

# The Tipping Point: Off-site Fabrication and Modular Building

Jacob D'Albora, FMP, LEED AP  
Director of BIM-FM Services  
McVeigh & Mangum Engineering, Inc



Credit(s) earned on completion of this course will be reported to **AIA CES** for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with **AIA CES** for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

---

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



# Copyright Materials

This presentation is protected by US and International Copyright laws.  
Reproduction, distribution, display and use of the presentation without written  
permission of the speaker is prohibited.



**MCVEIGH & MANGUM**

**STRUCTURAL · MECHANICAL · ELECTRICAL · PLUMBING · LEED · COMMISSIONING · BIM-FM**  
ATLANTA, GA · CHARLOTTE, NC · JACKSONVILLE, FL · RALEIGH, NC · [www.mcveighmangum.com](http://www.mcveighmangum.com)

© McVEIGH & MANGUM 2019



# Course Description

---

The construction industry is notoriously known as one of the slowest industries to accept change and evolve with recent technology. Even looking outside of a monitor screen, the industry is still resistant to assistance from technology in progressing manual labor which has always been the foundation of building buildings. This is about to change.

**This change will happen out of necessity not out of acceptance.**

## NORTH CAROLINA CONSTRUCTION NEWS

Off-site and modular building: The construction industry is at a tipping point

By Special to North Carolina Construction News - September 14, 2019

310 0



By Jacob D'Albora

# Learning Objectives

---

At the end of the this course, participants will be able to:

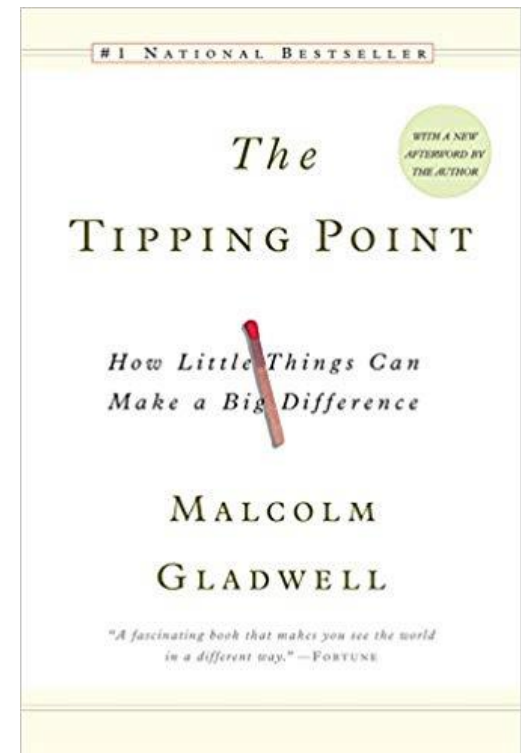
1. Learn what prefabrication and modular construction is.
2. Learn about the current trends that are currently affecting the construction industry.
3. Learn how BIM plays a key role in the integration of off-site construction.
4. Learn about some case studies of prefabricated or modular practices have been successfully implemented.

# The Tipping Point

---

*“The tipping point is that magic moment when an idea, trend, or social behavior crosses a threshold, tips, and spreads like wildfire. Just as a single sick person can start an epidemic of the flu, so too can a small but precisely targeted push cause a fashion trend, the popularity of a new product, or a drop in the crime rate.”*

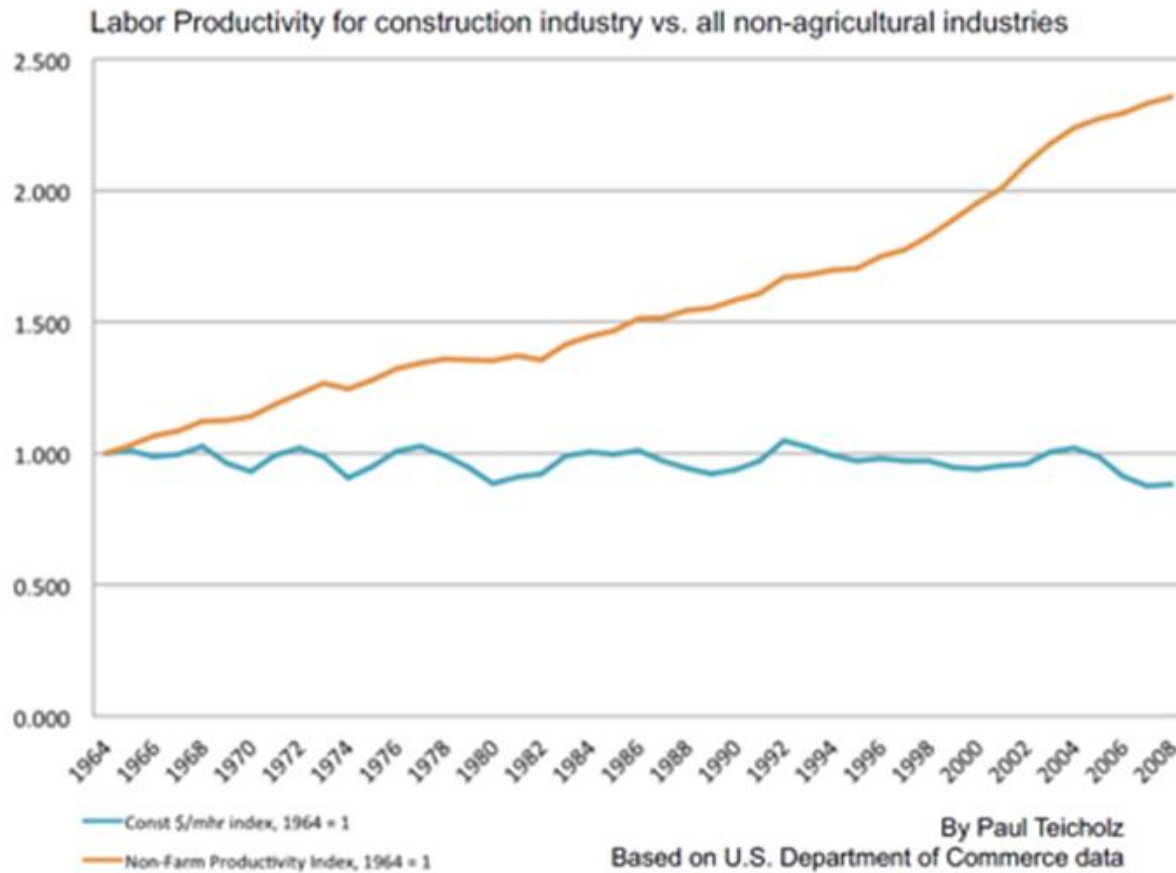
**Malcolm Gladwell**



# Technology Adoption

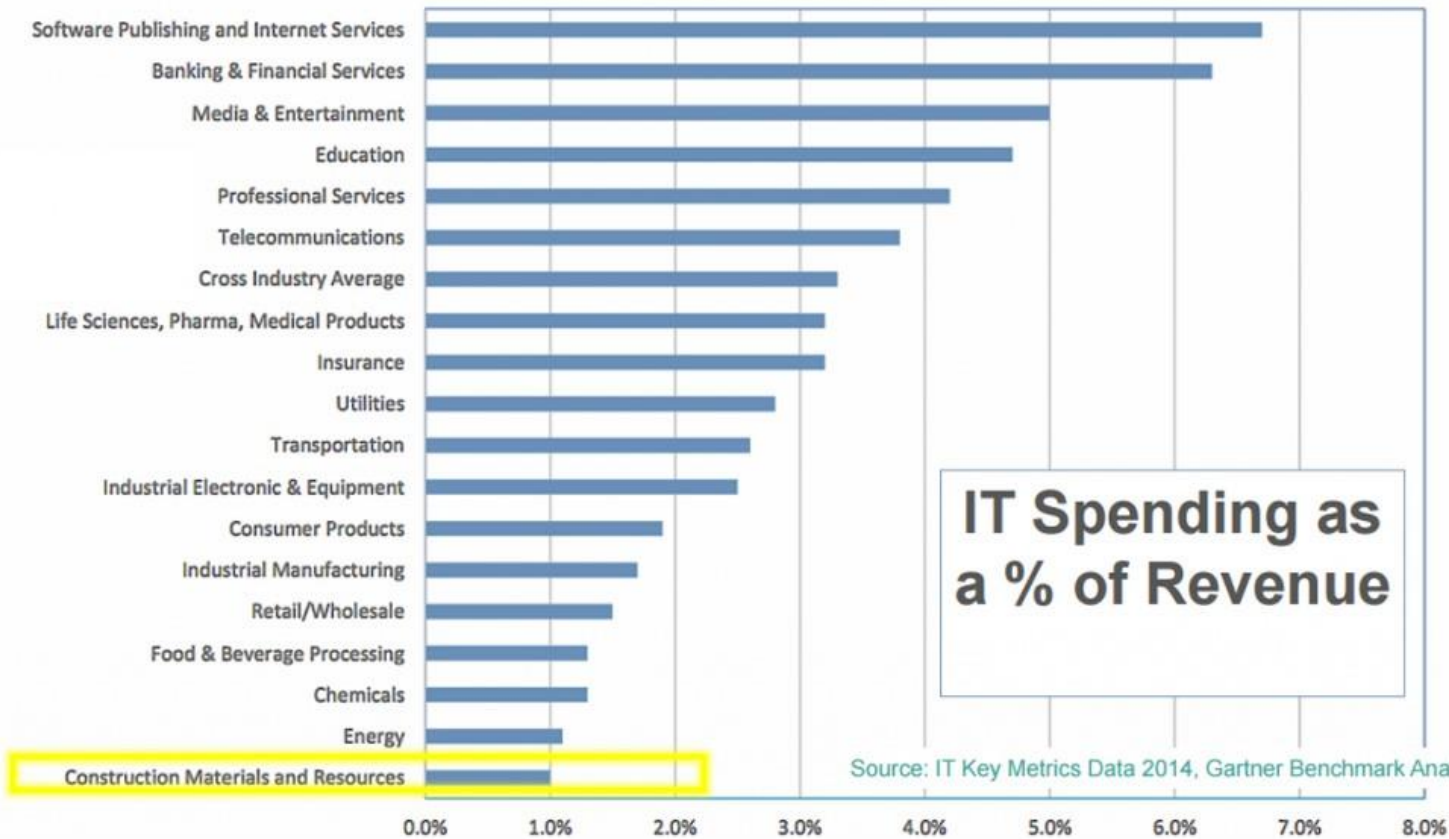
2010

Other industries have figured out how to add **250% more value per workhour** over the last 50 years!



# Technology Adoption

2014





# Technology Adoption

2015



<sup>1</sup>Based on a set of metrics to assess digitization of assets (8 metrics), usage (11 metrics), and labor (8 metrics).

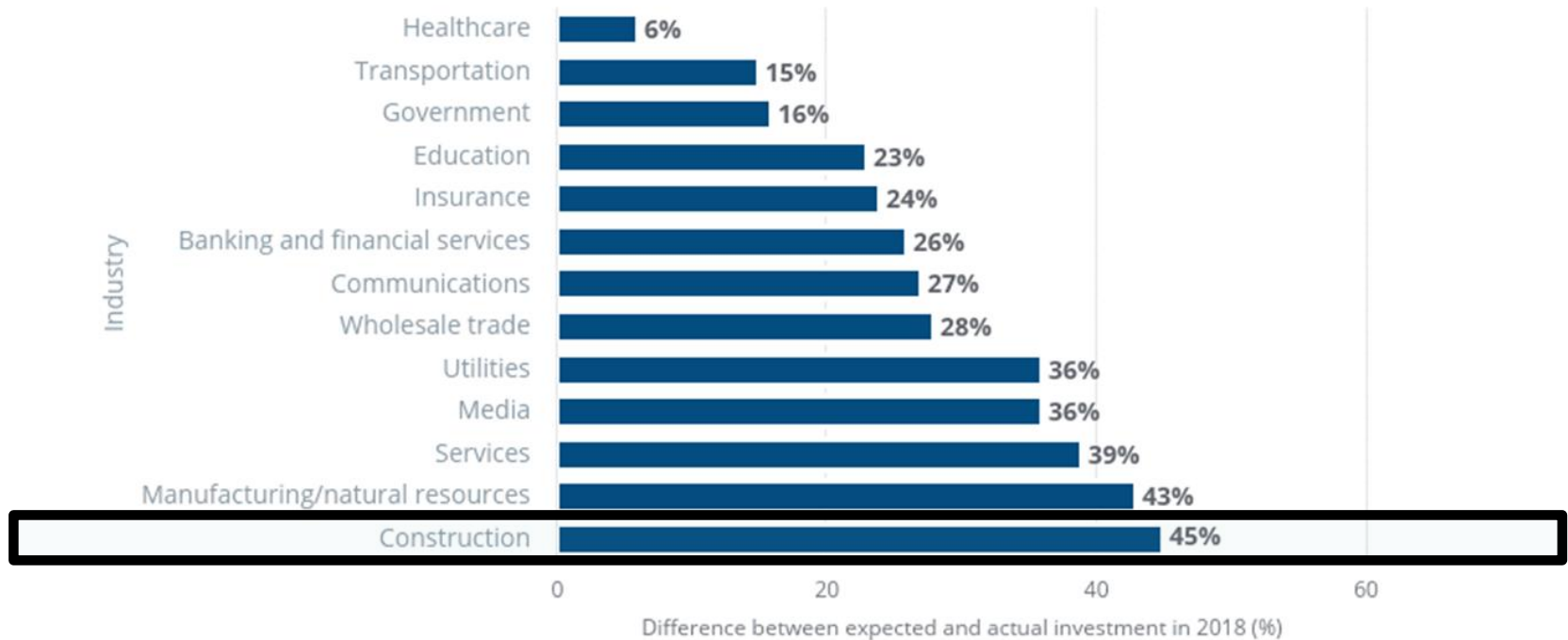
<sup>2</sup>Information and communications technology.

Source: AppBrain; Bluewolf; Computer Economics; eMarketer; Gartner; IDC Research; LiveChat; US Bureau of Economic Analysis; US Bureau of Labor Statistics; US Census Bureau; McKinsey Global Institute analysis

# Technology Adoption

2018

## Average Difference Between Expected and Actual Investments in Emerging Tech, by Industry



N=715

Gartner Digital Markets

Capterra GetApp Software Advice



# Off-site Construction

*Off-site construction. The process of planning, designing and fabricating building elements at a site other than the final location, creating a more rapid and efficient construction of a permanent structure.*

# Off-site Construction

## Prefab Construction



## Modular Construction



# Off-site Construction

## Prefab Construction



*practice of assembling components of a structure in a factory or other manufacturing site, and transporting complete assemblies or sub-assemblies to the construction site where the structure is to be located.*

# Off-site Construction

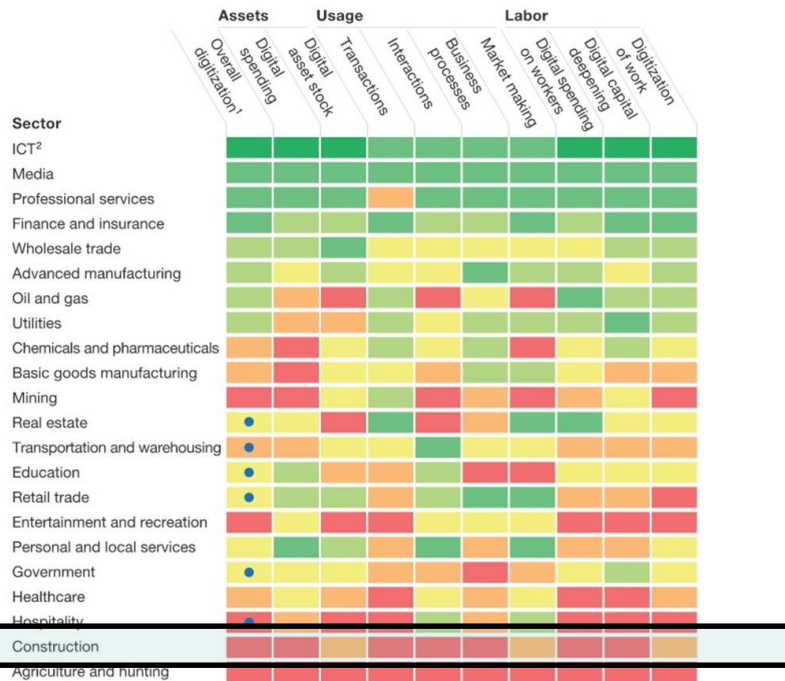
*the use of factory-produced pre-engineered building units that are delivered to site and assembled as large volumetric components or as substantial elements of a building. The modular units may form complete rooms, parts of rooms, or separate highly serviced units such as toilets or lifts.*

## Modular Construction





# Tipping Point



<sup>1</sup>Based on a set of metrics to assess digitization of assets (8 metrics), usage (11 metrics), and labor (8 metrics).

<sup>2</sup>Information and communications technology.

Source: AppBrain; Bluewolf; Computer Economics; eMarketer; Gartner; IDC Research; LiveChat; US Bureau of Economic Analysis; US Bureau of Labor Statistics; US Census Bureau; McKinsey Global Institute analysis

McKinsey&Company

## How are we going to get from here to there?

# Influencers



1. LABOR FORCE

2. RISING CONSTRUCTION COSTS

3. GLOBAL WARMING



*“As many as 40 per cent of borrowers  
could default on their student loans by  
2023.”*

*(H. Hoffower from the Business Insider.)*

**LABOR FORCE**

*“construction occupation market projected to grow 11 percent from 2016 to 2026, a gain of 747,600 new jobs”  
US Bureau of Labor Statistics*



*Construction costs 2.5% of growth in  
2018 which is twice the rate of other  
industries*

*Mckinsey & Company*

# RISING CONSTRUCTION COSTS



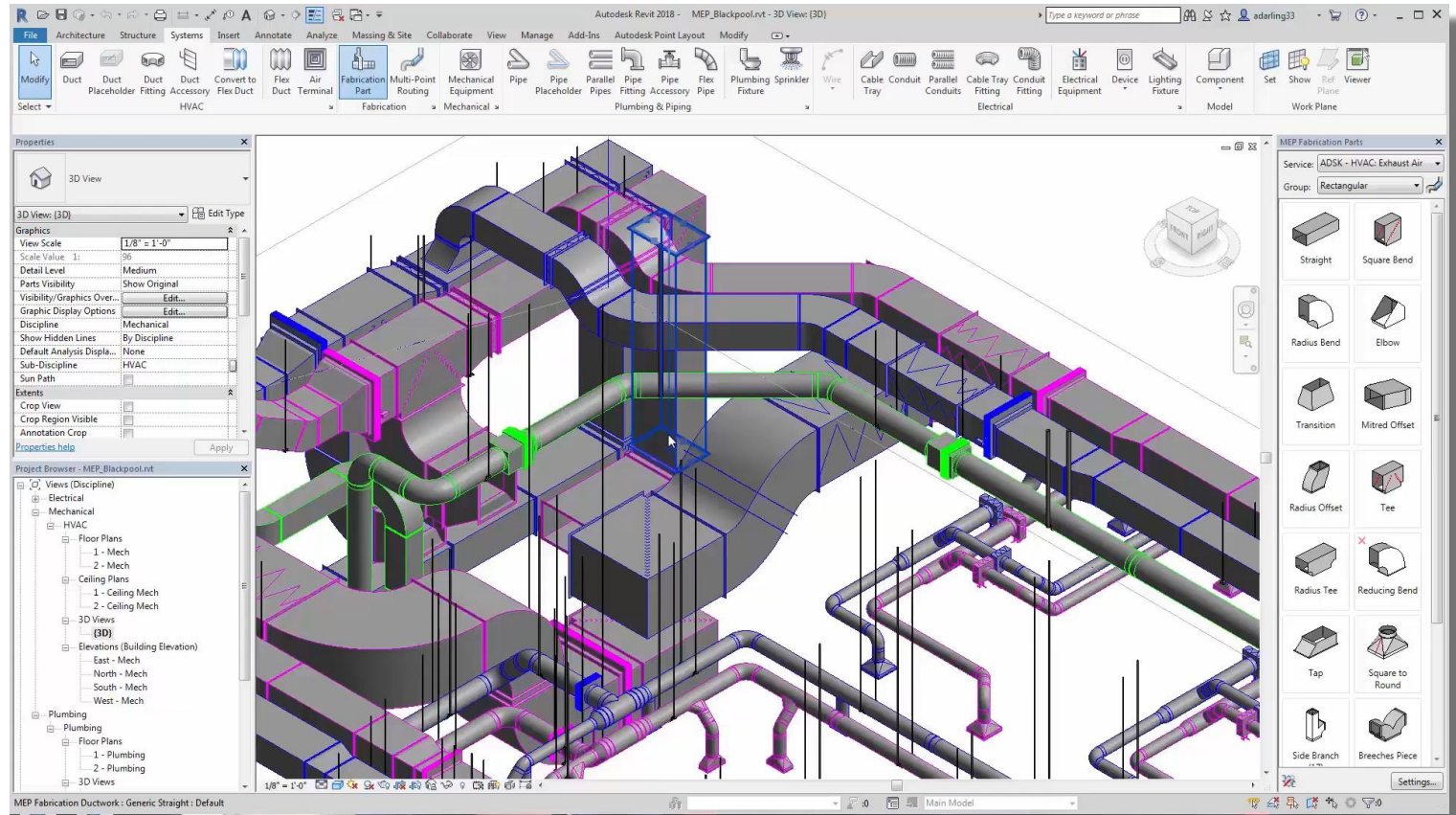
# McKinsey & Company Report on Modular Construction

## Advantages:

- Deliver projects 20%-50% faster than traditional methods
- Potential costs savings of up to 20%

*Summer of 2019 has been record setting temperatures across the United States, including 90-degree weather in Anchorage, AL.*

## **GLOBAL WARMING**



# BUILDING INFORMATION MODELING

HD-L41-OR-HVAC-EA-09 - FABRICATION - OFF RACK DUCT SCHEDULE (L41)													
Spool Tag	System ID	Type	Material Rating	Size	Insulation Thickness	Insulation Type	Insulation Area	Length	Coat	Material	Weight LBS/Ft	Weight	Comments
HD-L41-OR-HVAC-EA-09	EA-09	DUCT	304	14"	0"	None	0.00	10.00	0	304	11.88	118.80	
HD-L41-OR-HVAC-EA-09	EA-09	DUCT	304	14"	0"	None	0.00	10.00	0	304	11.88	118.80	

HD-L41-OR-HVAC-EA-09 - FABRICATION - OFF RACK DUCT FITTING SCHEDULE (L41)												
Spool Tag	System ID	Description	Size	Length	Insulation Thickness	Insulation Type	Coat	Material	Area	Weight LBS	Comments	
HD-L41-OR-HVAC-EA-09	EA-09	DUCT FITTING	14"	10.00	0"	None	0	304	0.00	0.00		

HD-L41-OR-HVAC-EA-09 - FABRICATION - OFF RACK DUCT SCHEDULE (L41)													
Spool Tag	System ID	Type	Material Rating	Size	Insulation Thickness	Insulation Type	Insulation Area	Length	Coat	Material	Weight LBS/Ft	Weight	Comments
HD-L41-OR-HVAC-EA-09	EA-09	DUCT	304	14"	0"	None	0.00	10.00	0	304	11.88	118.80	

HD-L41-OR-HVAC-EA-09 - FABRICATION - OFF RACK DUCT FITTING SCHEDULE (L41)												
Spool Tag	System ID	Description	Size	Length	Insulation Thickness	Insulation Type	Coat	Material	Area	Weight LBS	Comments	
HD-L41-OR-HVAC-EA-09	EA-09	DUCT FITTING	14"	10.00	0"	None	0	304	0.00	0.00		

HD-L41-OR-HVAC-EA-09 - FABRICATION - OFF RACK DUCT SCHEDULE (L41)													
Spool Tag	System ID	Type	Material Rating	Size	Insulation Thickness	Insulation Type	Insulation Area	Length	Coat	Material	Weight LBS/Ft	Weight	Comments
HD-L41-OR-HVAC-EA-09	EA-09	DUCT	304	14"	0"	None	0.00	10.00	0	304	11.88	118.80	

HD-L41-OR-HVAC-EA-09 - FABRICATION - OFF RACK DUCT FITTING SCHEDULE (L41)												
Spool Tag	System ID	Description	Size	Length	Insulation Thickness	Insulation Type	Coat	Material	Area	Weight LBS	Comments	
HD-L41-OR-HVAC-EA-09	EA-09	DUCT FITTING	14"	10.00	0"	None	0	304	0.00	0.00		

HD-L  
VIEW  
②



5/9/2019 9:53:46 PM

② VIEW

① HD-L41-OR-HVAC-EA-009-L41-OR-Map

5/9/2019 9:53:31 PM

5/9/2019 9:53:53 PM

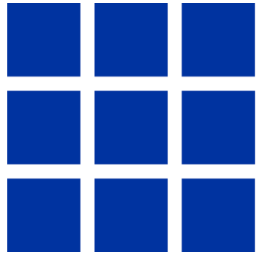
 <b>M&amp;T ENGINEERING SERVICES</b>  <b>QSI Quality Services Ltd.</b>	Sheet: 4	Revised: OR	Project: PharmaChem - Project Sunrise	Sheet Size: 11x17	Sheet No: 17447
	Date: 02/12/19	Scale: 1/4"=1'-0"	System: MME	Job No: 17447	
	EXHAUST AIR OFF RACK SPOOL			HD-L41-OR-HVAC-EA-009	











# FACTORY BLUE



# MARRIOTT NYC





# MARRIOTT NYC

The 168 prefabricated guest rooms will arrive in New York City fully constructed. Each "module" will house a fully outfitted hotel room complete with beds, sheets, pillow, flooring, and toiletries.

THE INDUSTRY CANNOT AFFORD  
TO BE SLOW TO ADOPT. IT CAN NO  
LONGER HAVE AN  
UNWILLINGNESS TO CHANGE OR  
EVOLVE.

**DOES ANYONE ELSE SEE A  
TIPPING POINT?**



THE INDUSTRY CANNOT AFFORD  
TO BE SLOW TO ADOPT. IT CAN NO  
LONGER HAVE AN  
UNWILLINGNESS TO CHANGE OR  
EVOLVE

# QUESTIONS?

DOES ANYONE ELSE SEE A  
TIPPING POINT?

This concludes The American Institute of Architects  
Continuing Education Systems Course

---



Jacob D'Albora, FMP  
Director of BIM-FM Services  
[jdalbora@mcveighmangum.com](mailto:jdalbora@mcveighmangum.com)

McVeigh & Mangum Engineering  
916 W 5<sup>th</sup> Street  
Charlotte, NC 28202

