

ELECTRICAL MANAGEMENT TRAINING

PRODUCTIVITY AWARENESS

Commissioned by ELECTRI International. Conducted by University of Oklahoma, Haskell and Irene Lemon Construction Science Division. Researchers: Ben F. Bigelow, Dr. Anthony Perrenoud and Dr. Matthew Reyes



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Electrical Management Training (EMT)

Introduction

For the electrical construction industry, professional development opportunities are crucial for employers and employees. In 2019, ELECTRI International initiated development of a project management training series geared toward electrical contractors. This report details the first phase of the new training series, known as the *Electrical Management Training* (EMT). This training is a resource for new hires, newly promoted trade workers, and managerial employees seeking continuing education. The training is intended to help contractors build their managerial "bench strength".

The research team proposed to develop training material that would teach content through personal experiences from current practitioners in a video format that was quick and easy to view. Included in this report are details from the study, which include: the necessary subject matter, the development of five videos for the first EMT course module, and recommendations for the future development of the EMT course modules.

Project Management Subject Matter

At the beginning of the project, researchers surveyed members of the ELECTRI Council to determine the most important topics that should be included in the project management training series. Twenty-nine topics on project management were presented to the Council members to rate, per topic, on a scale from 1 "Not at all Important' to 5 'Very Important'. At the conclusion of the survey, the investigators identified a clear benchmark to sort the level of importance of the topics. The 16 topics rated with an average score of 4.0 or higher were identified as the topics that would be covered in this study, as referenced below in Table 1.



Table 1: Top Sixteen Project Management Topics Used in the Study

Rank	Торіс	Level of Importance
1	Safety	4.6
2	Estimating Labor	4.4
3	Change Order	4.4
4	Ethics	4.4
5	Scheduling	4.4
6	Verbal Communication	4.3
7	Budget Management	4.3
8	Tracking Costs and Material	4.3
9	Estimating Cost	4.2
10	Conflict Resolution	4.1
11	Contracts	4.1
12	RFIs	4.0
13	Working with GCs	4.0
14	Crew Sizing	4.0
15	Estimating Material	4.0
16	Closeout	4.0

Table 2 presents the thirteen topics that fell below the benchmark on level of importance. However, these topics were found to be important and could be considered in the future.

Table 2: Project Management Topics Not Used in the Study

Rank	Торіс	Level of Importance
17	Written Communication	3.9
18	Time Managment	3.9
19	Working with Sub-Contractors	3.9
20	Daily Logs	3.8
21	Submittals	3.8
22	Working with the Union	3.8
23	QA/QC	3.7
24	Performance Evaluation	3.7
25	Claims	3.6
26	Effective Meetings	3.6
27	Negotiation	3.6
28	Pay applications	3.6
29	Site Logistics	3.5

A Task Force for the project was formed and included 12 contractors, 2 NECA staff members, 1 *electrical training ALLIANCE* member, 3 researchers, and 2 ELECTRI staff members. Guided by the researchers, the Task Force held ten conference phone calls and identified the necessary subject matter content for the 16 project management topics. They discussed each topic and collectively answered the following question: As a new Project Manager, what would you have liked to have known regarding the PM topics? Data were collected and the research team compiled a list of 76 different subtopics for the 16 PM topics. Below is the list of 16 topics and the subtopics recommended by the Task Force for the EMT course modules.

"Safety"

- 1. PM's role in safety planning
- 2. Safety monitoring and policing as a PM
- 3. The financial impact of safety incidents
- 4. Impact on a company's reputation from a safety incident
- 5. Experience Modification Rating (EMR) importance and impact
- 6. Handling safety incidents professionally

"Estimating Labor"

- 7. Effects of weather with regard to estimating labor
- 8. Effects of heights with regard to estimating labor
- 9. Managing labor hours from the existing budget
- 10. Increased labor hours at the end of a job and going over budget
- 11. Estimating crew makeup
- 12. Continuous improvement of estimating labor from previous job failures

"Change Orders"

- 13. How change orders can negatively impact a job, for example interruptions and breaking up the flow of work.
- 14. The need to evaluate the impact of a change order on the schedule and why this needs to be communicated to the GC.
- 15. The importance of communicating change orders in a professional/friendly way to the GC or Owner.
- 16. How proper justification for a change order helps the GC justify the changes to the owner, which, in turn, improves the relationship between the GC and the Electrical Contractor.
- 17. The importance of documenting change orders.

"Ethics"

- 18. The relationship between professional and personal life
- 19. How unethical actions can lead to major repercussion
- 20. The overall impact on a company from unethical practice

"Scheduling"

- 21. Importance of asking for an updated schedule from the GC
- 22. Importance of keeping a schedule manageable
- 23. Maintaining a flat manpower chart
- 24. Importance of "planning your work and working your plan" thereby minimizing GC micro-management

"Verbal Communication"

- 25. Importance of documenting decisions made through verbal communication
- 26. What should and should not be communicated verbally
- 27. Importance of using verbal communication to build rapport
- 28. Importance of using verbal communication as the first line of communication
- 29. Hazards of using digital communication without verbal communication

"Budget Management"

- 30. Importance of justifying how the budget is broken down into line items
- 31. Issues with too few line items and/or too many line items
- 32. Short duration budget cost, Work Breakdown Structure (WBS), and tracking line items within separate time frames.
- 33. Benefits of front-loading the schedule of values
- 34. Importance of billing mobilization costs upfront
- 35. Identifying what other items can be billed upfront
- 36. Communicating the need for upfront billing to the client and understanding the contract related to front-loading

"Tracking Costs and Material"

- 37. Over sourcing of material and the impact this has on labor costs
- 38. Determining in the field whether to make or buy material (produce in the field vs. pre-fabrication)
- 39. Impact of tracking long lead items and storage
- 40. Analyzing and tracking market conditions
- 41. Understanding purchase orders as defined in the contract

"Estimating Cost"

- 42. A PM's role and relationship with the estimating department
- 43. The need for a PM to understand how the estimate was built (importance of a handoff meeting)
- 44. A PM cannot presume the estimate is exact. The PM must take responsibility for cost control once the estimate is handed over
- 45. Inaccuracies in tracking costs due to poor setup and use of cost codes

"Conflict Resolution"

- 46. The importance of understanding and anticipating "pinch points" that can lead to a conflict
- 47. The importance of identifying the GC's personality, traits, and knowing the different roles of GC personnel
- 48. The financial impact and negative exposure from conflict
- 49. Strategies for addressing conflict (double teaming a conflict, good cop/bad cop)
- 50. Preplanning and identifying the relationships with all parties. Identifying the different needs of all parties.
- 51. The importance of handling conflict ASAP vs. avoiding facing the conflict

"Contracts"

- 52. The importance of understanding the contract to avoid conflict (presume nothing)
- 53. The importance of understanding insurance requirements
- 54. Understanding scopes of work, specs, materials, and method of installation
- 55. Importance of knowing billing dates and procedures
- 56. Importance of understanding liquidated damages

"RFIs"

- 57. The importance of documenting/communicating Requests for Information (RFI)
- 58. The importance of providing a due date and the actions that will be taken if the date is missed
- 59. The importance of writing skills and persuasion of suggested solutions

"Working with GCs"

- 60. The importance of making the GC's job easy so that the GC will be more willing to assist you
- 61. The importance of understanding that the GC is your customer
- 62. Build relationships before the job starts and know the GC's hierarchy to avoid going over someone's head
- 63. Importance of avoiding making enemies with the GC and passing issues that you cannot solve to your superiors for resolution

"Crew Sizing"

- 64. The importance of choosing your own crew size, and avoiding letting the GC tell you how to assign workers for your job
- 65. Knowing when to start your project with a light crew vs. when to start heavy
- 66. How preplanning and prefabrication impact crew sizing
- 67. The importance of getting maximum work out of your vendors
- 68. The importance of knowing the composite rate of crews and choosing efficient crew structures

"Material Management"

- 69. Importance of material scheduling (drop off, storage, long lead items). Early arrival of material onsite is just as bad as late arrival
- 70. Customer care and custody. Understanding that the PM is responsible for the material once it is in your hands, even if you do not own the material

"Closeout"

- 71. Closeout is the customer's main "hot button". The quicker and more efficient the closeout process is, the happier the customer will be. This has a major impact on future relationships
- 72. The importance of starting closeout at the beginning of the job. It becomes harder to complete closeout requirements the longer you wait
- 73. Knowing expectations of record drawings (as-builds). Importance of knowing and planning for requirements of record drawings at the beginning of the project
- 74. A PM needs to know the difference between the punch list and a change order. Importance of getting your punch list signed off by the GC as soon as possible
- 75. Knowing closeout details: testing requirements, permitting and inspections, job site equipment leasing and overhead costs, knowing your own subcontractor's closeout requirements, billing retainage
- 76. Importance of bond closeouts

Development of the Change Order Course Module

An objective of the study was to teach by relating real personal experiences expressed by current practitioners. Upon identifying the necessary subject matter, the research team distributed a survey to the ELECTRI Council to identify participants who would be willing to share personal experiences on the PM topics. The survey was e-mailed to the entire Council to enlist their participation but the result was a low response rate. The Task Force sought alternate methods for filming electrical PMs on the sub-topics. Simultaneously, the Task Force determined that the first module to be developed for this project would be the section on 'Change Orders'.

The Task Force decided the research team could travel to a single NECA Chapter location and film six to eight project managers about their personal experiences with change orders. Members from NECA's Atlanta Chapter identified seven PMs who agreed to be interviewed. In May 2019, the research team arranged for a video production team to travel to the chapter building and film the project managers on the topics related to Change Orders. More than seven hours of video was filmed and then used to produce five videos on Change Order Management. Screenshots of the videos are shown in Figure 1 and Figure 2.

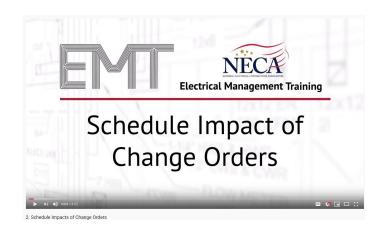


Figure 1: Title Screen on Video 2



Figure 2: Screen Shot from Video 1

Researchers presented the first draft of the five videos on Change Order Management at the mid-year ELECTRI Council meeting. The Task Force provided suggested modifications for the final video edits. The Task Force provided positive initial feedback about the direction in which the EMT videos were heading. The final videos were presented to the ELECTRI Council during the September 2019 NECA Convention in Las Vegas.

Links to the Five Videos on Change Order Management

- 1. Consequential Impacts of Change Orders: https://youtu.be/-iRbf6n0htw
- 2. Schedule Impacts of Change Orders: https://youtu.be/kCX_i275qZM
- 3. Communicating Change Orders: https://youtu.be/skwseXmdXZY
- 4. Justification of Change Orders: https://youtu.be/cVcq1BCflsc
- 5. Documentation of Change Orders: https://youtu.be/HBtGqLQRLvl

ELECTRI International Channel

These five videos are posted on an ELECTRI International YouTube channel developed by the research team. Currently, the videos are unlisted, which means that only users who have access to the video links may view the videos.

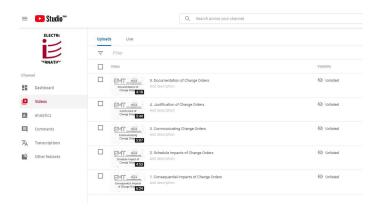


Figure 3: ELECTRI International YouTube Channel

Future Development of Course Modules

This report presents the necessary subject matter for PM training and provides the structure for developing the EMT training series. Through the experience of this research initiative, the research team recommends that filming videos should be done individually at selected NECA Chapters across the country. Selecting one topic and filming four to seven project managers in one location provides the necessary content to produce high-quality videos. Sub-topics should be used to develop interview questions for filming. A website that hosts all videos in chronological order would be the most optimum experience for future students.

About the Authors



Ben F. Bigelow is an associate professor and Director of the Construction Science Division at the University of Oklahoma. He attended High School in Coppell, TX and earned a BS in construction science at Texas A&M, an MS in construction management at Arizona State University, and a PhD from The School of Education at Colorado State University. Professionally Dr. Bigelow worked for a production homebuilder and has owned and operated his own small contracting business. He continues to perform select projects, and provides consulting services. He has been at the University of Oklahoma since 2017, prior to that he spent six years in the Construction Science Department at Texas A&M University. He has published 20 articles in peer reviewed journals, and he has been awarded over \$527,000 in funding to support his work. Dr. Bigelow is also an Associate Editor of the International Journal of Construction Education and Research. He has been an NAHB student chapter faculty advisor, and competition team coach since 2008. Dr Bigelow also works with teenage youth at his church.



Dr. Anthony Perrenoud is an Assistant Professor at the University of Oklahoma in the Haskell and Irene Lemon Construction Science Division. His decade-long electrical construction industry experience includes working as an Electrician, Project Manager, and a Regional Director. His research focuses on workforce development, leadership training, and risk management. In 2016, Dr. Perrenoud established workconstruction.org - a research group dedicated to attracting and training the future construction workforce.



Dr. Matthew Reyes is an Associate Professor in the Haskell & Irene Lemon Construction Science Division at the University of Oklahoma. Dr. Reyes received his PhD in Educational Psychology from the University of Oklahoma. His broad base of construction experience includes working as a laborer, crew foreman, assistant superintendent, project engineer, and project manager for the subcontractor and general contractor side of commercial projects.





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