

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

Manhole Rehabilitation First Step: Condition Assessment



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

Jim Harris, P.E.

- 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)





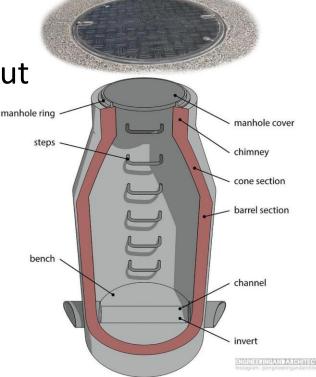
The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN

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 H₂S 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





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

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

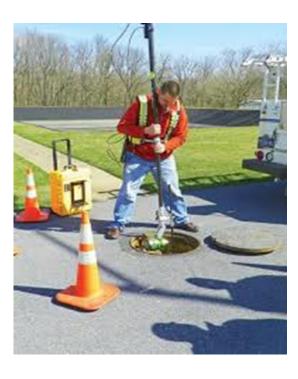


The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN

Level of Inspection Needed

LEVEL 1 – Above Ground







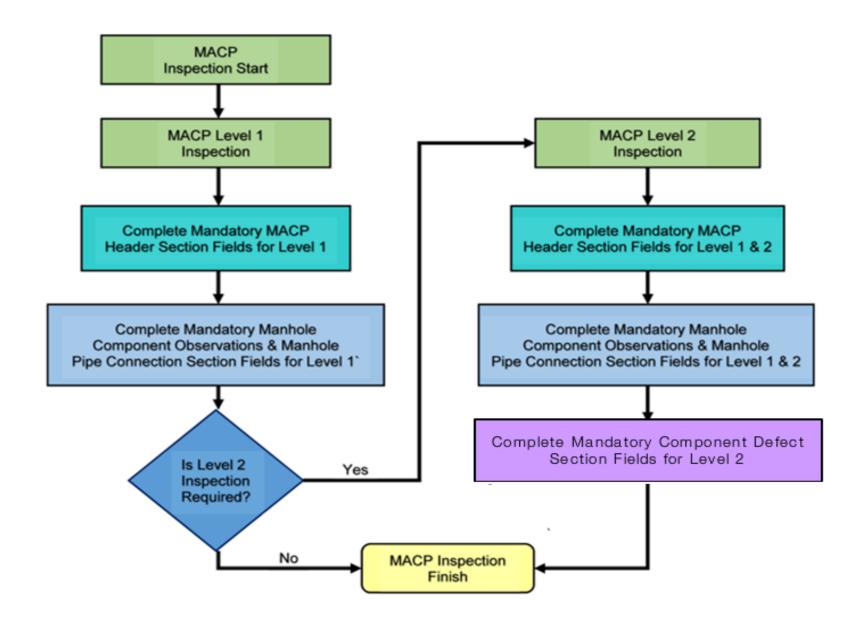
LEVEL 2 – Specialized Camera or Manned Entry





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

NASSCO OPTION





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

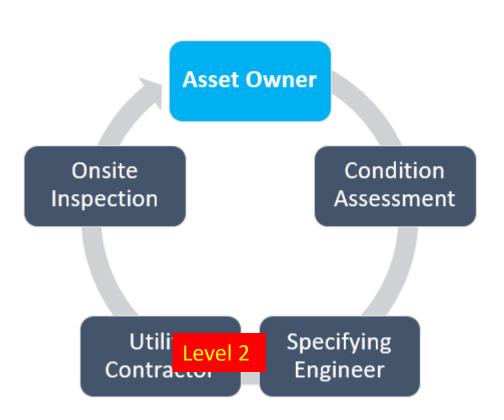


UNDERGROUND CONSTRUCTION TECHNOLOGY

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

Manhole Rehab is a Team Sport

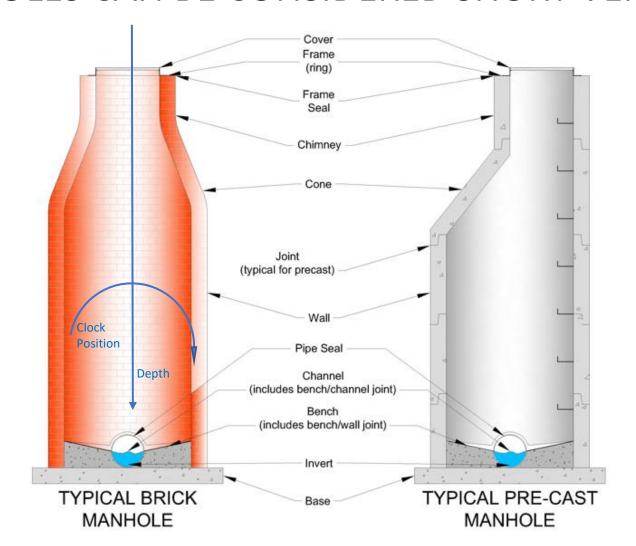






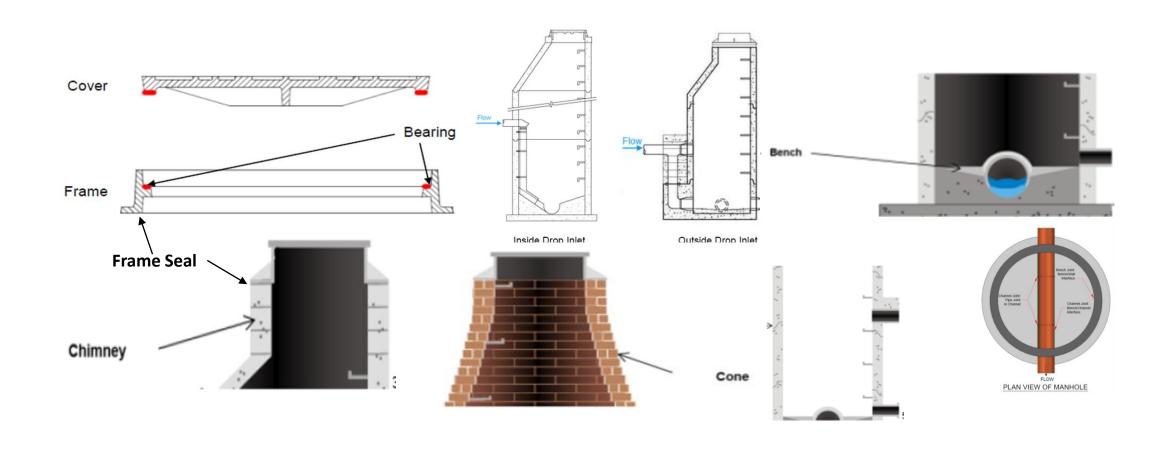
The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN

MANHOLES CAN BE CONSIDERED SHORT VERTICAL PIPES





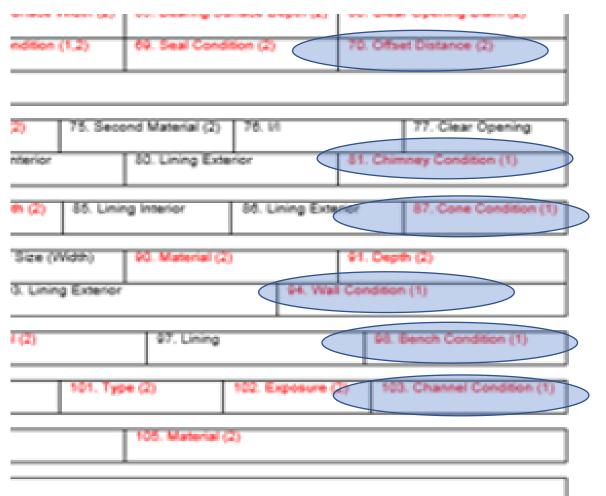
The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN





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

CONDITION OBSERVATIONS - LEVEL 1



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



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

LEVEL 2- LOCATING OBSERVATIONS

6:00

3:00 10:00

12:00

CME – Chimney Exterior

CMI – Chimney Interior

COE – Cone Exterior

COI – Cone Interior

WE – Wall Exterior

WI – Wall Interior

B – Bench

C – Channel



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

CONDITION OBSERVATIONS - LEVEL 2

Chimney Interior (CMI) – Missing Brick (MB)



Depth	Video		Code	Continuous		Value					ferential ation	Img	
(feet) (meter)	Ref	Component	Group Descriptor	Defect	Dime	ension	%	Joint	Step	At/	То	Ref	Remarks
(Modifier		1st	2nd	,,,			From	iii ii		
0.5		СМІ	МВ							10	01		
					_		-						-

Cone Exterior (COE) - Fracture Multiple (FM)



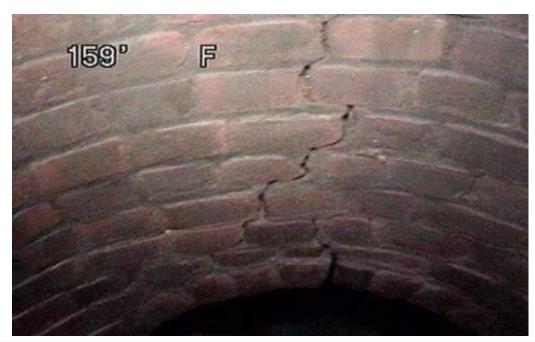
Depth (feet)	Video		Code	Continuous	1	Value				Circumf	-	Img		
	Ref	Component	Group	Defect	Dime	ension		Joint	Step	At/	-	Ref	Remarks	
(meter)			Descriptor Modifier		Ist	2nd	%			From	To	10.00		
0.5		COE	FM	501						04	07			
2.1		COE	FM	F01						04	07			
			6,791											



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

CONDITION OBSERVATIONS - LEVEL 2

Wall Interior (WI) - Fracture Longitudinal (FL)



Depth	VC 1		Code	6 .:		Vā	lue				Circumfo Loca		Im	
(feet) (meters)	Vide o Ref	Component	Group Descriptor	Continuous Defect	S/M/	Dime		%	Joint	Step	At/	То	g Ref	Remarks
(meters)			Modifier		L	1st	2n d	/0			From	10	itei	
13.3		WI	FL	S01							12			
18.0		WI	FL	F01							12			

Bench (B) - Root Ball (RB)



Depth	Video		Code	Continuous		Value					erential ation	Img	
(feet) (meter)	Ref	Component	Group Descriptor	Defect	Dime	ension	%	Joint	Step	At/	То	Ref	Remarks
(meter)			Modifier		1st	2nd	,,			From			
4.5		WI	RBB	S01			55			10	05		
6.0		WI	RBB	F01			55			10	05		
6.0		В	RBJ				55	J		10	05		



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

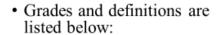
Likelihood of Failure-- LOF



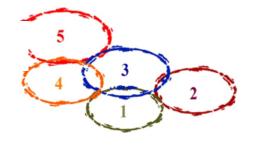
Condition Grades:

Condition grades are assigned for two defect categories:

- ➤Structural
- ≽O&M



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



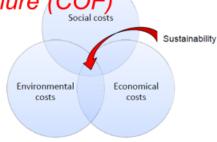
BAMI-

(pp36, 4.2.1)



RISK = LoF * CoF

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



(pp37, 4.2.2.2) Q4



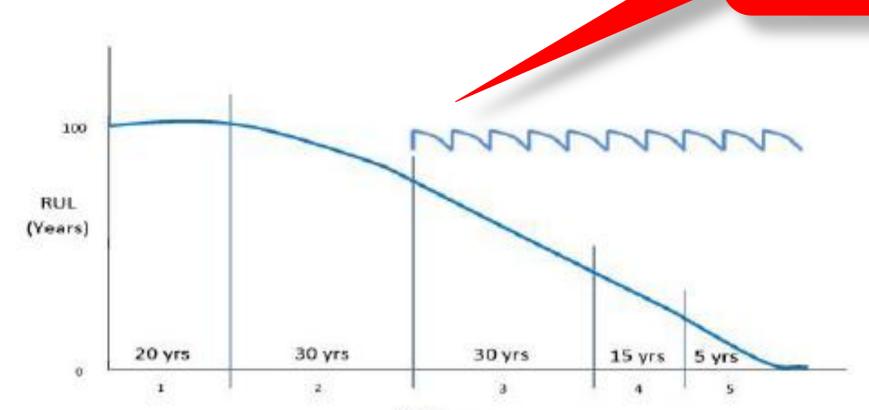


The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN



In this example, <u>policy</u> dictates that pipe will be regularly assessed and rehabilitated to maintain LOF = 2.

<u>BEFORE FAILURE OCCURS!</u>
(and rehab less expensive)







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

DELIVERABLES

	MH_Conditions					
	ConditionID 🕶	InspectionIE -	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		С	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

						13				9			,	-				Civ				141	00						-		- 3	200
Area	Uphre	OrMer	Leid	Yr	Meth	Light	Materi	of Li	gth	Otore	rived De	Nects	LO	£ CO	F Price	Or I	Assesment	Outo	- 0	out	Rehal	olitation	. 0	Parte	Rehab Cos	Total Cr	nt Mil	COST	COST	d	ate	Cew
AL.	ANG	T012	1921	1980	Slip Line	354	Polyethy	lene (10 m	pp.			0	3												50	5	5100	5000	3	130	\$17.7
AL.	AMO	2001	1921			92	vioritied Pipe	Clay	4 10	ja-			0								Phys	e Burct	,	2025	\$4,291	54,252	, ,	1100	\$4,813			
AL	A203	A062	1921	2004	Pipe Surst	198	Polyethy	lene d	so 15	% Sog			2.	1 2	6.3	,					Clies	en Line	,	2035	5876	\$336	s	5100	5476	20	254	\$9,46
i shubilitu		nute size 101	WEGH	Resert CCTV	OERL	destile	COST	Life metrolic date	Live Ren	ab 3014	MHE	3064	3911	2011	260	1636	3031	3000	201	ж	мя	383N	3001	308	3830 X	MB 3015	2010	3011	3814	209%	жw	380
	-	100	(unit	aine	Clean and C years for		94,007	inte	547,20	,	8,001					8,000	-				(4,047				\$4.000 \$40	200				0,047		
Pipelius	nt 3	OS 1	54.151	2008	Clean and C		\$207														9,151											
Clean Lin	n 2	06	54%	3008	tion aut to year to		5314	2054	29,402			\$476																				
Clean Un	- 20	ise .	to-o	3008	Clean and O years for		ome	3834	210,00	•		2540																				





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

