

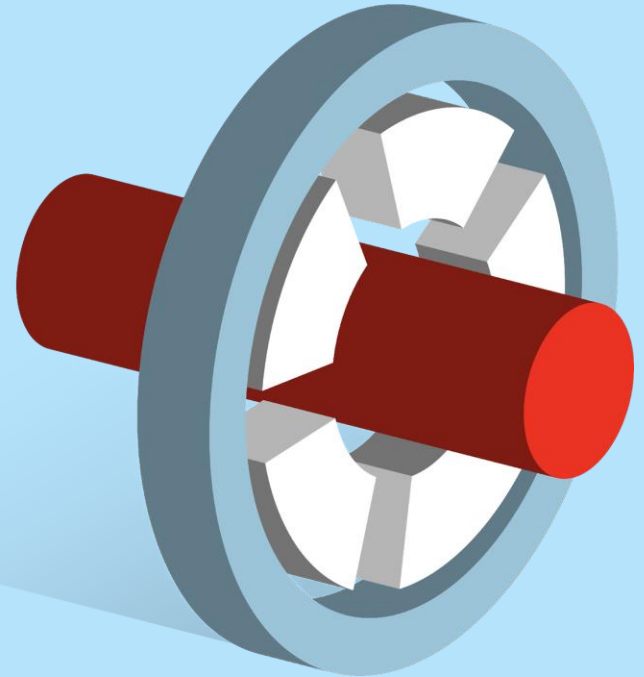


Getting higher quality

in your field operations

Jake Freivald
Vice President
Fulcrum

Jared Carey
Innovation Specialist
TREKK Design Group





Agenda



Jared Carey

Innovation Specialist
TREKK Design Group



Jake Freivald

VP, Product Marketing
Fulcrum

Goal: Get ideas about developing a culture of quality with field teams and lone workers.

Discussion topics

This webinar will discuss how digital inspections and standard operating procedures (SOPs) can draw remote team members into your culture of quality, including:

- Improving QA/QC inspections in the field, even for novice inspectors
- Simplifying communication for better supervision and mentorship
- Making it easier to compare notes with other teams and remote team members
- Improving the feeling of connectedness of lone workers and field teams

Using data to promote a culture of quality

Using data to establish a culture of quality

Collect data through:

- ▶ **Standard operating procedures.** Existing process includes quality checks – measurements that ensure operators are performing jobs well – to catch issues early
- ▶ **Scheduled inspections.** Predictability of failures or risk management requirements drive us to a time-based inspection process
- ▶ **Issue reporting.** Observant workers and supervisors can catch issues on an *ad hoc* basis without scheduled inspections.

Earliest possible detection of potential problems, plus avoidance of problem situations. Everyone is engaged. Takes buy-in from process owners.

Predictable, reliable processes with regular time, labor, and money requirements. Catches issues later than SOPs.

Less predictable and reliable, but engages the entire team. Catches issues later than SOPs, but can find things scheduled inspections don't.

What about geographic information systems (GIS)?

- Location
- Imagery
- Analysis
- Planning



Challenges of the field

Challenges of the field

Physical distance

Transit times

Less-frequent / harder communication



Addressing challenges

Physical distance

- Digits move fast: Eliminate paper
- Digits are light: Minimize the stuff you carry

Transit times

- Get the job done right the first time
- Enable virtual supervision and mentoring

Less-frequent / harder communication

- Make comms automatic and real-time
- Show how everyone is doing, including remote workers, using metrics

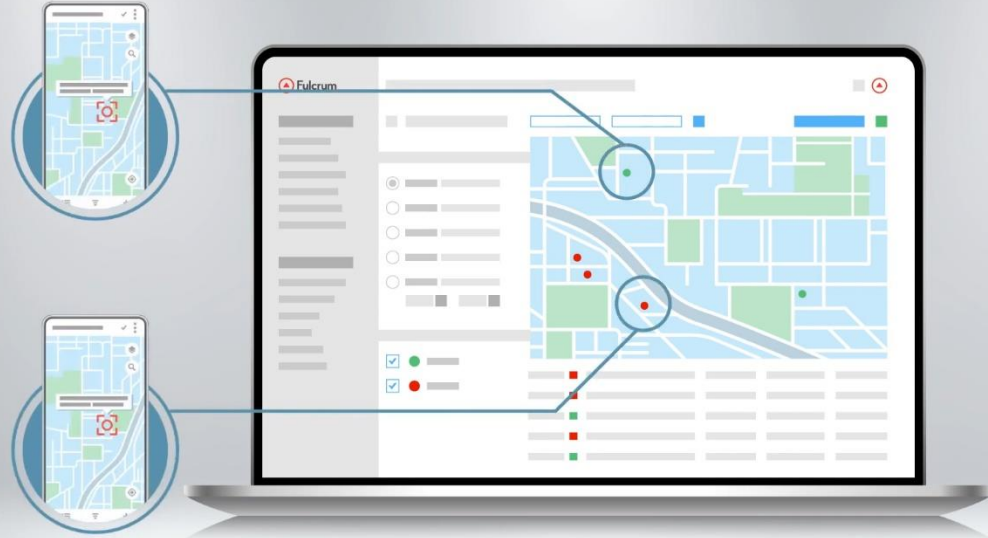


Fulcrum and field inspection management



Automating field inspection management

Our goals for the Fulcrum Field Inspection Management platform



- Drive intelligent automation to maximize **field team performance and agility**
- Harness **the value of location** for mobile teams
- Ensure **process rigor and compliance** at scale
- Create **real-time visibility** into performance across inspectors, teams, and stakeholders
- **Digitally transform field-based inspections** for safety, quality, & maintenance

Automating field inspection management

What Fulcrum's Field Inspection Management platform does

The Fulcrum platform

Fulcrum provides a SaaS-based **Field Inspection Management** platform that

- digitizes inspection processes,
- provides intelligent automation for inspection teams, and
- delivers data-driven reporting and analytics

to drive safer and higher-quality outcomes.



Jared Carey
Innovation Specialist
TREKK Design Group

On quality in the field

November 15, 2022

Leveraging Fulcrum: Getting Higher Quality in your Field Operations

TREKK Design Group, LLC



Jared Carey

Innovation Specialist – Kansas City

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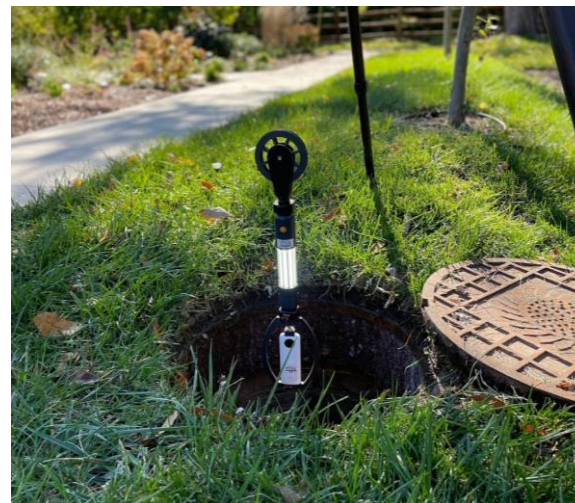
About TREKK

- Multi-disciplined civil engineering firm providing services, including:
 - Transportation
 - Traffic
 - Water and wastewater
 - Structural
 - Utilities
 - Survey
 - Construction inspection
 - Field services
- 180 employees in nine offices in Missouri, Illinois, Kansas, Nebraska, and Tennessee
- Roughly 25% of employees represent our Field Services



About Our Field Services...

- Review 1,000's of structures annually
- Vault Inspection and TREKK360
- GPS locate and mapping
- Manhole inspections and smoke testing
- Flow/rainfall monitoring
- Sanitary sewer evaluation studies
- Drainage system condition assessment
- Storm and sanitary sewer cleaning
- CCTV inspections (mainline and service)
- 45+ NASSCO-certified technicians/operators



To Begin, Start by Answering “Where & What?”

- GPS the structures.
 - Survey or mapping grade?
- Characterize & inspect the manholes.
 - How big, how deep, how bad?
- Characterize & inspect the pipes.
 - Diameters, materials, connectivity, condition?
- Be as **accurate** as possible.



The Challenge with Field Inspections...

- Accurate data capture is complex
- Traditional inspections use less efficient methods
- Quality is important
- Confined space brings safety risks
- We improvised by adopting two cutting-edge technologies:
 - 360-degree photos
 - “Smart” Forms in Fulcrum

Direction Brush Creek Kansas City MO

1331

WHOLE INFORMATION

meter of Barre X-Coordi 2769033.59
Y-Coordi 1047336.46
Elevatio 817.176126

PLAN AND PROFILE SKETCH

Photographs Taken of Diversion

ORFICE INFORMATION

Gate on Orifice? Type of Orifice Shape of Orifice Depth of Orifice

WIER INFORMATION

Type of Wier Width of Wier Depth of Wier

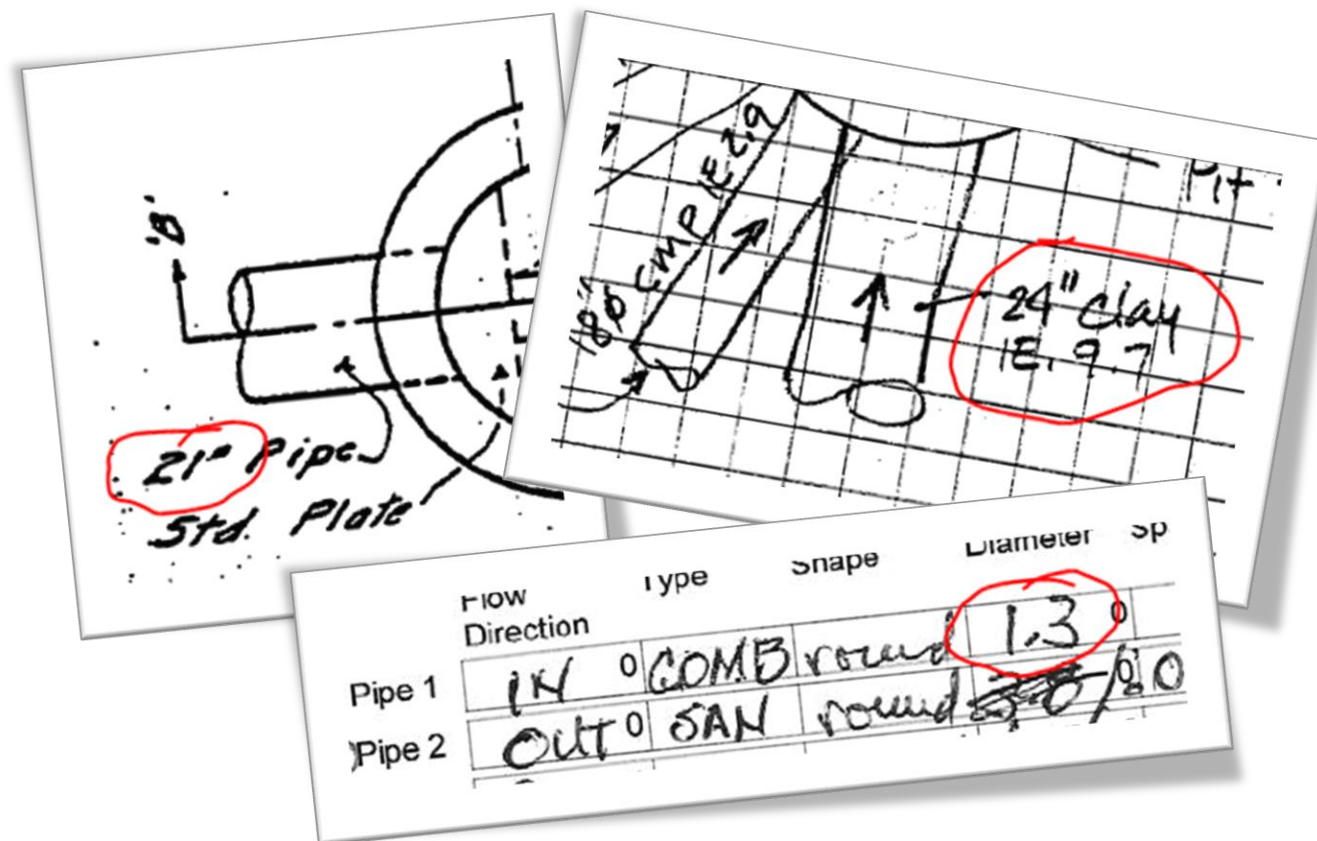
PIPE INFORMATION

Pipe	Flow Direction	Type
Pipe 1	In	0
Pipe 2	out	0
Pipe 3	out	0
Pipe 4	In	0
Pipe 5	0	0
Pipe 6	0	0

no grate



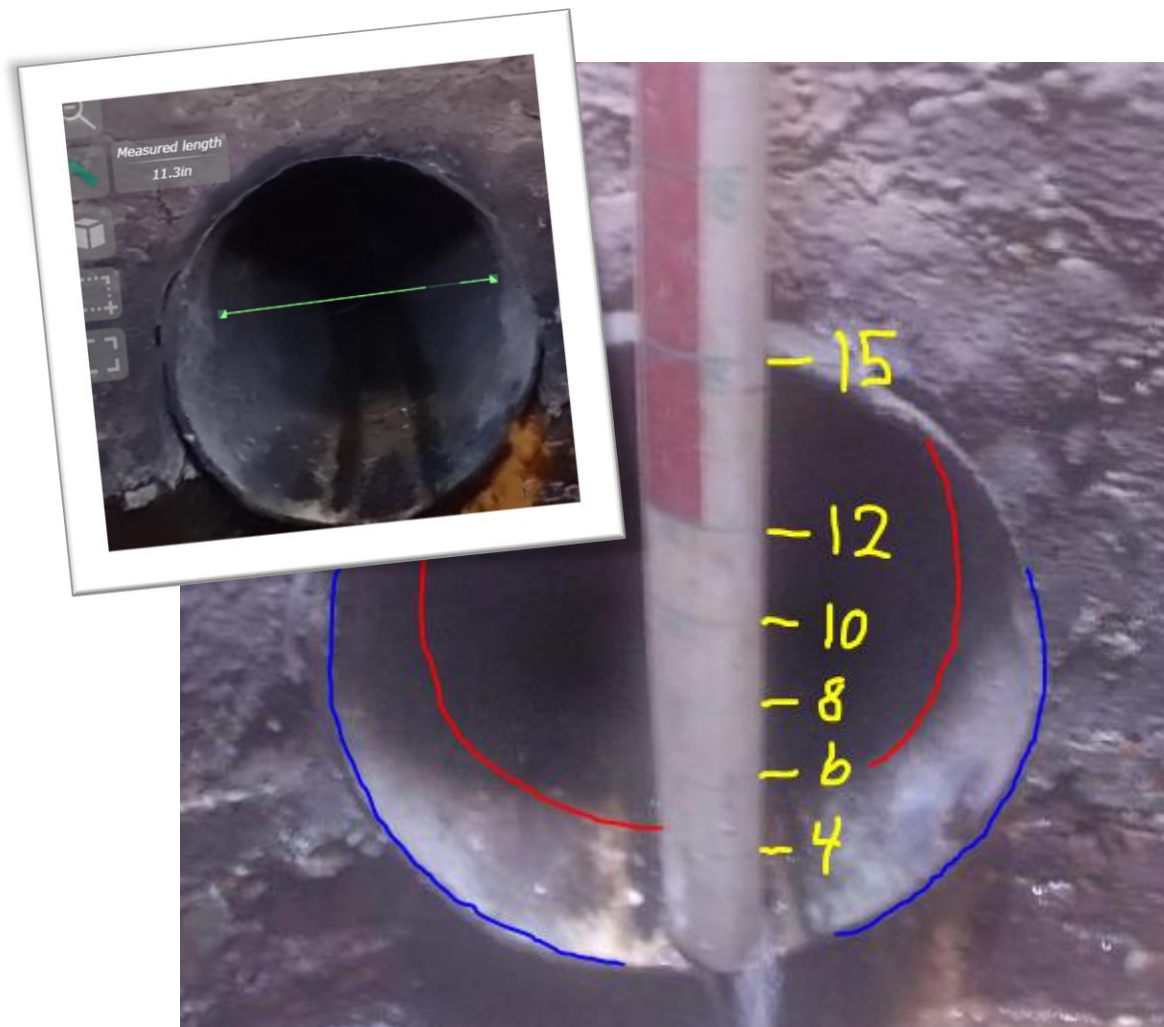
Real World Inspection Challenges:



- 1993 Pipe Diameter: 21" or 24"
- 2005 Pipe Diameter: 1.3' (15.6")
- 2021 Pipe Diameter: ???

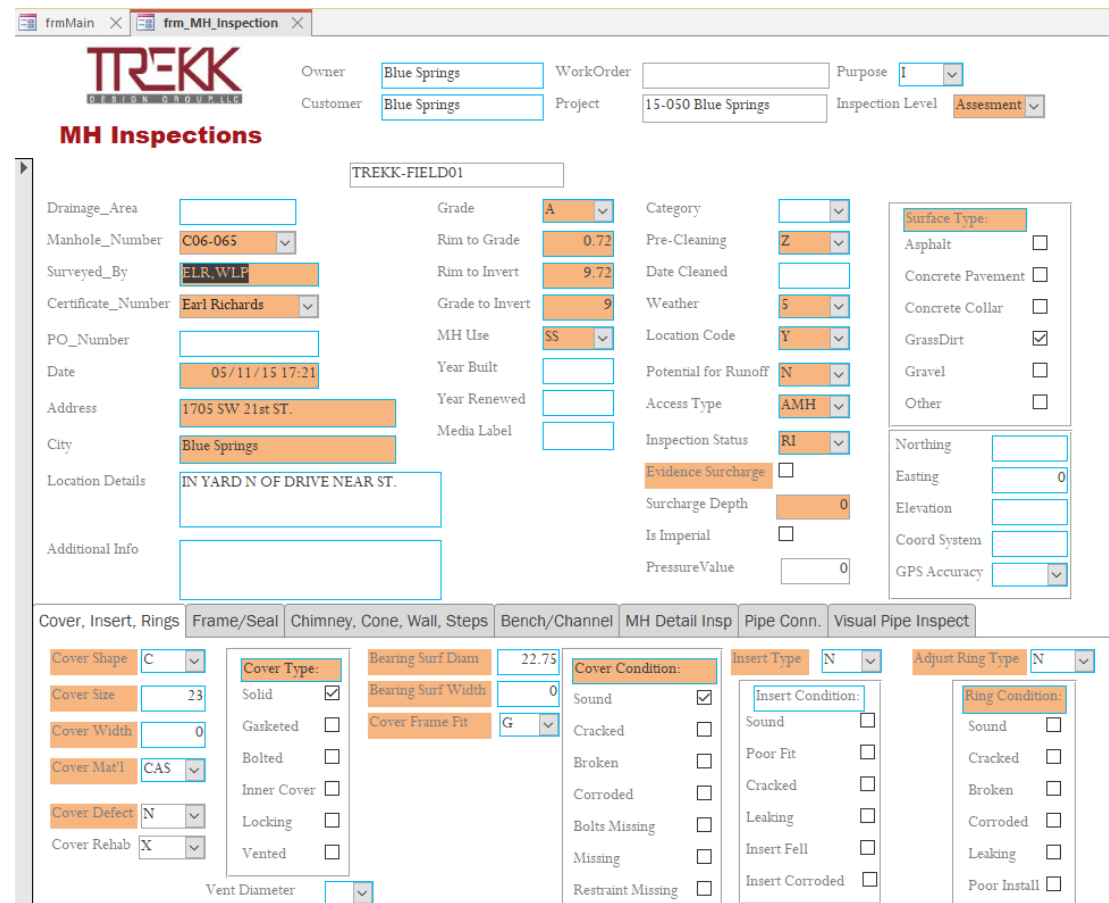
In Our World, Accuracy Can Be Tricky...

- Rod in flared end of CIPP Liner.
- It appears like 15" at first glance.
- Original GIS said 12" pipe.
- Liner subtracts at least 0.5" from 12".
- Better to call it 11" pipe.
- (Verified with 3D Model.)



The Old Ways Weren't Working...

- Legacy forms allowed more error.
- Photos were being assigned incorrectly.
- Photos were going missing.
- We didn't have comprehensive visuals.
- Logic was hard to program before.
- Reports were time-consuming to create.
- (Queue Fulcrum & 360-Photography.)



The screenshot shows a software window titled 'frm_MH_Inspection' with the TREKK logo. The form includes the following fields and options:

- Owner:** Blue Springs
- Customer:** Blue Springs
- WorkOrder:** (empty)
- Project:** 15-050 Blue Springs
- Purpose:** I
- Inspection Level:** Assessment

MH Inspections

TREKK-FIELD01

Drainage_Area: (empty)

Manhole_Number: C06-065

Surveyed_By: ELR_WLP

Certificate_Number: Earl Richards

PO_Number: (empty)

Date: 05/11/15 17:21

Address: 1705 SW 21st ST.

City: Blue Springs

Location Details: IN YARD N OF DRIVE NEAR ST.

Additional Info: (empty)

Grade: A

Rim to Grade: 0.72

Rim to Invert: 9.72

Grade to Invert: 9

MH Use: SS

Year Built: (empty)

Year Renewed: (empty)

Media Label: (empty)

Category: (empty)

Pre-Cleaning: Z

Date Cleaned: (empty)

Weather: 5

Location Code: Y

Potential for Runoff: N

Access Type: AMH

Inspection Status: RI

Surface Type:

- Asphalt
- Concrete Pavement
- Concrete Collar
- GrassDirt
- Gravel
- Other

Northing: (empty)

Easting: 0

Elevation: (empty)

Coord System: (empty)

GPS Accuracy: (empty)

Evidence Surcharge:

Surcharge Depth: 0

Is Imperial:

PressureValue: 0

Cover, Insert, Rings | **Frame/Seal** | **Chimney, Cone, Wall, Steps** | **Bench/Channel** | **MH Detail Insp** | **Pipe Conn.** | **Visual Pipe Inspect**

Cover Shape: C

Cover Size: 23

Cover Width: 0

Cover Mat'l: CAS

Cover Defect: N

Cover Rehab: X

Vent Diameter: (empty)

Cover Type:

- Solid
- Gasketed
- Bolted
- Inner Cover
- Locking
- Vented

Bearing Surf Diam: 22.75

Bearing Surf Width: 0

Cover Frame Fit: G

Cover Condition:

- Sound
- Cracked
- Broken
- Corroded
- Bolts Missing
- Missing
- Restraint Missing

Insert Type: N

Insert Condition:

- Sound
- Poor Fit
- Cracked
- Leaking
- Insert Fell
- Insert Corroded

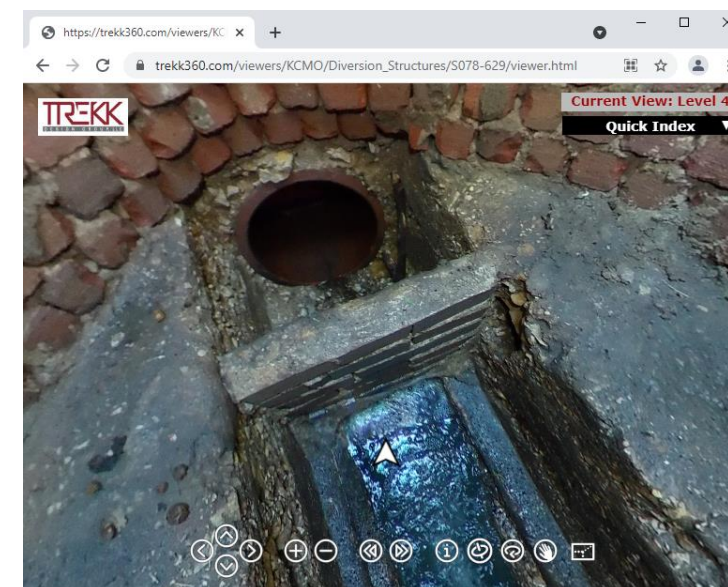
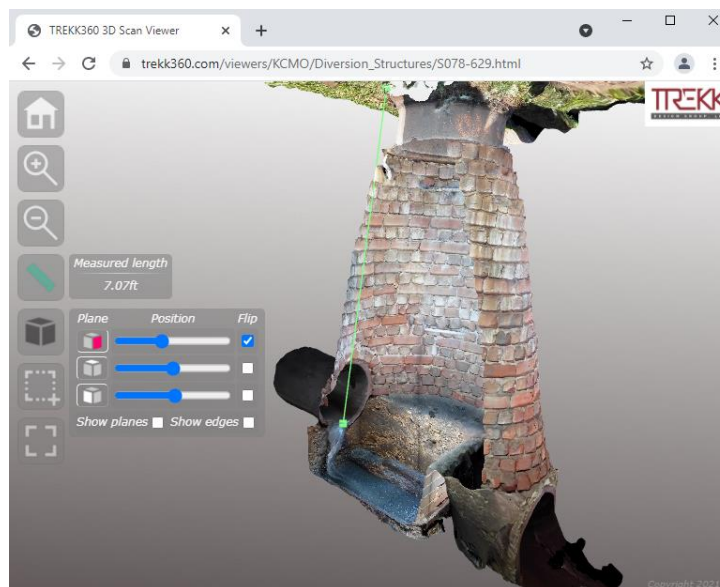
Adjust Ring Type: N

Ring Condition:

- Sound
- Cracked
- Broken
- Corroded
- Leaking
- Poor Install

The Importance of 360° Photography...

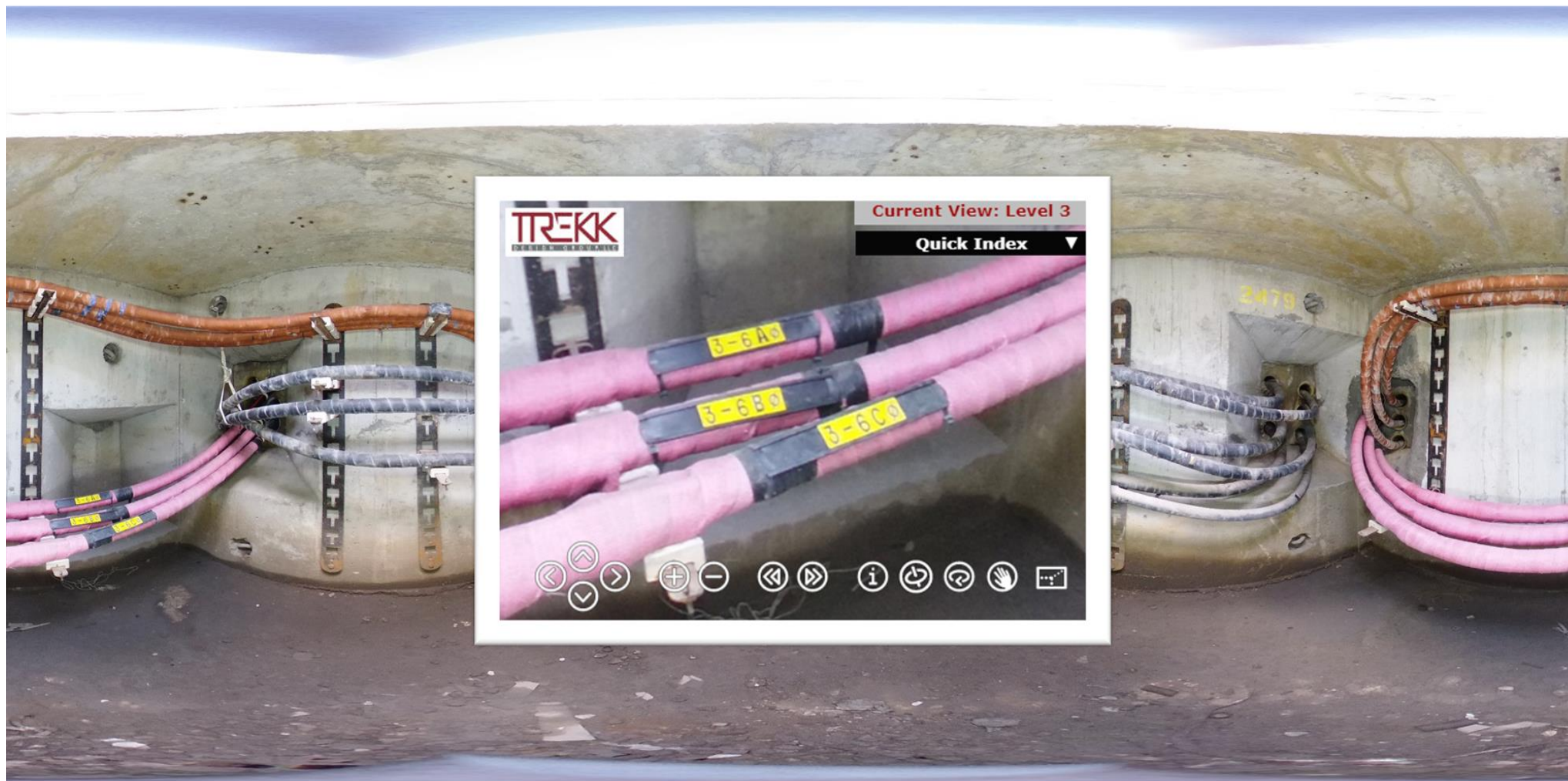
- Minimizes confined space entry
- Allows you to complete field inspections in the office
- Panoramic Views (like Google Street View)
- 3D model exports enable measurement abilities
- Safety advantages:
 - Wire-free operation
 - Less H2S exposure
 - No manned entry



360 Photos Offer Safer Perspectives...

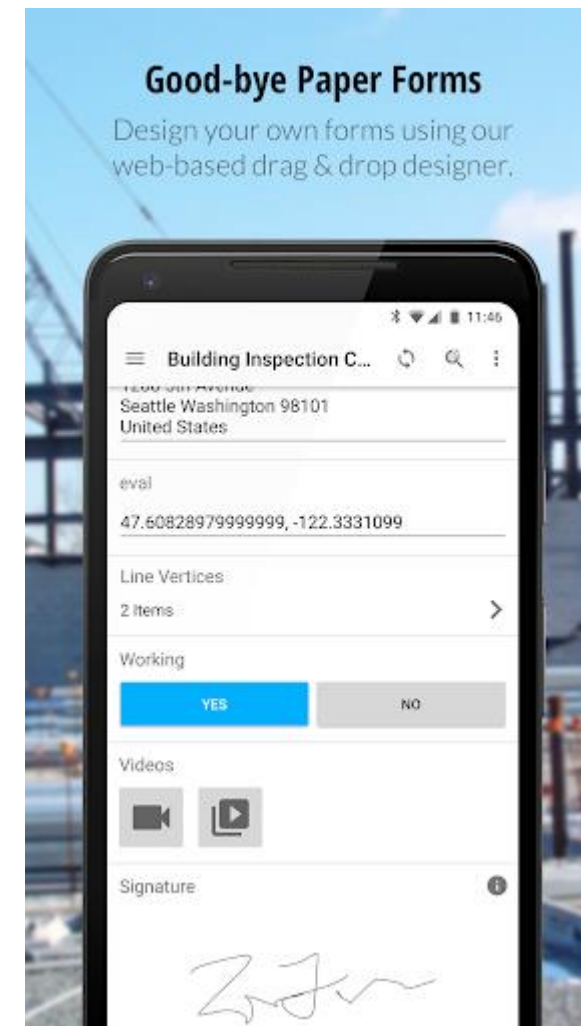


They Also Provide Quality Visuals...




The Importance of Fulcrum for Data Collection...

- Low-Code / No-Code reduces labor
 - Forms are quicker to code
 - Smart logic is easier to program
 - Reports are automatic
 - Imports & Exports & Data Shares are powerful
- Updates are instant across all field and office teams
- Real-time collaboration is only one sync button away
- The flexible power of building Smart forms means:
 - Less field and office technician training required
 - Higher consistency through guided data entry



One Overlooked Bonus: Clean Inspection Reports




██████████ 2019-06-07

Created 2019-05-14 16:30:02 CDT by Jared Carey
 Updated 2019-06-10 21:36:50 CDT by Jared Carey
 Location ██████████
 Status ■ Inspection Complete

Office Only

QC Review Status Review Complete
 QC Review Name Jared Carey
 QC Review Date 2019-06-10
 Inspection Date 2019-06-07
 Inspection Crew Earl Richards


GSE_FID ██████████
 GSE_FNO ██████████
 UFLID ██████████
 MATERIAL NL
 FAC_OWNER ██████████
 X ██████████
 Y ██████████
 GPSX 0.0
 GPSY 0.0
 EQUIP_NUM ██████████
 XMIR_KVA 0
 CAP_BANK ██████████
 Area Photo



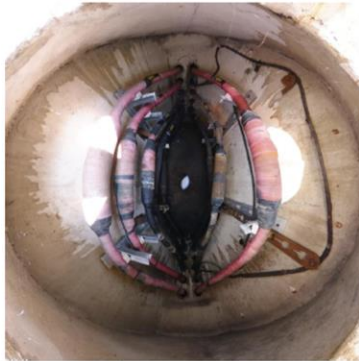
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Phone: 616.674.4655
www.trekkilc.com

IMPROVING LIVES.

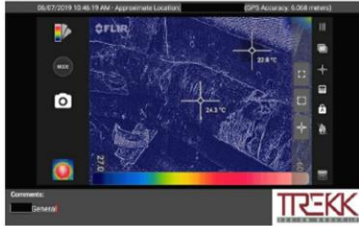
Page: 1 of 4



Top Photo



General Infrared Photo




Cable, SPLICE LEAKING

Inspection Name MV
 Inspection Type DETAILED
 Deficiency Status OPEN
 Deficiency Type Cable
 Deficiency Value (Cable) SPLICE LEAKING
 Deficiency Description
 Deficiency Comments Possible leak on ██████████ no unusual temperature profile

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Deficiency Photo



Cable, PRIMARY SUPPORT DAMAGED

Inspection Name MV
 Inspection Type DETAILED
 Deficiency Status OPEN
 Deficiency Type Cable
 Deficiency Value (Cable) PRIMARY SUPPORT DAMAGED
 Deficiency Description
 Deficiency Quantity 2
 Deficiency Comments corroded support brackets
 Deficiency Photo



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Fulcrum Reports Scale Across Our Many Disciplines

Lateral, 4951, Outlook St., Mission, , KS, 66202, United States

Created	2021-11-17 10:42:37 CST by Joann Smith
Updated	2021-12-23 13:43:47 CST by Tim Mathes
Location	39.039149656, -94.652064016
Status	Inspection Complete
Inspection Type	Lateral

General Information

Project Location (job)	Outlook St
Surveyed By	Gabe Gonzalez, Dennis Major
Date	2021-12-22
Time	12:36

Lateral General Information

Address	4951 Outlook St Mission, KS 66202
---------	--------------------------------------

Area Photo of Property

GPS Live Info

1	
Lateral Number	1
Lateral Material	VCP

Mainline Tap

Lateral GPS Accuracy	Survey Grade
----------------------	--------------

Lateral GPS Information

Lateral GPS Accuracy Numeric	0.016970564
Lateral GPS Time	Thu Dec 23 2021 13:40:55 GMT-0600 (CST)
Lateral GPS X	-94.652172093
Lateral GPS Y	39.039212387
Lateral GPS Z	953.778
Lateral GPS Location Description	Mainline Tap

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Lateral GPS Location Photo

Lateral Depth Feet	5.4
--------------------	-----

Centerline of Road

Lateral GPS Accuracy	Survey Grade
----------------------	--------------

Lateral GPS Information

Lateral GPS Accuracy Numeric	0.014866069
Lateral GPS Time	Thu Dec 23 2021 13:41:54 GMT-0600 (CST)
Lateral GPS X	-94.65210993366667
Lateral GPS Y	39.03920752516667
Lateral GPS Z	953.958
Lateral GPS Location Description	Centerline of Road
Lateral GPS Location Photo	

Lateral Depth Feet	4.5
--------------------	-----

Back of Curb

Lateral GPS Accuracy	Survey Grade
----------------------	--------------

Lateral GPS Information

Lateral GPS Accuracy Numeric	0.009433981
------------------------------	-------------

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Lateral GPS Time	Thu Dec 23 2021 13:42:26 GMT-0600 (CST)
Lateral GPS X	-94.6520593195
Lateral GPS Y	39.039206153833334
Lateral GPS Z	953.237
Lateral GPS Location Description	Back of Curb
Lateral GPS Location Photo	

Lateral Depth Feet	3.11
--------------------	------

Right of Way

Lateral GPS Accuracy	Survey Grade
----------------------	--------------

Lateral GPS Information

Lateral GPS Accuracy Numeric	0.014866069
Lateral GPS Time	Thu Dec 23 2021 13:43:03 GMT-0600 (CST)
Lateral GPS X	-94.65200792666667
Lateral GPS Y	39.03920961316667
Lateral GPS Z	953.978
Lateral GPS Location Description	Right of Way
Lateral GPS Location Photo	

Lateral Depth Feet	4.1
--------------------	-----

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IMPROVING LIVES. Page: 3 of 3

So How Did This Change the Game for Us...

- The Old Way vs Leveraged Technology:
 - Improved QA/QC?
 - Simplified Communication?
 - Collaboration?
 - Bridging the Field to Office Gap?
- Metrics to prove ROI:
 - Field revisits have reduced from roughly 6% to 1%.
 - Total inspection labor has reduced roughly by 25%.
 - Ability to natively work offline in the field
 - Performing office-based virtual inspections
 - Conforming “Smart” Forms to increase data relevance
 - No photos are missed, nor misplaced

Behind the Scenes: How We Leverage Fulcrum

The image shows a screenshot of the Fulcrum software interface. The background is a form layout for 'UG Storm Inspections 22-0023'. The form includes fields for 'Structure ID', 'Structure Type', 'Office Only', 'QC Review Status', 'QC Review Name', 'QC Review Date', 'QC Review Comments', and 'Final QC Reviewer Name'. There are also sections for 'GPS Accuracy' and 'GPS Information' with fields for 'GPS Accuracy Numeric', 'GPS Time', 'X coordinate', 'Y coordinate', and 'Rim Elevation'. A sidebar on the left lists various field types like Text, Numeric, Yes/No, Date, Time, Choice, Design, and Media.

Overlaid on the form is a code editor window showing JavaScript code for handling photo orientation and GPS data. The code includes comments and logic for different platforms (iOS and Android).

```

14 //FORCE TOPSIDE PHOTO TO BE HORIZONTAL
15 ON('add-photo', 'topside_photo', function(event) {
16   if (event.value.width < event.value.height) {
17     if (PLATFORM() === 'iOS') {
18       INVALID('Please retake this photo in landscape orientation. If you *did* take the photo in landscape orientation, check to ensure your device \'portrait orientation lock\' is OFF.');
```

```

19     } else {
20       INVALID('Please retake the photo in landscape orientation.');
```

```

21     }
22   }
23 });
24
25
26 //GPS Coordinate Capture
27 //This is the code storing the coordinates and accuracy level in the GPS fields of each record
28 ON('change-geometry', function (event) {
29   var location = CURRENTLOCATION();
30   if ((PLATFORM() === 'Android') || (PLATFORM() === 'iOS')) {
31     if (location.accuracy < 0.05) {
32       SETVALUE(('gps_accuracy'), 'Survey Grade');
```

```

33       SETVALUE(('gps_accuracy_numeric'), location.accuracy);
34       SETVALUE(('gps_time'), new Date(location.timestamp * 1000).toLocaleString());
35       SETVALUE(('sn_rim_ele'), ROUND((location.altitude * 3.280833), 3));
36       SETVALUE(('sn_x'), location.longitude);
37       SETVALUE(('sn_y'), location.latitude);
38       SETVALUE(('sn_rim_cd'), '4 - GPS Points');
```

```

39     } else {
40       ALERT('Warning!', 'Position of GPS was not survey level accuracy. Try again, or add a comment for why GPS cannot be obtained.');
```

```

41       SETVALUE(('gps_accuracy'), 'Mapping Grade');
```

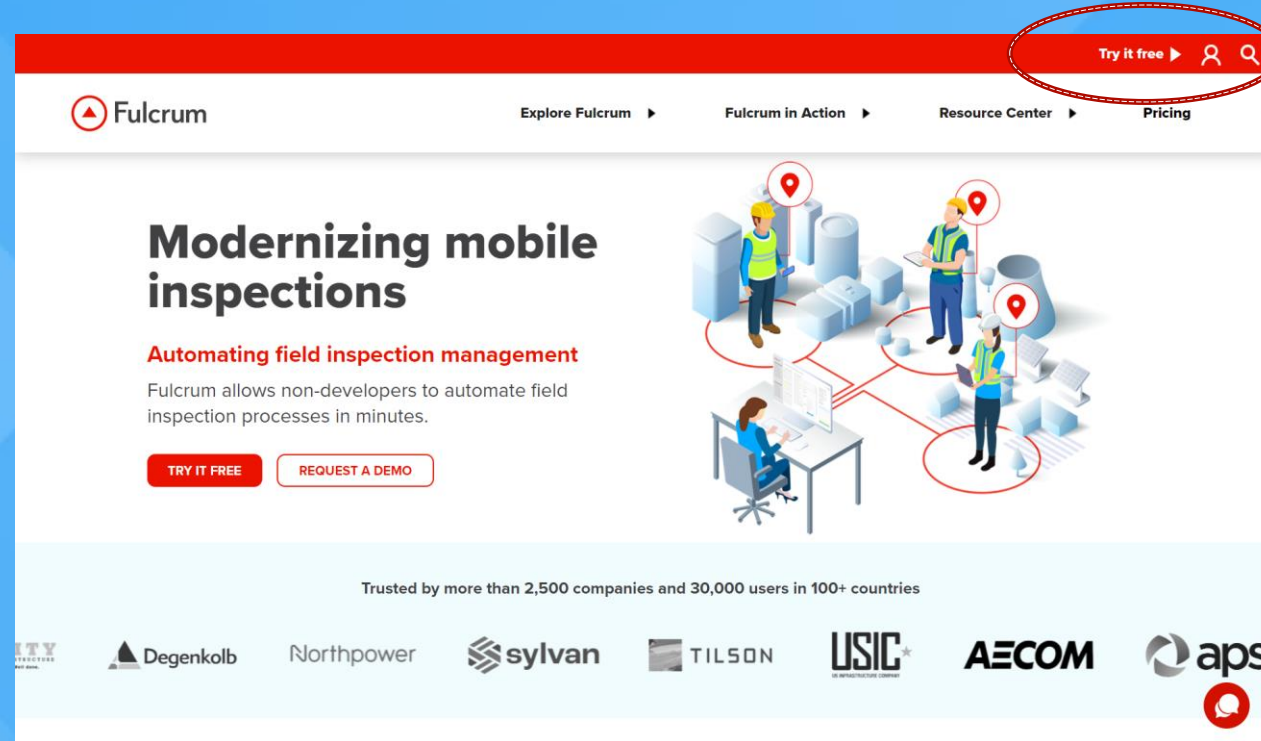
```

42       SETVALUE(('gps_accuracy_numeric'), location.accuracy);
43       SETVALUE(('gps_time'), new Date(location.timestamp * 1000).toLocaleString());
44       SETVALUE(('sn_rim_ele'), ROUND((location.altitude * 3.280833), 3));
45       SETVALUE(('sn_x'), location.longitude);

```

Live Demo

Thank you for listening! Questions?



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