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BEST PRACTICES IN PLANNING FOR PRODUCTIVITY

Commissioned by ELECTRI International.
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ELECTRI INTERNATIONAL
Research and Education for the Electrical Construction Industry



Acknowledgements

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About the Author



Amelia Celoza, PhD is an Assistant Professor in the Department of Civil, Environmental, and Architectural Engineering at the University of Colorado Boulder. She earned her BSE in Civil Engineering from Arizona State University and her MS in Civil Engineering from Stanford University, focusing on Sustainable Design and Construction. Prior to starting her PhD, she worked as a construction contracts manager on large manufacturing projects. She earned her PhD in Civil Engineering from the University of Texas at Austin with a focus on Construction Engineering and Project Management. Dr. Celoza's research focuses on how organizations collaborate and implement tools and processes to enable effective and efficient project delivery.

Research Overview	Motivation and overview of findings
Research Approach	Detailed information on data sources and analysis method
Planning Overview	Overview of the typical planning process
Proposal Development	Proposal development stage, focusing on estimating
Handover and Planning	Handover and planning, including initial purchasing, prefabrication / kitting, etc.
Project Execution	Execution, including coordination, material management, and monitoring and reporting
Lessons Learned	Continually learning from each project
Metrics	Summary of potential metrics to be established and tracked throughout a project
Technologies	Technologies that can be implemented to improve planning and productivity
Resources	List of planning resources, templates, and examples

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Research Goal and Key Takeaways

Research Goal: Identify best practices for planning to create more constructible and realistic project plans.

Key Takeaways

- Clear processes that are consistently implemented provide companies with a clear path to developing project plans and continually improve their work processes.
- Clear handoffs between teams and/or project phases helps transfer critical project-related knowledge.
- A more complex process is not always better. Find the right balance between people, processes, and outcomes.

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Research Scope

When this research project kicked off, we were focused on how to plan during preconstruction to improve productivity. As we progressed throughout this research, we realized the importance of consistently implementing planning processes throughout preconstruction and project execution to have successful and productive projects. Our research scope focuses on best practices in planning that can be implemented throughout all project phases. These best practices were developed with input from many different companies. You may choose to implement practices that are right for you and your team.

Sources of Data and Analysis Method

Interviews and documents were collected from 20 companies:

12 Electrical Contractors

- 3 Mid-sized (75,000 – 199,999 annual hours)
- 4 Large (200,000 – 499,999 annual hours)
- 5 Enterprise (500,000+ annual hours)

5 General Contractors

3 Electrical Supply Houses and Technology Providers

The ELECTRI Research Task Force included Electrical Contractors, Suppliers, Technology Providers, and Service Providers.

Analysis Method: A case study approach was used to define best practices in planning and to develop planning templates.

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Planning Process



All organizations had some version of the above process steps.

The following pages will go in-depth into each step and highlight opportunities, best practices, examples, and templates.

Proposal Development

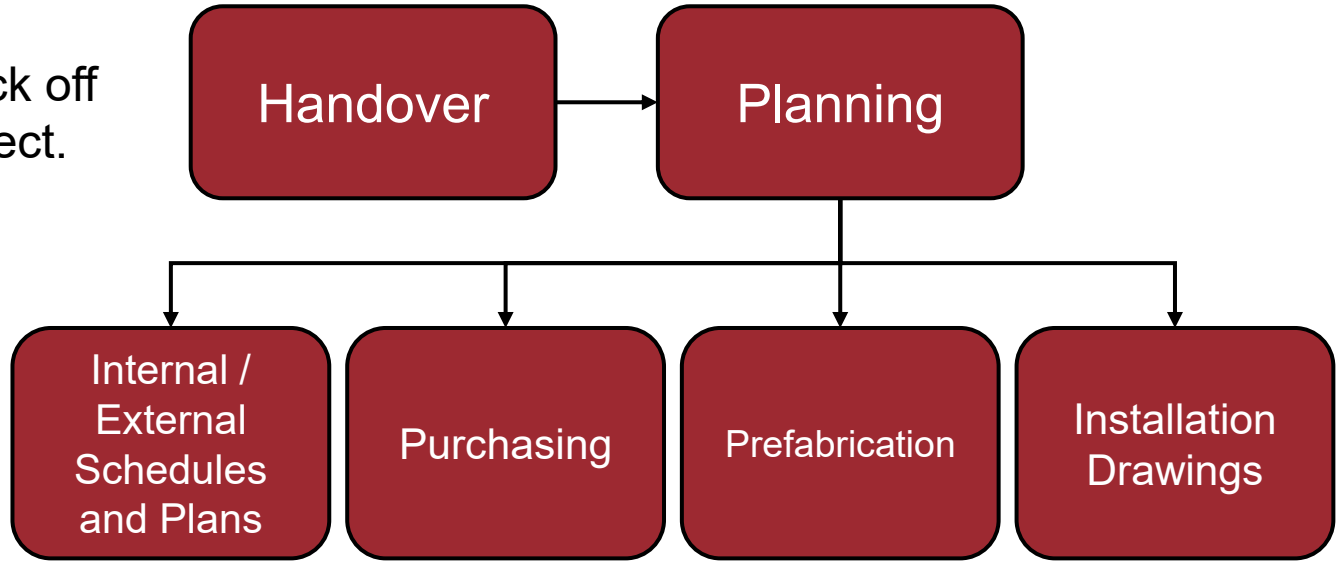
Planning Opportunities and Best Practices

- Use a project planning checklist to capture essential project information in one location.
  - *Example template: Project Planning Checklist*
- Establish cost buckets (higher level) or cost codes (more granular) for the job.
  - Example: Use preestablished cost codes in take-off software
- Put language into the proposal regarding processes that could affect the progress of project delivery.
  - Example: Submittals must be reviewed and approved within a designated time period otherwise the project will be delayed.

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Handover and Planning

Handover the project from Estimating to Operations to kick off the planning efforts of the project.



Handover

Hold a Handover or Kickoff meeting to transfer knowledge from the Estimating team to Operations.

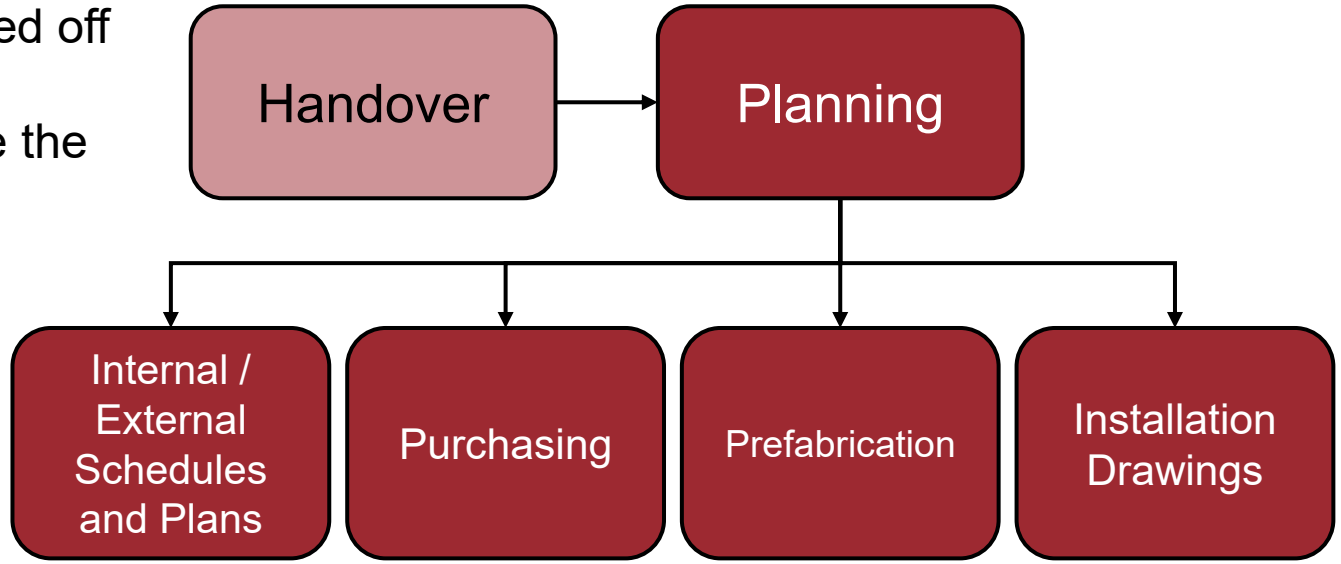
Opportunities and Best Practices

- Review all project information.
  - Examples: scope of work, drawings and specs, etc.
- Identify opportunities and risks.
  - Examples: labor, material, prefabrication, logistics / coordination
- Establish cost codes (if not done during the estimating phase).
- Establish a RACI (responsible, accountable, consulted, informed) matrix for key responsibilities throughout the project.
  - *Example template:* *Project Responsibility Matrix*
- Use checklists to ensure that important project information is discussed.
  - *Example template:* *Handover Meeting Agenda*
  - Tailor the checklist for your organization based on project type and past experience.
- Establish project folders or information structure within a project management system or document control system.

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Planning

Continue Planning efforts kicked off during the handover meeting; allocate resources to complete the job.



Planning: Schedules and Lookahead Plans

Establish internal and external project schedule and detailed plans.

Opportunities and Best Practices

- Develop high level schedules based on project milestones from the customer (GC or owner).
  - Involve field leadership to ensure that field needs are captured in the plans.
- Use a work breakdown structure to develop a hierarchy for tasks and subtasks.
  - Use work packages to develop more detailed plans that include start and end dates, durations, field leadership assignments, and manpower levels.
- Link cost codes or job codes to specific tasks to track job progress.
- Develop a Manpower Loading Schedule to evaluate manpower throughout the entire job to identify potential labor-related challenges.

Planning: Purchasing – Long Lead Equipment

Opportunities and Best Practices

- Start the submittal process as soon as possible.
  - Use a tracking system to ensure that submittals are moving through the process and not stalled.
- Use a tracking log to show the current status of all long lead items.
  - Track the following information:
    - PO Number
    - Date of PO
    - Date that Submittals Were Sent to Customer
    - Date that the Customer Approved Submittals
    - Release Date
    - Lead Time
    - Estimated Delivery Date

Planning: Purchasing – Bulk Materials

Opportunities and Best Practices

- Determine how much to order.
  - Example: 70-80% of total estimated quantities of bulk materials.
  - Consider bundling multiple projects to increase negotiation power.
    - Example: Copper contracts
- Utilize a materials management system to release materials from bulk orders based on upcoming work.

For more information on material management, check out ELECTRI's research on Outside of the Gate: Materials Management Model for Electrical Contractors.

Planning: Prefabrication and Kitting

Prefabricate, kit, or preassemble materials to improve onsite installation efficiency.

Prefabrication Opportunities

- Identify prefab opportunities (may have started during the handover meeting).
  - Example: Boxes, conduit racks
  - Could include pre-cutting, pre-bending, and pre-labeling components.
  - Leverage suppliers' ability to prefab.

Kitting Opportunities

- Use work packages to develop material kits.
  - Example: Put conduit, hangers, couplings, connectors, etc. required for one work package in bags and deliver to the jobsite.
  - Coordinate with onsite logistics for delivery and ensure materials are in the right areas for crews to install.

Opportunities and Best Practices

- Optimize material deliveries and staging onsite to improve safety and installation efficiency.
- Use a tracking system to coordinate between design, purchasing, the fabrication shop, and the site.
- Use BIM to optimize material for multiple work packages to minimize waste.
  - Example: optimizing conduit cuts over multiple work packages.

For more information on prefabrication, check out ELECTRI's research on Estimating With and Pricing of Prefabrication

Planning: Installation Drawings

Add detail to drawings to support field installation.

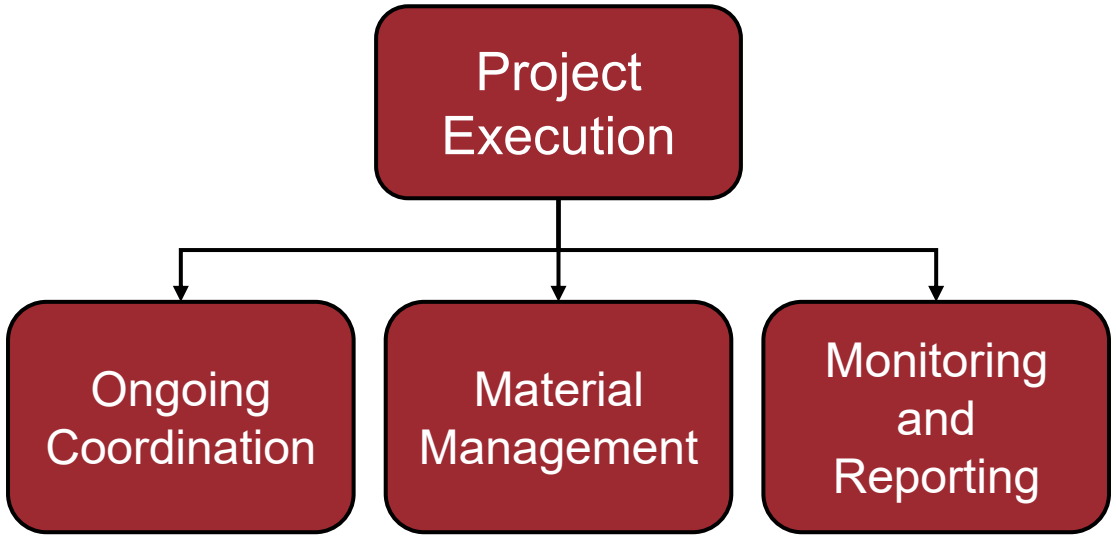
Opportunities and Best Practices

- Identify a work package and add details required for installation, such as routing.
- Develop detailed BIM drawings that can also be used during BIM coordination and clash detection with other trades.
- Combine installation work packages with material kitting or prefabrication to improve installation efficiency and materials management on site.
- Installation or work drawings can be used as the basis for as-built drawings.

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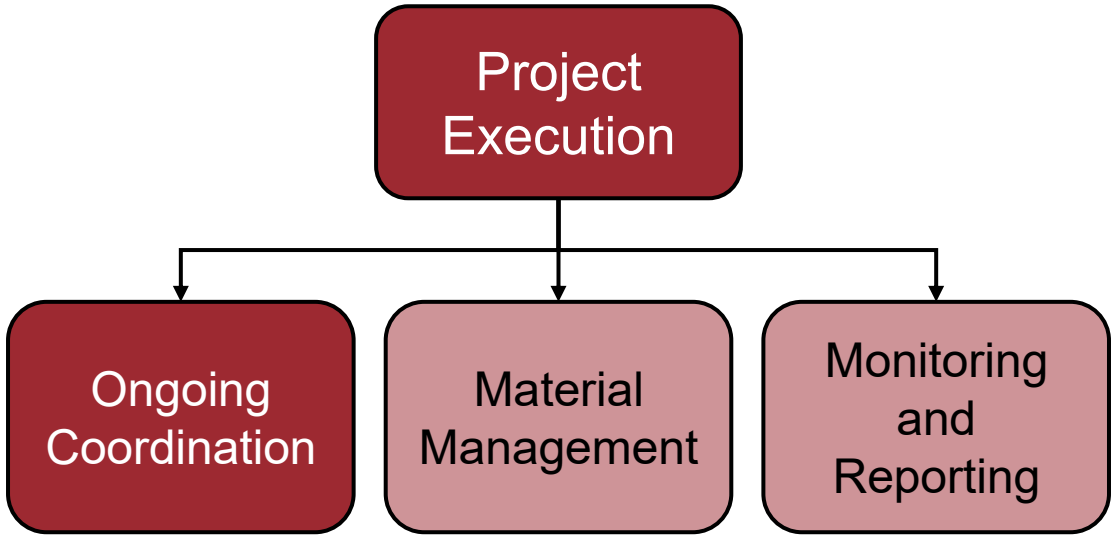
Project Execution

Continually plan, monitor, and control during construction to address potential changes.



Project Execution: Ongoing Coordination

Continually coordinate with **internal stakeholders** to proactively identify and mitigate impacts from changes or potential issues.

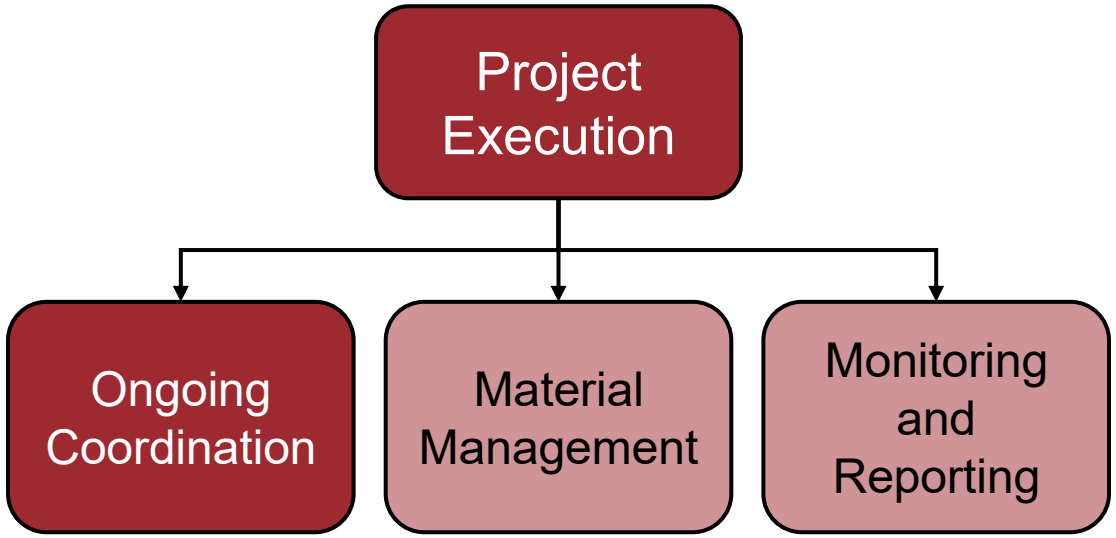


INTERNAL COORDINATION Opportunities and Best Practices

- Regular coordination meetings between Field and Office.
  - Example: PM and Foreman coordinate daily; PM, Foreman, and Project Executive meet every two weeks to review the job plan and manpower projects.
- Establish frequency of meetings based on project type, complexity, and experience of project personnel.
- Create and regularly update Lookahead Plans.
  - Example template: Three-Week Lookahead
- Identify opportunities to mentor and train up-and-coming personnel.

Project Execution: Ongoing Coordination

Continually coordinate with **external stakeholders** to proactively identify and mitigate impacts from changes or potential issues.

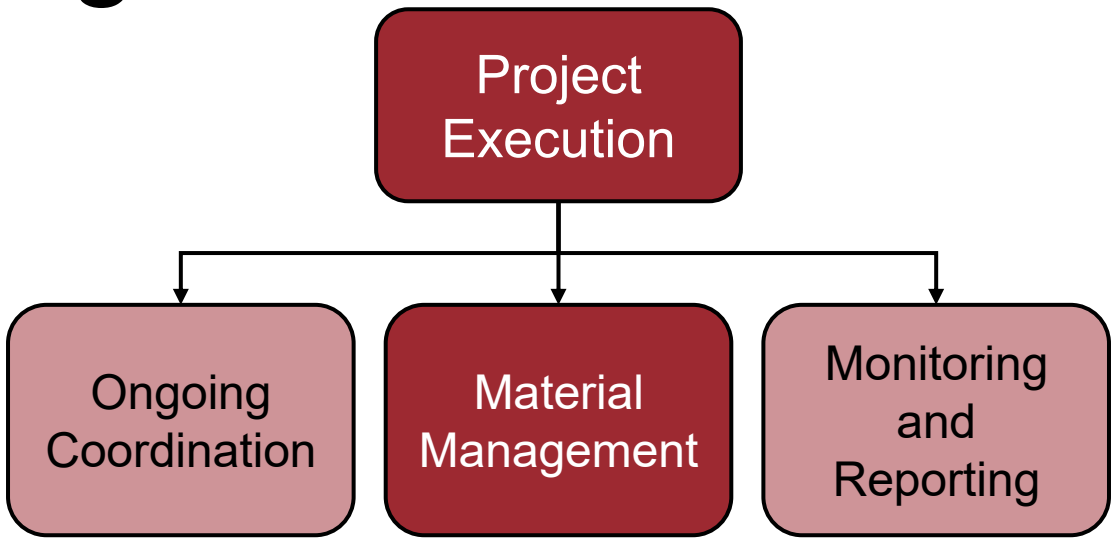


EXTERNAL COORDINATION
Opportunities and Best Practices

- Establish expected level of collaboration and coordination in front end documents to coordinate with GCs and other trades.
  - Example: Weekly coordination meetings to review two-week lookaheads.
- Proactively communicate with the GC.
- Work with the GC to incorporate the electrical contractor's schedule and lookahead plan with the overall schedule and plan.
- Regularly check in with suppliers to understand potential changes in prices and/or lead times.

Project Execution: Material Management

Manage material ordering and delivery to the jobsite.



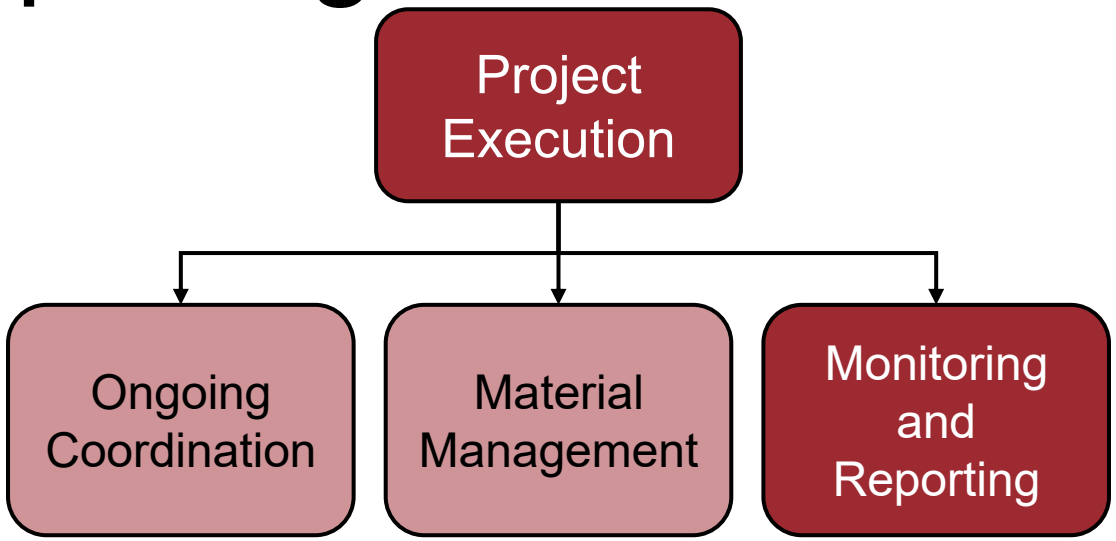
Opportunities and Best Practices

- Allow regular releases of materials from bulk orders that align with work packages.
- Utilize material management software that directly links information from estimates, purchase orders, suppliers, and invoicing.
- Collaborate with suppliers to implement kitting.
- Avoid ordering too frequently or over-ordering to improve management and staging of materials on the jobsite.

For more information on material management, check out ELECTRI's research on Outside of the Gate: Materials Management Model for Electrical Contractors

Project Execution: Monitoring and Reporting

Monitor and report key metrics to identify and address potential issues.



Opportunities and Best Practices

- Establish key metrics for your project.
- Determine the frequency of reporting needed to identify potential issues and correct them.
- Establish meetings with key project personnel to review reports and act when potential issues are identified and celebrate wins as they occur.
- Establish cost codes during the estimating phase or during project kickoff.
  - Determine how many cost codes are the “right” amount for you and your team. Having too many cost codes may make it hard to get accurate data.
- Use the same cost codes throughout different systems (accounting and timecards) and through different project phases.

Lessons Learned

Understand what issues occurred on jobs and develop strategies to avoid or mitigate them in the future. Celebrate what went well and continue those practices.

Opportunities and Best Practices

- Hold a formal meeting with the project team.
  - Consider involving preconstruction team members (like estimating) and operations team members.
- Identify what went well – how can we keep doing this?
- Identify root causes of issues – why did these issues happen?
  - Example: was there a system redesign, a change in material type, a cost reported that wasn't updated to reflect changes?
- Develop strategies to address the causes of issues – what can we do in the future to avoid these issues?
- Keep a library of lessons learned so others can learn from them.

Potential Items to Review

- *Example Template:* *Postmortem Meeting Agenda*
- Manpower quality
- Material ordering
- Project management support

Metrics

Key Questions

- What metrics are most important to your company?
- How can you develop tracking systems to enable automated reporting of these metrics?

Example Planning Metrics

- Planned versus estimated labor hours
  - Opportunity to break down information by cost code
- Planned versus estimated labor cost
  - Potential impacts from changes in hourly rates or changes in crew mix and/or crew rates
- Profit percentage
- Work in place or total quantities installed
- Production labor unit
- Estimated versus actual material cost

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Technologies

Technology	Purpose
Estimating software	Develop takeoffs and estimates.
BIM	Can be used during design detailing and throughout the coordination process; opportunity to support quantity takeoffs or prefabrication of materials.
Mobile workstations	Accessing drawings and other project information in the field. Can use a large monitor and computer in job boxes.
iPads / Tablets	Accessing drawings and other project information in the field.
BIM Collaboration Platform	Share BIM models to support coordination and clash detection.
QR Codes or Barcodes	Label equipment and materials.
Laser Scans	Capture as-is or as-built conditions.
Robotic Total Stations	Efficiently layout a job.
Time Tracking Software	Integrate timecards with reporting systems.
Material Management Platforms	Track material orders and releases, incorporate invoicing and payments.

Resource List

Planning Templates and Examples

- Example Weekly Work Plan
- Handover Meeting Agenda Template
- Postmortem Review Agenda Template
- Project Planning Checklist Template
- Project Responsibility Matrix Template
- Three-week Lookahead Template

ELECTRI Research

- Estimating With and Pricing of Prefabrication: https://www.electri.org/product/estimating-with-and-pricing-of-prefabrication/
- Outside of the Gate Materials Management Model for Electrical Contractors: https://www.electri.org/product/outside-of-the-gate-materials-management-model-for-electrical-contractors/

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