WORKFACE PLANNING
CONFERENCE-WIDE SESSION
FROM CONCEPT TO COMMISSIONING
INTRODUCTION

• *From Concept to Commissioning: what does it mean?*

• *Who is on the panel?*

  ✓ **Ron Embury** | Engineering Team Leader, NOVA Chemicals (Owner)
  ✓ **Ken Kohlruss** | Vice President Operations, Commonwealth Construction [CH2M Hill] (CMT)
  ✓ **Jose Herrero** | Vice President, Fluor (Engineering Contractor)
  ✓ **Tannis Liviniuk** | Lead Construction Analyst, Cenovus Energy (Construction Contractor)
  ✓ **Lloyd Rankin** | Researcher, COAA (Facilitator)
INTRODUCTION
Defines the basic design parameters for the intended project. Generation, review, and approval of the DBM is a prerequisite for the development of the Engineering Design Specification (EDS).
DESIGN BASIS MEMORANDUM (DBM)

1) Develop WFP execution strategy
2) Assign WFP sponsors and champions
3) Define WFP as required for all participants
4) Project Milestone Schedule (PMS) (level 1)

9) Write WFP requirements in contracts
8) Demonstrate capacity to support WFP

5) Develop WFP execution plan
6) High-level project review with construction input

7) Design a server to host the databases used by all participants
10) Design Area Definition

12) Demonstrate capacity to apply WFP
13) Path of Construction
1) Develop WFP execution strategy

2) Assign WFP sponsors and champions

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13) Path of Construction
At the DBM phase, we have three documents that set the stage for WorkFace Planning:

- Project Execution Plan
- Construction Execution Plan
- Constructability Implementation Plan
Project Execution Plan (PEP):

- Overall Project Milestone Schedule
- Project Strategy:
  - The project will be Construction-driven
  - Engineering and Procurement will sequence their work to meet Construction needs.
  - There will be extensive constructability input into the design and Engineering Work Package (EWP)
  - WorkFace Planning will be part of the Construction Execution Plan
  - No work packages (FIWPs) will start without all engineering, materials, tools, equipment and labour present on site.
  - Owner’s commissioning sequence will be by operating systems and will be introduced in the engineering and construction schedules.
Construction Execution Plan (CEP):

With respect to WorkFace Planning, the construction execution plan will:

- Set out the Construction Management Organization.
- Describe the Contracting Strategy
- Contain the WorkFace Planning Execution Plan
  - Workface Planning Approach
  - Workface Planning Overview
  - Workface Planning Implementation
  - Workface Planning Training
  - Workface Audit Process
- Progress Reporting
Constructability Implementation Plan (CIP)

- CIP is developed and started in the DBM phase. CIP is used to support WFP concepts.
  - Led by Construction
  - Sponsor(s) identified, Policy Statements described and Constructability Manager is appointed.
  - Sets out focus groups between engineering disciplines, Procurement, Owner, etc.
  - High-level construction sequence is developed.
  - Details of schedule integration is developed between parties.
    - i.e., Engineering drawing sequence developed to support FIWP Schedule
    - i.e., Procurement deliverables developed to support FIWP Schedule.
  - Various other activities are completed to promote ease of construction (design, layout, modular design, pre-fabrication, construction methods, weather, etc.)
DBM: OWNER

Contract types:
- C
- CM
- EP
- EPC
- EPCM
DBM: CONSTRUCTION MANAGEMENT TEAM

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WorkFace Planning Execution Plan

1.0 Definition
2.0 Purpose
3.0 Scope
4.0 Strategies
5.0 Participants
6.0 Roles and Responsibilities
7.0 Method
8.0 Systems
9.0 FIWP’S Release Process
10. Auditing
DBM: CONSTRUCTION MANAGEMENT TEAM

High-level project review which leads to Path of Construction
DBM: CONSTRUCTION MANAGEMENT TEAM

Path of Construction
DBM: CONSTRUCTION MANAGEMENT TEAM

WFP Automation
Bring your data together in one location

- 3D CAD
- Pipe Isometrics
- Structural Detailing Data
- Line List / Equipment List
- Instrument Index
- Electrical Lists

- L3 Project Schedule
- Rules of Progress
- Unit Rates
- Quantity Tracking (Progress)

- Weld Tracking / NDE
- TO Systems/Completions
- Hydro Testing

Materials Management

Field Tracking

Project Controls

Engineering Data

Virtual Construction Model

ConstructSim V8i

ConstructSim V8i

Bentley
Sustaining Infrastructure
DBM: CONSTRUCTION MANAGEMENT TEAM
DBM: CONSTRUCTION MANAGEMENT TEAM

ASCENSION systems inc.

- Experienced trainers, educators and assessors (auditors)
- Assessment services
- Self-assessment tools
DBM: ENGINEERING

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Sample plot plan (partial)
DBM: ENGINEERING

Click to see process

Click to see table of contents
DBM: CONSTRUCTION CONTRACTOR

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12) Demonstrate capacity to apply WFP
13) Path of Construction
Demonstrate high-level capacity to support WorkFace Planning

WorkFace Planning Awareness for Trades People scheduled for delivery February 2011.

Pre-beta sample available at this conference
DBM: CONSTRUCTION CONTRACTOR

WorkFace Planning Awareness for Trades People:

Fourth, if and when specially-skilled tradespeople are needed on the project, they must be identified early and available when required. Examples include welders, electricians, pipefitters, boilermakers etc., with specialized tickets or training.
WorkFace Planning Course Development Roadmap
EDS defines all elements of project scope and is the control document for commencement of detailed engineering and procurement activities on the project. It is also used in scoping the development of the Authorization for Expenditure (AFE).
11) Ensure all databases are provided with the latest data

15) Project Summary Schedule (PSS) (level 2)

16) Review and Approve PSS

17) Define and Issue CWP Release Plan

18) Appoint Lead Planner; Commence WFP Process

14) Review and integrate WFP processes and support functions

* Proactively resolve conflicts between project participants

20) Define and Issue EWP Release Plan by Design Area

21) Project Master Schedule (PMaS) (level 3)

17) Define and Issue FIWP Release Plan
11) Ensure all databases are provided with the latest data

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Level 2 Schedule

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<td>002</td>
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<td>003</td>
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**511177 - Cooling Water Plate & Frame Exchangers**

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<th>Schedule Ref ID</th>
<th>Discipline Code</th>
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WBI/EWP Structure

- Activity code breaks down discipline code into different activities

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<td>P</td>
<td>Paving and Road.</td>
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# Level 3 Schedule

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EDS: CONSTRUCTION MANAGEMENT TEAM

11) Ensure all databases are provided with the latest data

14) Review and integrate WFP processes and support functions
   * Proactively resolve conflicts between project participants

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EDS: CONSTRUCTION MANAGEMENT TEAM

Proactively resolve conflicts
Review and integrate WFP processes and support functions
Ensure all databases are up to date
15) Project Summary Schedule (PSS) (level 2)
16) Review and Approve PSS
17) Define and Issue CWP Release Plan
20) Define and Issue EWP Release Plan by Design Area
21) Project Master Schedule (PMaS) (level 3)
14) Review and integrate WFP processes and support functions
* Proactively resolve conflicts between project participants
17) Define and Issue FIWP Release Plan
Define and Issue CWP release plan

• Identify the size and description of all CWPs
• Determine when those CWPs will be developed and released
• These can be reported in Excel spreadsheets, Primavera schedules, and other documents
• The EWP schedule will be driven by the CWP schedule
EDS: CONSTRUCTION

Appoint lead planner and commence WFP process
Define and Issue FIWP release plan

• Identify the size and description of all FIWPs

• Determine when those FIWPs will be developed and released

• These can be reported in Excel spreadsheets, Primavera schedules, and other documents

• FIWP development is driven by the CWPs
DETAILED ENGINEERING

22) Engineer develops and releases EWPs

23) Construction develops and releases CWPs

24) Detailed Area Schedule (level 4)

25) Review and approve PMaS

26) Break up CWP into Field Installation Work Packages (FIWP)
DETAILED ENGINEERING: CONSTRUCTION CONTRACTORS

22) Engineer develops and releases EWPs

23) Construction develops and releases CWPs

24) Detailed Area Schedule (level 4)

25) Review and approve PMaS

26) Break up CWP into Field Installation Work Packages (FIWP)
Construction develops and delivers CWPs
Detailed Level 4 Schedule

• This is a schedule of the release of the Field Installation Work Packages (FIWPs)

• These can be reported in Excel spreadsheets, Primavera schedules, and other documents
Break CWPs into FIWPs
DETAILED ENGINEERING: CONSTRUCTION

Create FIWPs with simple point and click
22) Engineer develops and releases EWPs

23) Construction develops and releases CWPs

24) Detailed Area Schedule (level 4)

25) Review and approve PMaS

26) Break up CWP into Field Installation Work Packages (FIWP)
DETAILED ENGINEERING: 
ENGINEERING

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<tr>
<td>PREPARED BY</td>
<td>0opendra Singh</td>
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Construction is informed that Engineering is complete in this WBI and the WBI is released for construction with the drawings listed below.

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Vendor Drawings

---
CONSTRUCTION PHASE

31) Review and update Engineering

30) Issue Request for Information

29) Need for extra information?

34) Identify “Work to Go” items

37) Document the lessons learned

36) Approve results and initiate lessons-learned meeting

27) Implement and release FIWP (Dynamic Planning) (level 5)

28) Execute FIWP

32) Conduct Q/C verification

33) FIWP completed?

35) Deliver FIWP and present results
CONSTRUCTION PHASE: CONSTRUCTION CONTRACTOR

Implement and Release FIWP

Table of Contents

1. Constraints
2. Scope
3. Safety
4. QA/QC
5. Trade Coordination
6. Material Take Off
7. Scaffold Request
8. Equipment Request
9. FIWP Lookahead
10. Timesheets
11. Model Shots and Isos
CONSTRUCTION PHASE: CONSTRUCTION CONTRACTOR

Execute FIWP

One of our silver-level sponsors - Phoenix Industrial - has incorporated their maintenance experience into the Phoenix WorkFace Planning approach.
CONSTRUCTION PHASE:
CONSTRUCTION CONTRACTOR

Progress project
CONSTRUCTION PHASE: CONSTRUCTION CONTRACTOR

What if execution doesn’t go according to plan?

- RISK EVENTS
- ‘PLAN B’
- BACKLOG
CONSTRUCTION PHASE: OWNER

31) Review and update Engineering

30) Issue Request for Information

29) Need for extra information?

34) Identify “Work to Go” items

27) Implement and release FIWP (Dynamic Planning) (level 5)

28) Execute FIWP

32) Conduct Q/C verification

33) FIWP completed?

36) Approve results and initiate lessons-learned meeting

35) Deliver FIWP and present results

37) Document the lessons learned
WorkFace Planning Lessons Learned:

• Conduct Lessons Learned at the end of each phase of the project

• Do ‘temperature checks’ during each phase

• At the end of the project, conduct a final Lessons Learned.
Two of our sponsors have been recognized by COAA, winning awards for their excellence and leadership in WorkFace Planning.
NOTE: The information collected is anonymous and may be used for research purposes. By participating, you are giving your consent for the use of this data.
Technical Panel List
Intergraph PP&M
SmartPlant Construction

Michael Buss
Vice President Materials & Construction
Integraph PP&M: No. 1 or No. 2 in the industries we serve*

- No. 1 in Oil & Gas Industry
- No. 1 in Chemical Industry
- No. 1 in Power Plant Industry
- No. 1 in Life Sciences & Pharmaceutical Industry
- No. 1 in Mining Industry
- No. 2 in Offshore & Shipbuilding Industry
PP&M Customer Satisfaction

- 2009: Satisfied + Very Satisfied = 83%
- 2008: Satisfied + Very Satisfied = 80%
- 2007: Satisfied + Very Satisfied = 76%
Many competitive solutions are going back to the 80ies.
Most PP&M solutions are newer than 10 years.

In technology, Time matters!
Construction Readiness (Constraints)
Impact to Growth & Cost Based on a $1 Billion Project
(Statistics from IPA based on 12,000 Projects)
<table>
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<th>Do you agree with the business value a construction solution would deliver?</th>
<th>US &amp; Europe</th>
<th>Asia Pacific</th>
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<td>89%</td>
<td>90%</td>
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<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Unclear</td>
<td>11%</td>
<td>10%</td>
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Important to have Balanced Plan

- Cost
- Schedule
- Budget
- Completion Date
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<th>Question</th>
<th>US &amp; Europe</th>
<th>Asia Pacific</th>
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<tbody>
<tr>
<td>Do you think SmartPlant Construction can deliver business value geared</td>
<td></td>
<td></td>
</tr>
<tr>
<td>to improve your construction?</td>
<td>Yes</td>
<td>76%</td>
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<td>4%</td>
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<tr>
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Work Planning Hierarchy

- Plant
  - Nuclear Plant
  - Containment Area
    - Containment Structure
      - Steel Liner
      - Dome
      - Set Dome
Work Planning Hierarchy

1. Plant
   1.1. Nuclear Plant
     1.1.1. Containment Area
        1.1.2. Containment Structure
           1.1.2.1. Steel Liner
           1.1.2.2. Base Mat
           1.1.2.3. Formwork
           1.1.2.4. Pour Concrete
Field Pipe Welding of Spool in Turbine Room

1. Plant
   1.1 Nuclear Plant
      1.1.1 Turbine Room
         1.1.2 Steam Piping
            1.1.2.1 Spool S-174
            1.1.2.1 Spool S-175
            1.1.2.1 Heliarc Root Pass

Create Work Package for Field Welding
Break WP Components into Work Steps
World Wide: What some our partners say about Intergraph’s approach to Construction Management

- **Technip (Europe)**
  - “SmartPlant Construction opens the door to new possibilities in project execution on any scale”

- **URS Washington Group (USA)**
  - “SmartPlant Enterprise’s cutting-edge attributes will make us more efficient and add value to our customer’s projects”

- **CTCI Corp (China)**
  - “This application has the potential to introduce a step change in the way we do business and lead to improvements in our projects”

- **QUIP (Brazil)**
  - “The success we have had with Intergraph solutions makes our decision to implement SmartPlant Construction a natural progression toward further increasing our productivity and enabling us to better plan and manage our projects”

*The power of Intergraph working with partners to succeed!*
Summary

- User Friendly
- Easy to administer
- Real time link to Engineering, Procurement & Schedule
  - Refresh by a press of a button
- Easy to deploy
- Broader solution than just WFP
Global Capabilities……

….to support Homogeneous and Heterogeneous environments
# English Environment

![Image of schedule breakdown](image)

**Planned Start Date:** 11/14/2009  
**Planned Finish Date:** 11/29/2009  
**Actual Start Date:**  
**Actual Finish Date:**  
**Estimated Man-Hours:** 1000.5

### CWP schedule breakdown

<table>
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<tr>
<th>Pkg Number</th>
<th>Description</th>
<th>Planned Start</th>
<th>Planned Finish</th>
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Chinese Environment
Russian Environment

![Image of a software interface with project planning details.](image)

- **Planned Start Date**: 14.11.2009
- **Actual Start Date**: __.__._____
- **Estimated Man Days**: 1000,5

**Detailed Project Plan**

<table>
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<th>Planned Start</th>
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Global Communication
Making Good Projects Great

“More Business Value for Our Money”

Jim Porter
DuPont VP Engineering and Operations (Retired)
Workface Planning Conference
Calgary, Alberta
December 1, 2010
Safety Contact – Cell Phones & Driving
My Beliefs…

1. Construction Industry is critical to future **business success**.

2. Construction Industry must help owners understand how to capture **business value**.

3. Owners must operate in ways that ensure Construction Industry **effectiveness and sustainability**.
Business Value

\[
\text{ROIC} = \frac{\text{Net Income} - \text{Dividends}}{\text{Total Capital}}
\]
1. Standard work processes executed in a disciplined manner deliver predictable results.

2. Consistent use of proven “best practices” deliver good results.

3. Integration of standard work processes and proven “best practices” deliver predictable, great results.
WorkFace Planning

An integrated work process and a best practice.
“One Enterprise”
Project Work Processes

- Businesses Lead Cross Functional Project Teams to Do FEL and Determine “What, When, Where and How Much.”

- Engineering Develops the Most Competitive “How and Who” and Leads FEL and Project Execution.

- Requires Mutual Accommodation and Collaboration to a Higher Degree than Ever Before.
Elements of Capital Effectiveness

Business Strategy → Technology Strategy

- Alignment of Functions
- Leading Technology
- Use of Value Improving Practices
- Front-End Loading

Optimal Scope for Business Needs → Executed With Minimum Change

- Discipline
- Timely Involvement of Contractors/Vendors

Key Leading Indicators

SAFETY
- Low Cost
- Fast Cycle Time

BETTER IRR
- Excellent Operability

Key Performance Indicators
Goal of WorkFace Planning is to improve performance by getting the right things to the right place at the right time:

• The Project must be planned forward from Engineering to Start-up since process systems drive commissioning and start-up, commissioning and start-up drive construction and construction drives engineering and procurement.
• The planning process must work backward from Startup to Engineering to schedule the release of engineering to the field since the Path of Construction will drive the prioritized release of Construction Work Packages (CWP).
• The prioritized release of CWP will determine the order in which the Field Installation Work Packages (FIWP) must be prepared and released to drive the sequence in which engineering and procurement is delivered to the field.
Facilities Engineering Process

Global Customer Needs & Requirements

Business Objectives, Capital Forecasts

Project Basis, Capital Budget

Production Des Basis, CAC, Project Auth

Competitive Facility That Meets Business Needs

Products That Continuously Meet Global Customer Needs & Requirements Better Than All Competitive Products

Business Planning FEL-1

Facility Planning FEL-2

Project Planning FEL-3

Project Implementation

Facility Startup

Operate Maintain Improve

Front-End Loading

Owner Leads

Contractor Involved

Execution/Operation

Owner Audits

Owner Leads

Contractor Leads

Contractor Supports
FACILITIES ENGINEERING PROCESS

**Global Customer Needs & Requirements**
- Business Planning FEL-1

**Business Objectives & Capital Forecasts**
- Facilities Planning FEL-2

**Project Basis & Capital Budget**
- Project Planning FEL-3

**Production Des Basis, CAC & Project Auth**

**Process/Product Development**
- Market Forecasts
- Sales/Capacity Reconciliation
- Competitive Studies
- Legal/Environment/S&OH
- Process/Technology Evaluation and Selection
- Procurement Screening
- Strategic Review
- Informal VGAs
- Preliminary Process Hazard Assessments

**Form Project Team**
- Prepare Project Objectives
- Identify Site Options
- Hold Business Review
- Technology Screening & Conceptual Engineering
- Evaluate Business Feasibility
- SHE Strategy & Screening Reviews
  - Consequence Analysis
- Run Pilot Plant
- Prepare Basic Data
- Prepare Screening VGA

**Project Survey(s)**
- Design P&I Diagrams & Major Equipment
- Procurement Plan
- Execution Plan
- Preliminary Equipment Arrangements
- Scope of Work
- Schedule Analysis
- SHE Pre-Auth Reviews
  - PHR, Ergonomics & Fire Protection
- Estimate Preparation
- Appropriation Request
Plans are of little importance, but planning is essential.
-- Winston Churchill --
FEL: Window of Opportunity

INFLUENCE REALITIES

LEVEL OF INFLUENCE

Major Influence
Rapidly Decreasing Influence
Low Influence

Overall Influence Curve (of Front-End Loading)

Project Expenditures

FEL

PROJECT LIFE CYCLE

Conceptual Analysis & R&D
Pre-Proi Planning
Basic Data & Scoping
Proj Auth
Production & Engineering
Construction Engr Compl
Turnover & Start-up
**FACILITIES ENGINEERING PROCESS**

### Project Implementation
- Quality Review
- Process Development Letter
- Production Design
- Equipment Procurement
- Bid Package Specifications
- Contract Quotations
- Award Contracts
- Build Facility
- Checkout/Turnover
- Detailed PHA/QA
- Operating Procedures & Safe Work Practices
- Contractor Safety & Performance

### Facility Operation
- Pre Start Up Safety Review
- Energize
- Start Up
- Audit
- Operate
- Training & Performance
- Maintain
- Mechanical Integrity
- Improve
- Regenerate
- Incident Investigation
- Management of Change
- Emergency Planning & Response

### Competitive Facility That Meets Business Needs
- Production Design Basis, CAC, Project Authorization

### Products That Continuously Meet Global Customer Needs & Requirements Better Than All Competitive Products
The “Right” Plant Practices

- Technology Selection
- Process Simplification (Value Engineering 1)
- Classes of Facility Quality
- Waste Minimization
- Constructability Review (1)
- Process Reliability Modeling
- Minimum Standards and Specifications
- Predictive Maintenance
- Design-to-Capacity
- Energy Optimization
- 3D CAD (through execute)
- Value Engineering (2)
- Constructability Review (2)
- Constructability Review (3)

* Workface Planning

Potential to Impact Value

- Explore
- Appraise/Select
- Define
- Execute
- Operate

Project Phase
If cost is too high, return to design phase

Settle on target cost early, before doing significant Engineering, Design (and supplier pricing).

Target costs for each component force marketers, designers, and engineers from all departments and suppliers to struggle and negotiate tradeoffs.

Continuous cost reduction

Planned selling price less desired profit

TARGET COST

MANUFACTURING
Capital Productivity Best Practices

1: Set Up Teams for Success
2: Manage Teams for Success
3: Front-End Load Opposite Business Goals
4: Utilize Competitively Superior Technologies
5: Minimize Non-Value Adding Investment
6: Ensure SHE Excellence
7: Execute Project With No Changes

Project Timeline
DuPont Benchmarking Results

Performance traders
Slower, cost less than industry norm

Best-in-Class
Faster, cost less than industry norm

Underachievers
Slower, cost more than industry norm

“HOW?”

IBC 2000
IBC 1999
IBC 1998
IBC 1997
IBC 2001
IBC 2002
IBC 2003
IBC 2004
IBC 2005

Low Cost

High Cost

Industry Average

Iowa City, IA

Performance Traders
Faster, cost more than industry norm
Supply/Demand Forecasting Model
Web-Based Labor Market Information Management

Construction Workforce Development Center

In association with:

www.cwdfc.com
Benefit to Owners

- Reliable tracking system to assist with project planning
- Regional supply/demand summary info
- Easy access to input data on regular basis
- Secure interface & data confidentiality
- Common methodology

Benefit to Contractors

- Timely data for recruiting & training strategies
- Reliable tracking system to understand supply/demand
Strong Operating Discipline Required to Deliver a Great Project...

Strong Operating Discipline

- Safety
- Cost
- Quality
- Schedule
"Goal of WorkFace Planning is to improve performance by getting the right things to the right place at the right time"
“More Business Value for Our Money”

Different Levels of Value From WFP

- Owners
- Contractors
- Industry

**Owners** - Improved safety performance
- Improved planning
  * Execution strategy
  * Contracting Strategy
  * Optimize cost & schedule
- More accurate estimates (cost/schedule)
- Improved control
- Increased productivity
“More Business Value for Our Money”

**Contractors**
- Improved safety performance
- Improved planning
- Improved productivity
- Increased profitability

**Industry**
- Improved safety performance
- Improved work force development
- Increased work force availability
- Increased overall productivity
- Increased attractiveness of construction jobs
“Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so.”

Douglas Adams, (1952 - 2001)
English humorist & science fiction novelist
Cultural Evolution

TENDENCY TO DRIFT

Adversarial Relationship
  Authority
  Control
  Compliance
  Short-Term Focus

Standard of Behavior
  Policies
  Rules
  Standards
  Hierarchy

Standard of Excellence
  Communication
  Involvement
  Openness
  Trust
  Collaboration
  Commitment

Stakeholders
  Self Accountability
  Organizational Unity
  Principles
  Purpose
  Understanding
  Long-Term Focus

LEADERSHIP ENERGY
Effectiveness / Trust Relationships

Trust = f \left( \frac{Intimacy \times Competency}{Risk} \right)
My Reflections

- Must see project management holistically
- Best practices define the pathways
- Leadership is learn/teach/learn
- It’s never over
- Positive attitude critical

“People don’t resist change, they resist being changed!”
NOTE: The information collected is anonymous and may be used for research purposes. By participating, you are giving your consent for the use of this data.
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Jim Porter
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Opening

System Based Construction

- The challenges common to most projects can be anticipated.
- Because these challenges can be anticipated, they can be planned for.
Presentation Outline

- Define Area vs. System based Construction.
- Why & how the transition occurs. Is transitioning the problem?
- What are the significant challenges we face during system construction?
- What are some of the mitigating actions we may take to reduce their impact.
Area Versus System Based Construction

Area Construction
Area Versus System Based Construction

System Based Construction
Area to System Transitioning - Ideal

Engineering & Procurement

Concept ↓
Modeling ↓
Detail IFCs

Construction

Completion by System ↑
Area Construction ↑
Detail IFCs

C&SU

Plant Startup ↑
Completed Systems
Area to System Transitioning - Real

IFC Work Packages, Materials, etc.

Transition to System Based Construction

Engineering & Procurement

System Turnover

Construction

C&SU
Common Challenges During System Construction

Quality Issues

Late Engineering & Materials

Productivity Issues

Progress & Productivity Measurement
Quality Issues

The Challenge

- Construction Deficiencies
- Vendor & Fabrication Deficiencies
- Engineering Deficiencies
- Documentation / Turnover Deficiencies

Potential Solutions

- Regular and meaningful Quality Audits. Identify trends early.
- Use of the “Scorecard” to not only verify progress but to perform targeted inspections during construction through In-Process Verification.
- Source Inspection with early involvement from Operations personnel.
- Early identification of RFI during Work Face Planning & Packaging.
- Early system definition which allows for effective packaging of quality records for system turnover.
The Challenge

• Capacity to absorb late engineering changes or material deliveries decreases substantially.

Potential Solutions

• Early identification of pending engineering changes or late material deliveries to permit recovery planning.
Productivity Issues

The Challenge

- Increased Travel & Support Requirements.
- Increased Safety Awareness Requirements
- Motivational & Territorial Issues

Potential Solutions

- Find a middle ground between system priorities and area based efficiencies through effective Field Installation Work Packaging. Package deficiency work in same manner as original commodities.
- Work under system priority only as needed and accept that productivity will be impacted and plan accordingly.
- Integrated planning that anticipates energized systems, hydro test exclusion areas, etc.
- Work Packaging during System Based Construction adhering to geographic boundaries used during Area Construction.
The Challenge

• Rate of progress drops significantly during system construction.

Potential Solutions

• We need to take a closer look at how we measure progress up to and during this stage of the project. Anticipated work is being performed however there is no progress to earn against.
These challenges are real and cannot be eliminated.

We can, however, plan for them and manage our way through them.
Automation & Integration:

WorkFace Planning in an EPC Environment

Lowell Wiles
VP, Global Construction
Jacobs
December 1, 2010
EPC Execution

• **Benefits**
  • Necessary for compressed Schedules
  • Single Point Accountability
  • Opportunities for earlier, incremental planning

• **Challenges**
  • Phase Overlap
  • Synchronization of Phases
EPC Phase Overlap

Feasibility | Conceptual Design | Project Definition | Detail Design | Construction
---|---|---|---|---
Feasibility | Conceptual Design | Project Definition | Detail Design | Construction
Potential Schedule Savings
Model for EPC Success

- Front-end Construction Planning
- Strategic Scope Structure
- Integration of Automation Tools
- WorkFace Planning
Tenets for EPC Workface Planning:

- Scope is organized by Construction
- Construction Plan drives design sequence
- Construction work areas frame FIWPs
- Automation tools integrated to support WFP
Scope Organised by Construction
Construction Plan Drives Design Sequence

WORK SEQUENCE MODEL
PROJECT

Construction Plan Drives Design Sequence
CWA’s Frame FIWPs

CWA
Construction Work Area

CWP
Construction Work Package

Disciplines
Systems

FIWP
Field Installation Package

Disciplines
Systems

Test Package

Turnover System

Testing & Completion

Installation
Automation Tools Integrated

**Data Flow**

- **Weld Management**
  - IMS (Xenon)

- **Project Schedule**
  - P6

- **WorkFace Planning**
  - 3D Model
  - ConstructSim (Bentley)

- **Turnover System**
  - WinPCS (Complan)

- **Field Progress**
  - FLA

- **Material Management**
  - JMMS

- **Data Flow**
  - FIWPs
  - Work Availability Reports
  - 3D Visual Status
WorkFace Planning Begins Early

Critical Phases for WFP

- Const. Strategies
- Module Approach
- Develop CWA's
- Partition Model
- Synchronize Design Schedule
- Structure Automation Tools
- Detail Plans
- Build FIWPs
Results:

- TRIR .21
- Productivity factor = 11% better than budgeted
- Rework is < 2% and < 0.5% on construction
- Beat original schedule
What we’ve Learned:

- WFP success depends upon proper EP sequence
- WFP success depends on timely data integration
- Structure scope early, and stay with it
- It’s never too early to start WorkFace Planning!
Audience Participation

1. Based on your experience what is the expected % improvement in labour productivity an effective WorkFace Planning System will provide?

   a) Less the zero
   b) 0 to 10%
   c) 10 to 20%
   d) 20 to 30%
   e) More than 30%
   f) Can’t comment
2. Does your organization Utilize Front-End Construction Planning?
   a) Yes
   b) No
3. Can WorkFace Planning be effectively used if it is not implemented during FEED?

a) Yes

b) No
4. Do you believe WorkFace Panning can add value to all projects?
   a) Yes  
   b) No
Audience Participation

5. Do you use a 3D Visual Tool to help you assemble FIWPs?
   a) Yes
   b) No
Building Work Packages
Session Format

• Introduction
• Overview of the COAA approach to building Work Packages
• The Graham approach to building work packages
• The JV Driver approach to building work packages
• The Ledcor approach to building work packages
• Audience participation
• Questions to panel
What is in an FIWP?
The COAA Approach to Building Work Packages

Field Installation Work Packages (FIWP)

Page 1  3D Coversheet
Page 2  Coversheet
Page 3  Contents
Page 4  Work Scope
Page 5  EH&S Introduction
Page 6  EH&S site info
Page 7  QA / QC Requirements
Page 8  Tools and Consumables
Page 9  Check List
Page 10 Scaffold Request

Attachments
Technical Documentation
  - ISO List
  - Spool List
  - Drawings
Material Forecast
Score Cards
  - Spool Score Card
  - Weld Score Card
3D Model Shots
Other
  - Lessons Learned
  - Notes
The COAA Approach to Building Work Packages

- Who develops the FIWP?

- FIWPs are developed by dedicated planners (crafts people or engineering types with construction experience).

- Note: In some cases General Foremen or superintendents may develop the FIWP.
The COAA Approach to Building Work Packages

• How big is an FIWP?
  - Normally 500 to 1000 hours (but varies based on discipline and work being done)
The COAA Approach to Building Work Packages

- Can you use an FIWP that doesn`t have satisfied constraints?
  - Not normally, but you can modify the package to ensure that the new package has satisfied constraints
The COAA Approach to Building Work Packages

• What are FIWP built from?
  o Typically FIWPs are developed from Construction Work Packages but we are seeing FIWP developed directly from Engineering Work packages
The Graham Approach to Building Work Packages

Traditional execution:
The Graham Approach to Building Work Packages

• Information
• Materials
• Tools
• Equipment
• Resources
• Access to the Workface

Scope
Drawings
Planned Value
Schedule Dates
Material Confirmation
Construction Equipment
Scaffold Requirements
Safety
Quality Control
Labour
Permit
Requirements
The Graham Approach to Building Work Packages

Workface Planning Applied to Earthmoving
The Graham Approach to Building Work Packages

Workface Planning Applied to Earthmoving

- Standard set of FIWPs
- FIWPs applied to a Lift (not to a foreman)
- Foremen build daily plans to satisfy the FIWP
- Foremen report barriers daily
The Graham Approach to Building Work Packages

Beyond the COAA Model:

• WorkFace Planners develop execution plans with their superintendents for each EWP
• EP guides development of FIWPs
• Standard earthmoving FIWPs (procedures)
• Earthmoving FIWPs assigned to the task not the crew.
• Foremen create daily plans
• Barriers are logged and managed daily
• Subcontract FIWPs: built by our planners with guidance from their supervision
The JV Driver Approach to Building Work Packages

Wedding Scenario:
The JV Driver Approach to Building Work Packages
The JV Driver Approach to Building Work Packages

- FIWP Stakeholders
  - Planners are in the Field
  - Extract components to build the FIWP
    - HS&E
    - Quality
    - Project Controls
    - Schedule
    - Material Management
    - Document Control

APPROVED
The JV Driver Approach to Building Work Packages

- FIWP Stakeholders
  - Planners are in the Field
  - Extract components to build the FIWP
    - HS&E
    - Quality
    - Project Controls
    - Schedule
    - Material Management
    - Document Control

[Image of approved stamp]
The JV Driver Approach to Building Work Packages

- TCCC (Turnover, Care, Custody and Control)

- FIWPs are returned Certified Complete
  - Red Line Drawings
  - As Built Drawings
  - Construction Punch List
  - Signed and Completed ITPs
  - Confirmation of Construction Complete
  - Precommissioning
The Ledcor Approach to Building Work Packages

Building Foreman’s Workface Packages
Question-and-Answer Period
NOTE: The information collected is anonymous and may be used for research purposes. By participating, you are giving your consent for the use of this data.
Closing Comments

• Thanks for attending this session and providing us with your feedback

• If you have any further questions for any of the speakers please ask us after the session
Introduction to FIWP Planning

“Plan the Work”
- Dedicated Planner
- Materials & Equipment Coordinators

“Release the Work”

Field Installation Work Package
- √ Materials
- √ Tools
- √ Equipment
- √ Trades/Specialists
- √ Detailed Plan
- √ Drawings
- √ Vendor Info.
- √ Safety Requirements
- √ Supervisor Review
- √ Safety and QA

“Work the Plan”
- Supervisor

Prerequisites

Scope
- Team
- Tools

Ready √

37% → 47%

Tool Time Improvement
The goal of Workface Planning is to improve performance by:

- Develop a usable and practical standard planning tool to significantly increase productivity, reduce rework and enhance the probability of project success

- Create and maintain discipline and foster honest communication to proactively resolve issues before and as they arise

- The FIWP process will be a continuously improving body of knowledge

- Based on the COAA Best Practices
A Field Installation Work Package is a comprehensive package of Information that describes a specific scope of work in detail and typically includes:

- Safety & Quality considerations
- Discipline Drawings
- Material requirements
- Inspection & Test Certification
- Estimated number of man-hours
- Schedule
- Additional information… (To benefit the construction/implementation team.)
• Design Area(s) are broken into a series of Construction Work Pkgs (CWP)
• CWPs are agreed to with Engineering prior to construction
Packaging Work for FIWP’s

1st Step (Typically determined by area)

2nd Step

3rd Step

Areas

Level 3 - Disciplines

CWP

FIWP’s

Level 4

Estimate & Manhours

Level 5

FIWP Step Listing

Task

Task

Task

Task
Foreman’s Workface Package Preparation Guiding Principles

- Keep it SIMPLE
- Practical and User Friendly
- Understandable
- Standardize Tools
- Continuous Improvement
Packaging Work for FIWP’s (cont’)

4th Step Create FIWP

- Dedicated AND Experienced planners break out CWP’s into specific Field Installation Work Packages (FIWP’s)
- The consideration for FIWP Packages is commended during the detailed engineering phase

FIWP Document Template
1. Introduction
2. Health Safety & Environmental
3. Scope Of Work
4. Drawings & Data
5. Material Data
6. Inspection & Test Plan (QA/QC)
7. Operation & Maintenance
8. Support Information
1.0 Introduction

General overview of the scope of work to be undertaken with specific attention to any items needing consideration by Construction implementation.
2.0 Health Safety & Environmental

- Hazard Management Activities
- Work Pack Risk Assessment
- Material Safety Data Sheets
- Task Risk Assessment
- Manual Handling
- Specialist Safety Requirements
- Provision & Use of Work Equip.
- Toolbox Talks
3.0 Scope of Work

- Piping
- Mechanical
- Instruments
- Electrical
- Civil/Structural
- HVAC
- Job Cards / Activity Sheets
- Joint Completion Matrix
- Lifting Requirements
- Engineering Queries
- Hydro/ Integrity Testing
  - Planning
4.0 Drawings & Data

- Piping
- Mechanical
- Instruments
- Electrical
- Civil/ Structural
- HVAC
- Architectural
- Lifting Requirements
5.0 Materials

Material Requisitions

- Piping
- Mechanical
- Instruments
- Electrical
- Civil/Structural
- HVAC
FIWP - SmartPlant Materials Integration

- Forecasts are created by Field Installation Work Package (FIWP) priority
  - Only Inventory – Identify lines with 100% material on hand
  - Approved Purchase Orders – Create shortage reports
- Shortage reports forwarded to expediting group
  - Identify possible long lead items impacting schedule
  - Focus expediting efforts where most needed
- Material list added to FIWP package and signed off
- Pick tickets for 100% on hand inventory packages forwarded to the warehouse for bag & tag and staging
  - Release Authorization from warehouse
  - Picked heat numbers recorded for later user by Quality Assurance Department
Reported by FIWP Package at Isometric Level

List of all Lines that are available to begin construction
6.0 Inspection & Test Certification

- Owner Specification/ Code Inspection & Test requirements
- Mechanical Completion Certification
- Punch lists
- Joint Integrity Certificate
- Integrity Test Certificate
- Control Completion Certificate (process control items)
- System Handover Certificate
7.0 Operation & Maintenance

- Operating Manual Updates
- Maintenance Routine Updates
8.0 Additional Information

- Procedures/ Work Instructions
- Specifications
- Miscellaneous Data
- Weight Control
- Vendor Data
- Other Data
FIWP – Release The Work

Engineering
- Generate CWP
- Engineering Deliverable Listing

Construction Planning
- Develop execution Methods & scope (trade mix)
- HAZCON requirements
  - Method Statements
  - Risk assessments
  - Resource/ Planning
  - I & T Certification

Construction Execution
- FIWP Issued for Construction
- Responsible parties, which are to always include the Foreman, review the completeness and accuracy of the FIWP package prior to commencing work in the field
- Superintendents/PMs/Coordinators make final go/no-go decisions on FIWP release
- Foremen execute FIWP’s
- Project Controls monitor FIWP’s
- Quality Assurance audit FIWP’s

Handover
- Sub-System Completion records
- Ledcor’s Project Controls Systems

Hyperlink

Sub-System Completion records

Ledcor’s Project Controls Systems
SUMMARY

The Ledcor Group…Workface Planning to improve performance by:

- Planning using Practical methods
- Making the “Bar” clear
- Creating discipline
- Proactively resolving issues
- Significantly increasing productivity
- Reducing rework
- Continuously Improving
OPEN PANEL DISCUSSION

FIWP Steel

FIWP Steel #1

FIWP Steel #2

FIWP Steel #3

FIWP Steel #4
How Big is an FIWP Package?

Use Common Sense: It is a package of work as would normally be given to a foreman to build.

- Work for an FIWP is to be discipline specific and to a individual Foreman’s crew.
- The size of an FIWP can depend on the complexity of the work. Therefore work may be of longer (or shorter) than 2-3 weeks in duration. (example - Large concrete foundation (4 weeks), setting a piece of equipment (4 days).)
- FIWP packaging needs to align with all systems. (i.e. Estimating, FWP, Schedule)
- An FIWP may remain ‘open’ for longer periods (on hold at <100% complete) awaiting the completion of dependant and integrated activities from another FIWP. (example - Final termination of a group of cables, may be on hold until the equipment is set.)
Clarifier Base – Concrete Pour
OIL SANDS PROJECT

Heavy lift of rotary crusher at C&C silo

First pipe module being set at U&O silo
Oilsands SAGD Expansion
Setting OTSG Stack
Central Processing Plant – PIPERACK MODULES
Progress Monitoring and Control of FIWPs
Field Installation Work Package (FIWP) Planning Interfaces

- MC2 Estimate
- Smart Plant 3D Design
- P6 Schedule
- QA / QC NDE Welder Log
- SmartPlant Materials
- ToolHound Tools & Equipment
- FWP Plan
- FWP Progress
Foreman’s Workplace

- Foreman’s Planning Tool
- Compile Earned Progress
- Report Earned Progress by
  - Foreman
  - Schedule ID
  - JDE Cost Code
  - System
  - CWP
  - FIWP
- Data from IFC estimate information
- Worksheets continually updated to reflect current scope of work
FWP – Levels of Detail

PIPE
- Area
  - CWP / EWP
    - FIWP
      - Line
        - ISO
          - Spool
            - Installation Progress

CONCRETE
- Design Area
  - CWP / EWP
    - FIWP
      - Foundation
Scorecard Components

Concrete:

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<th>Item ID &amp; Hrs</th>
<th>Descriptions</th>
<th>Activities</th>
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Piping:

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</table>

- Itemized scope of work
- Schedule IDs
- Estimate MHs
- Area/System/EWP/Line#/Iso#/Priority/etc
- Activity steps
### FWP Main Screen

- Sort and filter immediately by any column
- Edit information directly on screen
- Progress activities by percentage complete
- Progress by standard sets of activities in a step-by-step manner
Typically do not receive complete detailed system definition until 75% complete

Need system definition as early as possible

FWP allows system information to be entered progressively as information becomes available

Greatly enhances ability to plan and execute final system by system turnover

FWP ADVANTAGE
- Can switch between Standard and System Sorts on the fly
Construction to Production

- Change the way we approach scheduling execution.
- Use existing Ledcor systems to tie in EWP’s, FIWP’s and turnover packages to achieve optimum balance between construction and start up.
- At the early onset of the project, focus superintendents on the sequence of start up, not mechanical completion.
- Continuous cross discipline interactive planning from EWP release through construction to start up.
WELCOME
Committee Members

Rob Cleveland
  *Christian Labour Association of Canada*

Michelle Devlin
  *Creating People Power*

Dale Hildebrandt
  *Ledcor Industries Ltd.*

Roland LaBossiere
  *Suncor Inc.*

Marla McCready (Co-chair)
  *Merit Contractors Association*

Hardy Lange van Ravenswaay
  *Progressive Contractors Association of Canada*

Shandra Linder
  *Syncrude Canada Ltd.*

Cailín Mills
  *Alberta Employment and Immigration*

Lindsay Osmond
  *Canonbie Contracting Ltd.*

Lynne Palumbo (Co-chair)
  *Construction Labour Relations*

Angie Perras
  *Bird Construction Company*

Cara Yu
  *KBR Canada*
Respect in the Workplace Toolkit

A Best Practice of the COAA

A collaborative initiative developed by the

COAA Respect in the Workplace Committee

May 2011
Respect is defined as the willingness to show consideration for the rights or feelings of others; to treat them courteously, inclusively and safely.
• Endorsement & Acknowledgements
• Tab 1: Respect in the Workplace Guidelines
• Tab 2: What is a Respectful Workplace?
• Tab 3: Developing and Implementing an RITWP Policy
• Tab 4: Sample Policy
• Tab 5: Employer Guide
• Tab 6: Supervisor Guide
• Tab 7: Employee Guide
• Tab 8: Forms and Checklists
• Tab 9: References and Resources
Violations of Respect

- Unprofessional Conduct
- Harassment
  - Bullying
  - Cultural Insensitivity
- Discrimination
- Workplace violence
NEW: Unprofessional Conduct!

- When behaviours, responsibilities and actions fall below the required standard set by the industry or an organization
- These standards referred to as a code of conduct, may be implied or written
- Code of conduct usually focuses on ethical and socially responsible issues

Everyone is accountable for conducting themselves by word, action and gesture in a manner that is reflective of respectful behaviour.

NEW: Cultural Insensitivity!

- Behaviour that is directed towards an individual based on characteristics such as age or communication style that causes humiliation or frustration
- Culture is a code of behaviours, values, beliefs, traditions, customs, patterns of thinking and a way of life that people unconsciously learn
TAB 8 - FORMS & CHECKLISTS

✓ Checklist: Do You Have a Respectful Workplace?
✓ Checklist: How to Develop and Implement an RITWP Policy
✓ Checklist: Is Your RITWP Policy Enforceable?
  • Incident Statement Form
  • Employer Investigation Form
  • Investigator's Incident and Corrective Action Report
  • RITWP Hazard and Risk Worksite Assessment Form
  • Work Safe Alberta Employee Risk Assessment Questionnaire
  • COAA Field Level Risk Assessment Form
“Overarching Value”

All people have the right to be treated with dignity and respect.
Training Format

Awareness Workshop
Train the Trainer
Can Respect in the Workplace be mandated?
History of Workface Planning at Syncrude

- **First piloted on Upgrader Expansion 1 (UE-1), 2000 – 2006 (multi-billion $)**
  - Many learning’s helped the formation of the COAA model in 2005

- **Used on Syncrude Emissions Reduction Project (SERP), 2006 – present ($1B+)**
  - WFP not introduced until detailed engineering was 100% complete and construction 30% complete

- **2008 Prepared formal WFP Application Manual based on the COAA WFP model**
  - This document forms the basis for Contractor expectations

- **2008 – 2010, Some experience on 4 projects valued <$500M each**
  - 2 projects have been completed and 2 are currently under construction

- **2010 hired a Construction Management Contractor to be a general contractor for a suite of Mining/Tailings projects**
  - WFP a requirement of the contractor

- **2010 Implemented a System for Managing (short interval management) for identifying barriers to executing the daily schedule**
  - SFM requires a daily plan from the Contractor, contractor identification of barriers that have arisen on the day, process for Owner representatives to work with the Contractor to break down barriers
  - WFP is the tool to remove barriers prior to field execution whereas SFM is the tool to collect and address barriers that come up daily
Key Learning’s

- **Include Owner expectations for workface planning in contract documents**
  - Set specific expectations with detailed procedures

- **Involve the Construction Contractor in constructability and the path of construction during the Engineering and Procurement phase**
  - EWP’s and CWP’s constructed with consideration of FIWP’s
  - Engineering 3D models support FIWP’s
  - Procurement knows the requirements for WFP (electronic information and piece marking)
  - Fabricators required to follow requirements for electronic information and piece marking

- **The Project Management Team must manage to the procedures and take timely actions to correct deviations**
  - Owner PMT must understand the procedures, own the procedures and ensure alignment in the Owner team and the Contractor team

- **Construction contractor needs to drive the application of WFP**
  - Superintendents need to feel ownership for the FIWP’s
  - Need to drive FIWP continuous improvement by ensuring field feedback to the planners

- **Manage the application of WFP to the right work – don’t default to doing everything**
  - Civil/Earth and Pipeline work (single discipline with separation from other scope) may not require WFP
  - Earthworks does not require FIWP but rather needs daily equipment line up, standard packages for sand haul, sand placement, excavation
  - Consider WFP for mitigating the consequences of cost or schedule on critical scope
Project Experience

- **Expectations**
  - 8 weeks of signed off work packs on the shelf ready to go
  - All aspects considered (safety, quality, RFI’s, execution plan, materials, scaffold, cranes …)
  - Reflect the execution schedule
  - Superintendent, GF and Foreman buy-in sought

- **Went Well**
  - Planners initiate RFI’s prior to execution
  - Minimize Foreman paperwork (helps with less experienced Foremen)
  - Cross trade jurisdictional conflicts almost non existent
  - QC requirements identified early so issues can be resolved before work pack is in the field
  - QC validates FIWP at completion before progress is earned
  - Less rework than historical and shorter punch lists
  - Few scaffold delays
  - No waiting on materials
  - Safety considerations reflected

- **Things to Watch**
  - Superintendent buy in is critical for success
  - FIWP’s initially dissected by foremen to cherry pick activities
  - Build in a feedback cycle from the field to the Planner to improve FIWP effectiveness
  - Consider having a planned value for each FIWP for progressing
  - Manage the squad check process for FIWP to avoid too many approvals (restrict to Safety, Quality and Superintendent)
Onshore Projects
Business Improvement

Work Face Planning Update
MRM Flare Upgrade Project

Nov 30, 2010

Duncan Lancaster
Work Face Planning

COAA – Improve planning of workface activities to improve productivity and reduce costs

- better utilization of expensive resources
- improve HSE performance

Implemented COAA model on MRM Flare Upgrade Project with:

- focus upfront in home office vs field
- supplemental resources
FIWP’s are created for each discipline for an average of 10 workers X 10 Days X 10hrs (1000 Hours – Productivity included)

Approx. 600 FIWP will be created for the Flare Upgrade project based on the EWP’S and CWP’S.

Planning started in December, start FIWP’s when dwgs IFC

Backlog Target - 8 weeks

One planner (GF level) for each discipline (Piping-Structural-Mechanical- Electrical- Civil-E&I-Scaffolding…etc.)
**Work Packages include:**

<table>
<thead>
<tr>
<th>Work scope</th>
<th>Tools / Consumables</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSE info</td>
<td>Equipment</td>
</tr>
<tr>
<td>Safe work practices</td>
<td>GF Check list</td>
</tr>
<tr>
<td>Bowties</td>
<td>Drawings</td>
</tr>
<tr>
<td>Permit info</td>
<td>Critical lift plans</td>
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<tr>
<td>Sign off sheet</td>
<td>3-D Shots</td>
</tr>
<tr>
<td>Inspection Test Plan</td>
<td>Scaffold request</td>
</tr>
<tr>
<td>Materials</td>
<td>Lessons learned</td>
</tr>
</tbody>
</table>
Scaffolding

Upfront plan on scaffold

Scaffolder planner determines multi discipline use

Coordinator tags scaffolding accordingly for use by number of trades

Supervisors sign off when complete

This eliminates needless tear downs and rebuilds
Planning

Permit Coordinator meetings, planning lead determines priorities (PL performs integrator role)
8 week look ahead schedule reviewed per discipline every Monday

Leading indicators include:
• Number of FIWPs complete 8 weeks prior to field execution
• Number of packs created monthly per planner / discipline
• Graph to show packs completed by due date. (Green, yellow & red)
Owner Requirements
Owner requires…

Describe your WFP program
&
What projects have you implemented it on?
Owner requires...

What are the contractor’s internal procedures for managing key workface planning interfaces with other contractors and owner supplied services.
Describe the content and purpose of your Field Installation Work Packages.
How does the contractor organization define and progress the direct field labor scope?
In the capacity of a General Contractor, describe your processes and procedures to develop WorkFace Plans that address at a minimum the following requirements:

- Level 5 multi-discipline look-ahead schedule
- Access and Infrastructure Plan (including scaffolding, trailers etc.)
  - Crane and Equipment Plan
  - Material Handling Plan
COAA Workface Planning Conference

“Panel Discussion - Owner’s Expectations”

Andrew Hardy, P. Eng.
Project Execution Leader – Strathcona Refinery
Imperial Oil – Owner Expectations

For Project Delivery
1) Safety, Health and Environment
   • All individuals and organizations must share safety and protection of the environment as core values.
   • Facilities must be safe to construct, operate and maintain.
2) Quality and Reliability
   • Quality of the engineering and construction directly relates to safety and business results.
3) Capital Efficiency
   • To create value for the business, optimize life-cycle cost for assets.
   • Corporate emphasis globally on increasing field labour productivity.

For Workface Planning
1) Improved safety performance
2) Fewer quality issues
3) Increased field labour productivity
4) Improved predictability for cost and schedule
Workface Planning at Imperial Oil

- No experience in the downstream. Some experience in other parts of the company.

- Strathcona Refinery is implementing workface planning on work that includes construction of new facilities in operating units as well as during turnarounds.
  - Lessons learned will be shared globally

- Construction Focus areas for workface planning:
  - Aligning project team with workface planning model
  - Contractors to create Field Work Installation Packages and provide additional planning versus historical practice
  - A constraint based system to be used for releasing work to the field

- Turnaround focus areas for workface planning:
  - Historical level of planning already sufficient
  - Increased focus on efficiencies in a geographic area (ie. workface) vs. individual jobs
  - Additional emphasis on “plan B or plan C”; having contingency work available
  - Productivity improvement will help ensure labour availability

- Benefit to contractors:
  - Improved safety performance and productivity
  - Enhanced competitive position
Owner’s Expectations From Workface Planning

Why Workface Planning?
Owners’ Expectations From Workface Planning

What do Owner’s Want From Their Projects?

- Projects delivered:
  - On-time
  - On-price
  - On-quality
  - *Executed Safely!*
Owners’ Expectations From Workface Planning

- Why Do Owner’s NEED to Be Involved in WFP?
  - Recent Projects’ Execution failed to produce On-time, On-price, On-quality performance
  - Design Cycles & Deliverables did not support the Construction Execution Plan
  - The Construction Execution Plan was not “In Sync” with the Owner’s Turnover & Commissioning Plan
  - Inadequate FEL left too many gaps for EPC contractors to bridge
Owners’ Expectations From Workface Planning

When do Owner’s need to be involved in Workface Planning?

From DBM onward, Owner’s must ensure that Workface Planning encompasses all phases of the project life cycle:

- **Concept (DBM):** Deciding what to build effectively
- **Preliminary Design (FEED):** Engineering the project efficiently
- **Construction (Detail/Execution):** Building it productively
- **Commissioning:** Ensuring the project comes on-stream in the sequence and way intended
Owners’ Expectations From Workface Planning

- How Does Workface Planning Improve Project Execution?
  - Aligning Execution Plans to be in Sync with the Owner’s Turnover & Commissioning Plan
  - Tuning Design Cycles & Other Project Deliverables To Construction Execution Plans
  - Early Planning For Seamless Integration Between Project Silos
Owners’ Expectations From Workface Planning

- In Summary, Owner’s Expectations from WFP are Planning Processes that Produce Efficient:
  - Designs that Support Construction Execution
  - Construction Execution Plans Tuned to Turnover & Commissioning
  - Seamless Interface Management plans between Silos and “Brownfield” Interfaces.
Introduction:
- Who I am
- Time in TransAlta
- Background
- What I’m currently doing in the PMO

Role of TransAlta PMO
- Governance – TRACT
- Project Management Standards (Project Management Process and Templates)
- Project Management Services

Briefly outline Current Construction Model
- 8 Stage Gate process
  - Screening
  - Early Development
  - Mature Development Evaluation
  - Mature Development Definition
  - Construction
  - Integration
  - Commissioning
  - Wrap Up and Lessons Learned

Describe that TransAlta has not implemented WFP into our construction projects
- That said, I see our model embedded in the four basic WFP steps. For example:
  - Design Basis Memorandum = TransAlta Screening/Early Development
  - Engineering Design Specifications = TransAlta Mature Development Evaluation
  - Detailed engineering = TransAlta Mature Development Definition and Construction
  - Construction = Construction/Commissioning/Integration/Wrap-up and Lessons Learned
- However, the value in WFP resides in the detail.
- Where TransAlta also sees value in WFP is in how it drives collaboration within the key stakeholders and decision points are very well defined.
- We find the collaboration piece in TransAlta a challenge at times and accountabilities at times get confused. The WFP model is very clear when it comes to accountabilities and I see it can be modified to meet our purposes depending on who has been hired to do each piece of work.
Finally, we see that aligning our model more closely with the WFP model will likely benefit us in that the same terminology, timings, and expectations that are used outside the confines of TransAlta are used internally. Speaking the same language!!

Challenges

Based on what I’ve seen in the limited time in my current role I make the following comments:

- Good Processes do not always lead to good work.
  - TransAlta has a lot of very good processes that are clearly defined and mature in nature. Where we tend to have an issue is not with the process, it’s getting folks to understand the value of the process and following it because it creates.
  - A solid and mature process is a double edge sword in my opinion. On one hand the process is embedded into our culture so any adjustments will come with some significant change management challenges.
  - To be successful, I’m of the opinion that we need to make the process the path of least resistance because it’s easy, and repeatable. As a result, users will naturally migrate to it.
  - I see implementing WFP methodologies into our process will come with those same challenges. I think TransAlta will not be alone in this challenge.

Bottom Line

- TransAlta will be conducting a detailed review of the WFP model in conjunction with our process in January to incorporate as many of the WFP best practices as possible. When we’re done, the final outcome may not have the same look and feel as the WFP model but judging from what I’ve gleaned so far, the majority of the WFP model will be embedded in our process.
- Once this piece of work is complete, the heavy lifting will begin. We will begin the change management necessary to communicate our expectations internally and externally. Similar to what we do now, it will be our intention that contractors and engineering firms will need to conform to our model and planning expectations.

Opening Question

- How can we best implement any changes into our planning model and immediately get the buy-in by the end users?
Owners Expectations

“More Business Value for Our Money”

Jim Porter
DuPont VP Engineering & Operations (Retired)
WorkFace Planning Conference
December 1, 2010
Core Values

- Safety and Health
- Environmental Stewardship
- Highest Ethical Standards
- Respect for People

The Goal Is “Zero”
Elements of Capital Effectiveness

- Business Strategy
- Technology Strategy

- Alignment of Functions
- Leading Technology
- Use of Value Improving Practices
- Front-End Loading

- Optimal Scope for Business Needs
- Executed With Minimum Change
- Timely Involvement of Contractors/Vendors

Key Leading Indicators

Key Performance Indicators

SAFETY

- Fast Cycle Time

BEetter IRR

- Low Cost
- Excellent Operability
Facilities Engineering Process

Global Customer Needs & Requirements

Business Objectives, Capital Forecasts

Project Planning FEL-2

Project Basis, Capital Budget

Production Des Basis, CAC, Project Auth

Competitive Facility That Meets Business Needs

Facilities Engineering Process

Front-End Loading

Owner Leads

Contractor Involved

Execution/Operation

Owner Audits

Owner Leads

Contractor Leads

Contractor Supports

Operate Maintain Improve

Business Objectives, Capital Forecasts

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Owner Leads

Contractor Leads

Contractor Supports

Operate Maintain Improve
“More Business Value for Our Money”

Different Levels of Value From WFP

- Owners
- Contractors
- Industry

Owners: - Improved safety performance
- Improved planning
  *Execution strategy
  *Contracting Strategy
  *Optimize cost & schedule
- More accurate estimates(cost/schedule)
- Improved control
- Increased productivity

How best to get Owners to see the value potential from WFP?
“More Business Value for Our Money”

Contractors: - Improved safety performance  
- Improved planning  
- Improved productivity  
- Increased profitability

Industry: - Improved safety performance  
- Improved work force development  
- Increased work force availability  
- Increased overall productivity  
- Increased attractiveness of construction jobs
Overview

• Scope of Discussion

• Owners and Contractors Expectations

• Key Themes / Focus Areas

• Questions

• Wrap-up

Survey: who is here? Owner, Construction contractor, EP contractor
Scope of Discussion – An Owner’s perspective

• Procurement (Owner and Delegated)

• Materials Management

• Logistics and Transportation

• Contracting

NB: It should be noted and re-emphasized, all the required project disciplines have requirements to support Work Face Planning, especially Project Management, Construction Management, Project Controls (Cost estimating and Control, planning and scheduling), HSE, Quality Management, Document Management.

Successful set up for Workface planning in the Supply Chain areas of responsibilities **WILL** fail if the other requirements are not met.
## Some examples of Other WFP requirements

| Project Management                     | • Early Project Decision to implement WFP  
|                                       | • Project Philosophy of Design to Start-up – to construct  
|                                       | • EWP’s production to support CWP requirements  
|                                       | • project organization design to support WFP  
| Construction Management               | • construction sequencing driving schedule of CWP production which drives EWP production  
| Project Controls – Planning Scheduling | • appropriate scheduling to ensure engineering deliverables meets cwp’s  
|                                       | • appropriate scheduling level of detail to measure progress  
| Project Controls – Cost Estimating, Control Productivity Calculations | • appropriate WBS and CBS to divide Project scope into CWP’s, FIWP’s  
|                                       | • standard rules of credit to grant progress |
### Some examples of Other WFP requirements

<table>
<thead>
<tr>
<th>Quality Management, HSE, Document Management</th>
<th>• clear requirements for all CWP’s</th>
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<tbody>
<tr>
<td>Engineering Design</td>
<td>• ability to sub divide areas of plant into CWP’s</td>
</tr>
<tr>
<td>Quality Management, HSE, Document Management, Other project disciplines</td>
<td>• clear requirements for all CWP’s what is required to start work, what is required to claim completion</td>
</tr>
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</table>
Owners and Contractors Expectations

• Clear unambiguous description of expectations – requirements, standards, procedures, responsibilities, roles and position descriptions
  • i.e. the requirements of any good contract!

• From this morning, ensuring the conversations which drives common understanding

• From this morning’s session, survey showed two highest valued areas to focus on are roles and responsibilities of all parties and clear expectations / minimum standards for Work \Face Planning
Owners

- Clear description of requirements regarding the identification, procurement of materials and equipment, esp. tagging to CWP’s
- Complete materials responsibility matrix – conveying responsibility for all phases of procurement: ID material requirements, specify, purchase, expedite, transport, receive, manage, issue, surplus management & asset recovery
- Requirement for procurement registers to support provision of materials at work location and/or for engineering design to support engineering schedule -> which is aligned to construction schedule / CWP’s

Contractors

- Clear understanding of procurement responsibilities
- IT application to be used, any interface requirements to Owner Systems, procedures, standards and organization to deliver delegated procurement responsibility
Key Themes / Focus Areas – Materials Management

- Owner must clearly define to contractor process for reserving and accessing material for work packages.
- Clear understanding and implementation across all contractors re: materials master codes to be used/ conversion tables if required
- Material status information and reports must be made available to contractors and construction management. The information must be current.
- Minimum of notice required for first allocation of material by work package (8 weeks at Nexen).
- 2 week notice required to hard reserve material for work package
- Bag & Tag completed and any deficiencies reported to all within 1 week of requirement.
- Module status and ROS dates must be defined and kept current
- Module received at site dates must be reported immediately
- Module punch list items must follow from mod yard to site.
• Owner must clearly define material storage / warehouse/ lay down areas on site to contractor; location of various commodities / equipment

• Materials Management organization, procedures, processes, standards and IT application in place that support MM and packaging for FIWP’s (Owner or contractor managed).

• Early set up of Materials Management database structured to support CWP’s, FIWP’s

• Agreement between Construction and Materials Management vis. expectations on required on site storage / letdown for “back log”
Key Themes / Focus Areas - Contracts

Owners

- Clear description of requirements regarding **owner and contractor** responsibility re WFP, any owner standards in contracts – ALL project disciplines
- Effective contractor prequalification wrt capability to implement WFP, any gaps assessed, plans to close in place -> this will drive finalizing execution / contracting strategy
- Construction contractor front end involvement, but with specific tasks, requirements, deliverables for both owner and contractor
- Inclusion of specific WFP minimum requirements and focus on performance / functional specification approach, not descriptive – The On site general contractor should own the process / organization/ applications for Construction work face planning, whoever that is
- Inclusion of Materials responsibility matrix, owner minimum requirements for Work Face Planning
- Description of IT applications to be used, interfaces and data transfer requirements, esp. EP modeling, to Pipe Fab/Module assembly, to site construction planning
Key Themes / Focus Areas – Logistics and Transportation

- Transportation providers arranged to support material and equipment transfers (marshalling / warehouse facility to Pipe fabricator, or to Module Assembly, or to Site)

- Clear work processes and responsibilities for requesting, managing, reporting on transportation, especially owner, contractor responsibilities (responsibility should be described in MRM)
Survey Questions
Application of Project Control Fundamentals in a WFP Environment

J. Dees
N. Chavan

• OVERVIEW – Jimmy Dees
  – Organization structure and accountabilities
  – Brief history of the set-up of foundational principles and processes
  – Where we are today and the what we are trying to accomplish with planning effort
  – Set-up learning's

• PRACTICAL APPLICATION OF SYSTEM FOR MANAGEMENT (SFM) – Niteen Chavan
  – Syncrude’s process of applying WFP principles
PROJECT CONTROLS BASICS 101

- Know What has to be done... a detailed budget and tracking profiles which provide schedule and cost control baselines
- Know what has been done... reports providing actual performance data consistent with agreed upon baselines... and in a timely fashion
- Know how actual performance compares with performance norms... analysis of performance to date
- Know what remains to be done ... forecast the potential result
- Identify and recommend corrective actions to bring performance in line with expectations ... control
- Check results of corrective action ... verify
Organization Structure

Project Business Services
established 2006

- Project Control Leaders
- Estimating Services
- Cost and Planning Services

- Support Services
- SAP Implementation
What we do

**Goals**
- Cost Predictability (portfolio)
- Cost Effectiveness (project)
- Cost Utilization (annual)

**Why?**
- Supports long range portfolio planning (how large is the wave?)
- Assures predictable ROI
- No “surprises”

**Effective management of engineers/suppliers/contractors**

**How?**
- Effective Schedule estimate & Cost estimate development process
- Early execution planning…(do-ability)

- Effective cost and schedule work processes and standards
- SFM initiatives (planning)
- Meaningful stewardship (weather forecaster vs. reporter)
- Effective contracting strategy

- Effective project controls
- Reliable financial information

• Predictable 1\textsuperscript{st}, 2\textsuperscript{nd}, 3\textsuperscript{rd}, & 4\textsuperscript{th} QTR forecasts (provide movement & flexibility of annual monies)
QUICK HISTORY LESSON
How did we get here?

– Painful learning's… back to the future
– Had to re-establish some basic processes and tools
– Implement over the portfolio of projects
– Build confidence in the greater organization
Assessment Findings (April 2006)

PAINFUL LEARNING’S

• Identification and Tracking of projects thru the stages is a problem. (Name, TWR#, AFE#, W/O#, Job#, etc)
• Responsibilities of BA’s and PC’s varies by Strategy Center
• In most cases, costs are being captured by P-code but budgets are not being recorded by P-code
• Some PC staff are involved with preparation/coding of CWA’s, Workorders, etc. Many are not.
• With the exception of hours, no tracking of quantities is being done by Project Controls
• Reporting by Contractors is non-existent, verbal, or inconsistent
• Progress and earned-value reporting is inconsistent in both methods used to gather progress data and how it is reported
• There is limited information readily available for management decisions based on schedules and costs for Capital projects.
• Not a good handle of costs for projects “cradle to grave” (including reasons for escalation)
Establish “List of Projects”

OBJECTIVE

• To locate, consolidate and document ALL the lists that currently exist
• Establish some rules around naming and numbering of projects
• Establish rules around adding and deleting projects from the list
Building Estimating Competency

OBJECTIVE

• Establish estimating as a Core Syncrude Competency
• Establish a Professional Estimator Career Path with Documented Expectations for All Levels
• Establish Estimating Training Strategies and Plans
• Build Internal Estimating Competency to Manage, Direct and Review Estimating Workload
• Supplement with External Resources as Required:
  – Other Owners
  – Contracting agency
  – JV’s
Building Estimating Competency

**COMPLETED**

- Estimates prepared using standard project code of accounts (P-Codes)
- Estimates prepared reporting key unit quantities by major account
- Estimates prepared using standard Estimate Basis Memorandum and Estimate Confidence Packages
- Syncrude Estimate Tracking System (SETS) used to monitor all estimates prepared
Standard Estimate Preparation And Reconciliation

HARD OBJECTIVES

• All estimates summarized to ALEX format
  – [WHAT] Construction summarized by Major Code of Account (w/summary of key quantities and direct field hours). Hours tend to remain “static” while costs are “fluid”.
  – [WHY] It Supports “HARD” reconciliation between gates
  – [WHY] Allows for hi-level validation
  – [WHY] Begin to establish “Benchmarks”

Concerns

– Need earlier involvement during the Business Planning cycle
– Educate estimators as to “Why” this information is required
Standard Estimate Preparation And Reconciliation

SOFT OBJECTIVES
• Establish credibility with owners
  – We are able to communicate scope in way everyone understands
  – Helps identify execution risks earlier in the project life cycle
• Inspire confidence early on with the execution team
  – Team “feels” they have more control
  – Ability to make key execution decisions earlier in project life cycle
  – Puts us in a “planning” versus “reactionary” role
WHY QUANTITIES?
- Engineer Quantities
- Purchase Quantities
- Construct Quantities

- “Force discipline within the Engineering house to design to the estimated quantities”
Project Control, Trending, Benchmarking Process

- Estimate
- Control and Trend
- Final Benchmarking
NEXT STEP – CONTRACTOR PERFORMANCE INITIATIVE (SFM)
2007-08 Status
(re: tools to effectively manage)

STATUS

• Limited metrics are historical, not forward looking
• Current metrics do not drive discussion or continuous improvement
  – Reporting is focused on accounting numbers rather than contractor performance (Ie. Wage rate, productivity against agreed target, progress against plan, field in-directs against plan, etc.)
• Limited understanding of performance drivers
• Limited understanding of performance norms
Case for Change (understanding performance norms and drivers)

CHANGE NEEDED

- Stewardship reporting is informational rather than changing behaviors and outcomes. Does not address Owner or contractor performance and barrier removal
- Lack of integrated planning / scheduling details (daily / weekly / monthly)
- Contractor planning and execution not validated (quality)
- Limited follow-up on planning and execution
- Unclear roles, responsibilities and accountabilities
- No systematic barrier resolution / continuous improvement process
LEARNINGS

• Had to overcome heavy investment in current processes
  – “this is the way we’ve always done it”
• Need improved teamwork and collaboration between SCL management and contractors
• Roles and responsibilities should be better defined
• Recommended metrics need to be better understood
• Cultures and capabilities varied greatly between contractors
  – Insufficient technical and management skills
  – Need to reward innovation versus compliance
Must measure performance to properly forecast cost and schedule at completion. Formulates achievable target (based on benchmarks) at AFE… health and wellness of project in relation to target.
Stewardship and The SFM

REPORTING

• Project reporting: Weekly and Monthly
  – Dashboard reporting implemented on all projects utilizing SFM (minimum)
  – Metrics tracked:
    • PF over time
    • Field Indirects over time
    • Progress and schedule attainment over time
    • Plus other financial metrics

• Portfolio reporting: Frequency aligned with quarterly scorecard calendar
  – Same metrics as Project reporting
Next Steps

**ACTIONS**

- Set benchmark (time on tools)
- Revisited stewardships to align with new focus & direction
  - Move from accounting focus to contractor performance focus
  - Align on metrics (daily, weekly, monthly)
  - All levels (Project, Department, Business Unit)
- Put in place “core” implementation group
  - Retained “key” pilot members to lead effort
  - Empowered them…
  - Finalized tools (use of existing systems +)
  - Prepared training package for contractor, rolled-out, etc.
- Continue to monitor, measure and maintain
PRACTICAL APPLICATION System for Management (SFM)

Niteen Chavan
Workface Planning and Project Control Process

Processes

CWP/EWP’s

Workface Planner

Develop Field Installation Work Package

Project Controls

- Construction Schedule
- Estimation
- Cost Coding
- Crew Size, Material & Equipment Planning
- Progress Measurement
- Reporting

SFM

Inputs
Superintendent, GF, Foreman, Construction team
CWS – AWS – CWP/EWP – FIWP

- CWS – Contractors Work Scope
- AWS – Area Work Scope (Physical area OR plant, OR a specific system/sub-system OR combination of Plant/Area/System)
- CWP/EWP – Construction Work Package / Engineering Work Package

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Use System for Managing tools to manage the daily work, remove barriers and improve performance
Our daily Behaviors of detail daily planning makes the difference

Use System for Managing tools to manage the daily work, remove barriers and improve performance
7 Key Tools make up the System for Managing

1. Hours Quantity Plan (HQP)
2. Daily Schedule Control
3. Project Shift Meeting
4. Weekly Performance Report
5. Weekly Update Meeting
6. Barrier Identification Chart
7. Barrier Action Log
# HQP – Hours, Quantity Planning

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<td></td>
<td>Barrier Hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Barrier Code</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Comments</td>
<td></td>
</tr>
</tbody>
</table>

**Shift Summary**

**Notes:**

**Shift Turnover Comments:**
Project Shift Meeting: Analysis, Agreement & Action

Objective of the Daily Project Shift Meeting is to:

- Review performance variance from last shifts plan
- Prioritize resources on daily schedule control.
- Set clear and specific expectations.
- Identify immediate barriers.
- Review & remove barriers as required.
- Inform Construction Specialist of barriers requiring his/her help.
## Weekly Performance Report

<table>
<thead>
<tr>
<th></th>
<th>Mon</th>
<th>Tue</th>
<th>Fri</th>
<th>Weekly Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plan</td>
<td>Actual</td>
<td>Plan</td>
<td>Actual</td>
</tr>
<tr>
<td>Headcount (Dir+Ind Labour)</td>
<td>10</td>
<td>7</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Direct Field Hours</td>
<td>100</td>
<td>75</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>Indirect Field Hours</td>
<td>50</td>
<td>75</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>Total Equipment Hours</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Total Lost Time Hours</td>
<td>10</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Quantity (UOM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Tasks / Activities</td>
<td>10</td>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Overtime Direct Hours</td>
<td>20</td>
<td>30</td>
<td>20</td>
<td>30</td>
</tr>
</tbody>
</table>
### Weekly Performance Report – KPI’s

#### Key Performance Indicators (KPI) Weekly:

1. **Schedule Attainment (SA)**
   - Formula: \( \frac{\text{Actual tasks/qty completed}}{\text{Planned tasks/qty}} \)
   - Tasks

2. **Workforce Utilization (WU)**
   - Formula: \( \frac{\text{Actual (Dir + Ind) Hrs}}{\text{Planned (Dir + Ind) Hrs}} \)
   - Workforce Utilization

3. **Overtime Workhours (OT)**
   - Formula: \( \frac{\text{Actual OT Craft Hrs}}{\text{Total Direct Field Hrs}} \)
   - Overtime Workhours

4. **Equipment Utilization (EU)**
   - Formula: \( \frac{\text{Actual Equip. Hrs}}{\text{Planned Equip. Hrs}} \)
   - Equipment Utilization

5. **Headcount Utilization (HU)**
   - Formula: \( \frac{\text{Actual Headcount}}{\text{Planned headcount}} \)
   - Headcount Utilization

6. **Lost Time Hours (LTH)**
   - Formula: \( \frac{\text{Actual Lost Time Hrs}}{} \)
   - Lost Time Hours

7. **Labour Prod. Factor (PF)**
   - Formula: \( \frac{\text{Total Hours Earned}}{\text{Total Hours Actual}} \)
   - Labour Prod. Factor

8. **Constr. Prod. Unit Rate**
   - Formula: \( \frac{\text{Actual Direct Work Hrs}}{\text{Actual Installed Qty}} \)
   - Constr. Prod. Unit Rate

9. **Prod. Est. Performance**
   - Formula: \( \frac{\text{Actual Prod Unit Rate}}{\text{Est. Prod. Unit Rate}} \)
   - Prod. Est. Performance

10. **Wage Rate**
    - Wage Rate

11. **Indirect to Direct Ratio**
    - Indirect to Direct Ratio

---

*Standard Project KPI’s generated through ALEX*

---

*KPI’s generated through data base*
The SFM elements all come together in this meeting
Weekly Update Meeting

The purpose of the Weekly Update Meeting is to review and discuss the status of the project, discuss and address barriers and take a two week look ahead.

**Weekly Performance**
- Analysis of Weekly Performance Report: Schedule Attainment, Headcount Utilization, Workforce & Equipment Hours
- Analysis of Hours, Quantity Plan: Overtime, Workforce Utilization

**Barriers**
- Analysis of Barrier Identification Chart
- Review and develop Barrier Removal Action Plans

**Two Week “look ahead”**
- Review of Contractor Schedule
Barriers

• Barrier:
  – Anything which takes time away from the completion of a planned work activity in that shift.

• Not a Barrier:
  – Normally scheduled non-work items such as toolbox talks or weekly safety meetings unless their duration is longer than the defined amount of time.

• Expectation:
  – 90% of all barriers are solved at the work site by the Foreman/GF/CS
## Barrier Action Log

### CAPX_ Project Barrier Removal - Issue & Action Log

<table>
<thead>
<tr>
<th>#</th>
<th>Meeting Date</th>
<th>Issue</th>
<th>Action</th>
<th>Comments</th>
<th>Responsibility</th>
<th>Due Date</th>
<th>Status</th>
<th>Days Past Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25-Nov-09</td>
<td>MATERIAL</td>
<td>WORK IN PROGRESS - SANFORD</td>
<td>COSYN</td>
<td>SANFORD/ Neil Wilson</td>
<td>JAN 21/10</td>
<td>OPEN</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>25-Nov-09</td>
<td>O'RIANS WAY</td>
<td>USE BRITING</td>
<td>SPARE</td>
<td>DAVE CLARKE</td>
<td>DEC 1/09</td>
<td>COMPLETED</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>02-Dec-09</td>
<td>Pipe weld Cracking/ weld material</td>
<td>IRA-Ring is too small for the pipe</td>
<td>Capital Group Will Impact Schedule</td>
<td>Eng - IRA CORE (Trevor Duky)</td>
<td>ASAP</td>
<td>COMPLETED</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>09-Dec-09</td>
<td>Neptune stuck in mud</td>
<td>Dig up mud in Jan</td>
<td>Schedule Delay</td>
<td>Greg Day</td>
<td>12-Jan-10</td>
<td>COMPLETED</td>
<td>Train one outage on Dec 11/09</td>
</tr>
<tr>
<td>5</td>
<td>09-Dec-09</td>
<td>IRA-Core heaters</td>
<td>Switch to blanket</td>
<td>3 Day Delivery</td>
<td>Greg Day</td>
<td>16-Dec-09</td>
<td>COMPLETED</td>
<td>Blankets have arrived</td>
</tr>
<tr>
<td>6</td>
<td>09-Dec-09</td>
<td>Delay in welding start Cost 32</td>
<td>YIELD as per schedule</td>
<td>Look at Modified shift or move machines</td>
<td>To pull back schedule</td>
<td>Daae Clarke / Neil Wilson</td>
<td>6-Jan-10</td>
<td>COMPLETED</td>
</tr>
<tr>
<td>7</td>
<td>16-Dec-09</td>
<td>Demolition of Fire &amp; P.W</td>
<td>AEPR RBR to repair</td>
<td>Fire failure waiting on outage</td>
<td>Uwe Clarke / John Allen</td>
<td>30-Mar-10</td>
<td>OPEN</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>16-Dec-09</td>
<td>Cold snap for a week</td>
<td>Lost scheduled hours due to cold weather and reduce contractors home</td>
<td>Schedule Delay</td>
<td>Daae Clarke / Neil Wilson</td>
<td></td>
<td>COMPLETED</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>06-Jan-10</td>
<td>Neptune drill bit worn</td>
<td>Push through sand area and replace head</td>
<td>Schedule Delay</td>
<td>Daae Clarke / Doug Oweas</td>
<td>13-Jan-10</td>
<td>COMPLETED</td>
<td>Withills to complete</td>
</tr>
<tr>
<td>10</td>
<td>13-Jan-10</td>
<td>Weld Cracks</td>
<td>Ascen to compete test</td>
<td>Schedule Delay</td>
<td>Trevor Duke</td>
<td>20-Jan-10</td>
<td>OPEN</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>13-Jan-10</td>
<td>Turnover Package</td>
<td>Why is it taking so long - Greg to talk to John</td>
<td>Turnover delay for operations</td>
<td>Trevor Duke / Greg Day</td>
<td>30-Jan-10</td>
<td>OPEN</td>
<td></td>
</tr>
</tbody>
</table>
Barrier Removal Process

Contractor identifies barrier as it happens or from daily reports, and attempts to solve

Barrier Removed? NO

Work on next barrier YES

Assigned to CS / GF for resolution NO

Barrier Removed? YES

Work on next barrier

Discuss top Barriers in Monthly Stewardship Meeting. Address and assign unsolved barriers.

Barrier Removed? NO

Discuss Barrier in weekly meeting, assign and enter into Action Log YES

Work on next barrier
Wrap-up

Questions?
ConstructSim V8i

WFP Automation
Bring your data together in one location

- 3D CAD
- Pipe Isometrics
- Structural Detailing Data
- Line List / Equipment List
- Instrument Index
- Electrical Lists

- L3 Project Schedule
- Rules of Progress
- Unit Rates
- Quantity Tracking (Progress)

Engineering Data

Virtual Construction Model

Project Controls

Materials Management

Field Tracking

- Material Availability
- Material Feasibility
- Offsite Fabricator Status

- Weld Tracking / NDE
- TO Systems/Completions
- Hydro Testing
Create FIWPs with simple point and click
ConstructSim V8i

3D PDFs for easy use in the field

Live easy to manipulate PDF model
From Concept to Commissioning

WorkFace Planning 101
What is Workface Planning?

The process of organizing and delivering all elements necessary, before work is started, to enable craft persons to perform quality work in a safe, effective and efficient manner.
Introduction

Agenda

• When?
• Why?
• How?
• Who?
• What?
When

Ralph Levine

• Runners

• Repeaters

• Renegades
Renegades

- Complex
- Technology
- Material
- Labor
- Interdependencies
- Unique
Why

- Cost
- Schedule
- Functionality
- Risk
How

- Processes
- People
- Tools
- Training
- Communication

Photo credit: “sidehike”; Flickr.com
Who

- WorkFace Planners
- WFP Leads
- Integration Coordinators
- Resource Coordinators
- Construction Supervision
What

✓ Faster
✓ Better
✓ Cheaper
✓ Happier?
What do the Captain and Cook have to do with construction mega projects?

Nothing!

But! There is something to be learned

- Shared Goals
- Shared Training
- Shared Language
- Well defined organization structure
Problems for Mega-Projects

- Large cost over runs and schedule delays
  - People shortages
  - Material shortages
  - No shared or at best inconsistent goals
  - Little or no shared training
  - No or defacto shared language
- Litigious
- Outdated business model
  - Minimize costs
Workface Planning

- Establish Common Framework
- Establish Common Priorities
  - *Construction Driven*
- Use of similar terminology
  - *Is FIWP or FWP*
- Documentation
Workface Planning Issues

- New concept - not fully developed or proven
- Varies from Org to Org
- No shared training
- No common language
- Support systems
  - WFP Systems are new and do not address complete scope
  - Few standards
  - Data integration issues
  - Many ad hoc programs
- Not a complete solution
The Multi-Objective Problem

Minimize Costs

Workface Planning  System Optimum
Captain to Cook Redux

How did we get the Captain and Cook on the same page?

- Training!
- Training!
- Qualification
- Organization!
- And assessment.
The Submarine Model

- Expert training – Each prospective crewmember is already trained in a specialty area
- Platform Training – 3 to 6 month Submarine School
- Qualification – One year on board training lead to qualification as Submariner
- Continued training – Leading to increased responsibility
- Assessment
Expert Training

- Machinist
- Electrician
- Electronic Tech
- Commissaryman (the Cook)
- Engineering (the Officers)
- Management Trainees (the Officers)
- Management (the Captain)
Platform Training

• Submarine School – All
  – Training in all aspects of submarine operations
  – Classroom
  – Simulator training
  – Safety training
  – Common Language
Onboard Training

Training

• On board training – All
  – Overall training on all aspects of operations and systems
  – Hands on training on unique systems
  – Conducted by senior crewmembers
Qualification

• Earning your Dolphins
  – Written exam
  – Oral exams and walk through
  – Recognition
Organization

The Captain

Supply
- Storekeeper
- The Cook

Operations
- Weapons
- Sonar
- Comms

Engineering
- Mechanical
- Electrical
- Aux

Executive Officer
Captain Qualification

- Successfully performed in all division officer billets
- Served as Executive Officer
- Attend Prospective Commanding Officer program – 3 to 6 month assignment
- Qualify for Command
Recommendation

• Establish universal Workface Planning program
• Establish company specific training programs for all levels
• Develop qualification program for all levels
• Develop Assessment tools for individual and team
Universal Training

• All must attend
• Standardized across stakeholders
• Available online or through stakeholder networks
• Cost effective
• Continuing education
Company Specific Training

- All must attend
- Train in company specific implementation
- Available online or through stakeholder networks
- Cost effective
- Continuing education
Qualification Program

- On the job demonstration of Workface Planning knowledge
- Recognize qualification
- Qualification transferrable
- Renew qualification by project or employer
Recommendations

• Establish Project Manager Career Path and Qualification program

• Need to move beyond PMI or upgrade PMI training

• Develop contact language to give Project Manager “Captain Like” authority over project resources and performance
Lessons Learned and Benefits Obtained
Session Format

- **COAA**
  - Lessons Learned
  - Benefits Obtained

- **Kiewit**
  - Lessons Learned
  - Benefits Obtained

- **Jacobs**
  - Lessons Learned
  - Benefits Obtained

- **Flint**
  - Lessons Learned
  - Benefits Obtained

- Audience Participation
- Session Close
Introduction of Topic and Panel

Topic: Lessons Learned and Benefits Obtained

• Facilitator
  o Lloyd Rankin, Facilitator, ASI

• Panel
  o Theresa Hewitt, EPC Manager, Kiewit
  o Jim Craig, Director of Construction Operations, Jacobs
  o Darrell Coughlin, General Manager, Construction and Planning, Flint
Lessons Learned

WFP initiatives need to be driven by the owner. They need to:

• Start early
• Assign a WFP Sponsor and Champion
• Understand what WFP is
• Assign clear deliverables to your contractors
• Audit and assess all stakeholders
• Be aware overheads will increase
• Get involved
Benefits Obtained

• Greater Productivity
• Greater Predictability
• More Reliable Progressing
• More Trust
• Less Rework
• Better Quality
• Shorter Punch-lists
• Improved Communication
• Fewer Surprises
• Lower Risk
Lessons Learned: Kiewit

Set-up for successful WFP:

✓ Early alignment between contractor, owner and engineer on roles and expectations for deliverables
✓ Construction drives breakdown of work areas
✓ Construction to develop a scoping document – communicate expectations
✓ Engineering allocates drawings against the CWPs in their progressing system
✓ Find a way to schedule engineering to release by CWP
✓ Method of knowing engineering % complete by CWP
Lesson Learned: Kiewit

Execution of WFP:

✓ Build WFP cycle into the project schedule
✓ Tailor the FIWP template by discipline
✓ Keep template simple – only include what you need to execute the work
✓ Get buy-in from General Superintendents and Construction Managers
✓ Plan in the engineers office – before going to site
✓ Plan FIWP documents for turnover – cross reference to system
✓ Sign off the FIWPs as you go – not all just before turnover
Benefits Obtained: Kiewit

Execution of WFP:

✓ WFP on all projects – even if not client mandated
✓ WFP can be applied to all work – all trades
✓ Scaffold
✓ Prep for heavy lift / module setting
✓ Material requirements are identified – minimize emergency orders
✓ Model shots give crews real visualization of the work
✓ Sets up for consistency/organization during turnarounds
✓ Work package updates make change management visible
Lessons Learned: Jacobs

✓ IT WORKS!
✓ Implement WFP orientation and education on future projects
✓ Include WFP checklist in construction readiness review
✓ Implement WFP during Phase I (FEED)
✓ Package design / procurement to match construction plan
✓ IFC drawings and material must support workface plans and FIWP sequence and Schedule
Lessons Learned: Jacobs

- First pass at FIWP complete prior to mobilization
- Implement WFP for all Craft (not just pipe/structural)
- Require workface planning in primary sub-contracts
- Revise work processes around material management systems’ updates
- Integrate WFP into weekly Schedule meetings
Benefits Obtained: Jacobs

- Discipline Work Package Templates
- Standard work process
- Verified 100% material availability
- Increased productivity
- Early allocation of support craft
- Increased Scaffolding and Equipment utilization
- Synchronization with schedule
- Maintain critical path
- Controlled issuance of work
- Stay on schedule

Bottom Line – Improved Productivity & Workforce Utilization
Sample Project: Jacobs

- TRIR .21
- Productivity factor 11% better than budget
- Cost below budget +/- 10%
- Rework < 2%, < 0.5% on construction
- Beat original schedule
Lessons Learned: Flint

✓ Need clear scoping narrative for estimating group and sub-contracts.
✓ Construction needs clear understanding of their role as it pertains to WorkFace Planning
✓ Need a backlog of FIWPs before ever going to the field to start construction (always seem to go to early)
✓ Better communication between fab/mod and the site (RAS Dates)
✓ Daily productivity reports help keep the superintendents and construction manager on top of what is happening and any recovery required.
✓ Involve quality in the planning process.
Lessons Learned: Flint

- The sooner you start to plan the work the more benefits will be realized (involve Work Face Planning / Construction and Operations as early as possible)

- Need to develop the release plan both EWP and FIWP early (Once the equipment is identified and the areas plotted a EWP list can be built, from here break the EWP’s into FIWP’s)

- Size of the work package is not as important as the content, need to cut scope where it makes the most sense. (As long as the package is by Foreman.)

- Need good scoping narrative, make the scope clearly understood (Use plan view to identify scope location.)

- The more detailed the Construction Schedule is the easier it is to forecast completion.
Benefits Obtained: Flint

- WorkFace Planning early involvement gives the ability to affect constructability and timely procurement.
- Detailed level 5/6 plan gave us the ability to forecast finish dates with accuracy.
- Daily productivity reporting gives construction management confidence in finish dates. Allows timely reacting to items that are lagging.
- Proper scoping narratives for subs gives cleaner request for quote responses.
- Detailed planning lead to easier turnover to client (painless!)
Benefits Obtained: Flint

- Level 5/6 plan (detailed plan) leads to better cost control – no over-runs.
- Morale on job is much higher leading to a happy/productive work force.
- Quality and Construction worked together as a unit towards a common goal. (Planning for turnover starts when planning starts!)
- Cutting the scope in the proper place leads to smoother work flow.
- Productivity Improvement.
- Work Face Planning works on all sizes of jobs…the key is to be planned and have all your deliverables in place prior to execution!
NOTE: The information collected is anonymous and may be used for research purposes. By participating, you are giving your consent for the use of this data.
1. Based on your experience, what is the expected % improvement in labour productivity an effective WorkFace Planning System will provide?

a) Less than zero  
b) 0 to 10%  
c) 10 to 20%  
d) 20 to 30%  
e) More than 30%  
f) Can’t comment
2. Does your organization use WorkFace Planning?
   
a) Yes
   
b) No
3. Who should the primary driver for WorkFace Planning be?
   a) Owner
   b) Construction Contractor
   c) Engineering Contractor
   d) Don’t know
4. Do you believe projects should be construction-driven?
   a) Yes
   b) No
5. Is there enough time provided to effectively implement WorkFace Planning?

a) Yes

b) No
Closing Comments

- The presentation slides and voting results will be posted on the COAA website following the conference.
- Please take a minute to evaluate our session.
- Thank you for attending this session.
- If you have any questions please talk to our panel after the session.