New Standard for Sewer Main Condition Assessment

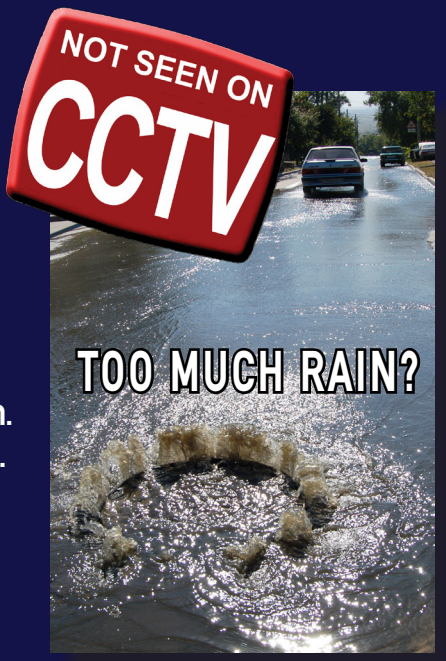
Find Infiltration & Certify Cured-In-Place Pipe

EPA-Referenced ***7th EDITION, VOLUME 1, OPERATION AND MAINTENANCE OF WASTEWATER COLLECTION SYSTEMS manual.***

New Lesson 4.4 - ELECTRO SCANNING INSPECTION by Ken Kerri, Ph.D., P.E.

Chapter 4 - Inspecting and Testing Collection Systems

- Find 90-100% of Infiltration Missed by CCTV Inspection.
- Determine Flow Reductions from Rehabilitation.
- Certify CIPP Lining, Repairs, & Rehabilitation.
- Identify Sources of Infiltration to Prevent SSOs.
- Add to Existing CCTV Truck or Van.



Focused Electrode Leak Location (FELL)

Represents the industry's first reliable, proven, and measurable way to provide unbiased pipe condition assessment without third party interpretation or operator coding. Let Flow Meters show key areas, and FELL show specific locations.

Most Sewer Leaks Can't Be Seen or Measured *Without FELL*

Add to Your CCTV Truck or Van

- ***Aries***
- ***Cues***
- ***Envirosight***
- ***IBAK***
- ***Rausch***
- ***UEMSI***
- ***or Custom***

Quantify Flow Reductions From Your Next CIPP Project

Measure Same-Day Pre- & Post-Rehabilitation Defect Flows in GPM.

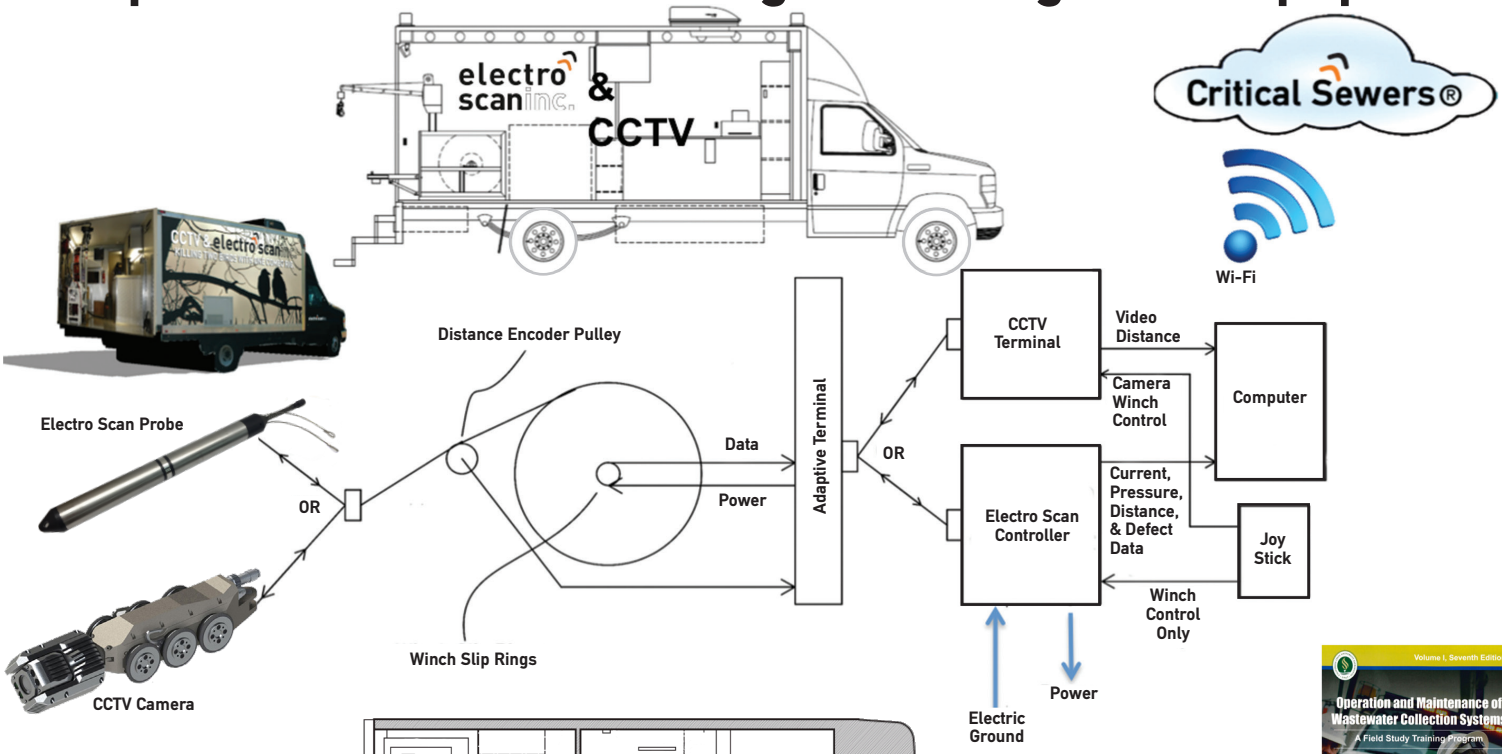
U.S. Patent 9143740 and 9304055. Multiple International Patents Pending.

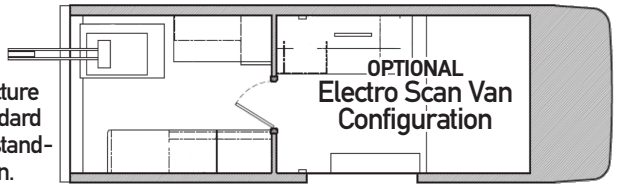
Services Available From Electro Scan Inc.

electro scan inc.

1745 Markston Road, Sacramento, California 95825-4026, USA | 916.779.0660 | info@electroscan.com | www.electroscan.com

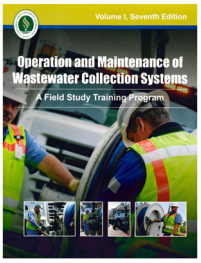
Adaptive Architecture Leverages Existing CCTV Equipment





Electro Scan's adaptive architecture can either be added to any standard CCTV truck or purchased as a stand-alone Electro Scan configuration.

As featured in the 7th Ed., Vol. 1, *OPERATION AND MAINTENANCE OF WASTEWATER COLLECTION SYSTEMS* manual, Page 232



Comparing CCTV & FELL For Pipe Assessment

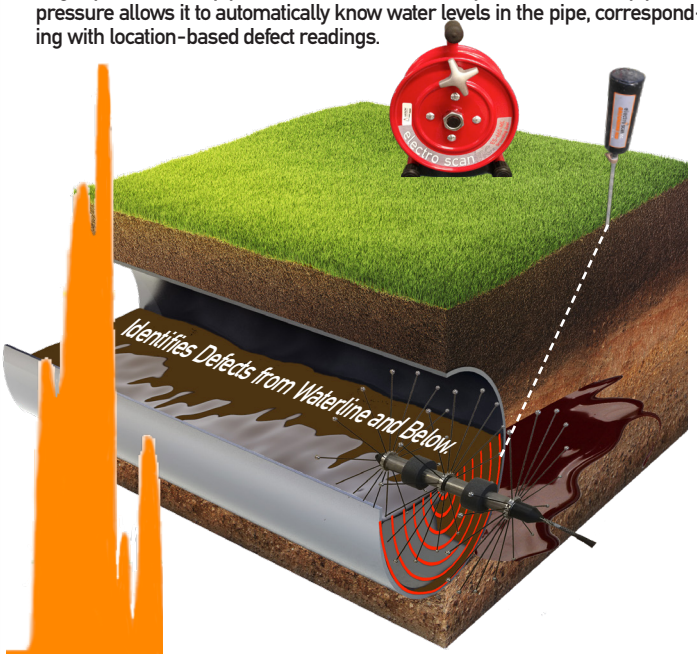
		CCTV	FELL
1	Automatically Finds Potential Sources of Infiltration 360° of Pipe Wall	No	Yes
2	Automatically Finds Leaks Inside Joints Through Bell and Spigot	No	Yes
3	Automatically Finds Leaks at Service Connections	No	Yes
4	Automatically Finds Sources of Infiltration at Cracks	No	Yes
5	Automatically Finds Leak Locations (within 0.4 inches or 1cm)	No	Yes
6	Automatically Measures Size of Leaks - Estimated in GPM or LPS	No	Yes
7	Automatically Finds Defects That Leak from Bad Couplings	No	Yes
8	Automatically Finds Defects That May Still Leak After Repairs	No	Yes
9	Automatically Finds Defects That Leak in CIPP Lining Projects	No	Yes
10	Automatically Finds Defects After Service Re-Connections	No	Yes
11	Automatically Finds Leaks, if Hidden by Silt or Debris on Bottom of Pipe	No	Yes
12	Able to Conduct Inspections, When Sewer Pipe is Full of Water	No	Yes
13	Able to Determine Size of Potential Leak, if Roots are Present	No	Yes
14	Automatically Finds Leaks, if Hidden by Fats, Oils or Grease (FOG)	No	Yes
15	Able to Determine Size of Leaks, if Pipe Has Encrustation	No	Yes
16	Requires Active Infiltration to Identify Infiltration	Yes	No
17	Contains Moving Parts That Can Clog from Excess Debris or Silt	Yes	No
18	Requires Bypass Pumping During Inspection, if Pipe is Full	Yes	No
19	Requires Special Training and Certification to Identify Defects	Yes	No
20	Relies on Visual Observations to Record Defects	Yes	No
21	Avg. Speed of Inspection (6"- 30" Sewer Main Diameters)	3 ft/min	50 ft/min

Large Diameter Pipe Assessment

A major advantage of Electro Scan's FELL technology is the ability to assess large diameter pipes. While standard configurations handle diameters up to 30 inches (800mm), larger diameters can be assessed exclusively using Electro Scan Services.

Agencies may still assess larger diameter pipes, but if the pipe is not able to be fully surcharged, i.e. water able to fully surround the probe, then the pipe wall will only be assessed from the level of the waterline and below.

Pipe flows may continue, without bypass pumping, and downstream manholes may be temporarily plugged to allow higher water levels to assess a larger portion of the pipe wall. Electro Scan's ability to track internal pipe pressure allows it to automatically know water levels in the pipe, corresponding with location-based defect readings.



Critical Sewers® Cloud Certifies Water Tightness

Certify repairs & rehabilitation for water tightness in minutes, without operator coding or third party data interpretation.

1. Vitrified Clay Pipe (VCP) Assessment

DEFECTS	
S	45
M	13
L	6

% OF DEFECT LENGTHS	
Small Defects	0.01580
Medium Defects	0.00700
Large Defects	0.00650
All Defects	0.02930

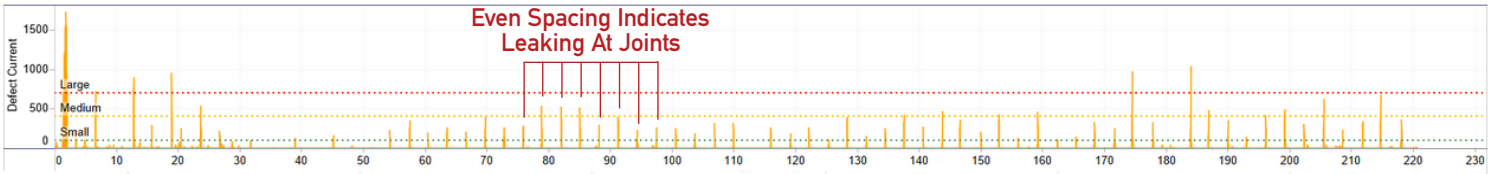
GPM SUMMARY	
Minor GPM	24.070
Moderate GPM	
Severe GPM	10.000
Total GPM	40.890
GPD	58,882
GPD IDM	140,747
Minor GPM %	55.21%
Moderate GPM %	15.64%
Severe GPM %	29.15%

DIAMETER & DISTANCE: 10

221.00 ft

0 50 100 150 200

OPERATOR INFO	
Atmospheric Test	Scan Start
12/2/2015 1:29:30 PM	12/2/2015 1:43:16 PM



Defect Grade	Defect Start (ft)	Defect End (ft)	Length of Defects (ft)	GPM	GPD	GPD/IDM
L	1.88	2.63	0.75	10.00	14,400	34,421
L	12.87	13.07	0.20	1.77	2,549	6,092
L	184.06	184.21	0.15	1.51	2,174	5,198
L	174.55	174.70	0.15	1.37	1,973	4,716
M	199.29	199.46	0.17	1.11	1,598	3,821
M	23.73	23.88	0.15	1.06	1,526	3,649
L	19.00	19.08	0.08	0.98	1,411	3,376

2. Point Repair Assessment

Good News: *Point or spot repairs (Circles 1, 2, & 3) completed by this sewer utility were generally 'Good' (i.e. no electric spikes).*

Bad News: *Point Repairs left large leaks at end points. And, most of the pipe is still leaking badly.*

Point Repairs Were Selected Based on CCTV Inspection!

ZOOM-IN

3. Cured-In-Place Pipe (CIPP) Assessment

Leaks Identified in Pipe Wall from Accidental Cuts, Poor Curing, Defective Reconnections, and Contractor Damage.

DEFECTS	
S	0
M	0
L	1

% OF DEFECT LENGTHS	
Small Defects	0.000000
Medium Defects	0.000000
Large Defects	0.003000
All Defects	0.003000

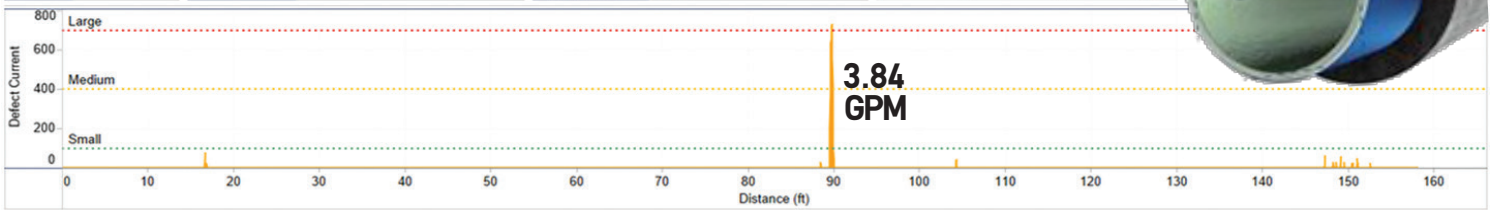
GPM SUMMARY	
Minor GPM	0.000
Moderate GPM	
Severe GPM	0.000
Total GPM	3.840
GPD	5,530
GPD IDM	23,057
Minor GPM %	0.00%
Moderate GPM %	100.00%
Severe GPM %	0.00%

DIAMETER & DISTANCE: 8

158.00 ft

0 50 100 150

OPERATOR INFO



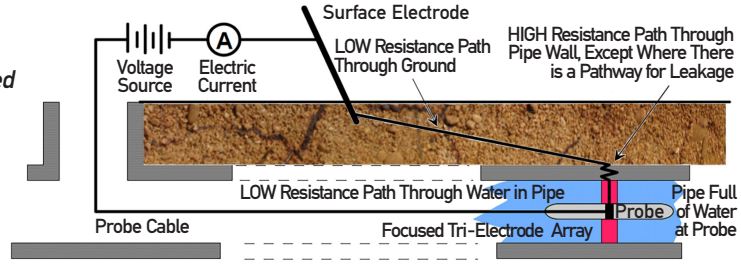
Automatic, Measurable, & Unbiased Reporting

Conveyance	Combined Sewer & Storm Systems, Separated Gravity Mains, Force Mains, Siphons, and Stormwater Networks.	
Required Flow	None. Dry Pipe or Fully Surcharged Flow.	
Pipes	Pipe Diameters	6 to 30 inch (150 to 800mm)
	Pipe Shape	Any, including Circular, Box, Egg-shaped, Oval, and Trapezoidal.
	Pipe Materials	Electrically Non-Conductive Pipe Walls, including Asbestos Cement, Brick, Cement Mortar Lined and Coated Steel, Cured-In-Place Pipe, Ductile Iron with Epoxy Coatings, Fiberglass Reinforced Pipe, High-Density Polyethylene Pipe, Prestressed Concrete Cylinder Pipe, Polyethylene, Polyvinyl Chloride, Reinforced Concrete, Vitrified Clay Pipe, etc.
ES-620	Dimensions	Length: 32 in (812.8mm); Circumference (Width): 2.875 in (73mm)
	Scan Recording	Critical Sewers® Field Laptop PC, Wifi Connection to Critical Sewers® Cloud Application.
	Speed	45-60 ft/minute (15-20 meters/minute)
	Operating Temperature	20°F to 120°F (-7°C to 50°C)
	Power Supply	120VAC / 60Hz - or - 220VAC / 50Hz
	Range	1,500 ft (460m) range from single point of access. Dependent on jet truck hose length.
	Current (max)	40 mA
	Electrical Array	Focused tri-electrode array
	Defect Flow Calculation	± 30% Accuracy measured in Gallons Per Minute (GPM) or Liters Per Second (LPS).
	Defect Location	± 0.4.inches (1cm)
Advantages	1. No manual coding required. 2. Finds 90-100% defects missed by CCTV inspection. 3. Locates & measures leaks in GPM or LPS. 4. No bypass pumping required for inspection. 5. Use in field either rain or shine. 6. Recommended for all Pre- & Post-Rehabilitation. 7. Finds defects inside joints not seen by CCTV.	8. Differentiates superficial cracks from cracks through pipe. 9. Find & measure defects hidden by grease, silt, & encrustation. 10. Automatically evaluates 360° of pipe wall. 11. Determines water tightness of sewers & lateral connections. 12. Fewer breakdowns. No moving parts. 13. Recommended by WRc, developers of NASSCO CCTV Codes. 14. Reports available in minutes, not hours, days, or weeks.
Limitations	1. Does not provide a clock position of defect location inside the pipe, but location is accurate to within 0.4 inches (1cm). 2. Does not scan metallic pipes or fittings, unless there is a coating or liner (minimum of 1-2mm).	

(Above) The award winning ES-620, including the Water Environment Federation (WEF) Best Product Innovation Award (2013), and NASTT/No-Dig Best New Product Award (2013).

ASTM F2550

Committee F36 Approved



ASTM F2550-13 standard covers the location & measurement of all cracks, fissures, broken joints, and leaking service connections by measuring the change in electrical current able to pass through defects in a pipe wall.

(Above) Scan readings displayed in real-time, during field survey, on field computer monitor. Data is uploaded via wifi communications to the Electro Scan Critical Sewers® cloud application, with detailed reports available in minutes.

Includes one (1) complete set of funnel cones for 6"-15" diameter pipe assessments.

"Separate scans should be taken before and after any pipe repair, relining, or rehabilitation activity."

Section 4.432, Page 247

Ken Kerri, Ph.D., P.E.
Former Chief Project Consultant
Office of Water Programs
California State University Sacramento (CSUS)
Author, Electro Scanning Inspection

Plug & Play Design Allows Seamless Integration With Multi-Conductor CCTV Camera Reels

electro scan inc.

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