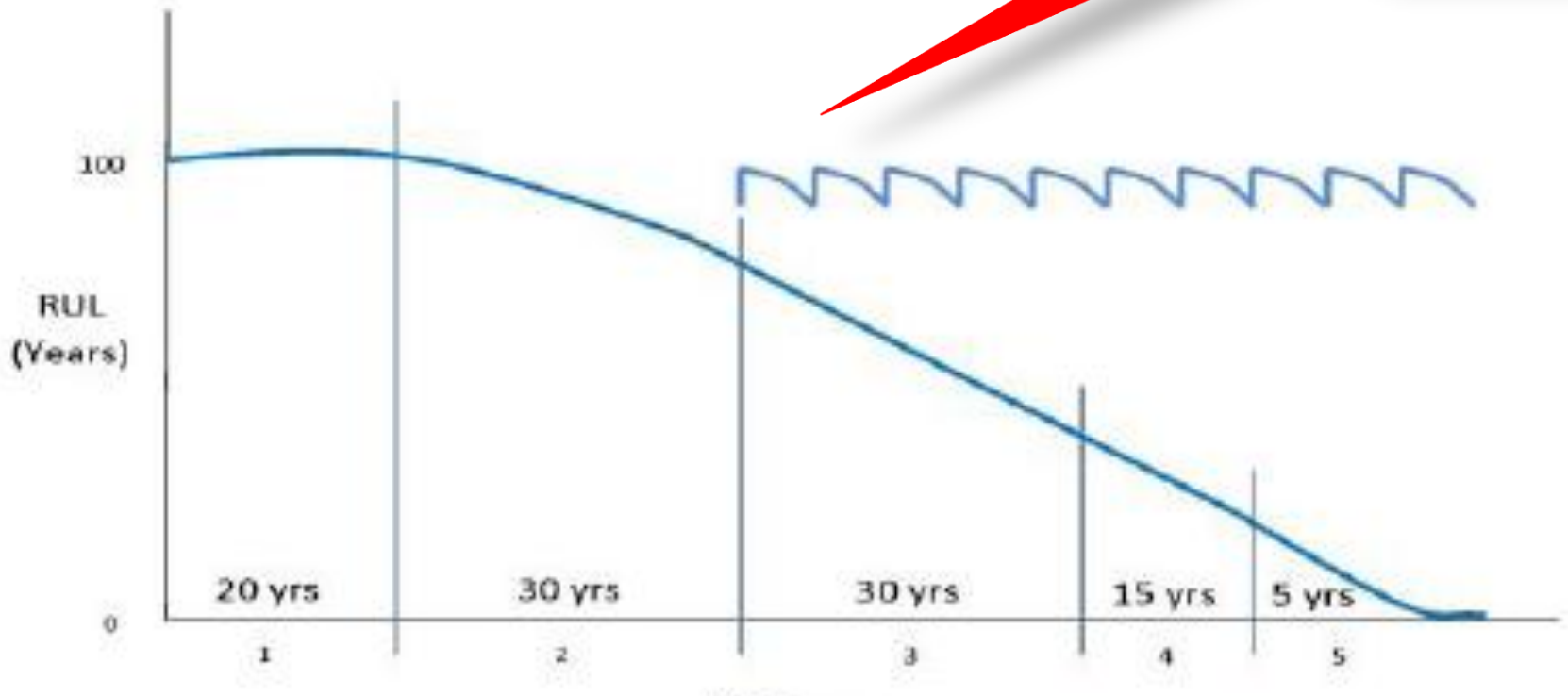
TRIPLE BOTTOM LINE (TBL) APPROACH

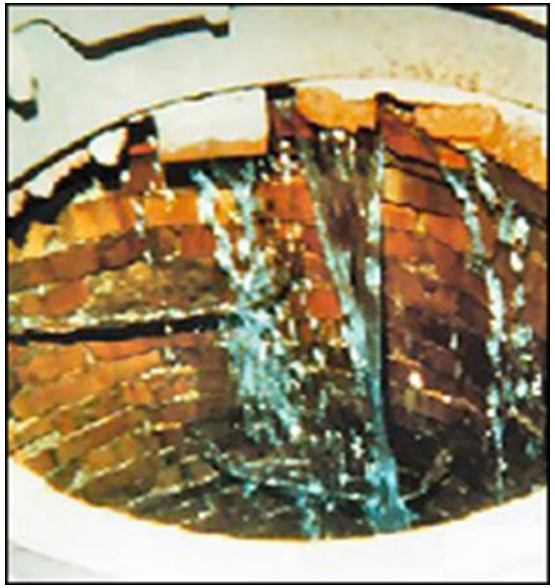
- TBL concept focuses not only upon direct Economical Costs
- TBL expands financial bottom line to view other non-traditional factors.
- Also focuses on social and environmental aspects
- The goal is sustainability of all the assets in a balanced manner

BAMI-I (pp37, 4.2.2.2) Q4 Trenchless Technology Center

DECISION MAKING

In this example, policy dictates that pipe will be regularly assessed and rehabilitated to maintain LOF = 2.
BEFORE FAILURE OCCURS!
(and rehab less expensive)

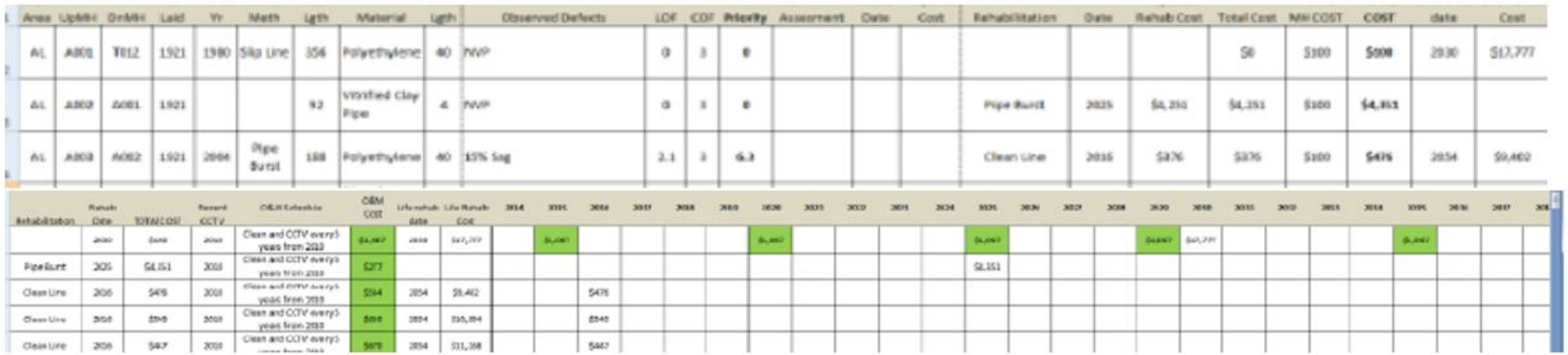


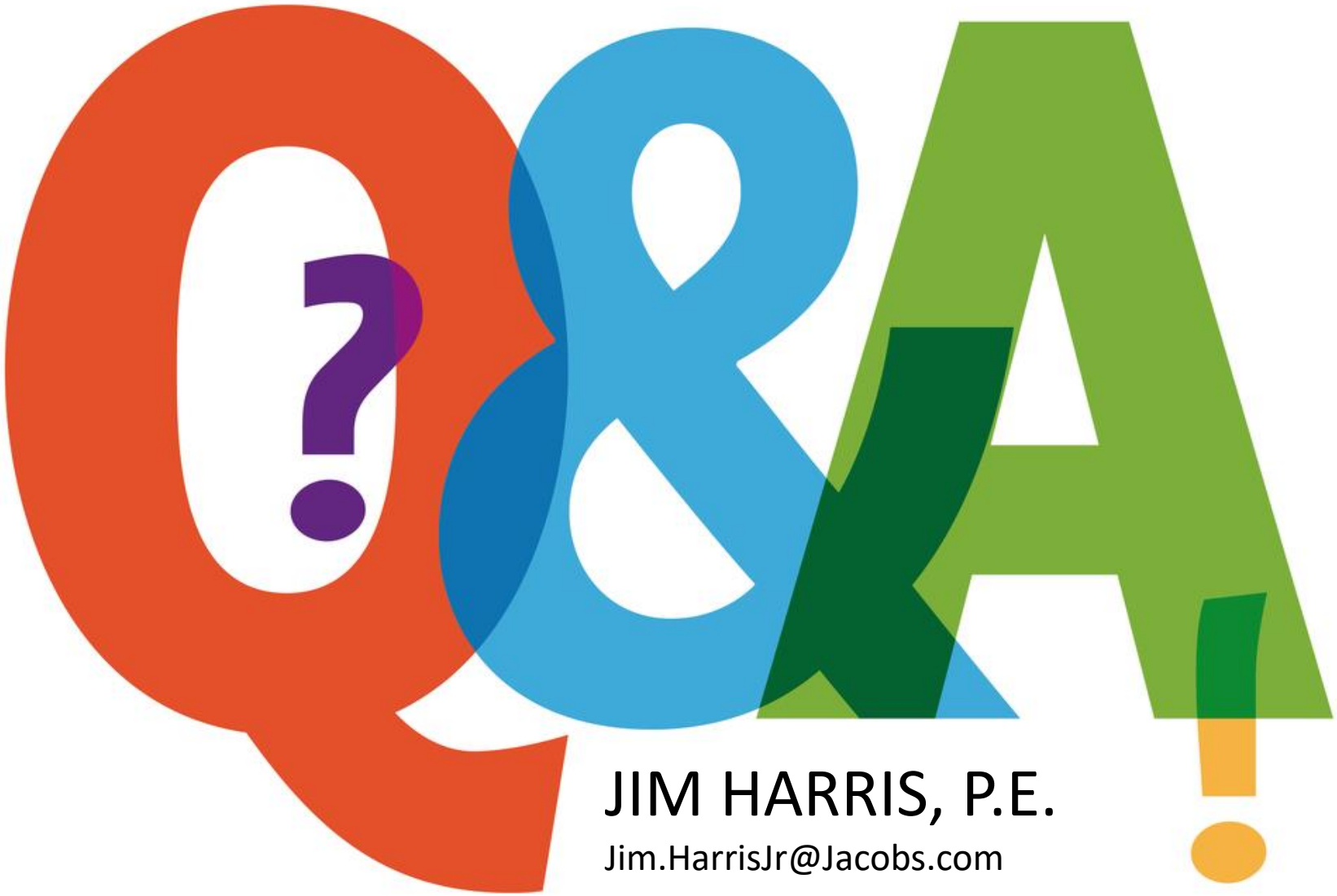


DELIVERABLES

MH_Conditions

ConditionID	InspectionID	Distance	Counter	MH_Compor	MACP_Code
1	1	0		CME	MGO
2	1	0.9		CMI	DSF
3	1	0.9		CMI	IS
4	1	3		C	DAE
5	2	0		CMI	MGO
6	2	0.9		WI	IS
7	3	0		CMI	MGO
8	3	0.3		CMI	MMC
9	3	0.3		CMI	MMM
10	3	0.9		COI	SRI
11	4	0		CMI	MGO
12	4	0.2		CMI	CM
13	5	0		CMI	MGO





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