ELECTRI International

ELECTRI Research Update: Rework

Understanding, Identifying and Measuring Rework

Presenters:

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Format of Council Room Sessions

We encourage you to ask questions and share your own experiences.

If you have questions, go to the reactions button at the bottom of the screen in Zoom and raise your hand or type questions directly into the chat box.

Stay on mute until your name is called after you raise your hand.

ELECTRI

Understanding, Identifying and Measuring Rework

The Team

Task Force

Steve Killius (Co-Chair)
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Josh Bone

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Build an accountable team with shared destiny

Measure what matters

Rework

🫢 What is Rework?

Unpaid rework refers to:

- activities in the field (including prefabrication) that have to be done more than once, or

- activities that remove work previously installed as part of the project,

- where no change order has been issued and

- no change of scope has been identified by the Owner.

💰 Let's break it down

Imagine your company generates **$20M** in revenue:

- 👷 50% Labor = $10M

- 📦 50% Materials = $10M

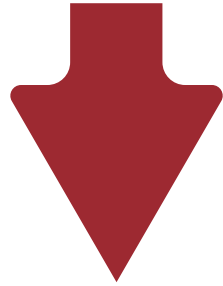If **only** 1% of you labor is lost to rework

Then
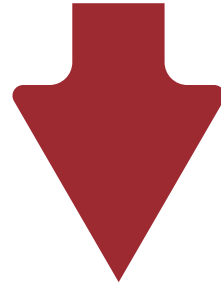
$100K of bottom-line profit is gone… year after year…
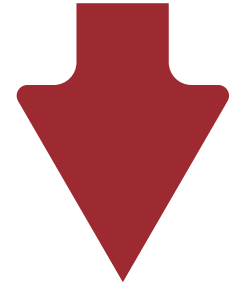
🔦 The Hidden Costs of Rework

Morale ⬇

Time ⬇

Quality ⬇

Reputation ⬇
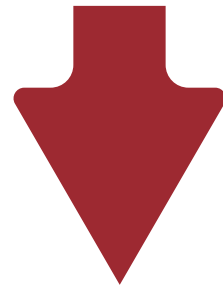
Internal Tension ⬆
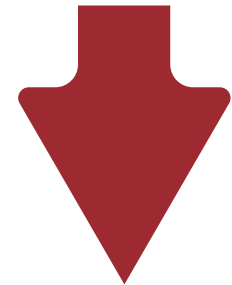
Client Relations ⬇

Why this project?

Rework is disrespectful and demoralizing to all our people!

Rework is abnormal work!

Rework has different root causes leading to different problems

Not talking about or documenting rework doesn't make it invisible – it makes it a **repeat offender**!

Rework = Erosion of your bottom-line year after year!

Take Action and…

Get a GRIP on Rework!

This ELECTRI Project

Create a playbook for electrical contractors that will help you:

1. Understand rework culture.

2. Identify and understand problems causing rework.

3. Turn mistakes into learning opportunities.

4. Strategically reduce rework.

Introducing 🔥 GRIP 🔥
Your _G_uided _R_ework _I_mprovement _P_ackage!

GRIP

GRIP

Guided Rework Improvement Package

COMBAT Strategy — Supporting Tools

Check your Company's Rework Culture

1. Check
2. Outline
3. Measure
4. Build
5. Assess
6. Teach

Error Aversion

Error Management

Rework Culture

Check your Company's Rework Culture

Measure rework culture:

- Perception regarding 17 statements that describe error management culture

- Perception regarding 11 statements that describe error aversion culture

Check your Company's Rework Culture

- Respondents recognize mistakes as valuable for learning and growth.
- There is strong perseverance toward goals despite mistakes.
- The culture supports seeking advice when errors occur.
- Respondents acknowledge the importance of being open about errors and seeking help from others.
- Respondents disagree with the idea that admitting to errors is asking for trouble.
- There is room for improvement in developing a structured organizational system to learn from errors collectively, analyze mistakes thoroughly, and prevent future mistakes.

Outline a Problem-Solving Framework

1. Check

2. Outline

3. Measure

4. Build

5. Assess

6. Teach

$Rework = Abnormal\ Work = Problems = Opportunity\ for\ Problem\ Solving$

Therefore

There is a need for a
structured problem-solving framework
at all levels!

- Prefab
- Estimation
- Procurement
- PM
- VDC
- Field Leader
- Workforce
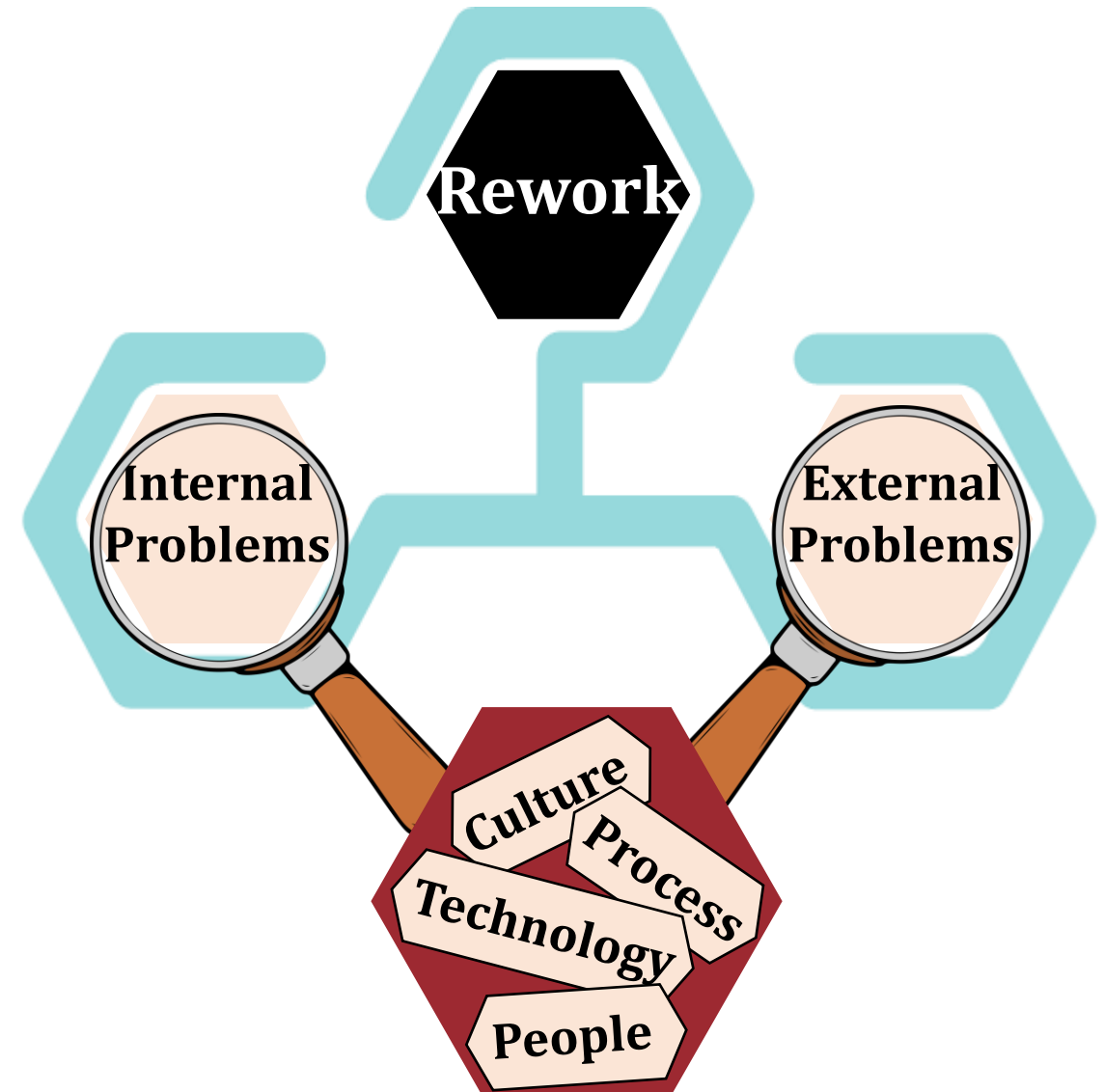- And many more

Outline a Problem-Solving Framework

100+

Problems collected from

Outline a Problem-Solving Framework

1. Check

2. Outline

3. Measure

4. Build

5. Assess

6. Teach

Rework Troubleshooting Form Template

Section	Details
Project Name	*Add Project Name*
Recorder Name	*Add Name*
Date Reported	*Add Date*
Problem Category	*Develop a prepopulated list of Problem Categories*
Problem Sub-category	*Develop a prepopulated list of Problem Sub-Categories to be more specific*
Problem Description	*Provide a description of the problem*
Problem Impact	*Assess the impact of the problem [low, medium, high]*
Where in the project?	*Specify where in the project the rework event occurred (office, field, prefab, procurement, planning, kickoff, etc.)*
When in the project?	*Specify when in the project the rework event occurred*
Who was involved?	*Specify wo was involved and impacted by the rework event*
Root Cause	*Use 5 Whys to get to the root cause. Don't guess. Use Facts.*
Countermeasure (Y/N)	*Yes/No*
Countermeasure Action	*If yes, indicate what the countermeasure was*
Countermeasure Type	*If yes, indicate if the countermeasure was Temporary or Permanent*
Countermeasure Success	*If yes, indicate if the countermeasure was successful*

Based on the 8-Step Problem Solving Framework.

Measure Rework Systematically

Sidebar navigation:
1. Check
2. Outline
3. Measure
4. Build
5. Assess
6. Teach

Timeline: Day 1 ... ... Day *i* ... ... Day *n*

Day *i* branch:
- Rework Event #1
  - At Point of Detection
  - At Point of Occurrence
    - Record Rework
      - Apply Problem-Solving
        - Document
- End-of-Day Reflection
  - End-of-Day Problem Solving
    - Document

Day *n* branch:
- i.e., Lesson Learned
- PPR Post-Project Review
  - End-of-Project Problem Solving

Measure Rework Systematically

Job Coding Worksheet

Low Voltage		Electrical	
Suffix	**Scopes of Work**	**Suffix**	**Scope of Work**
VD	Voice/Data/Coax/Fiber	E	Electrical
FA	Fire Alarm		
NC	Nurse Call		**Disciplines within Scope**
CAM	Cameras	01	Layout/Preplan/AsBuilds/Submittals/O&M
GE	GE - Medical & Telemetry	02	Demo
BA	Building Automation	03	Material Handle/Cleaning
AC	Access Control	04	Temporary
BI	Burglar/Intrusion	05	
		06	Feeder Conduit
		07	Feeder Wire
	Disciplines within Scope	08	Feeder Cable
01	Layout/Preplan/AsBuilds/Submittals/O&M	09	
02	Demo	10	Branch Conduit
03	Material Handle/Cleaning	11	Branch Wire
04	Rough In	12	Branch Cable
05	Cable Tray/Basket	13	
06	J-Hooks/Sleeves/Fire Stopping	14	Light Fixtures
07	MDF/IDF work - building the room	15	Devices and Plates
08	Pull Wire/Stuff Wire/Sort Wire	16	Prewired Assemblies
09	Terminate/Label	17	Equipment Connections & Disconnects
10	Test/Commission/Troubleshoot	18	Subpanels & Transformers
RW	REWORK	19	
		20	Generators & Transfer Switches
		21	Service Equipment & Switchboards
		22	Test/Commission/Troubleshoot
		RW	REWORK

When posting time - the job number is entered first, followed by the Scope Suffix and finally the Discipline Suffix (example - 3600-VD-02 would be job 3600 working on voice

REWORK DEFINITION: Activities in the field (including prebabrication) that have to be done more than once in the field, or activities which remove work previously installed as part of the project regardless of source, where no change order has been issued and no change in scope has been issued

When posting time with rework - the job number is entered first, followed by the Scope Suffix and finally the Disclipline Suffix (example: 3600-VD-RW would be job 3600 work on voice & data rework)

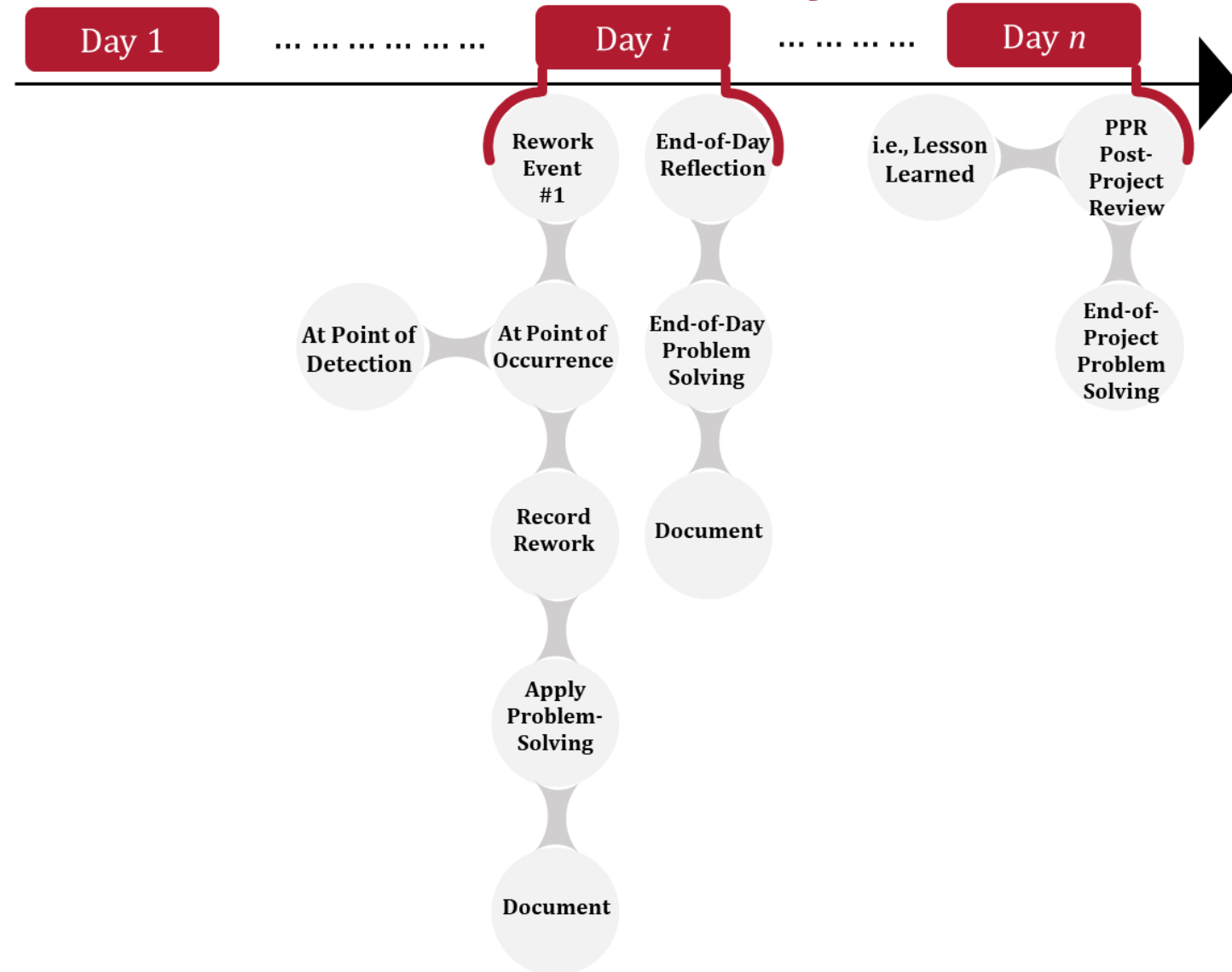© Shea Electric and Communications, LLC

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1. Check

2. Outline

3. Measure

4. Build

5. Assess

6. Teach

Measure Rework Systematically

1. Check

2. Outline

3. Measure

4. Build

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6. Teach

Post Project Review "PPR" Process

1. Determine the team members who will attend the PPR meeting. One apprentice who was involved on the project must attend the meeting.
2. Schedule a date and location to hold the PPR meeting. This needs to happen within 30 days after the project is finished.
3. Team members should review the PPR outline and make notes for discussion prior to the PPR meeting.
4. One person shall be declared the "note taker" for the meeting. This person will note the important takeaways to be shared after the meeting.
5. The PPR meeting shall follow the PPR outline. Remember the purpose of the PPR is to have meaningful conversation, but to also follow the outline and stay on track.
6. After the meeting is completed, the "note taker" shall type up the notes and send out to the group who attended the PPR. This will ensure the notes are accurate. These must be sent out within two business days after the meeting.
7. Once the notes have been reviewed the PPR group, the notes shall be emailed out company wide.
8. One apprentice who attended the PPR shall share the notes at the next company meeting.
9. The PPR notes shall be placed in the job file on the server.
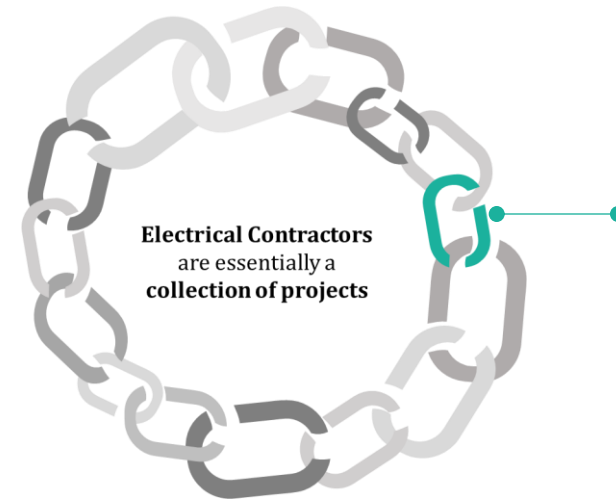
Build the Right Strategic Pilot Project

- Engage a Committed Field Leader

- Select the Right Project

- Apply the System and Measure Rework

- Secure Leadership Support

- Be Patient and Focused

Electrical Contractors are essentially a collection of projects

Build the right strategic pilot project!

Assess Outcomes

- Evaluate the results

- Evaluate the system

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Credit: Pict Rider
1193052301

Teach the Approach to Others
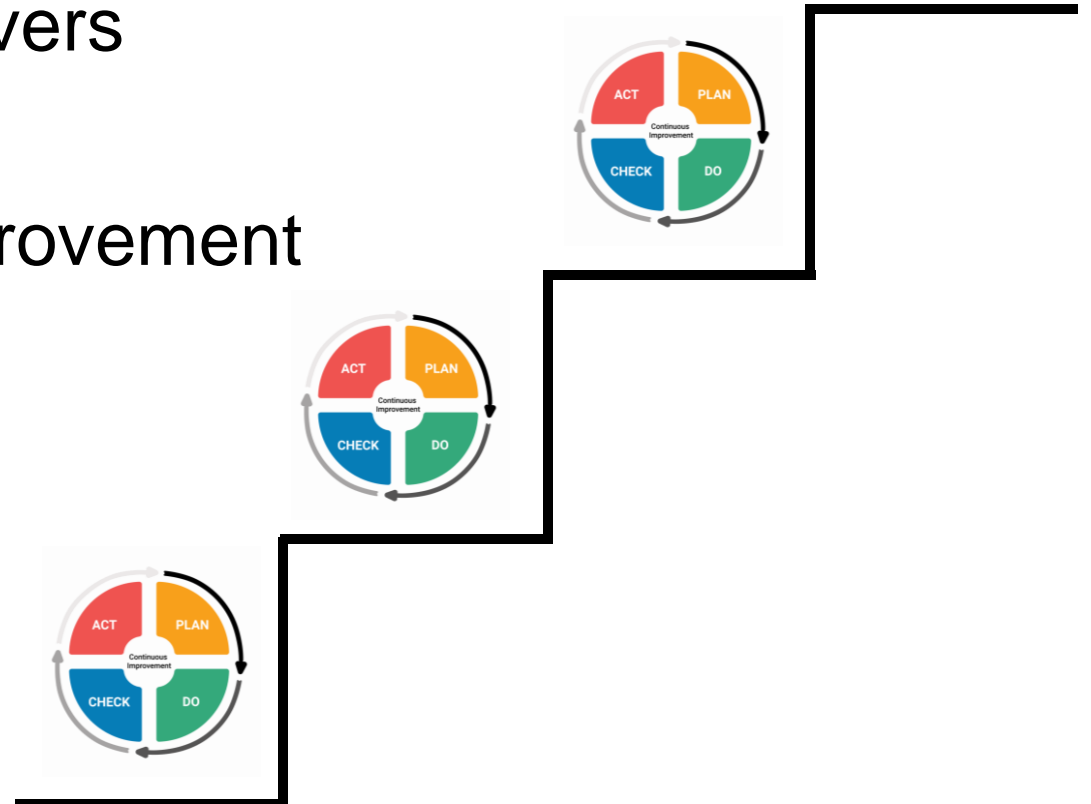
- Change does not happen unless you standardize

- Empower problem-solvers

- Foster continuous improvement

More Success!

Rework Culture P.A.T.H.
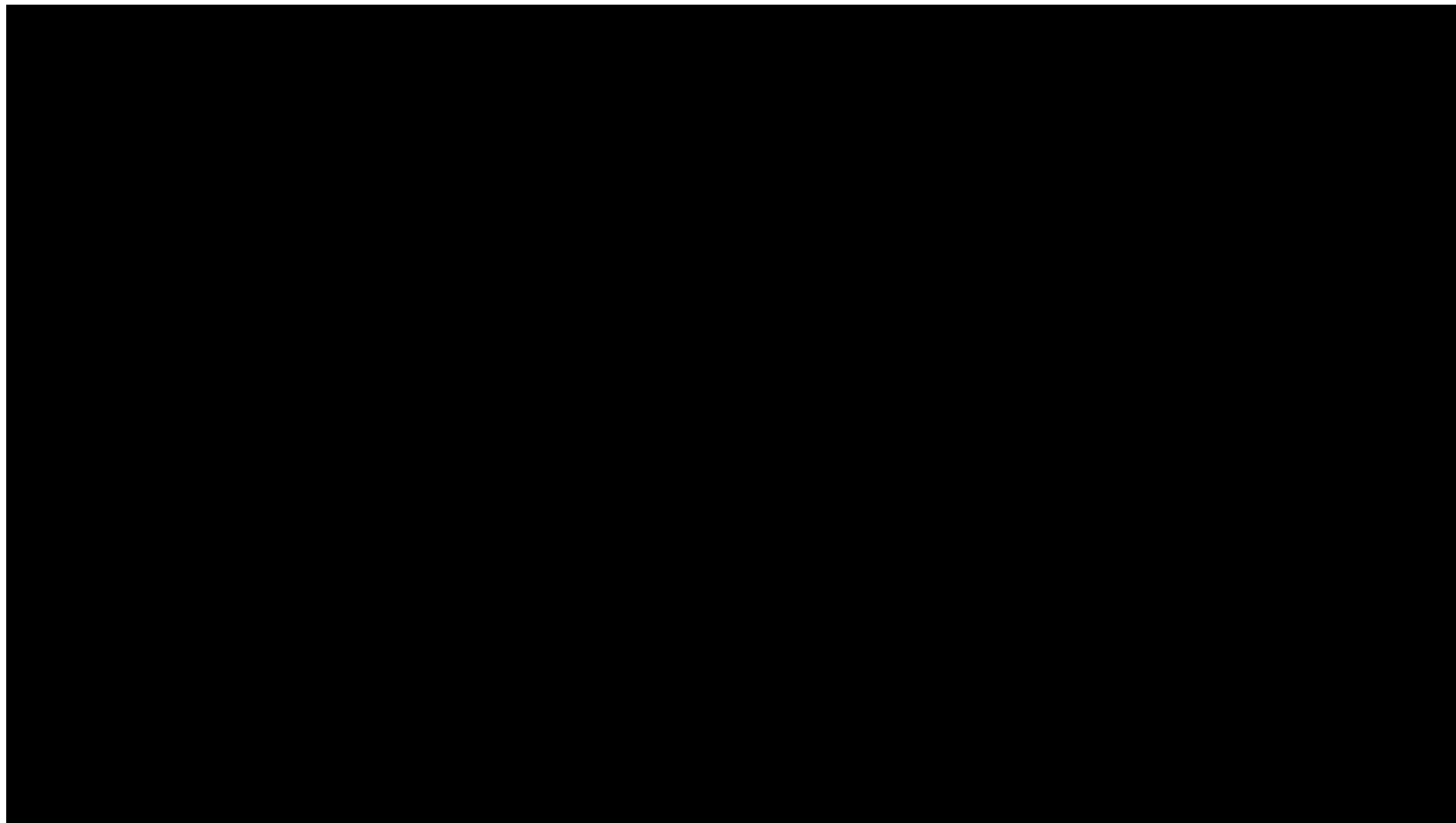
P.A.T.H.

Kickoff Meeting

Field Leader

Rework Form

- Rework Culture Perception Assessment Tool of Habits

- Rework Culture P.A.T.H. is an excel tool to:
    - Continuously assess your culture.
    - Identify recurring behaviors and attitudes that contribute to rework.
    - Focus on improving processes by changing habits that lead to inefficiency.

P.A.T.H. Promotional Video

Kickoff Meeting – Rework Considerations
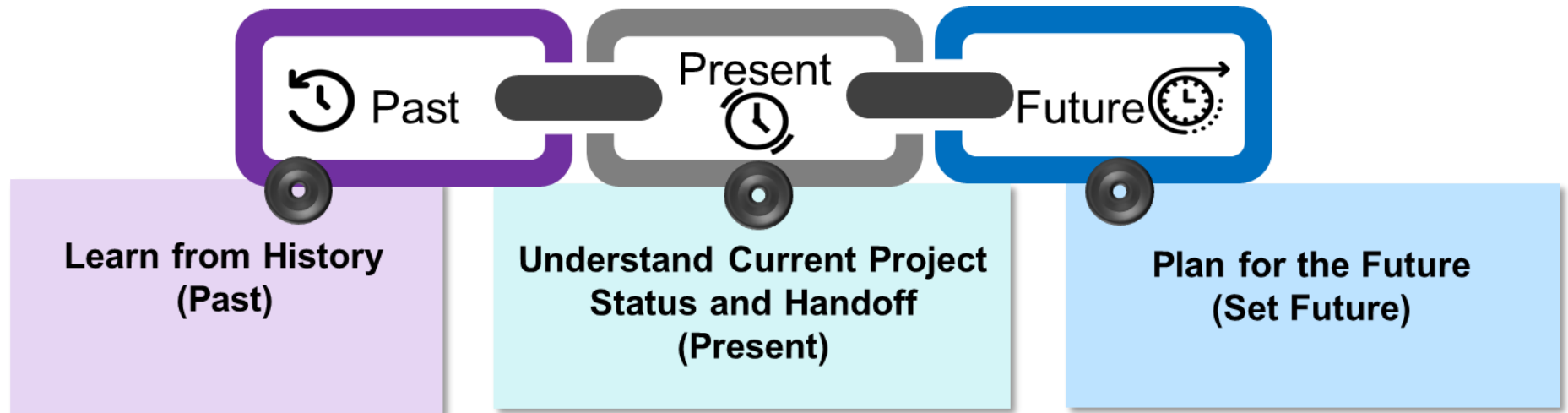
P.A.T.H.

Kickoff Meeting

Field Leader

Rework Form

Past · Present · Future

Learn from History (Past)

Understand Current Project Status and Handoff (Present)

Plan for the Future (Set Future)

See Template

Kickoff Meeting – Rework Considerations

P.A.T.H.

Kickoff Meeting

Field Leader

Rework Form

DRAFT Kickoff Meeting – Rework Considerations

Project Team

Internal Team

☐ Ensure all necessary stakeholders are present.

Position	Name	Kickoff Attendance	Kickoff Attendance Status
Project Manager		Mandatory	
Field Leader		Mandatory	
Prefab Director		Mandatory	
Design Team			
Estimator		Mandatory	
VDC Manager		Mandatory	
Purchasing Agent		Mandatory	
Accounting Representative		Mandatory	
Executive		Mandatory	
List other internal team members			

External Team

Position	Name	Aware of any special requirements?	Special Requirements Notes
Owner			
Architect/Engineer			
General Contractor			
Other Specialty Contractors			
Electrical Subcontractors			
Vendors/Suppliers			
List other external stakeholders			

Field Leader Checklist

Field Leader

- Effective leadership in the field requires not only managing tasks but also anticipating and preventing potential issues.

- This checklist outlines practical actions that field leaders can implement to manage rework.

See Template

Field Leader Checklist

P.A.T.H.

Kickoff Meeting

Field Leader

Rework Form

Rework Field Leader Checklist to Drive Continuous Improvement

Field and PM
☐ Always confirm change orders with the electrical project manager before proceeding.
☐ Report and discuss mistakes with the project manager immediately—no skipping lessons learned.

Field and Prefab Relationship
☐ Ensure clear, consistent communication between Prefab teams and field.
☐ Don't assume Prefab designers know field requirements – communicate specific needs.
☐ Maintain clear coordination between project managers, field, and prefab teams on equipment specs and installations.
☐ Verify Prefab designs align with field conditions before installation begins.
☐ Provide specific instructions for Prefab material handling (loading, delivery, etc.).
☐ Verify all Prefab components upon arrival – don't assume they're correct.

Field and VDC
☐ Regularly update VDC teams on any field changes – don't assume they know.

On the Jobsite
Leadership
Internal
☐ Take time to get to know your crew better through informal discussions. Understand your crew members better. Learn about their past experience, strengths, areas for improvement,

Rework Form

- The Rework Troubleshooting Form is designed based on the 8-step problem-solving approach and provides a standardized form to identify, document, and solve rework events when the occur.

See Template

Rework Form

Rework Troubleshooting Form Template

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*Based on the 8-Step Problem Solving Framework.

Get your reading glasses!

Final Report

Understanding, Identifying and Measuring Rework

ELECTRI International
Research and Education for the Electrical Construction Industry

Prepared by Hala Nassereddine, Ph.D.
NCM Consulting LLC

Feedback

I read the executive summary and am very impressed.

This is some great stuff!

I found the Field Leader Checklist to be particularly helpful in providing guidance for new superintendents

The Learn from the Past section is something I plan to incorporate moving forward. Not sure why we haven't been doing that all along! And the idea of discussing/implementing a rework reporting system is new for us.

If you are interested, please email Hala Nassereddine
at
hala.m.nassereddine@gmail.com

Q&A

THANK YOU!