

***DfMA Continued* - Methods for Workforce Training II**

Diana Lee & John Russell

United Association | @uapipetrades

Who we are

The UA VDC Team

Diana Lee (Milwaukee, WI)

UA VDC Team Member

VDC Manager

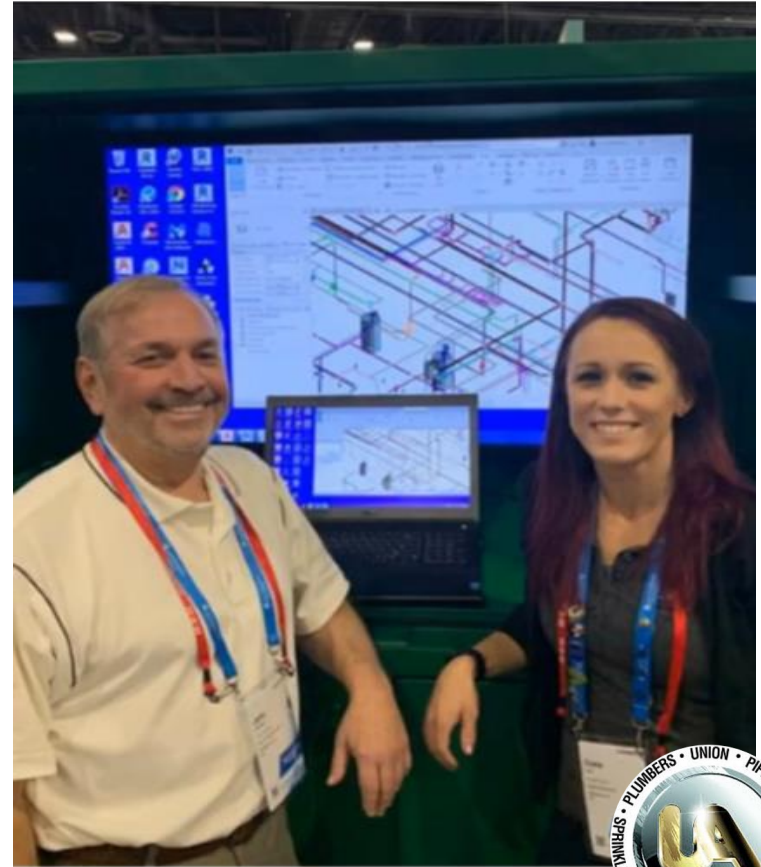
MATC Pipe Trades Instructor

John Russell (Washington, D.C.)

UA VDC Team Member

VDC Manager

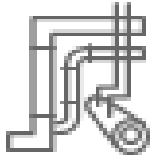
Plumbers Local 5 Instructor



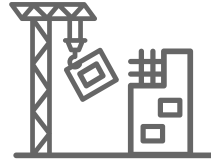
About the UA

The United Association

Overview



The United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States & Canada (UA), is affiliated with the national building trades.



We represent approximately 356,000 plumbers, pipefitters, sprinkler fitters, service technicians, welders and metal trades in locals across North America.



We honor a federation agreement with both the Australian Plumbing Trades Employees Union and Irish Technical Engineering and Electrical Union.

UA Training

United Association Courses

Higher-Level Training

- Instructor Training Program (ITP)
- UA Certifications
- Construction Supervision
- Accelerated Welder Training and VIP Program

Technology Program

- *DfMA* and Modular Fabrication
- Revit MEP
- Total Robotic Station
- Cloud Collaboration Software
- Laser Scanning
- VR/AR/XR
- Drone Applications



What's New?

What we're covering today

UA Training @ AU

Design side

- Applying design fundamentals, automation and modular assembly ideas to DfMA for pipe trades.
- Using Autodesk software and cloud-based programs for pipe trades DfMA production.

Fabrication side

- Training personnel for DfMA fabrication.
- Training personnel for DfMA application to construction projects.



DfMA

TAYLORISM

DfMA Workflows

Scientific Management is a theory of management that analyzes and synthesizes workflows. Its main objective is:

- improving economic efficiency
- labor productivity

It was one of the earliest attempts to apply science to the engineering of processes to management.

Scientific management is sometimes known as ***Taylorism*** after its pioneer, Frederick Winslow Taylor.

Boothroyd & Dewhurst coin *DfMA*

DfMA Workflows

A technique to quantify product designs for ease of automatic assembly. Approach was expanded to include manual assembly so manufacturing engineers could make justifications for automation proposals.

- Reduce the number of assembly operations by reducing the number of parts
- Make the assembly operations easier to perform

Producibility guidelines traditionally directed designers to focus on simplifying individual parts, so they were easier to manufacture and cost less.

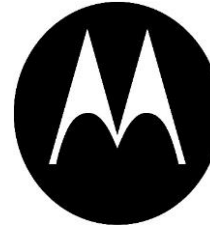
Dr. Boothroyd's ground-breaking research exposed the fact that this practice actually lead to substantially higher product costs relative to the use of fewer, multi-functional parts.

DFM + DFA = ***DfMA***

Who uses DfMA?

Companies who've been using *principles* for awhile now....

- Ford Motor Company
- Harley-Davidson
- John Deere
- Motorola
- General Electric



How does the UA use DfMA?

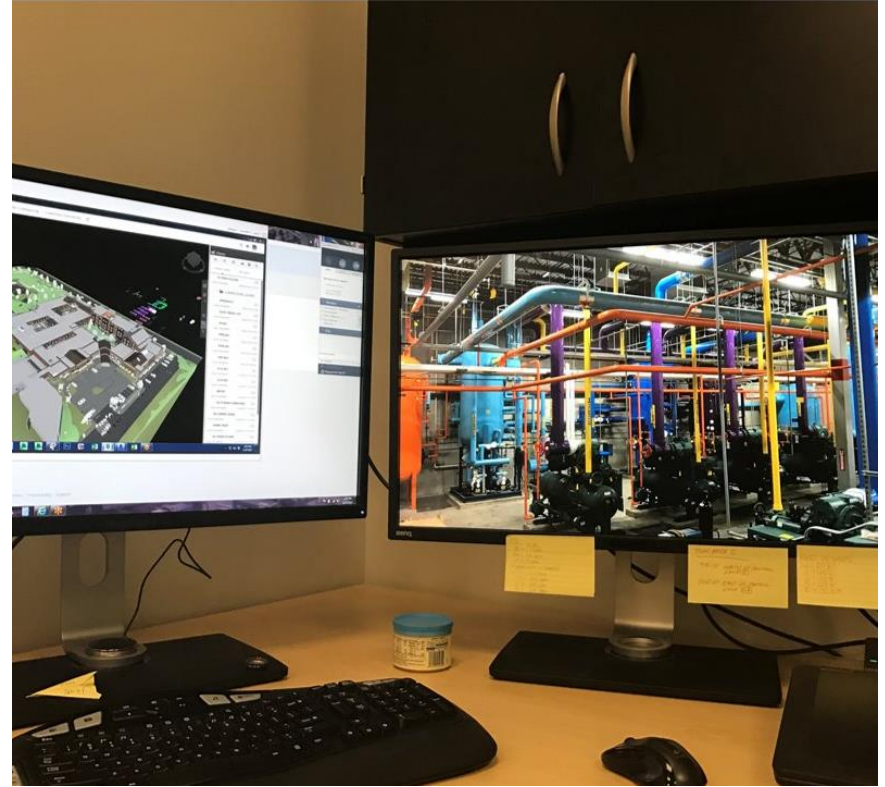
DfMA for PIPE TRADES

- Modeling/creating spool drawings
- Manufacturing piping spools
- Field installation of fabricated modules



How do we train for DfMA?

UA Best Practice Methods



UA Course 3110:

“Design for Manufacture and Assembly (DfMA) and Modular Construction”

- Regional Pilot Course – Madison WI, June 2021
- Course Debut at 2021 UA Instructor Training Program
- Future Regional and ITP Classes



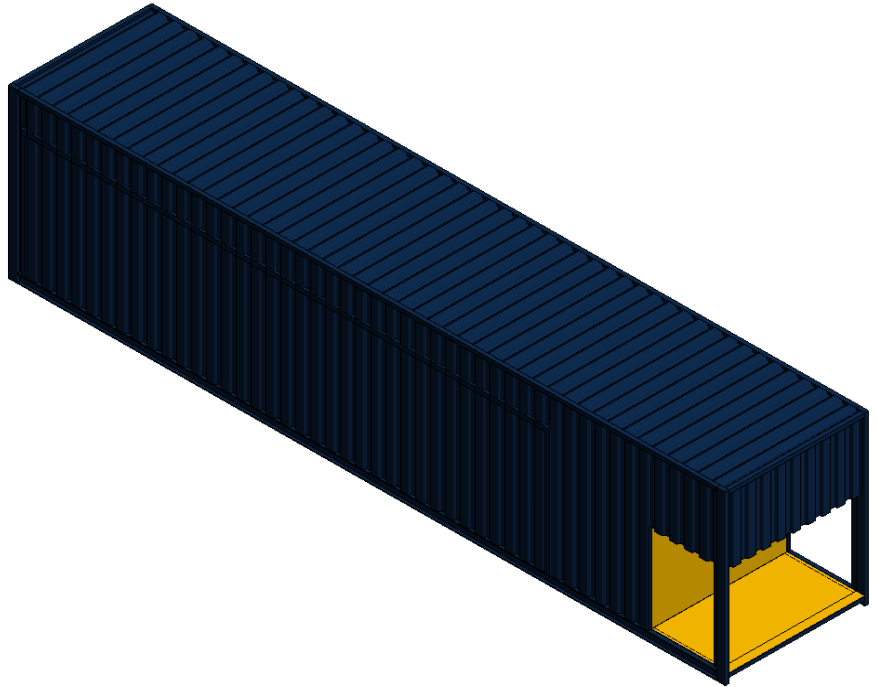
Fabrication Freight Container

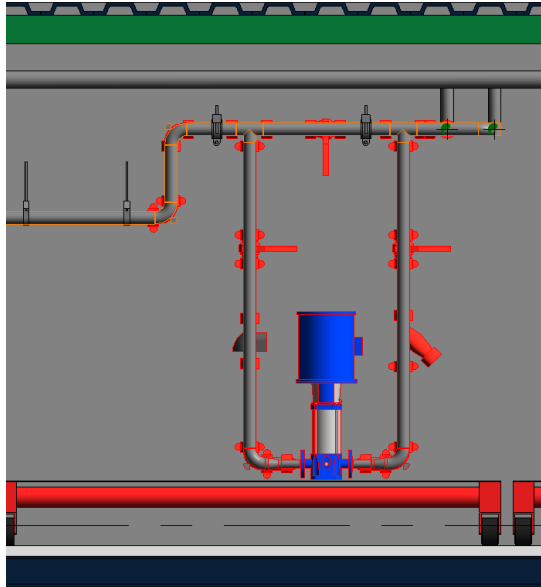
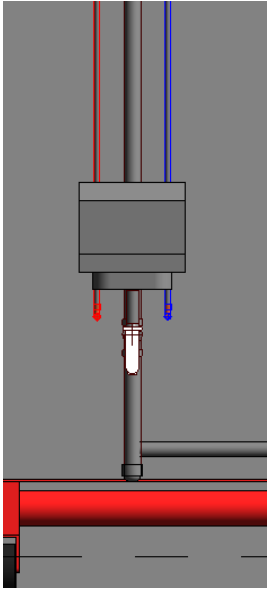
UA Fabrication Training Container

Last year @ AU 2020

MOBILE Training Unit

- ⑩ Interchangeable prefabricated training module for piping and equipment assemblies
- ⑩ Assemblies are stored in a freight container for transport to UA regional training centers and local union training facilities
 - Instruction in DfMA, generative design, automation workflows and digital twin configurations





UA Training Modules

Last year @ AU 2020

Interchangeable combinations for tradeshow & training events:

- Process Piping
- Centrifugal Pump Skid
- Water Heater and Lavatory
- Refrigeration Module
- Metering Devices
- ...other skids for our industry in progress

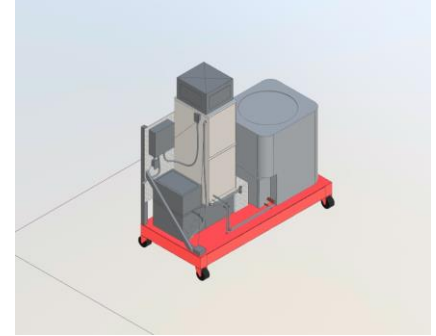
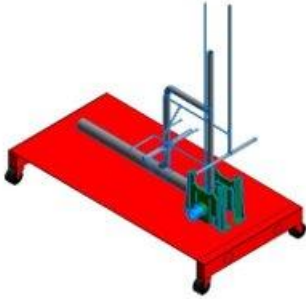
UA FFC-1

Pipe Trades Training Module



UA Training Modules

@ AU 2021 (and beyond)





DfMA and Design

The Future of Modular MEP Design

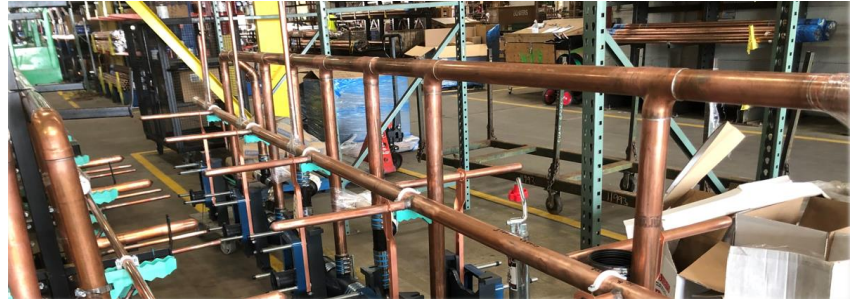
Since last year @ AU 2020

Modular Design Progression

- MEP COORDINATION
- MCERF CMT – COMPLEXITY TRAINING
- GENERATIVE DESIGN

While also considering

- Level of DEVELOPMENT
- Level of AUTOMATION



Connect with the United Association



@unitedassociationhq



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United Association



The background features four abstract, dark, metallic-looking geometric shapes in the corners, resembling stylized computer monitors or architectural elements. They are arranged symmetrically, with two in the top corners and two in the bottom corners, all pointing towards the center.

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