

# RETHINK EVERYTHING! AGAIN!!



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/S & B Engineers and Constructors, Ltd.

HBR 2013 John Fish jrfish@fbd.com



HOUSTONBUSINESSROUNDTABLE

# RETHINK OUTLINE

- Construction Labor forecasts
- Update on CII/FIATECH Research
- IPA 7 Deadly Sins of Project Execution

# RETHINK

- ◎ **EDUCATION:** Khan Academy Edx
- ◎ **DEPARTMENT STORES:** Apple, jcp
- ◎ **PHONE:** Wireless VOIP Smart Remote Control/Access
- ◎ **ENTERTAINMENT:** Cable vs. Broadband (Netflix, iTunes)
- ◎ **ENERGY:** Cheap Natural Gas – Abundant Oil
- ◎ **GRID:** Decentralized Power Generation
- ◎ **TRANSPORTATION:** Driverless Trucks/Cars
- ◎ **MANUFACTURING:** In-Sourcing, Automation
- ◎ **3D PRINTERS** – Decentralized Manufacturing
- ◎ **CONSTRUCTION:** Think Manufacturing
- ◎ **ENGINEERING:** Discipline Roles, Deliverables
- ◎ **DELIVERABLES:** Assembly Instructions
- ◎ **DEFENSE:** Iron Dome, Robots, Drones



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# *RENAISSANCE*

## THE STUNNING ECONOMIC IMPACT OF LOUISIANA'S NEW INDUSTRIAL REVOLUTION



Greater New Orleans Business Roundtable August 29, 2013

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# LOUISIANA

## Pipelines & Platforms





# Lower 48 states shale plays



Source: Energy Information Administration based on data from various published studies.  
Updated: May 9, 2011

# Global Natural Gas Costs – 2<sup>nd</sup> Quarter 2008

(\$US per million BTUs)

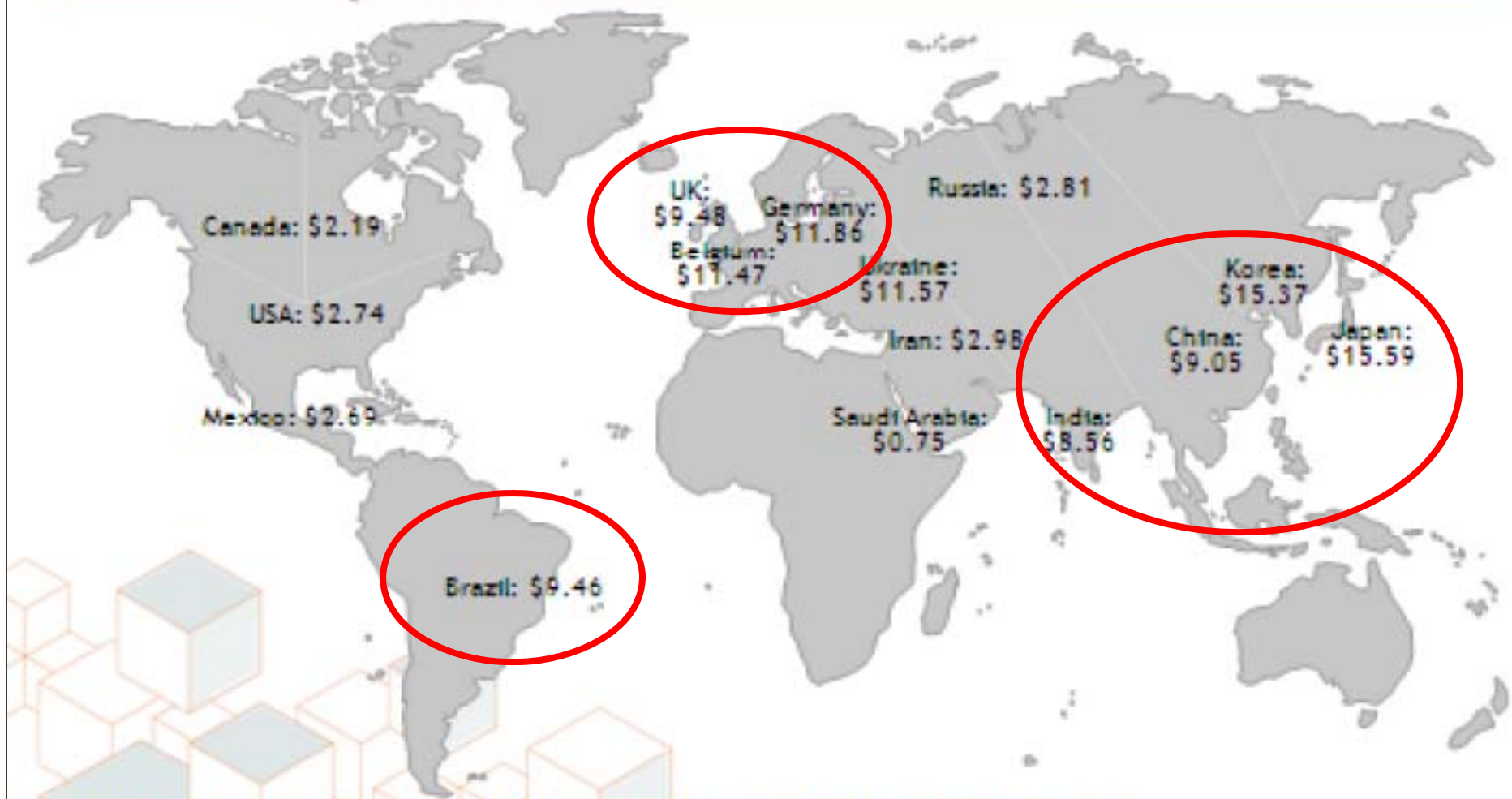


Note: Prices generally reflect domestic wellhead/hub prices or imported prices via pipeline. Some nations (e.g., Japan and Korea) import LNG. Thus, the higher prices. Other nations import LNG but these prices aren't generally reflected in the above.



# Global Natural Gas Costs: 2012

(\$US per million BTUs)



Note: Prices generally reflect domestic, wellhead/hub prices or imported prices, i.e. global. Some nations (e.g., Japan and Korea) import LNG. Thus, the higher prices. Other nations import LNG if it's a minor share of demand but these prices aren't generally reflected in the above.

## World LNG Estimated April 2013 Landed Prices



# Natural Gas Price History

  
**Natural Gas Price**  
3.70 USD/mmbtu  
26 Jun '13

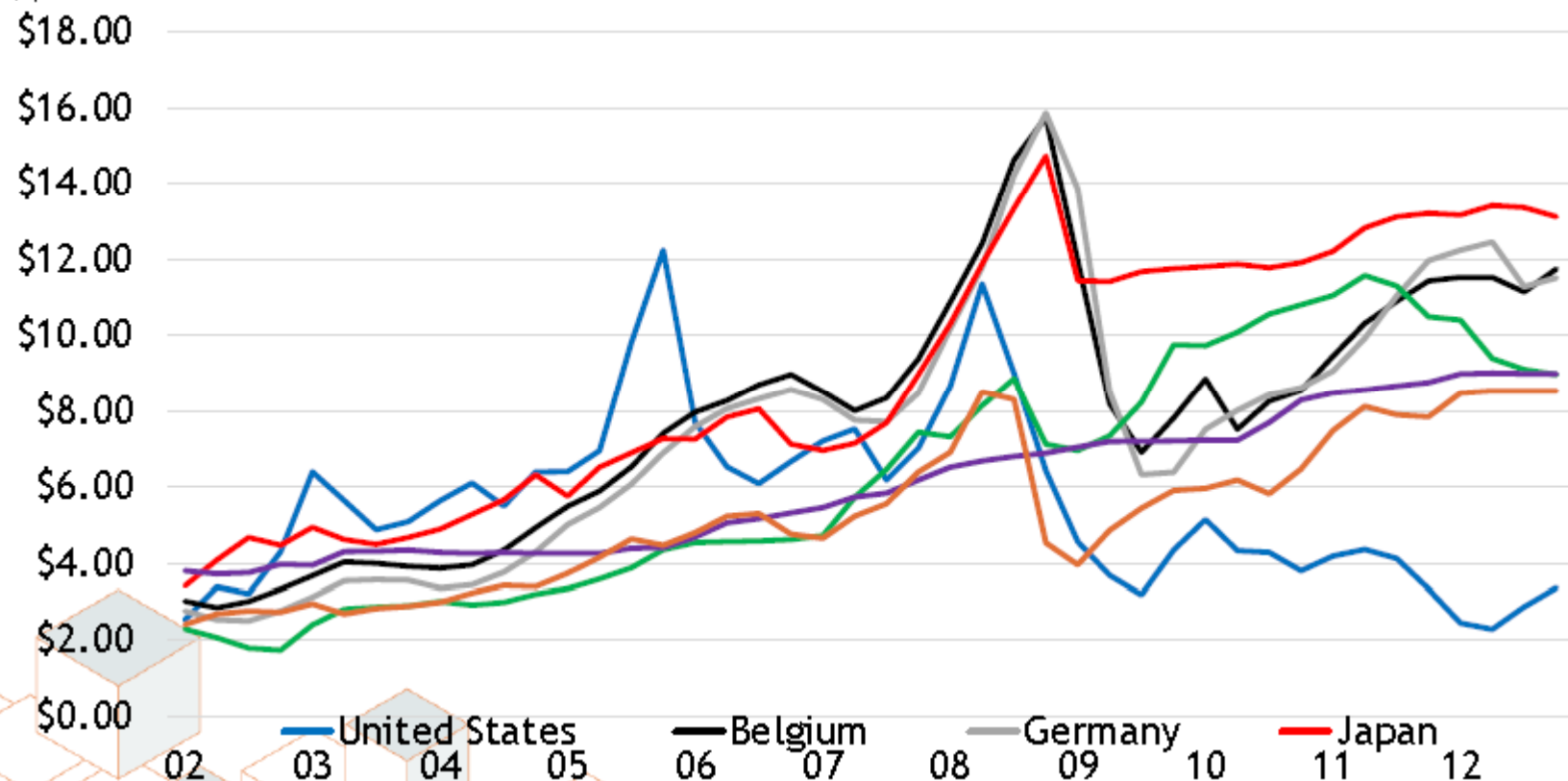


**InfoMine.com**



# Global Natural Gas Price Trends

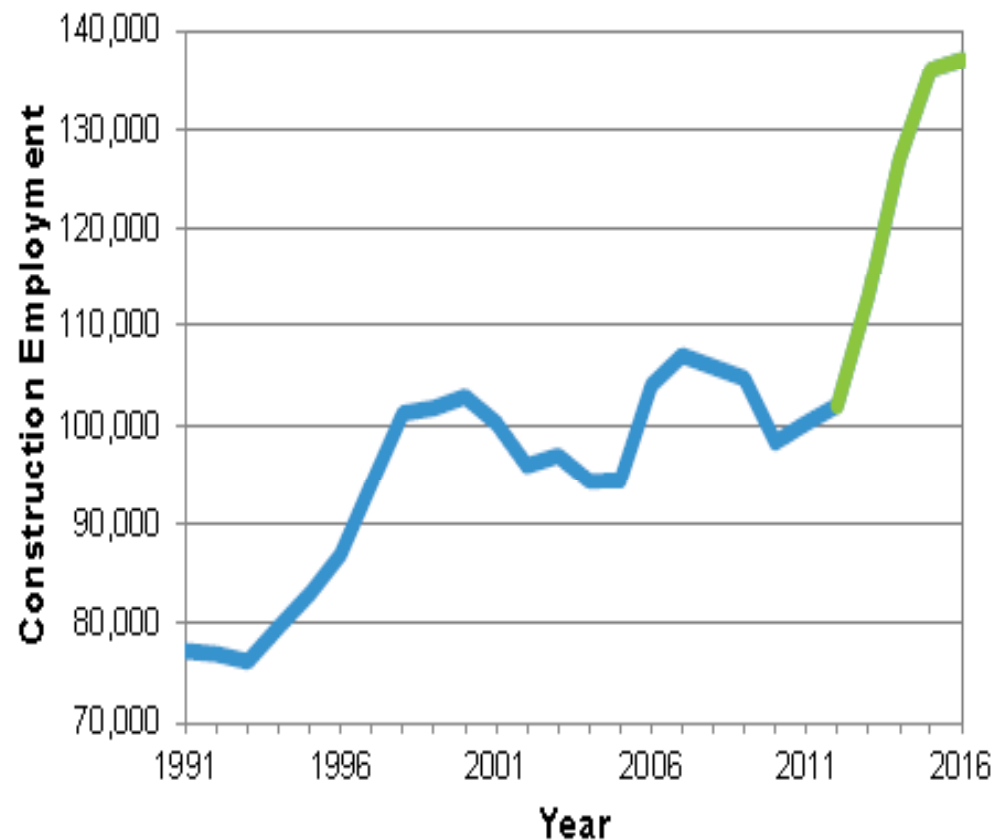
\$ per million BTUs



Source: EIA, Petrobas, IMF, World Bank, various national statistical agencies

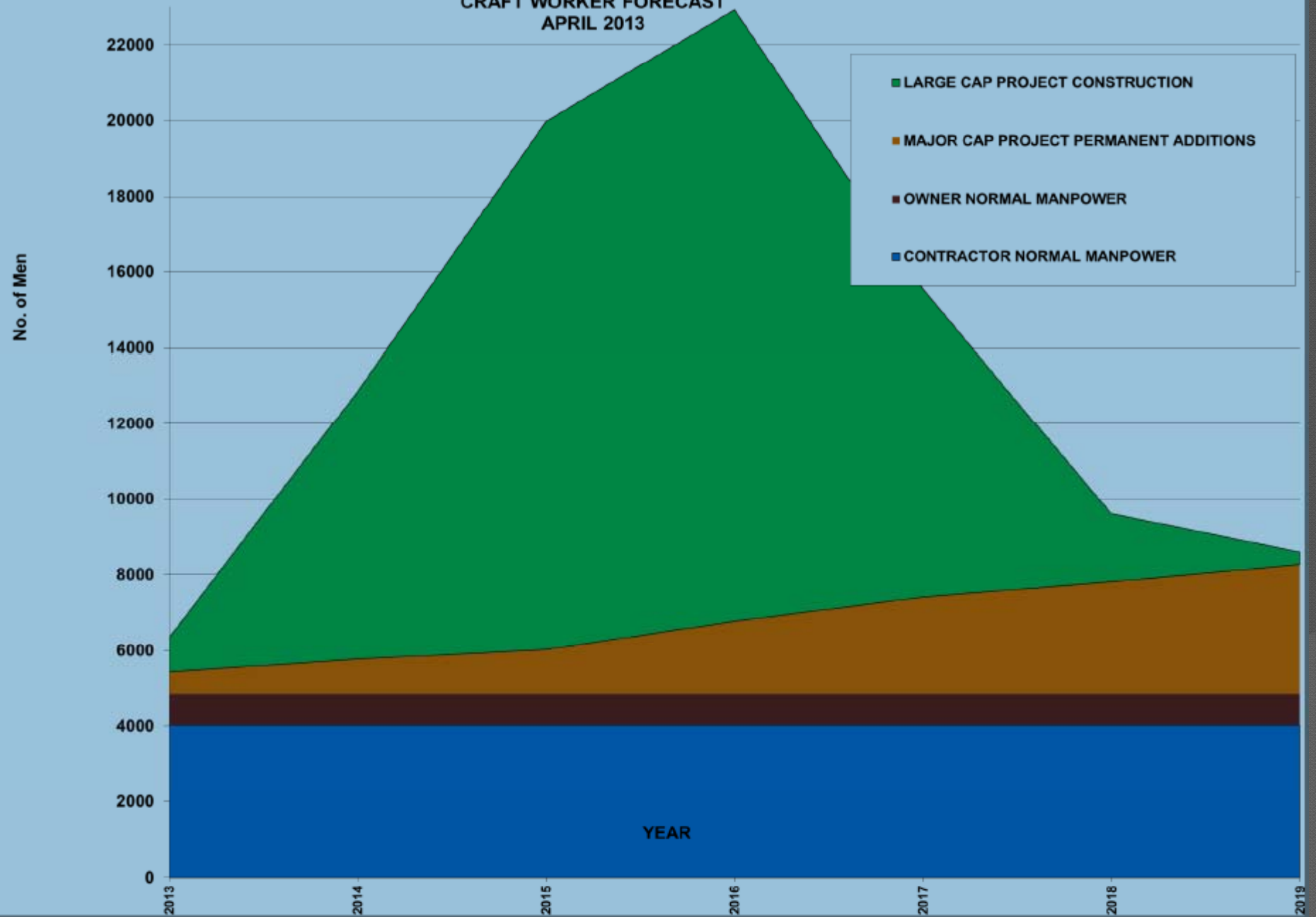
# Historic demand for industrial craft workers

- **\$60 billion** of announced plant expansions and new plants
  - Driven by low price of natural gas and greatly improved business climate
- **86,300** new crafts workers needed through 2016
  - 35,000 new jobs
  - 51,300 jobs available because of attrition



Source: LSU Division of Economic Development, Louisiana Workforce Commission and Louisiana Economic Development

**SOUTHWEST LOUISIANA  
MAJOR CAPITAL PROJECT  
CRAFT WORKER FORECAST  
APRIL 2013**





**TEXAS**  
**NEW**

DOUBLE  
LOUISIANA

# Questions and Contact Information



Dan Borné, Greg Bowser or Rob Landry  
Louisiana Chemical Association  
2040 One American Place  
Baton Rouge, LA 70825

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Greg	225.376.7650	<a href="mailto:greg@lca.org">greg@lca.org</a>
Rob:	225.376.7656	<a href="mailto:rob@lca.org">rob@lca.org</a>

[www.lca.org](http://www.lca.org)

# What's New at CII/CMAA/FIATECH



Innovate to meet the demand



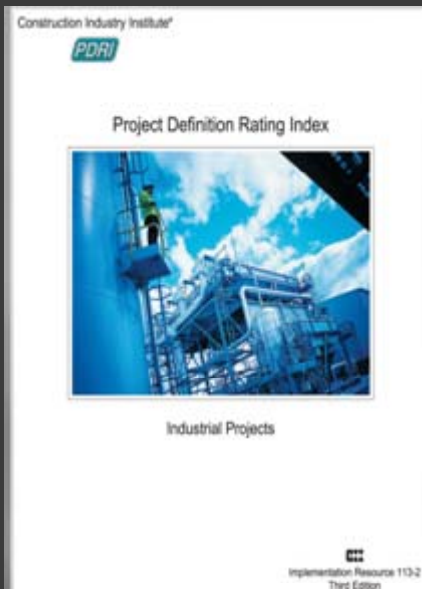
Focus on sharing of information  
and WorkFace Planning



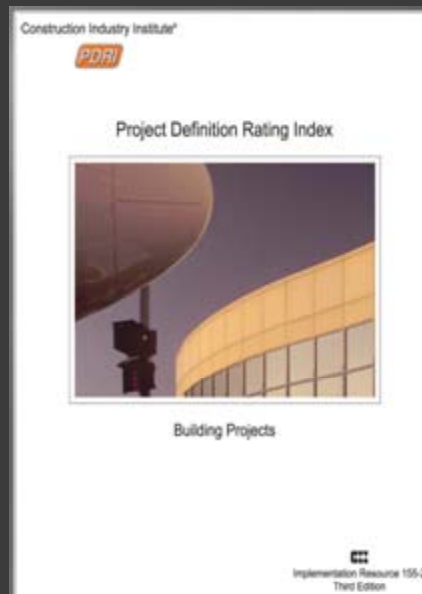
Move Construction to MFG



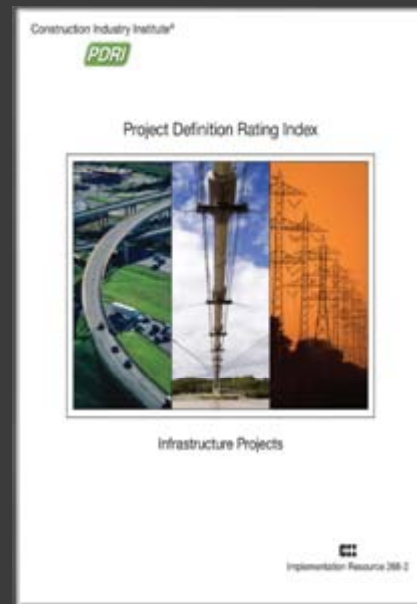
# Project Definition Rating Index



**1996  
Industrial**



**1999  
Buildings**



**2010  
Infrastructure**



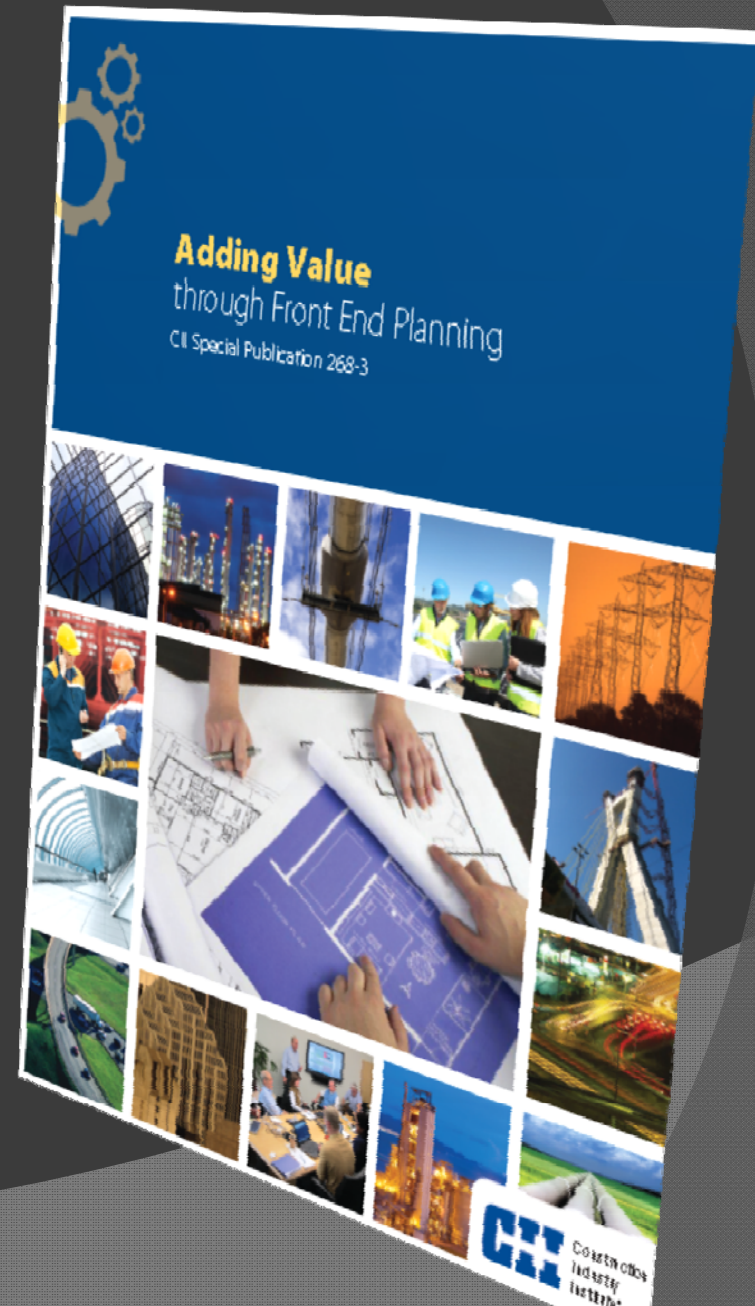
# 2013

**CII Special Publication  
268-3**

**ADDING VALUE Through  
Front End Planning**

**Puts it all together on  
one document.**

**Radical Change to  
MAGAZINE type  
publication**





COMING  
SOON

***PDRI***

**For SMALL  
PROJECTS  
CII RT-314**

# **CHALLENGE**

**DEFINITION of a  
SMALL PROJECT?**





# **COMPREHENSIVE RISK IDENTIFICATION & MITIGATION RESOURCE**

# CURRENT RESEARCH TEAMS

- [252](#) Construction Productivity Research Program Team (2007 - 2013) (5- to 6-year project)
- [256](#) Project Site Leadership Role in Improving Construction Safety - Continuation (2011 • 2012 )
- [268](#) Integration of CII Front End Planning Products (2011 - 2012)
- [272](#) **WorkFace Planning, from Design through Site Execution**
- [280](#) Methods for Dealing with Uncertainty - Applying Probabilistic Controls in Construction (2010 - 2012)
- [281](#) **Project Management Skills of the Future - (2010 - 2012)**
- [282](#) Managing Indirect Costs (2010 - 2012)
- [283](#) **Modularization (2010 - 2012)**
- [284](#) Leading Indicators for Safety (2010 - 2012)
- [290](#) **Quantifying the Impact of Change from Project Authorization to Startup (2011 - 2013)**
- [291](#) Improving the Accuracy of Project Outcome Predictions (2011 - 2013)
- [292](#) **Knowledge Transfer from the Near-Retirement Generation to the Next Generation (2011 - 2013)**
- [293](#) Strategies for HSE Hazard Recognition (2011 - 2013)
- [294](#) Deploying Best Practices in Unfamiliar Countries (2011 - 2013)

- [300](#) **True Impact of Late Deliverables at the Construction Site (2012 - 2014)**
- [301](#) Using Near Miss Reporting to Enhance Safety Performance (2012 - 2014)
- [302](#) **Interface Management (2012 - 2014)**
- [303](#) Managing a Portfolio of Projects-Metrics for Improvement (2012 - 2014)
- [304](#) Sustainability Practices and Metrics for the Construction Phase of Capital Projects (2012 - 2014)
- [305](#) Measuring Project Complexity and Its Impact (2012 - 2014)
- [306](#) **Quantitative Measurement of PM Competencies (2012 - 2014)**
- [307](#) Mitigating Threats of Counterfeit Materials in the Capital Projects Industry (2012 - 2014)
- [308](#) Achieving Zero Rework through Effective Supplier Quality Practices (2012 - 2014)



Construction must move  
away from  
“the field”  
and into  
“the factory.”



Question at CII Conference:

Where is the NEXT high value  
design center?

**NEED A NEW BUILDING? Call the  
Philippines BusinessWeek 9/9/2012**



**Bechtel/Chevron Whiting Refinery \$3.8B  
Craft Labor LT \$10/HR  
Offshore Modular can save 20%**

# GORGON Project Australia



**51 Modules      1,000 to 7,000 Tons Each**  
**Total Tonnage: 200,000**



# GORGON Project Australia



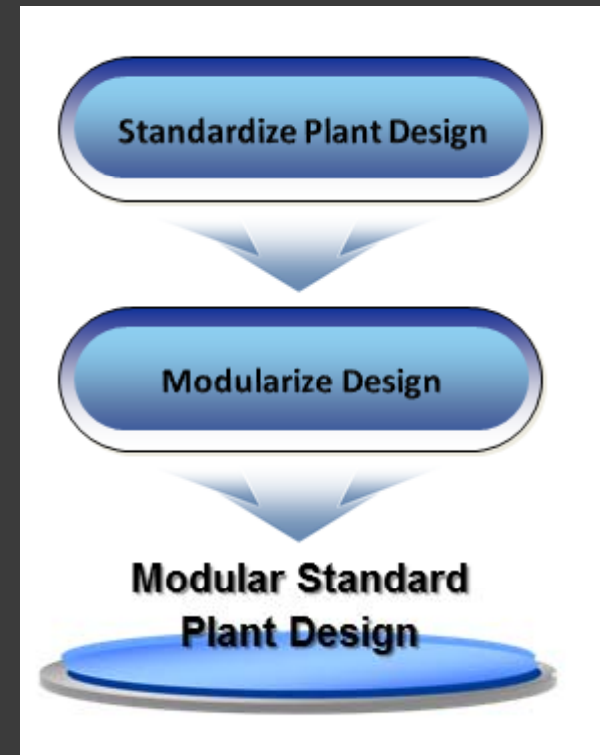
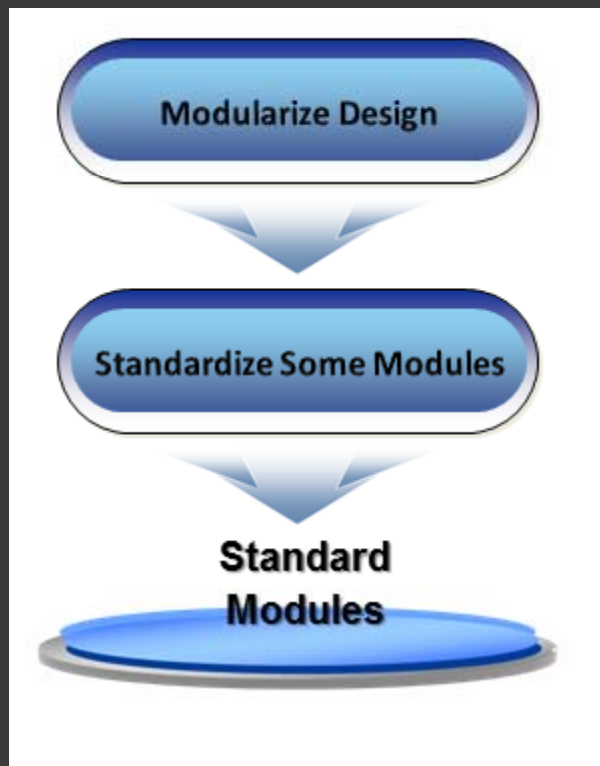
The Construction Village continues to grow with 10 of the 12 accommodation clusters completed.

# CONSTRUCTION vs. MANUFACTURING

- *Environment – weather – unpredictable*
- *Duration – years rather than hours*
- *Repetitive processes rather than 1x*
- *Continuous supply chain*
- *Task-trained people, work in one place, vs.*
- *Craft-trained people who move around*
- *Client involvement*



# Modularization + Standardization



CII RT-263

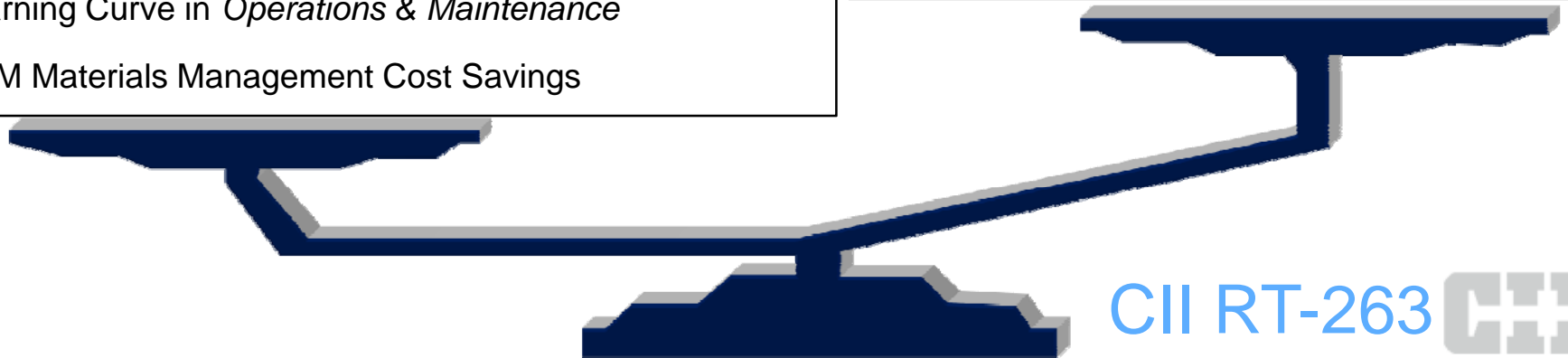
# Standardization Benefits & Tradeoffs Scale

## 10 Benefits (Mostly Variable Cost Savings)

- Design Only Once and Build/Fabricate Many Times
- Design & Procure in Advance/Respond to Schedule Needs
- Accelerated, Parallel Engineering for Site Adaptation
- **Learning Curve in Fabrication**
- Volume Discounts in Procurement
- Construction Materials Management Cost Savings
- Learning Curve in *Module Installation/Site Construction*
- Learning Curve in *Commissioning/Startup (planning & execution)*
- Learning Curve in *Operations & Maintenance*
- O&M Materials Management Cost Savings

## 3 Tradeoffs

- Cost of Assessing the Market and Establishing Scope (F)
- Cost of Establishing the Design Standard (F)
- Sacrificed Benefits from Conventional Customization (V)







● **Mobil App Community of Practice**

● **Field KIOSK for Craft Foreman**

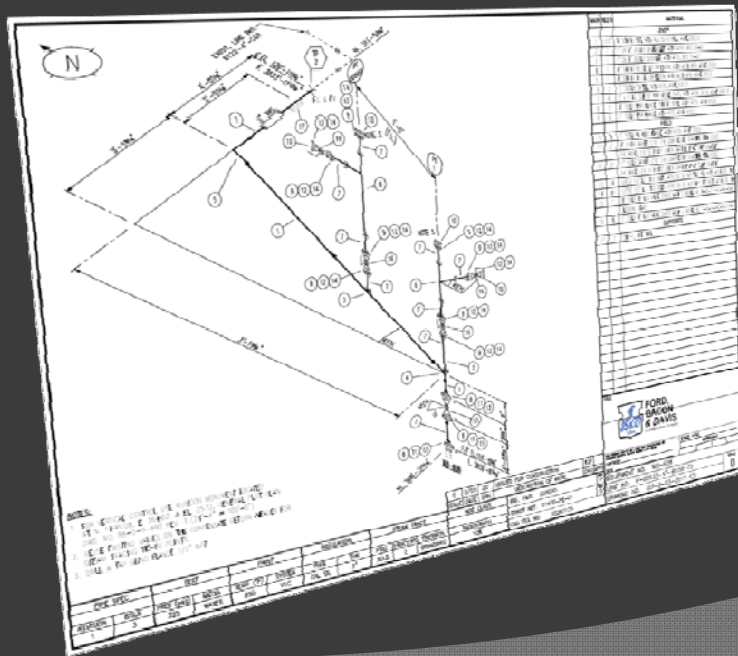
# RETHINK AUTOMATION

- Millions spent on Technology
- No perceived productivity increase
- WHY?
- Path Forward



# RETHINK AUTOMATION

- We use EXPENSIVE Technology to product the TIME HONORED DELIVERABLES



**There is nothing so useless  
as doing efficiently  
that which should not be done at all.**  
*~Peter F. Drucker*



**Waste is a tax  
on the whole people.**

*~Albert W. Atwood*



# RETHINK DISCIPLINE ROLES

- ⦿ Work Splits – No change since 1950's
- ⦿ How we work in a 3D Model
- ⦿ Deliverable Information presentation
- ⦿ Are there OTHER Disciplines?
- ⦿ Role of the Generalists?

# RETHINK VENDOR INFORMATION

- ⦿ Develop a Standard
- ⦿ Automate Delivery
- ⦿ Utilize PULL concepts
- ⦿ Automate Delivery to Owner for Life Cycle
- ⦿ QA Documentation Accessibility/Handover



# **Realizing Productivity Improvement Through INTEROPERABILITY**

## **Information Exchange between Software Platforms and Applications**

Reg Hunter

Sr. Program Director, Fiatech

[Hunter@Fiatech.org](mailto:Hunter@Fiatech.org)

512/992-8328



U.S. Department of Commerce  
Technology Administration  
National Institute of Standards and Technology

Advanced Technology Program  
Information Technology and Electronics Office  
Gaithersburg, Maryland 20899

## Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry

Michael P. Gallaher, Alan C. O'Connor, John L. Dettbarn, Jr., and Linda T. Gilday



# NIST Aug 2004

***“The cost of inadequate interoperability in the U.S. capital facilities industry: \$15.8 billion per year.”***

## TWO THIRDS by OWNER/OPERATORS

## *TIME LAG to KEYPUNCH - MONTHS/YEARS*





## True Engineering Enterprise Interoperability

Information Centric environment

Same data used to design & build facility

Same continuity in data to operate and maintain facility

Process Stream Data	3D Plant Model	Equipment Specs	P&IDs/ PSM Data	Operating Conditions	BPFs	Mechanical Integrity
Flow Sheets	Cost Information	Plant/Project Drawings	Contracts	Schedules/ Progress	Spare Parts List	Equipment Master Data



**WARNING**  
**3D PLM**  
**is**  
**COMING SOON ALSO**



Fiatech™



# WARNING

3D PLM

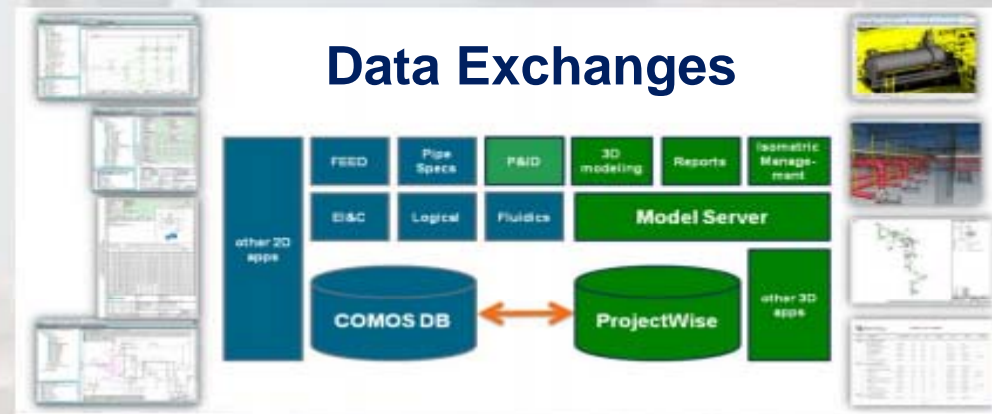
is

COMING SOON ALSO

# 3D PLANT LIFECYCLE MAINTENANCE LINKING DESIGN & ASSET DATA TO OPERATIONS & MAINTENANCE

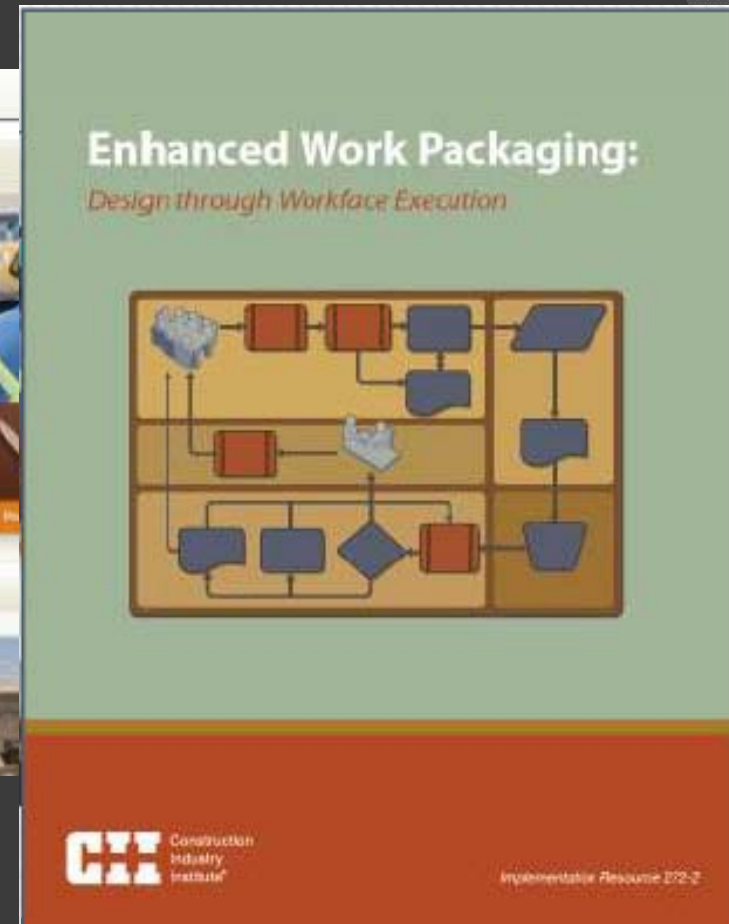
**DESIGN**

**O & M**





# Advanced Work Packaging (AWP)





# **How do we implement INSTALLATION WORK PACKAGES (IWP) at the job site**

# BEGIN with the END in MIND

@ FEP THINK



## BUILD



Develop a project WBS  
Align:  
Engineering & Construction  
Work Packages

# WHY WORK PACKAGE?

**OBJECTIVE: Get the CRAFT what they need to be productive**

**Information**

**Materials**

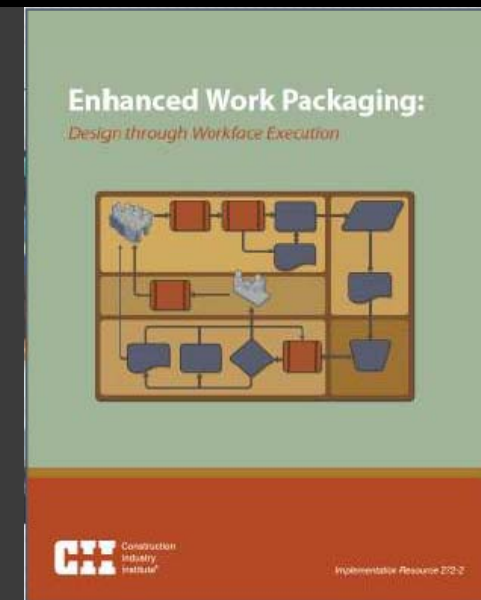
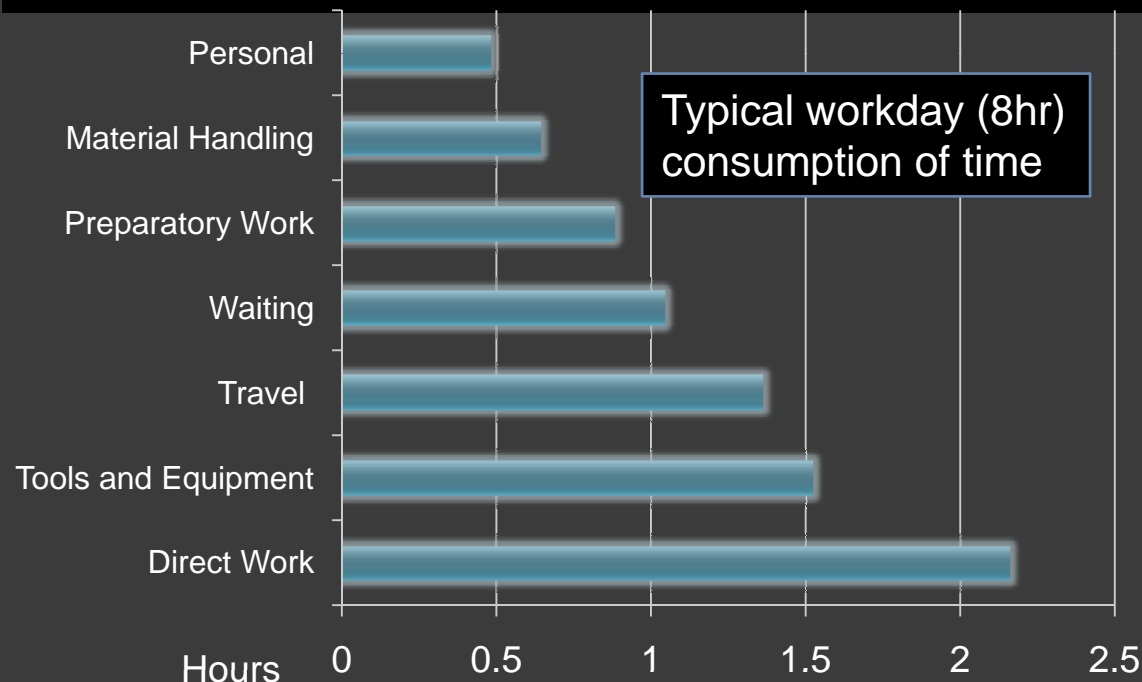
**Equipment**

**Tools**



# PRODUCTIVITY RESEARCH

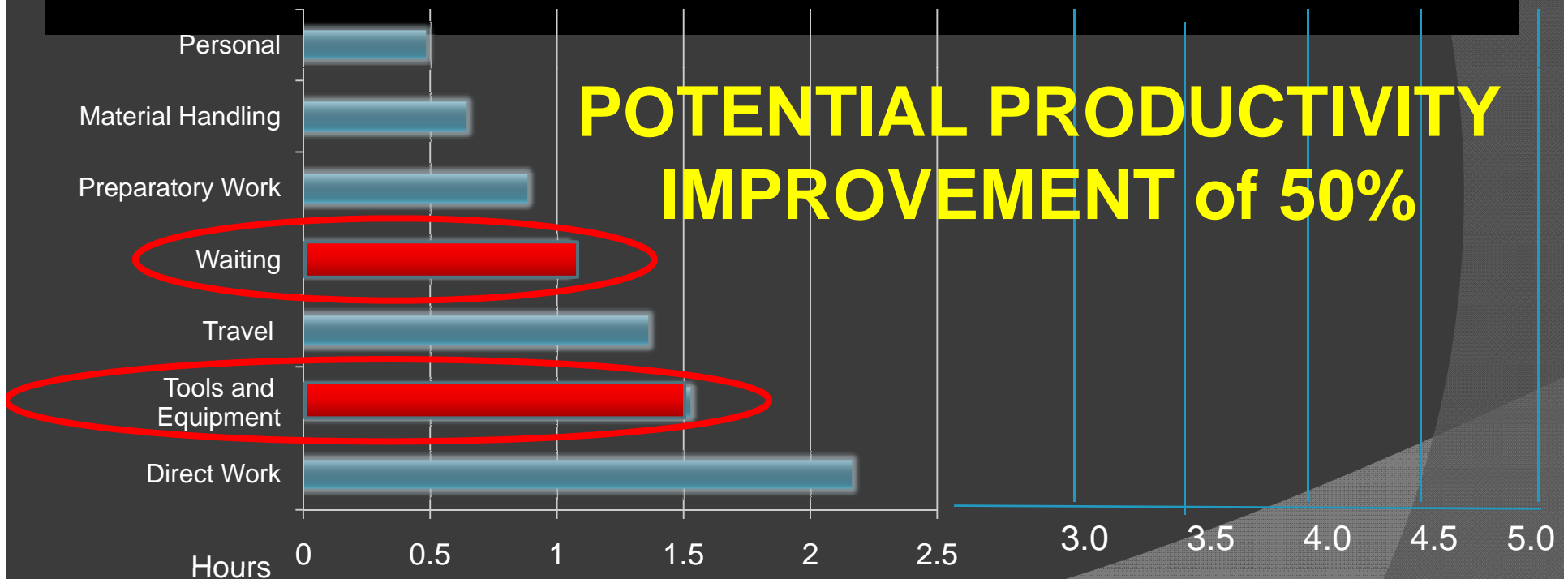
- Construction Industry Institute (CII) studies\* have shown that 25% to 40% of the construction installed costs is from direct labor.
- Enabling Integrated Automated Advanced Work Packaging (AWP) has been identified as the best means to increase productivity, safety, quality, predictability and schedule performance.



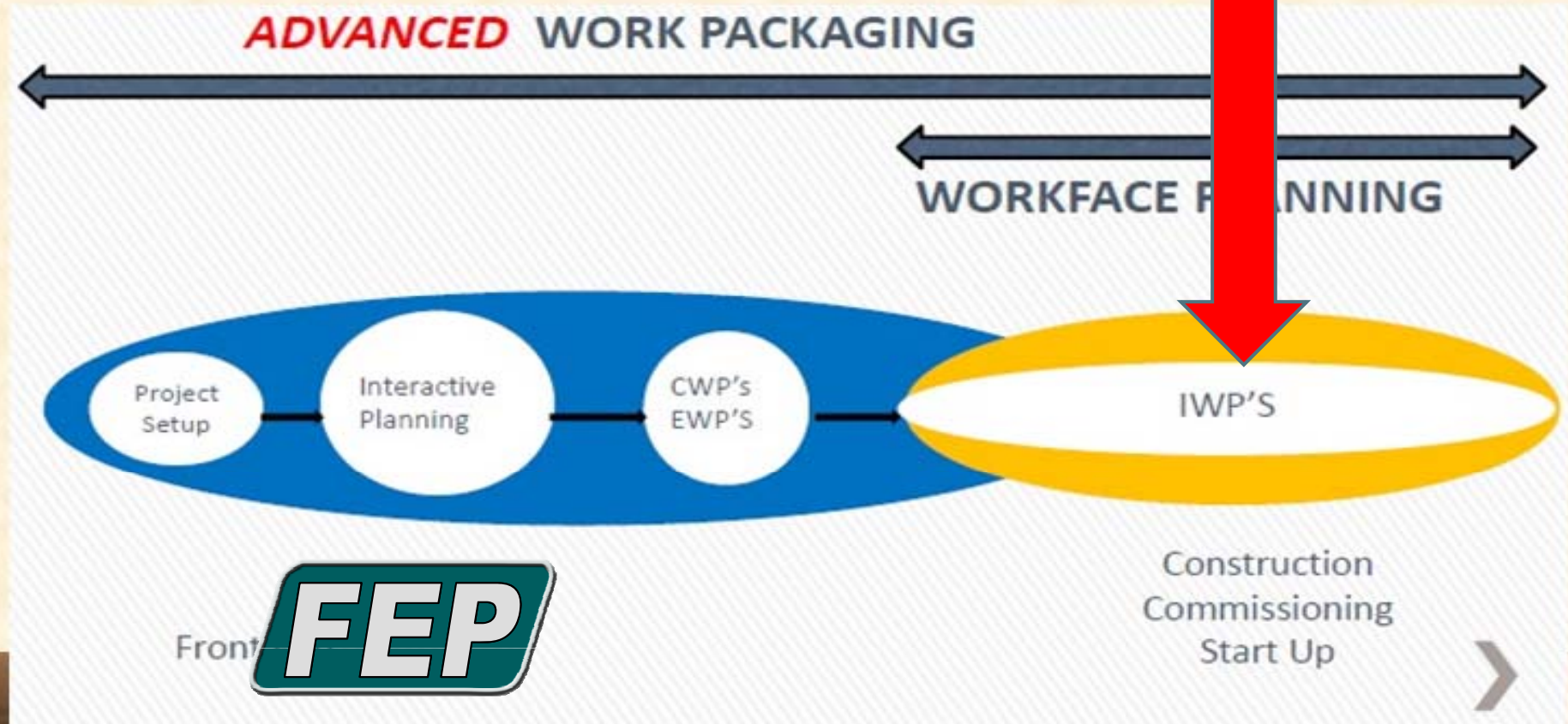
\* IR 252-2A, 2010

# IWP PRODUCTIVITY BENEFITS

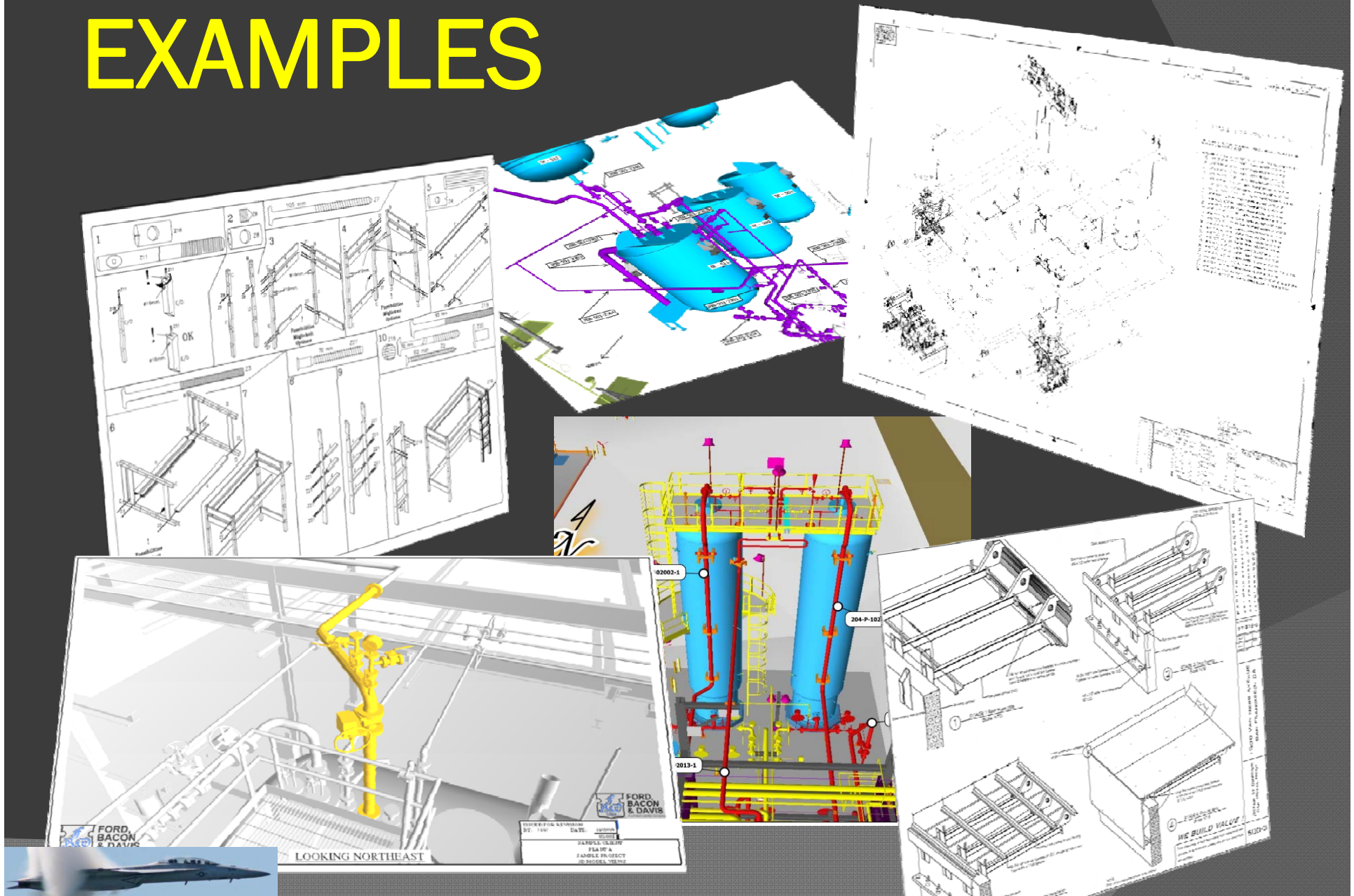
Elimination of WAIT, TOOLs & Equipment  
can **POTENTIALLY** improve productivity  
from 2.2 hours a day to almost 5.



# What do WE HAND to the CRAFT in the way of ASSEMBLY INSTRUCTIONS?



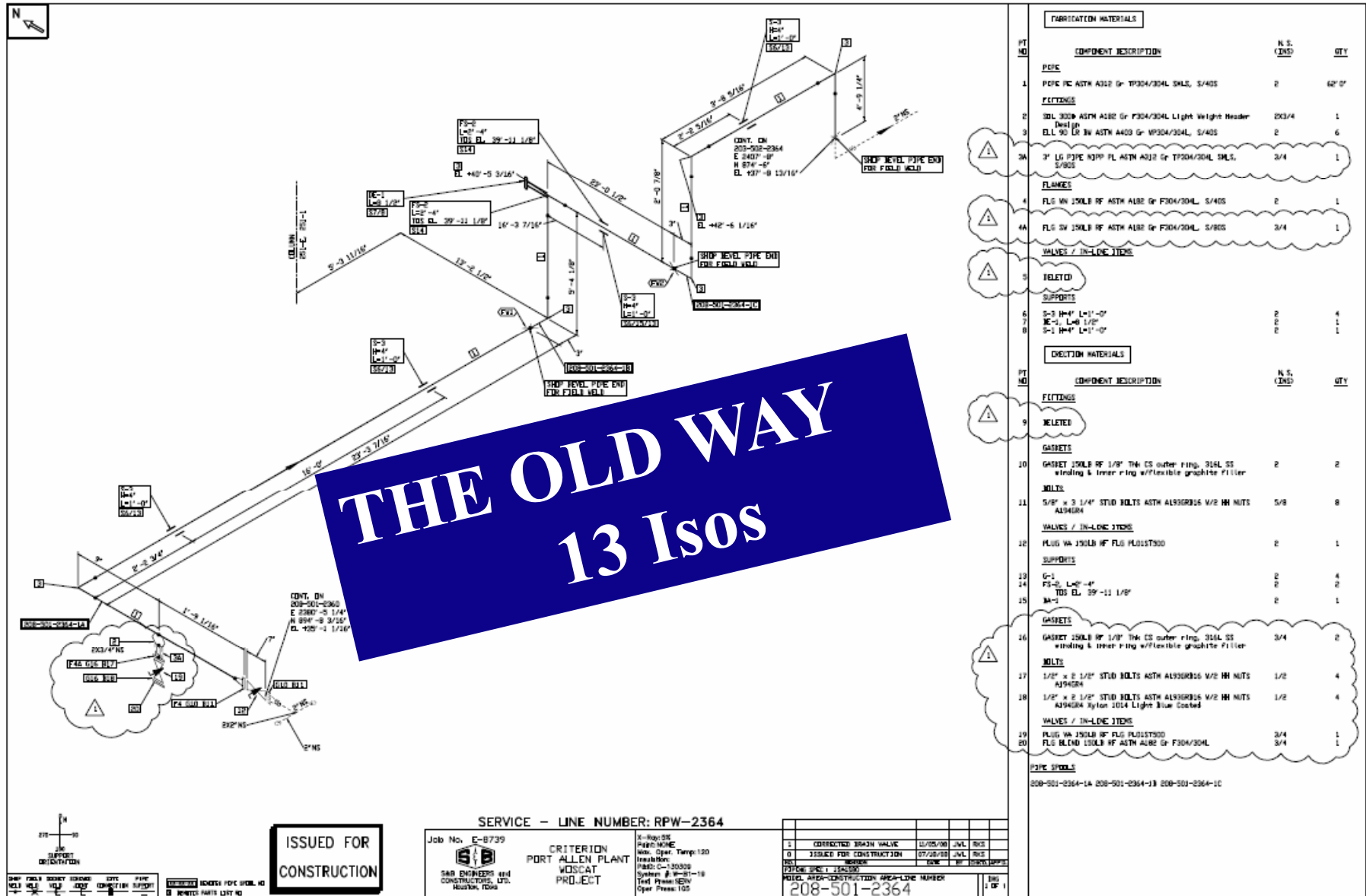
# RETHINK DELIVERABLES EXAMPLES





# Traditional Fab & Erection

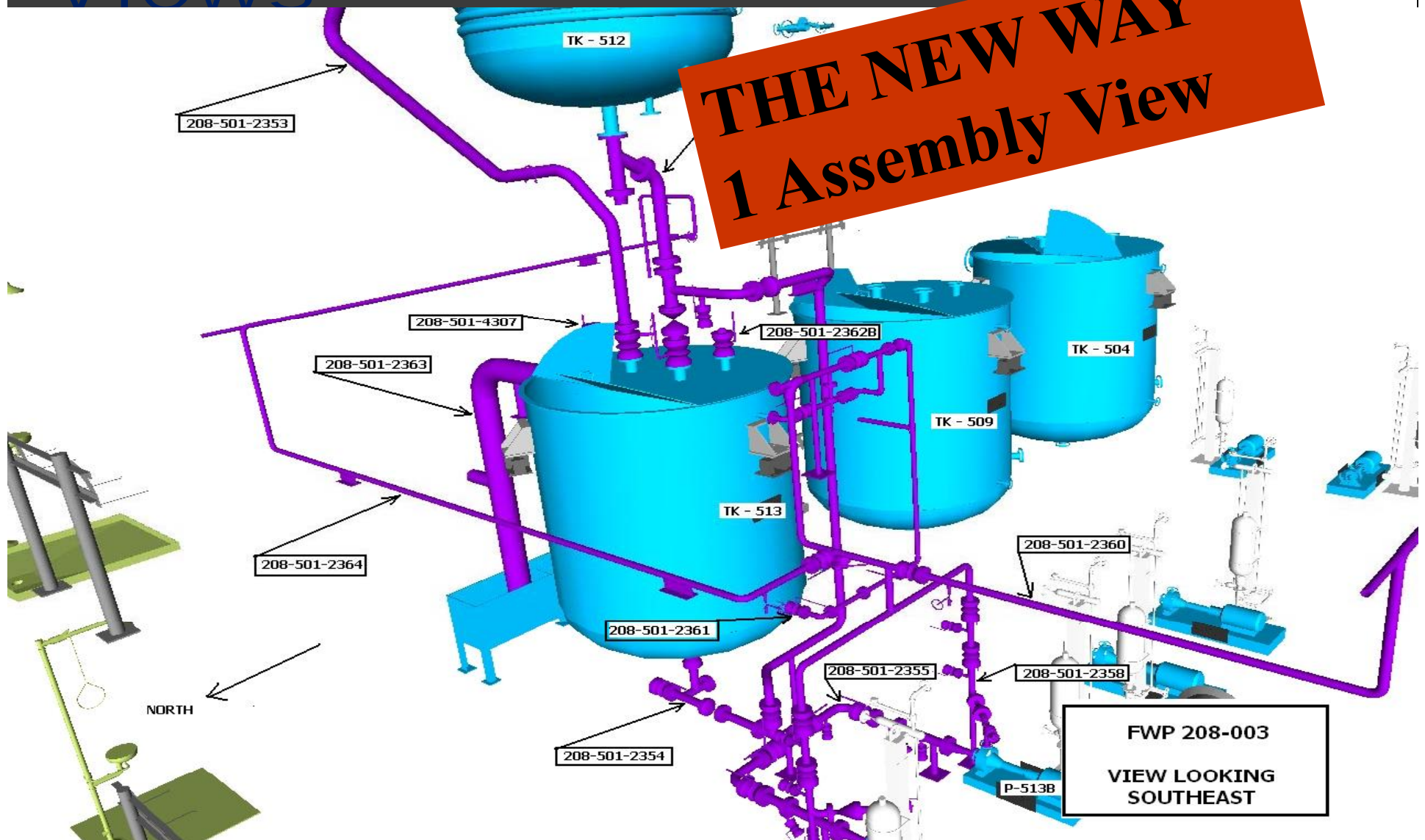
## Iso



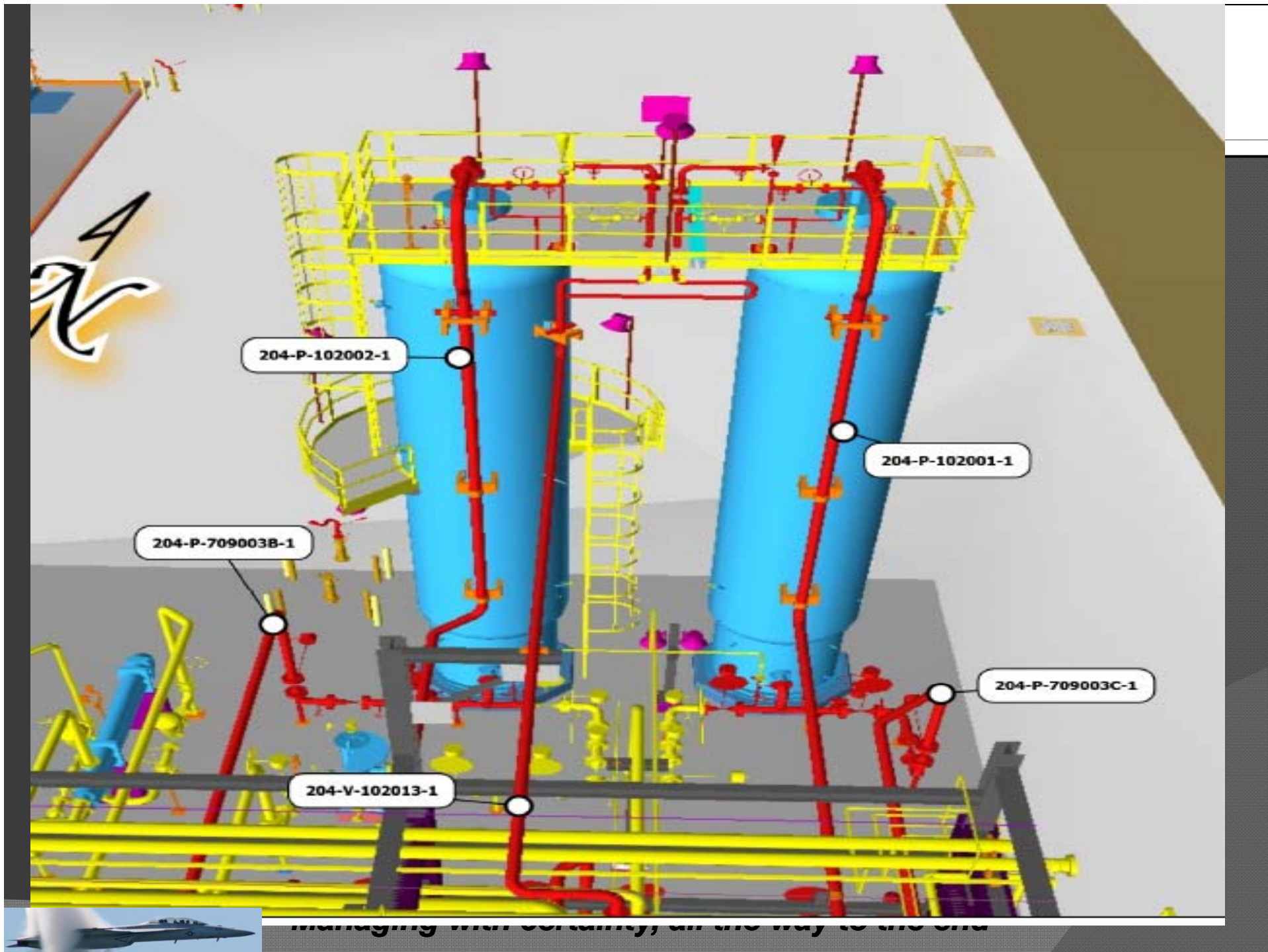
**"Managing with certainty, all the way to the end"**

# Easy to Read Assembly Views

**THE NEW WAY  
1 Assembly View**



***“Managing with certainty, all the way to the end”***





CONSTRUCT-X

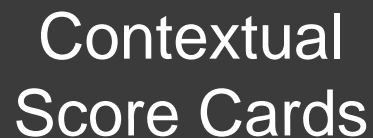
THE NEXT-GEN WORK PACK CONCEPT

Nov 2013



# Universal Access in PDF










# Interactive & Annotated 3D Model



# Exploding Parts View

# Scaffold Request Mark-Up Form



IWP P-03C-001									
Discipline	Activity	CWA	CWP	Sequence	Rev	Package Status	Project	Planner	
									
Perspective									Torque

### Drawings

03C-45438-08  
03C-45439-03  
03C-45441-01  
03C-45441-02  
03C-45449-02  
03C-45449-03  
03C-45454-01  
03C-45454-02  
03C-45455-01  
03C-45455-02

### Materials

Spools  
Valves+  
Supports  
Welds  
Bolt-Ups

### Checklists

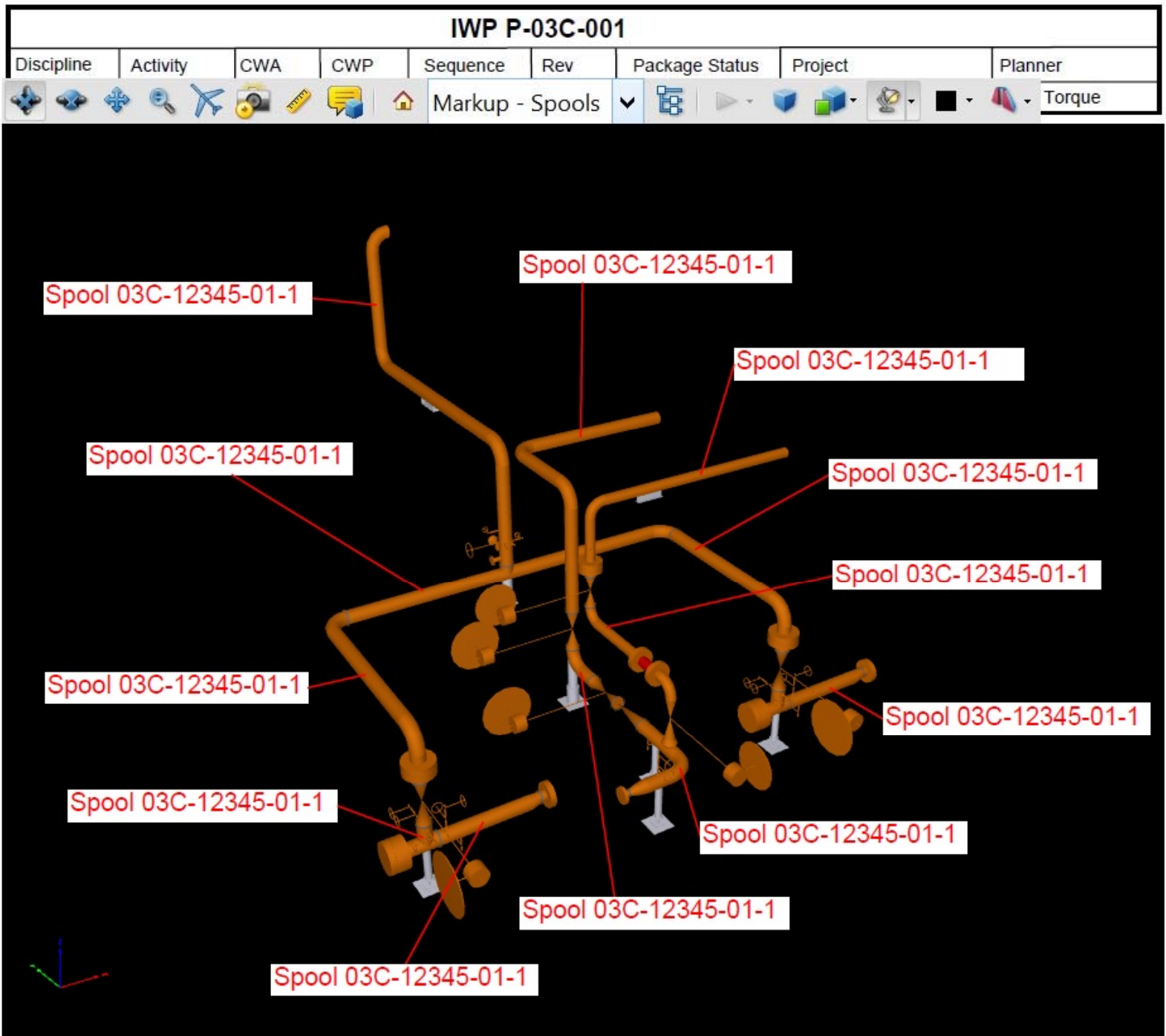
Safety  
Permits  
QA/QC  
Scaffold  
Tools

### Model Views

Scorecard  
Approvals

# Click to Access

- Drawings in Scope of Work
- Bill-of-Material Lists
- Required Equip / Tools
- Safety Checks
- Permitting Checklist
- QA/QC Checklist
- Scaffolding Request
- Progressing Scorecards
- Signatures / Approvals







## IWP P-03C-001

Discipline	Activity	CWA	CWP	Sequence	Rev	Package Status	Project	Planner
Piping	Install	03	P-03C	001	0	Not Yet Released	Black Gold Refinery	John Torque

### Drawings

03C-45438-08  
03C-45439-03  
03C-45441-01  
03C-45441-02  
03C-45449-02  
03C-45449-03  
03C-45454-01  
03C-45454-02  
03C-45455-01  
03C-45455-02

### Materials

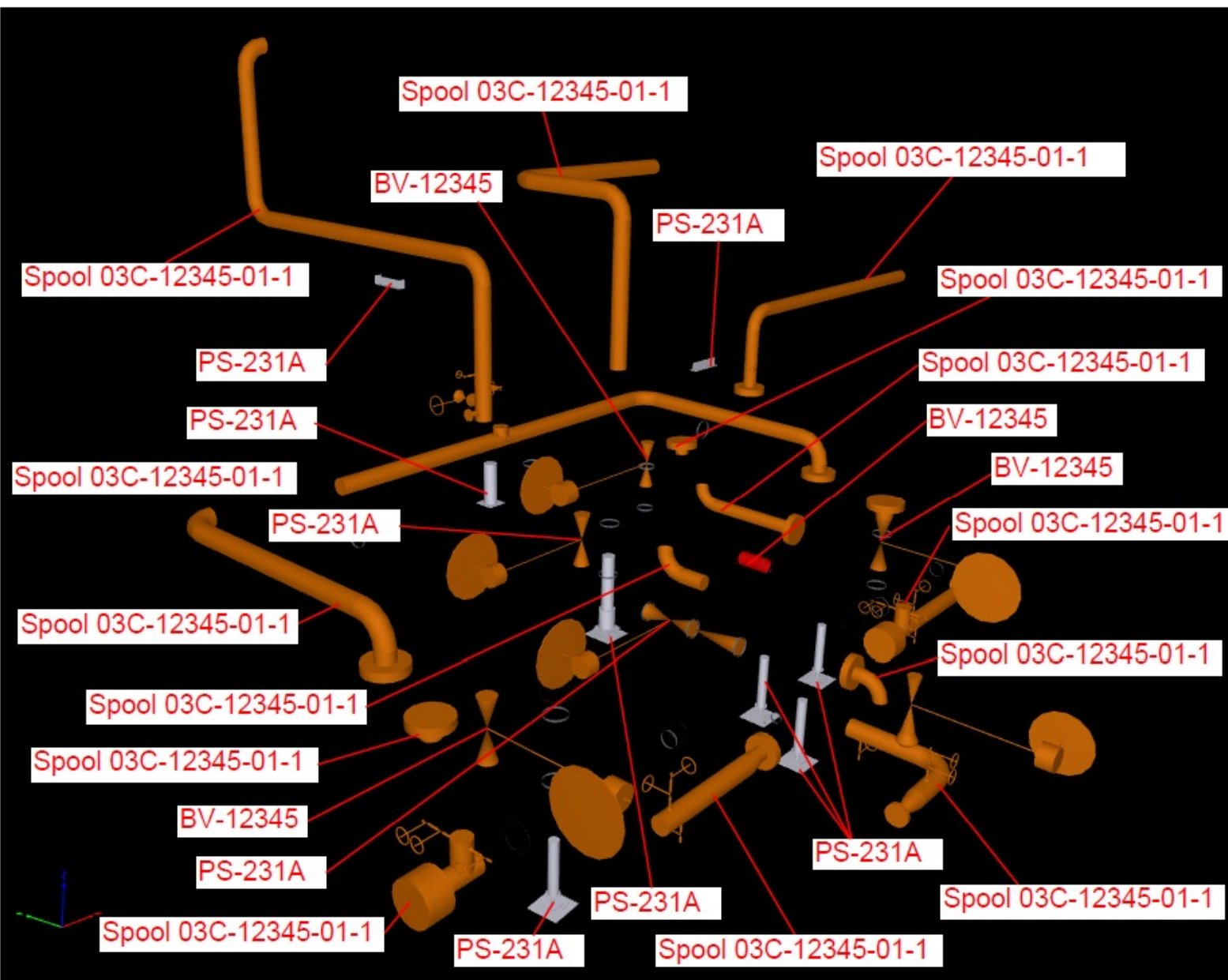
Spools  
Valves+  
Supports  
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Bolt-Ups

### Checklists

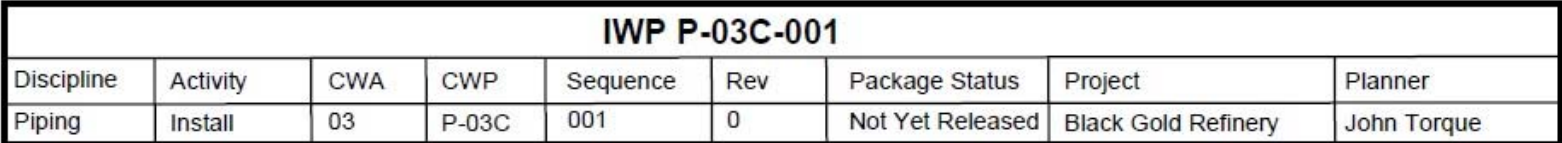
Safety  
Permits  
QA/QC  
Scaffold  
Tools

### Model Views

Scorecard  
Approvals

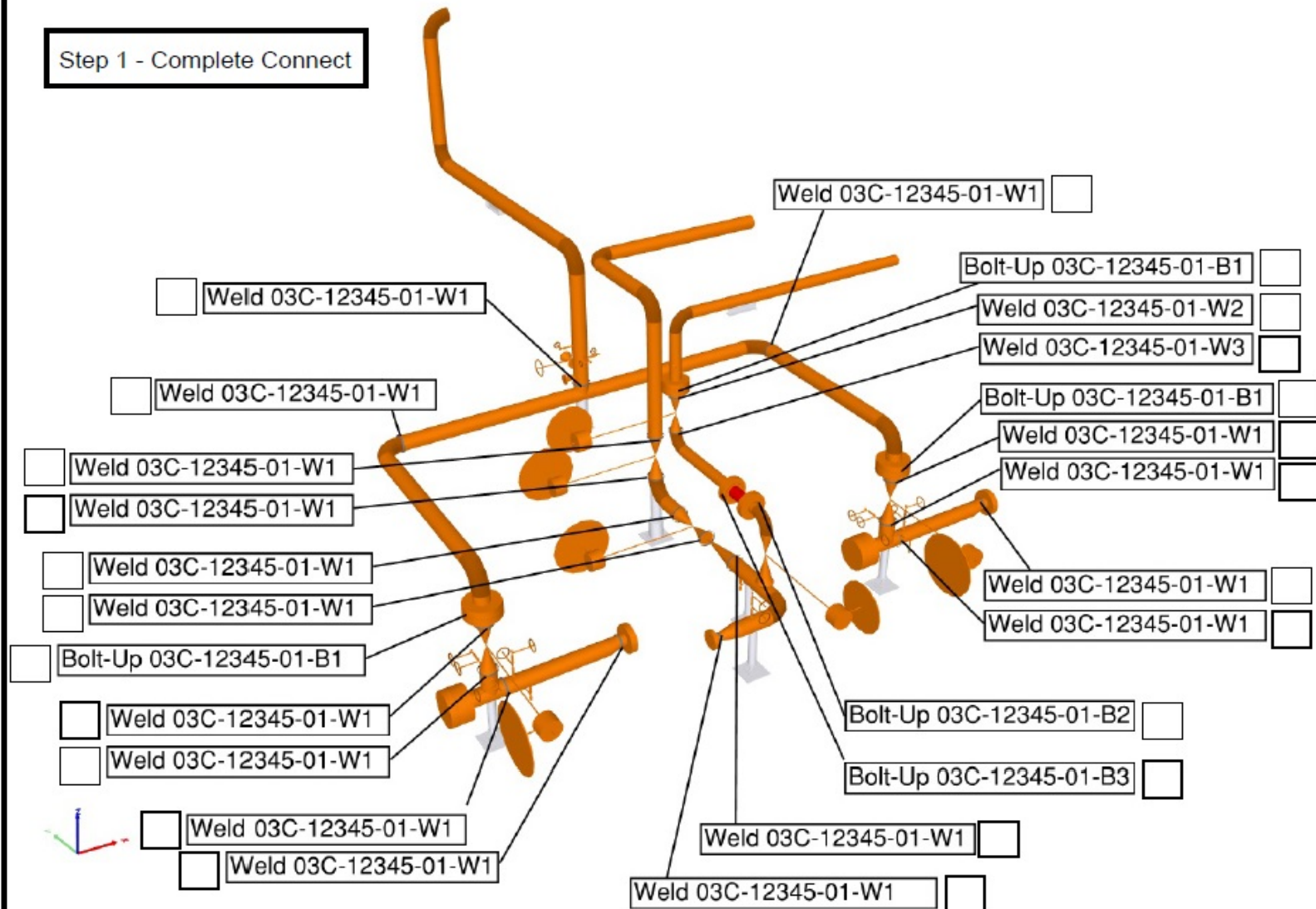






### Approvals

### Step 1 - Complete Connect





## IWP P-03C-001

Discipline	Activity	CWA	CWP	Sequence	Rev	Package Status	Project	Planner
Piping	Install	03	P-03C	001	0	Issued	Black Gold Refinery	John Torque

### Drawings

03C-45678-01  
 03C-45678-01  
 03C-45678-01  
 03C-45678-01  
 03C-45678-01  
 03C-45678-01  
 03C-45678-01  
 03C-45678-01  
 03C-45678-01

### Materials

Spools  
 Valves+  
 Supports  
 Welds  
 Bolt-Ups

### Checklists

Safety  
 Permits  
 QA/QC  
 Scaffold  
 Tools

### Model Views

### Scorecard

### Approvals

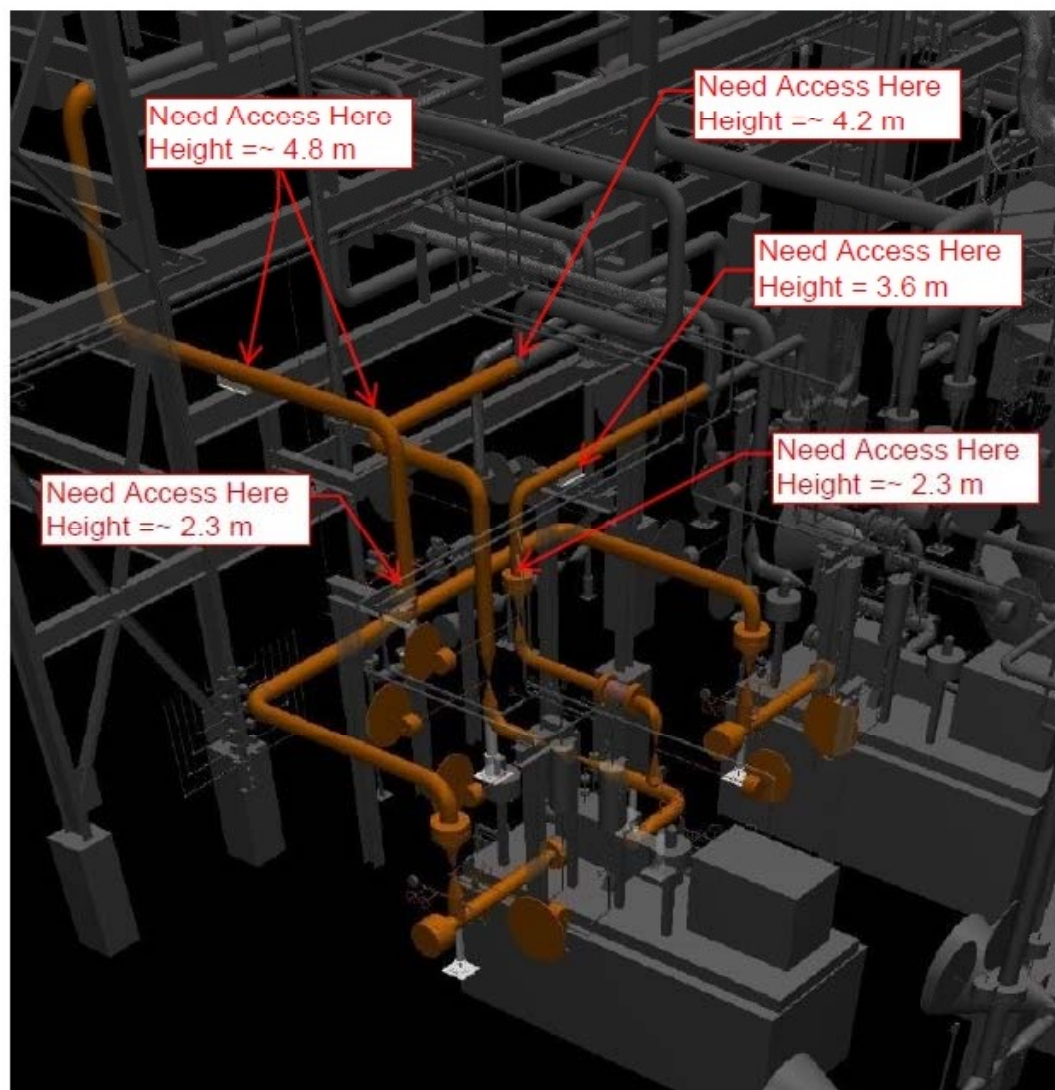
## Scaffolding / Access Requirements

### Scaffold Request

Requested By	
Request Date	
Required Date	
Est. Duration	
Location(s)	

### Scaffold Details

Tag Number	
Scaffold Type	
Scaffold Size	
Erection Date	
Foreman	
Radio Channel	





For more information on how to  
realize next generation work pack  
concepts today, contact

[ted@construct-x.com](mailto:ted@construct-x.com)



IPA Presentation

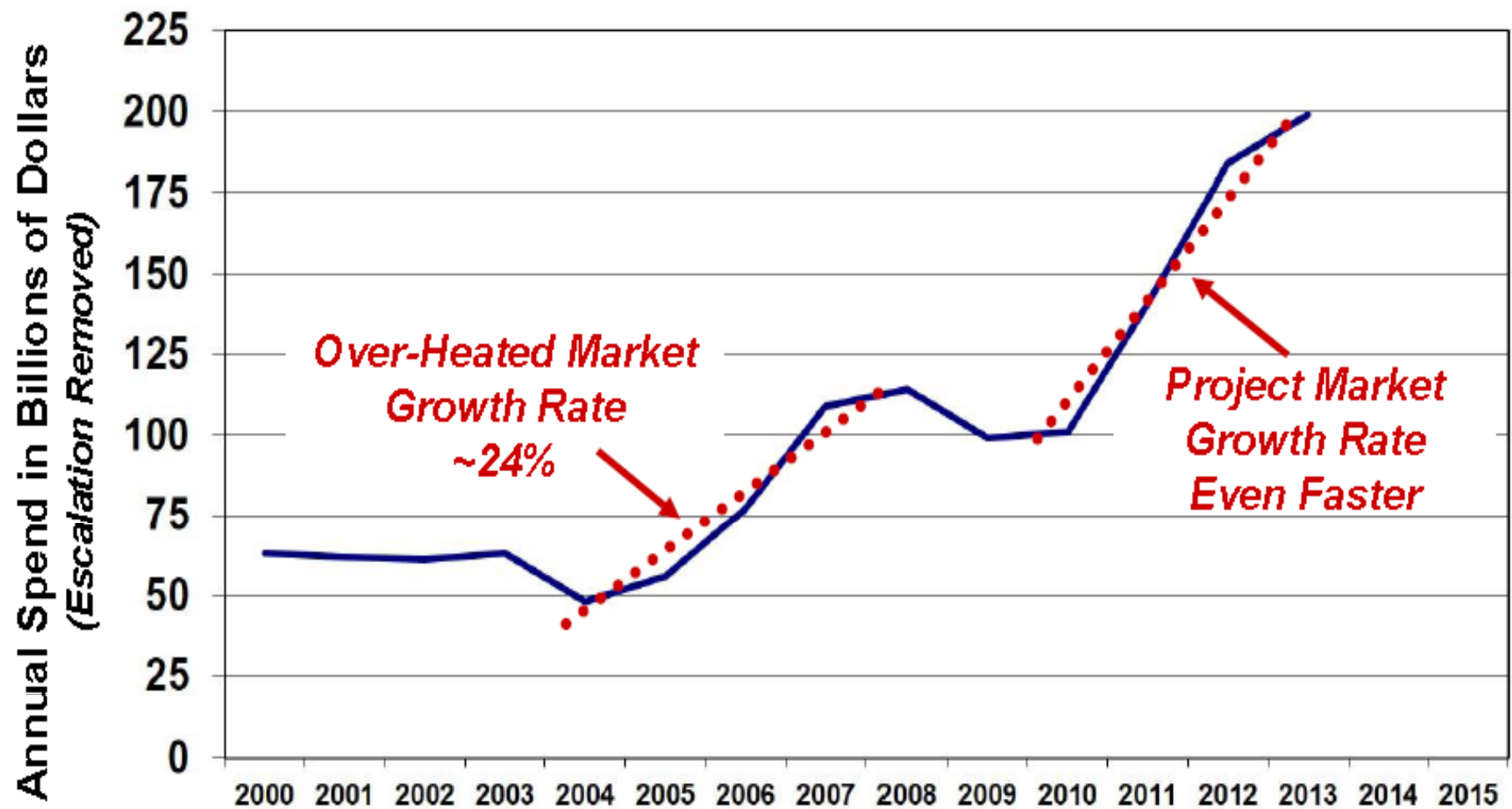
# **7 Deadly SINS MEGAPROJECTS**

Andrew F. Griffith

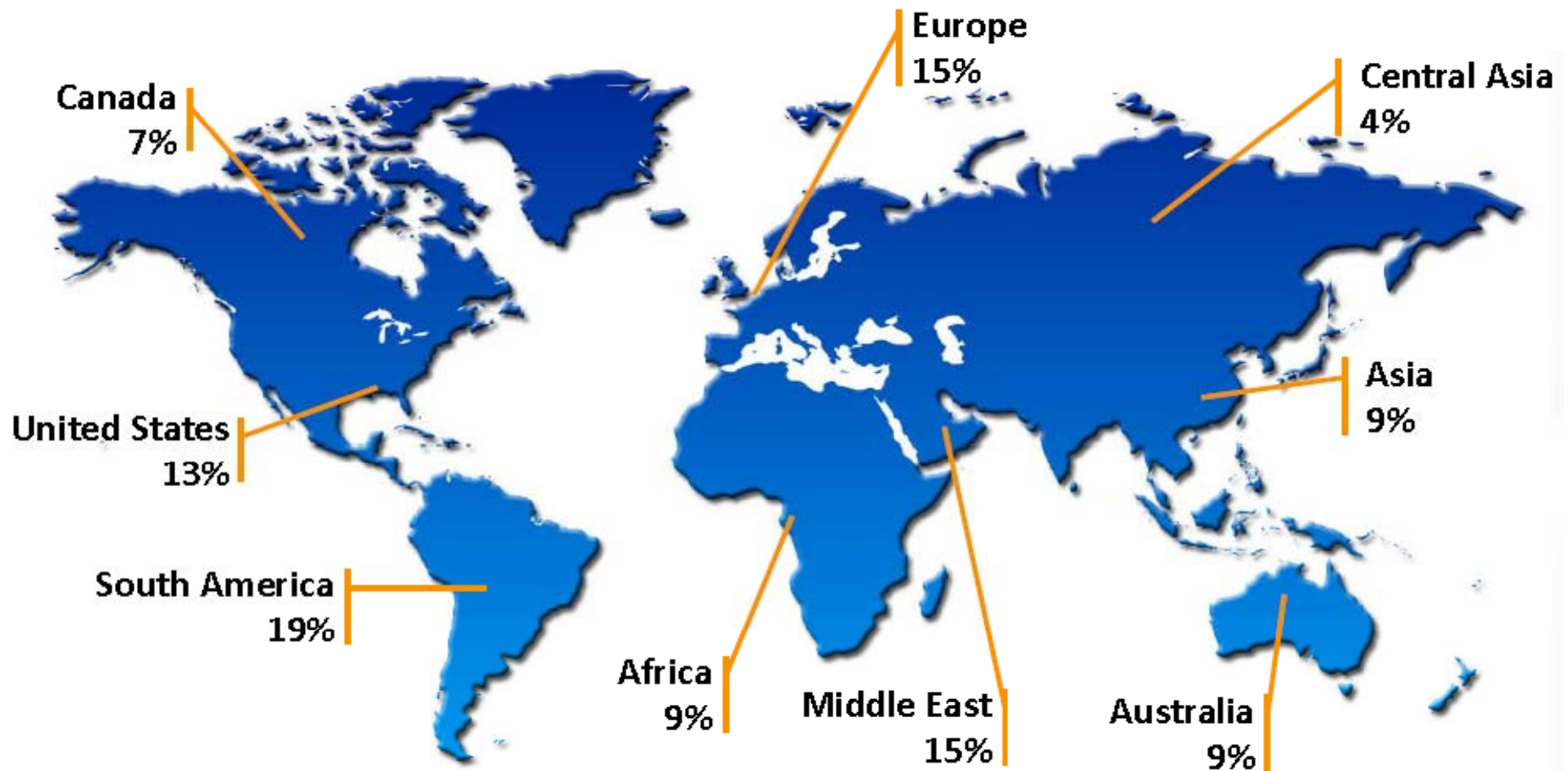
Independent Project Analysis, Inc.



# IPA Forecast of Industrial Megaproject Activity 2000 - 2015



# Geographical Distribution of MEGAPROJECTS Evaluated



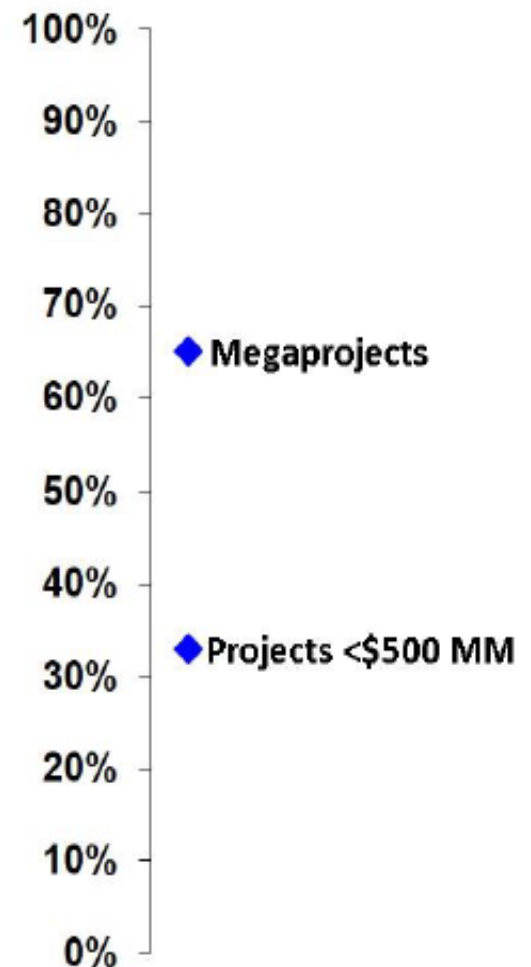
# Defining Success and Failure

- We deem a project to be a failure if one or more of the following occurred:

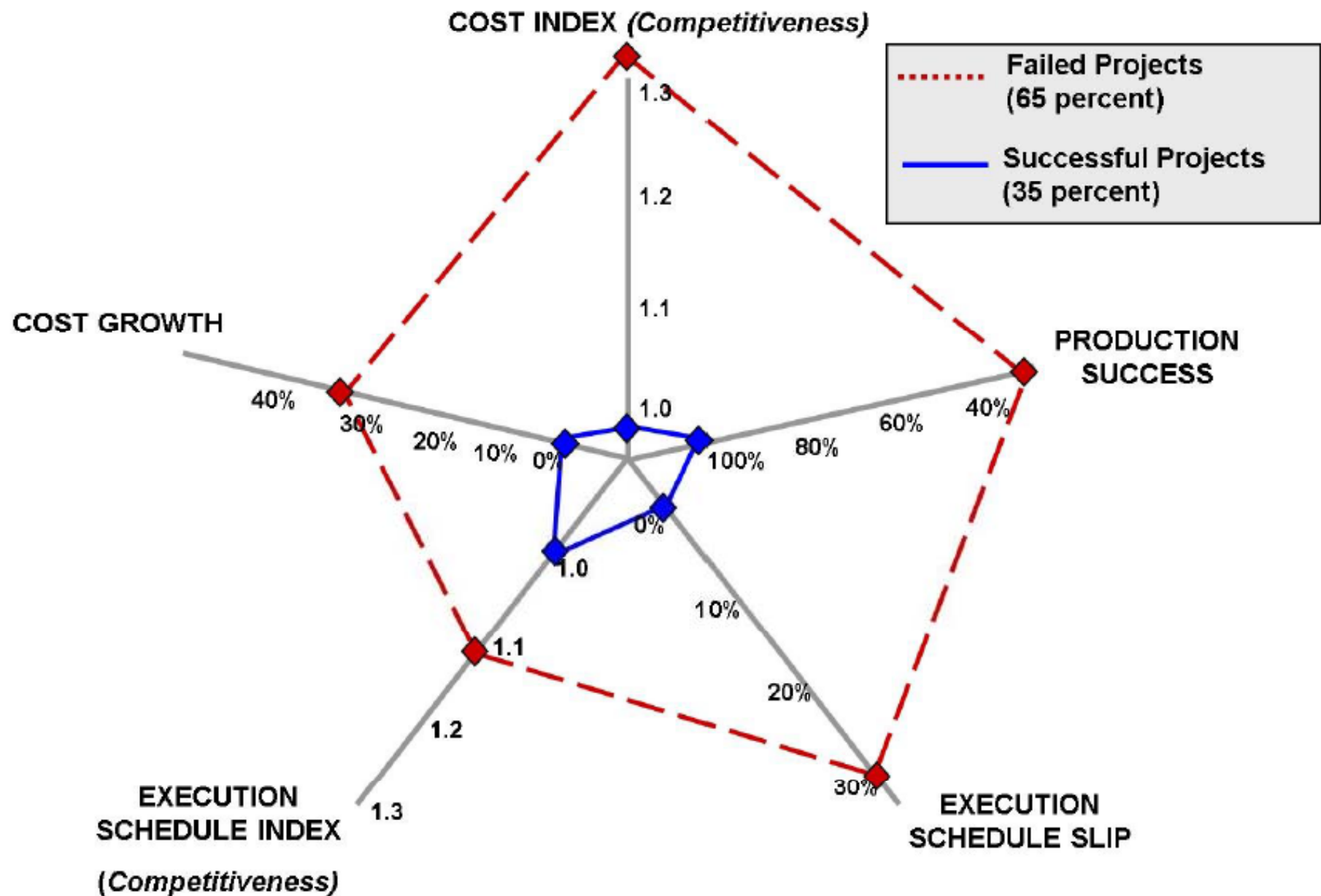
Costs grew (real)	25% +
Schedule Slipped	25% +
Cost Competitiveness ( <i>Absolute Measure</i> )	25% +
Severe and Continuing Operational Problems for 2 Years or more after startup	Yes

- About two-thirds of large projects failed by these criteria—twice the rate of smaller projects

## Failure Rate



# Megaprojects Split Into Radically Different Groups





# 7 DEADLY SINS



1. I want to keep it all!
2. I want it yesterday!
3. We'll just work out the details of the deal later.
4. Why do you want to spend so much up-front?
5. Let's cut that cost estimate down!
6. Let contractors carry the risk; they're doing the project!
7. Fire the *project Manager*!

# 1. I want to keep it all.

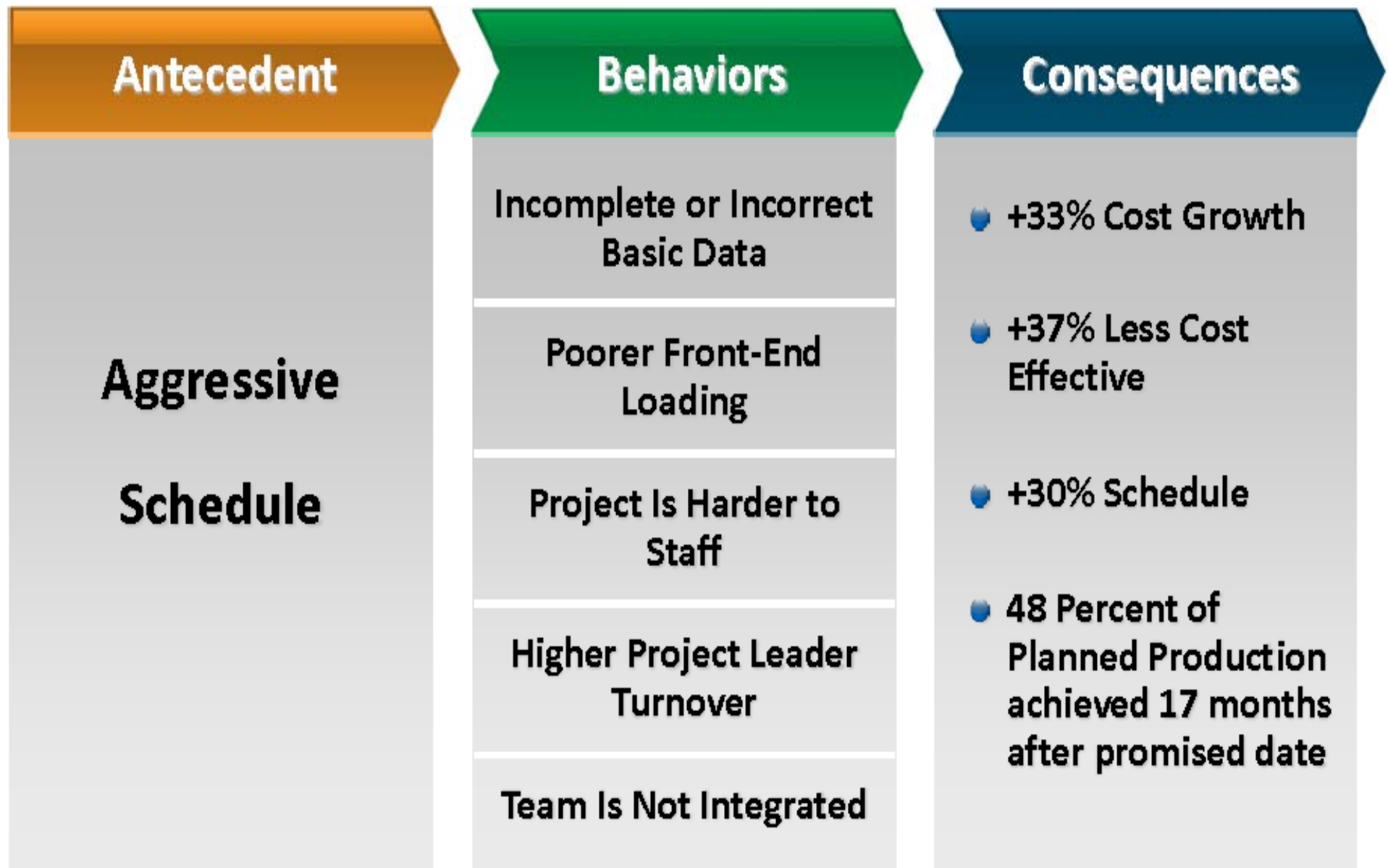
- Stakeholders want input
- All must see value
- If they perceive unfairness they will disrupt

## 2. I want it YESTERDAY!

The drive for speed, results in the projects outrunning:

- Basic technical data development
- Stakeholder alignment
- Permitting requirements
- Front-end loading development
- Even the business deal

# The ABCs of Megaproject Failure





### 3. *“We’ll Work Out the Deal Later”*

The business deal must be worked out before developing the project scope.

- Exactly how are we going to generate a large enough revenue stream?
- How is the cost/tax regime of the resource going to be adjusted to fit the economic realities?
- How will downside risks be allocated?
- How will any upside be divided?

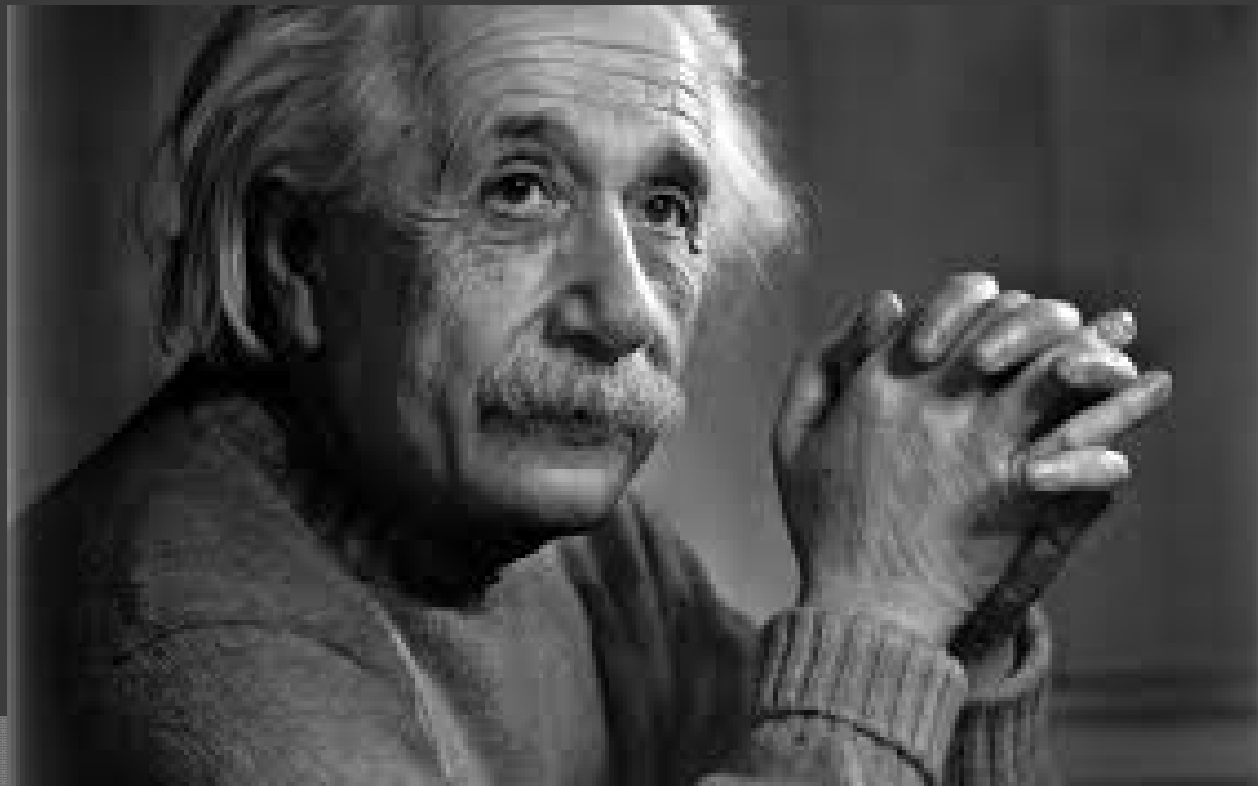
The deal must shape the project; the project cannot shape the deal!

## *4. Why Do You Want to Load-up the Front-End?*

- ⦿ Activities accomplished in Front End Planning have determine project outcomes.
- ⦿ Full FEP will require 3 to 5% of Total Installed Cost.
- ⦿ FEP Drives Predictability for:  
Cost, Schedule, Safety & Operability
- ⦿ FEP is the BEST investment OWNERS can make.

If I had one hour to save the world, I would spend 59 minutes defining the problem and one minute solving it.

Albert Einstein



## *5. Let's Get that Estimate Down!*

- ⦿ Define the Scope
- ⦿ Believe the estimate
- ⦿ Estimates are a reflection of:
  - The scope you want
  - The circumstances for execution
- ⦿ “Cost Reduction Exercises” RARELY WORK



## 6. *The Contractors Should Carry the Risk!*

- ⦿ Owners want FIXED PRICE (lump Sum)
- ⦿ Contractors are NON-CAPITALIZED, variable cost firms
- ⦿ They have limited ability to carry equity risk
- ⦿ Must price risk aggressively when forced to carry it.
- ⦿ This is NOT gouging! It is common sense!

## *7. Let's Hold the Wrong Folks Accountable!*

- ⦿ 207 projects – PM culpable LT 10
- ⦿ Business promoting the project is primary source of failure
- ⦿ Search for scapegoats should start in Business Mirror.

# 7 KEY VIRTUES



1. I want to allocate the value fairly  
and stabilize the project
2. I want it on a schedule that will permit success, no faster
3. The deal will precede and shape the scope
4. We will follow best practice in front-end definition
5. The only way it can cost less is if I want less
6. It is our project. We carry the risk
7. Accountability and responsibility start at home

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# RETHINK SUMMARY

- Tsunami of Projects 2014-2016
- Shortage of EVERYTHING
- MUST RETHINK EVERYTHING
- Improve Productivity at Craft Level
- Change OWNER SINS to VIRTUES

# AWP – Related Initiatives



Construction  
Industry  
Institute®

RT 272  
RT 263

<https://www.construction-institute.org/scriptcontent/rt272.cfm?section=res>



COAA  
Construction Owners  
Association of Alberta

## Workface Planning – Best Practice

<http://www.coaa.ab.ca/Productivity/WorkFacePlanning.aspx>



## 4D/5D BIM

<http://www.5d-initiative.eu/>



<http://www.buildingsmartalliance.org/>



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## WORKFACE PLANNING

Expediting Equipment & Material Selection  
and Acquisition (EMSA)

# Advanced Work Packaging (AWP) Drivers



Construction  
Industry  
Institute®

Enhanced Work Packaging (RT 272)



COAA  
Construction Owners  
Association of Alberta

Workface Planning – Best Practice



4D/5D BIM & Information Modeling Requirements



& Stakeholders