AUTODESK **UNIVERSITY** 2015

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MEP Fabrication: Small to Mid-Size Companies

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Learning Objectives

- Understand how to scale fabrication for your needs
- Understand how placement of equipment / machinery effects productivity
- How fabrication affects job site safety
- How culture and behavior of people effect productivity

Description

In this class we will discuss the fundamental elements that make a successful fabrication shop by talking about material flow, people flow, automation, equipment placement, bulk buying, material movement, cultural / behavior changes, software, BIM coordination, effects on job site safety, early turn over and packaging for delivery to job sites. There will be time for Q&A during after the presentation.

My goal is to get through the presentation efficiently to have a room discussion on fabrication. I assume there will be wide array of talents in the room and I want to turn this into a discussion to share pain points and help each other figure out how to fabricate without being the biggest shop on the block.

Your AU Expert

John Mack has been in the construction industry for 29 years, and his unique background brings a lot of experience into a conversation. John has held positions as a project manager, material expediter, journeyman plumber, foreman plumber, general foreman plumber, plumbing detailer, piping detailer, detailing department manager (for sheet metal, piping and plumbing), teacher, software developer, corporate CIO/CTO and global business development / customer success manager. He is currently working as the Best Practices Leader for XL Construction in Milpitas, CA.

Definition to get us all on the same page

What is the definition of fabricate

1. To make by assembling parts or sections
2. To make by art or skill and labor; construct

Understand how to scale fabrication for your needs

Decide What You Want to Fabricate

The first part is deciding what to fabricate.

After that is decided design out the parts needed to create the fabricated assembly.

1. Where will the parts come from? Am I making them or am I ordering them.
2. How many of each part will I need? Don't over order too much, but even worse don't under order
3. Where will I store the parts? The size of the area where parts are stored.
4. What is the flow to build the final assembly?

Understand the size of the finished assembly and think about:

1. Where can the final assembly be stored prior to shipping?
2. How will you ship it?
3. How will it move onto the job site?
4. How will it move into the building?
5. How much time is needed to install it?

Know the space you have to work with

After understanding the parts needed, how much storage you will need for parts and how you will move the final assembly you now need to plan the space for the actual fabrication. Call this Space Planning. I have found the most efficient way to do this is to create a full scale electronic plan view of the area you have to work with, including all the storage areas for parts. You will also need to create full scale blocks to represent any large equipment used to build the assembly.

Recognize the Flow of the Fabrication

Create the plan drawing

After the area is established the flow comes next. First part of the flow is the placement of the large equipment needed to assemble in relations to the stored parts. Moving parts a long distance takes time and time is money. The objective is to minimize the distance to the stored parts to where they are to be used in the assembly. This is also to minimize the movement of people.

People, Material and Equipment Placement

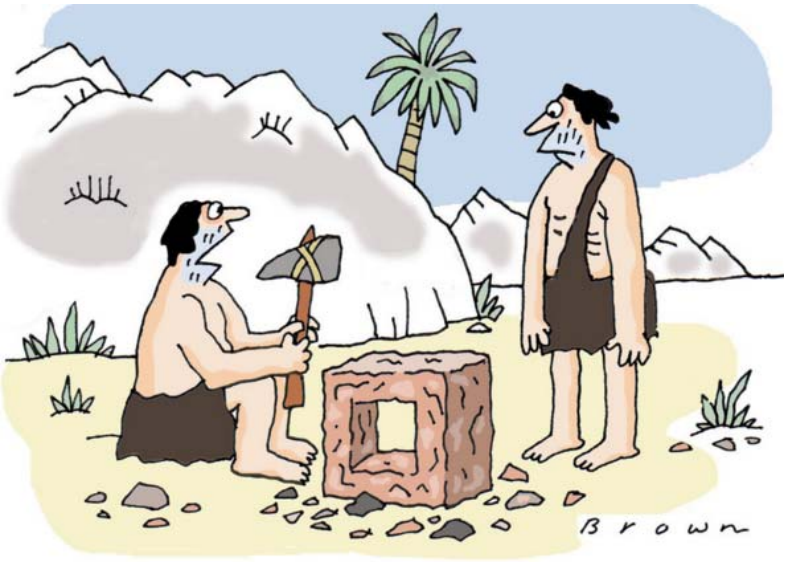
After the area is established the flow comes next. The objective is to create a flow of material to minimize part movement. Movement is waste, but it is a necessary waste. To do this it is ideal to place the stations for the assembly in a linear path, so there is no back tracking. Form the start of building the assembly to putting on the truck for shipping.

Tools

Have enough tools that people are not wasting time trying to find the right tool when it is needed. If the tool is not in the location of the person you have just wasted that persons time, and most likely other people's time too. If a person walks across the fab area for any reason, that person will talk to others along the way, thus taking time away from production. Labor is the most expensive cost and also the most controllable cost of a fabricated assembly.

Wheels

Everything that can possibly be put on wheels should be. It make movement of parts and assembled parts much easier. The items should remain on wheels all the way to the final installation and if needed after the installation of the assembly.



"I call my invention 'The Wheel' , but so far I've been unable to attract any venture capital."

Make Test Runs

Practice makes perfect. Keep testing until you get it the way you want it. Even after it works always be open to new ideas that come up to make it run more efficient.

Create an Andon System

Definition of Andon

An Andon is a Japanese lantern

Today it is a light indicator, when set off the production line stops and everyone huddles to fix the issue on the production line.

In manufacturing an Andon is a term referring to a system to notify management, maintenance, and other workers of a quality or process problem.

To have an Andon system in place there needs to be a hierarchy of who is the contact for the issue, along with a time frame for a response. If the person is not available or the response time is not met then the issue goes up the chart to the next person and so on until the issue gets fixed and the production line can return to full operation. Anyone working on the supply chain can "pull the Andon cord". It does not have to be a light indicator, just a way of stopping the supply line in the event of a defect or issue. This keeps higher quality, less defects and the ability to make things more efficient.

Understand how placement of equipment / machinery effects productivity

Moving people to where the work is or moving equipment to meet the flow needs

Common sense says having the large equipment placed at the correct spot in the assembly line is the most efficient way to build. This is not always achievable. If you cannot get the equipment to the correct spot understand the extra time it will take to move the parts to the equipment and back into the assembly line. This has a double impact 1) moving people 2) disrupting the flow of the assembly.

Like I stated earlier, "If a person walks across the fab area for any reason, that person will talk to others along the way, thus taking time away from production," for them and the others they talk to. Some large shops color code shirts for a visual to know when someone is where they are not supposed to be.

If you do have to place something out of sequence have a dedicated person for this task. A dedicated person will allow flow to be much quicker than if you just have whoever is available move the materials. A material runner should be a low cost worker that is learning the trade, like an apprentice.

Just in time delivery

This the method that the fabricated part is delivered to the job site and immediately installed. This is important as it minimized the waste of moving the fabrication more than needed. Remember movement is waste that adds time to the install; time is cost.

This also works for ordering material for the fabrication. If you can stage the delivery of parts in time with when they are needed for assembly in the fabrication then you are saving movement of parts and space for storage.

Definition from Farlex Financial Dictionary. A supply chain management system designed to reduce carrying costs to a minimum. A firm only orders what it expects for its immediate needs; therefore, it keeps a low inventory. For example, if a retailer believes it will sell 1,000 widgets in a week, it orders precisely 1,000 widgets from its manufacturer. Just in Time systems require that the retailer at the end of the supply chain can accurately predict demand for its products. They also require that each stage of the supply chain knows exactly how much time it takes to fill an order when it is made. The automotive industry and budget retailers commonly use Just in Time systems.

Think of the definition for construction when ordering or delivering parts.

How fabrication affects job site safety

One does not necessarily think that fabrication can affect safety. Well it does, in a good way, which also affects the bottom line of the company when it comes to insurance. Better safety = Better insurance rates = Less outgoing dollars for the company.

How can fabrication help with safety? The best way is to tell you is to just list them.

- Employees working in a controlled environment

- Employees working on bench tops, or at least on the ground, instead of overhead
- Less people in the field to install
- Less mess in the field to clean up due to cutting and scrap material being done in the controlled environment of the fabrication area
    - Less mess = Less injuries
- Material handling minimized.
- Use of stationary equipment
- Equipment better maintained in fab area since it is easy to at

How culture and behavior of people effect productivity

The hardest part of all is to change the culture of a construction company that does things the traditional way, AKA putting it together in the field.

The message for change has to come from the top. Setup small tests to prove each theory of fabrication before stepping fully into it.

People have to come first. The people must be trained in the new way of doing work and they must accept it. Hire key people to get the process started correctly. Get the correct people – If you cannot change the person, then change the person. Do not be afraid to let people go that do not believe. There are plenty of other people that do believe and want the job. A single person that does not believe can greatly effect productivity.

Remember you might have to try something many time, in different ways, before it actually works. Do not be afraid to make mistakes. Mistakes can be your biggest learning experience and this has to be accepted in the new process.

Multi-Trade Assembly

I am working on an example of a small multi-trade assembly for the presentation. I am not done yet, but can at least tease you with the idea of an assembly that does not take much room to put together.

The Presentation

The presentation will have much more than the handout as I can work on it to the last day. I will upload the presentation after the class, so it is the most current when you grab it. I may even add to it depending on the class discussion.

Ideas or Requests for the Class

If you have any ideas or request for topics for the class please contact me and I will see what I can do to accommodate.

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Please only use the cell if you have something too difficult to put into email. I do have an everyday job, lol.