



The Disappearing Act

FIXTURES & THEIR ASSOCIATED WORK

Industrialization of Construction®
Applied in Fixtures & Lighting

BY DR. PERRY DANESHGARI
AND DR. HEATHER MOORE
WITH CONTRIBUTIONS
FROM JENNIFER DANESHGARI
AND DEANNA O'DELL

The electric lamp is about 200 years old, having been around about as long as the widespread use of the steam engine. What makes us think that fixtures and lighting as we know it will stay the same forever? We have all seen the trends in slow motion including LED, PoE, and other technologies that have threatened to replace lighting hardware as we know it today. Along with the change in hardware that brings light will be a change in the electrical work that makes it happen.

This article will provide a brief overview of the Industrialization of Construction®, and then use lighting as a specific example to discuss the applications. Over half of the work associated with lighting can and will be done away from a jobsite; some of this will take place with hardware and manufacturing changes, but a majority will be due to the digitalization of the installation process. Similar to the magic of a “disappearing act,” watching the steps in slow motion always reveals what our eyes cannot believe once the frames speed up. We will attempt to show you the same “magic” herein.

The construction industry has been sending signals that Industrialization is coming for several decades, shown in Figure 1.

MCA, Inc. has published and presented on this topic for 10 years now and has several resources available to help your company learn what it is and learn where you stand in the trajectory of Industrialization. The steps of Industrialization are shown in Figure 2. Any industry that shows the signals in Figure 1 goes through the steps in Figure 2. It took two centuries for agriculture and one for manufacturing; the difference in pace was due to available

technology, but more so, collective human knowledge and learning from the past. We are between Steps 1 and 2 in construction.

The trends toward plug-and-play devices and hardware in construction are not new. Specifically, in electrical work, MC cable, box assemblies, and pre-wired switches have reduced the material and effort needed at the jobsite. However, we know that no single technology has significantly helped improve productivity in construction (IEC, *Insights Magazine*, Dr. Perry Daneshgari and Dr. Heather Moore, *Industrialization of the Construction Industry*, 2013. Winds of Change, Event Horizon, 2016. Winds of Change, 2017).

Why not? In construction, we are still having four times more labor cost contribution to every dollar sold than Industrialized Industries. As long as our electricians are involved with every step of a fixture assembly, we cannot improve the cost or overall industry productivity. With that in mind, we will walk through an example of the work associated with any fixture and explain how it will be done differently once construction gets past step 2 of Industrialization.

Ask any electrician how long it takes to install a fixture, and you will most likely get answers amounting to less than an hour. This is the first indication of their recognition of all the "work" associated with completing the fixtures according to the requirements of the customer. For example, have they thought about cleaning the lenses or taking the labels off? Are they thinking about tracking down the cut sheets to assemble from? Do they realize how much garbage and packaging will be coming with their fixture deliveries? Figure 3 shows more photos of the type of effort and space that fixtures consume on jobsites. These non-installation items are often not thought of or planned, and therefore, will always be done without a plan, i.e. on the jobsite and potentially by an overly qualified

CONSTRUCTION INDUSTRY SIGNALS OF INDUSTRIALIZATION

- Market is changing
- Less specialization is required
- Unionization declines
- System productivity is the main difference
- Types of markets are changing

FIGURE 1: International Institute of Building Sciences, 2020. MCA Inc., Dr. Perry Daneshgari and Dr. Heather Moore, *The Winds of Change, Articles Volume III E-Book*, 2018

INDUSTRIALIZATION HAPPENS THROUGH...

- Management of Labor
- Management of Work
- Lean Operations
- Modeling and Simulation
- Feedback from the source

FIGURE 2: International Institute of Building Sciences, 2020. MCA Inc., Dr. Perry Daneshgari and Dr. Heather Moore, *The Winds of Change, Articles Volume III E-Book*, 2018

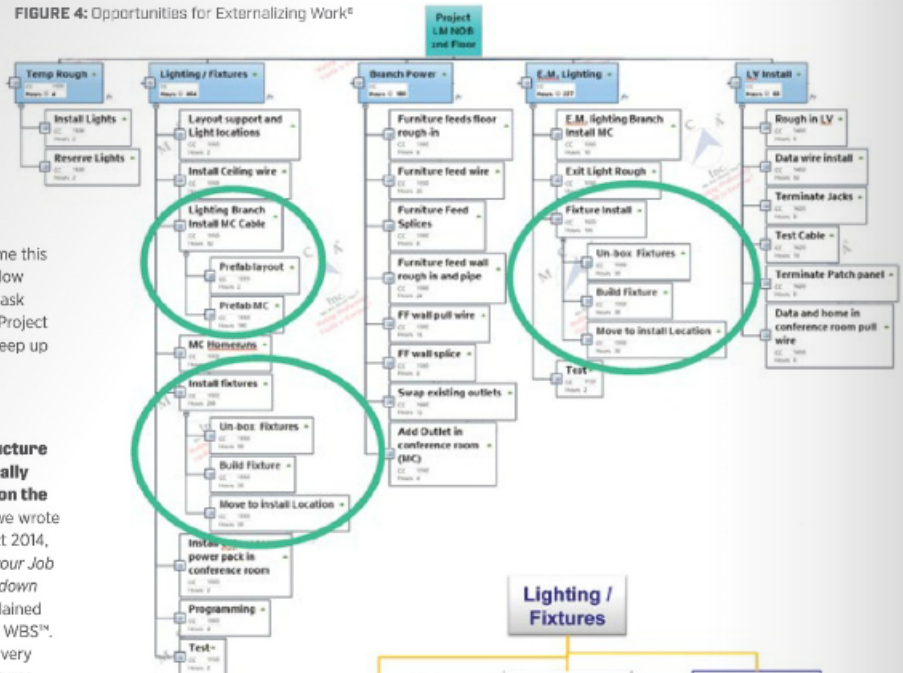


FIGURE 3:
Fixture Handling
Happening
Onsite



FIGURE 4: Opportunities for Externalizing Work*

FEATURE



electrician. To overcome this costly proposition, below are the steps you can ask your Field Leads and Project Managers to take to keep up with Industrialization:

1. Develop a Work Breakdown Structure (WBS™) specifically for the fixtures on the job. In an article we wrote for IEC in Sept/Oct 2014, (*How to Manage your Job Using Work Breakdown Structure*) we explained the full process of WBS™. It should be done very specifically for fixtures.

2. Make sure the WBS™ reflects all of the work required from receiving the fixture to having it burning. Figure 4 shows a simple example that could be expanded or tailored by fixture type as needed.

3. Identify how much of the work on the Fixture WBS™ MUST be done at the jobsite. Circle or highlight the opportunities to Externalize Work®, either in a prefab shop or utilizing a vendor facility or vendor services. In Figure 4, the circled work activities were identified with this potential. Figure 5 shows another example of a completed WBS™ with specific plans for prefabbing and handling fixtures offsite. This is what a “finished product WBS™” should look like, and the plan can then be communicated to prefab, vendors, etc.

4. Following the plan, develop the schedule for the fixture work, including WHO will do WHAT, WHEN, and WHERE. This schedule should be communicated and updated as needed as job conditions change or information from manufacturers and distributors becomes available.

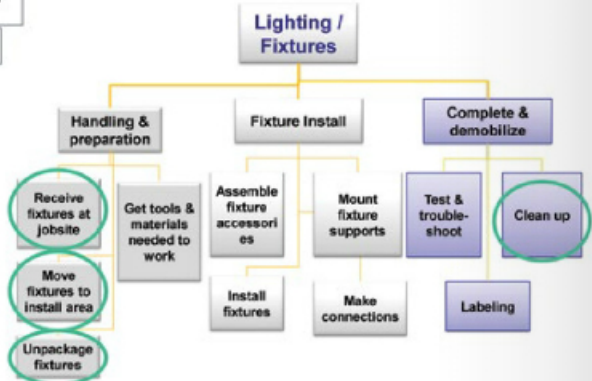


FIGURE 5: WBS™ Example

Even if fixtures as we know them disappear or are replaced with new technology, the work itself will not. **The know-how of electricians will always be needed** and can be used much better if we can get it out of their heads and onto paper.

With a plan, anything is possible. The results may not be something you would order from a catalogue, but they can lend significant savings and risk reduction to the project. Figure 6 and 7 show examples of fixture handling and assembly being done external to the jobsite. All four examples required the process described above, with involvement of the project team. Once this process is understood, the nature of the fixture and its encasement doesn't matter. The steps of receiving, handling, assembling, testing, troubleshooting, etc. are always involved. By thinking about the work beyond installation, we can keep up and even get ahead of fixture hardware changes. Even if fixtures as we know them disappear or are replaced with new technology, the work itself will not. The know-how of electricians will always be needed and can be used much better if we can get it out of their heads and onto paper.

FIGURE 7: Pre-assembled high-bay fixtures shipped in collapsible bins, courtesy of Cleveland Electric, 2003.



FIGURE 6: Externalizing Work® of Fixtures

Conclusion

Industrialization is happening in construction. The market is changing and increasing system productivity on jobs is key. It is critical that Manpower, Material, and Money are recognized as an intertwined system that, if managed correctly, can allow productivity to be maximized on big ticket items, such as lighting.

Productivity is increased by removing all non-critical work from the jobsite. This will keep the electricians performing their specialized installation work. Up front planning in a WBSTM breaks down the work to help identify the key items that MUST be done on the jobsite, allowing for Externalizing Work® of the rest. This Externalizing Work® can be in a prefab shop or utilizing a vendor facility or vendor services. If lighting and fixtures are then delivered to the job sites ready for installation, and all items that do not transfer value on a jobsite are removed, the "disappearing act" of fixtures can then be from the jobsite only, and not from our industry as a whole.

Dr. Perry Doneshgari is the founder, president/CEO of MCA Inc. MCA Inc. is a research and implementation company that focuses on implementing process and

product development, waste reduction, and productivity improvement of labor, project management, estimation, accounting and customer care. MCA, Inc. has worked with various national and international companies all over the globe. Dr. Perry has taught several classes and conducted several presentations for MCAA, MCAA of Canada, the Electrical Contracting Foundation, NWCCC, and was keynote speaker at the 2009 annual IEC National Convention. Dr. Perry has completed over 12 research projects for construction and distribution industries and has published several papers and articles. He has published a handful of books, most recently, Prefabrication Handbook for the Construction Industry; as well as a series of four books for ELECTRI International on the Industrialization of Construction® and the future of the industry. Dr. Perry has also published an ASTM Standard for Job Productivity Measurement.

Dr. Heather Moore is vice president of operations for MCA Inc. and has taught numerous classes for the construction industry and contributed to several research projects for ELECTRI, MCAA, NHF and NAW. She holds a Ph.D. in Construction Management from Michigan State University and an MBA and a B.S.E. in Industrial and Operations Engineering from University of Michigan. She specializes in process design and operations research. ⚡