TARGET VALUE DESIGN AND OTHER COMMUNICATION TOOLS FOR THE DESIGN BUILD TEAM ... A CASE STUDY

2017 Regional Conference
“Progressive Design Build: Improving the Process”
May 12, 2017

Chad Headlee - JE Dunn
Carl Hole, AIA – RNL
TARGET VALUE DESIGN AND OTHER COMMUNICATION TOOLS FOR THE DESIGN BUILD TEAM ... A CASE STUDY

**Agenda**

- Project Introduction
- Overview of Tools
- Tool Deep Dive
- Owner Engagement
- Current Status
The project: CDOT Headquarters / Region 1

Summary Program

No specific site selected

$45 Million Fixed Limit Estimated Budget

“Class B Office Building”
The project: CDOT Headquarters / Region 1

175,000 sf Office Building
34 Departments / 775 Staff

Program information
The project: CDOT Headquarters / Region 1

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424 Space Structured Parking (130,140 SF)
80 Spaces Surface Parking
Fleet / Staff / Visitor

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“Class B Office Building”

Program Information
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Schedule

- **2015**: Start Design
- **2016**: Contracts Executed (November), Start Construction (December)
- **2017**: Finish Construction (March), Move In (April)
- **2018**
The project: CDOT Headquarters / Region 1

Schedule

MONDAY
JE DUNN / RNL TEAM MEETING
RNL INTERNAL IN-PERSON MEETING

TUESDAY
CONSULTANT STAND-UP CONFERENCE CALL
REVIEW WORK REGISTER
SHORT, 15-30 MIN. “CHECK IN”
ALL CONSULTANTS, RNL, JE DUNN CALL-IN MEETING

REVIT MODELS
UPLOAD TO SHARED FOLDER

WEDNESDAY
CLIENT MEETING
RNL & JE DUNN POINT OF CONTACT + CDOT TEAM IN-PERSON MEETING

THURSDAY
WORKSESSION
REVIEW OF CLUSTER VALUE MATRIX
AROUND 3 1/2 TO 4 HOURS, STAGGERED MEETINGS OR DISCIPLINES MEET TO RESOLVE SPECIFIC ITEMS
ALL CONSULTANTS, RNL, JE DUNN IN-PERSON MEETING

FRIDAY
The project: CDOT Headquarters / Region 1

Diagram showing the various contracts involved:
- JE Dunn / Trade Partner Contracts
- CDOT / JE Dunn Contract
- State Standard Design Build Contract
- JE Dunn / RNL Contract
- AIA B143
- RNL / Consultant Contracts
- RNL Standard Consultant Contract

Contracts
Owner Engagement

Approval Process
The Tools

- P3
- Kaizen
- Plus Delta
- Level of Development
- Cluster Meetings
- Work Register
- Trend Logs
- Communication Plan
- Ishikawa
- Task Assignment
- Cost Model
- Conditions of Satisfaction
- Onboarding
- Action Items Log
- Big Room
- Target Value of Design
- Last Planner
- Pull Plan
- A3
- Reflection Meetings
- Root Cause Analysis
- Value Stream Mapping
- 5Y
The Tools

3 Broad Team Goals

What Tools to Use?
The Tools

No Surprises

What Tools to Use?
The Tools

No Surprises

No Rework

What Tools to Use?
The Tools

No Surprises

No Rework

Drive Value to CDOT

What Tools to Use?
The Tools

Conditions of Satisfaction
Onboarding
Action Items Log
Big Room
Target Value of Design
Last Planner
Pull Plan
A3

Reflection Meetings
Root Cause Analysis
Value Stream Mapping
5Y

What Tools to Use?

P3
Kaizen
Plus Delta
Level of Development
Cluster Meetings
Work Register
Trend Logs
Communication Plan
Ishikawa
Task Assignment
Cost Model

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The Tools

Cost Model

Target Value of Design
Big Room...
Cluster Meetings...

Last Planner
Level of Development...
Pull Plan...
Work Register...

Conditions of Satisfaction
Reflection Meetings
Onboarding

A3

What Tools to Use?
The Tools: Deep Dive

<table>
<thead>
<tr>
<th>Tool</th>
<th>How it was used</th>
<th>Outcome</th>
</tr>
</thead>
</table>

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The Tools: Deep Dive

<table>
<thead>
<tr>
<th>Description</th>
<th>Option 1A /-Story Articulated Office 175,000 sf</th>
<th>Option 2A /7-Story Articulated Office 175,000 sf</th>
<th>Option 2B /-Story Articulated Office 175,000 sf</th>
<th>Option 2C /7-Story Articulated Office 175,000 sf</th>
<th>Option 3A /7-Story Rectangular Office 175,000 sf</th>
<th>Option 3B /7-Story Rectangular Office 175,000 sf</th>
<th>Option 3C /7-Story Rectangular Office 175,000 sf</th>
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</thead>
<tbody>
<tr>
<td>Sitework</td>
<td>1,480,731</td>
<td>1,888,088</td>
<td>1,884,118</td>
<td>1,852,409</td>
<td>1,890,835</td>
<td>1,887,350</td>
<td>1,863,455</td>
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<tr>
<td>Office Building</td>
<td>36,885,543</td>
<td>36,393,288</td>
<td>36,316,752</td>
<td>35,985,100</td>
<td>35,902,754</td>
<td>35,836,591</td>
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<tr>
<td>Construction Subtotal</td>
<td>49,673,000</td>
<td>45,940,000</td>
<td>47,059,000</td>
<td>52,684,000</td>
<td>45,459,000</td>
<td>46,415,000</td>
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<td>1,255,664</td>
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<td>1,215,669</td>
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<td>1,607,883</td>
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<td>1,843,926</td>
<td>1,591,062</td>
<td>1,624,524</td>
<td>1,822,520</td>
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<tr>
<td>Preconstruction</td>
<td>164,000</td>
<td>164,000</td>
<td>164,000</td>
<td>164,000</td>
<td>164,000</td>
<td>164,000</td>
<td>164,000</td>
</tr>
<tr>
<td><strong>Total Construction Cost</strong></td>
<td><strong>$56,064,000</strong></td>
<td><strong>$52,107,000</strong></td>
<td><strong>$53,294,000</strong></td>
<td><strong>$59,256,000</strong></td>
<td><strong>$51,598,000</strong></td>
<td><strong>$52,611,000</strong></td>
<td><strong>$58,607,000</strong></td>
</tr>
</tbody>
</table>

**Metrics**

- **Site Area**: 2.96 Acres
- **Office Footprint**: 30,000 SF
- **Office SF**: 175,000 SF
- **Office**: 7 Story
- **Garage Cost/Stall**: 5 Story, 2 Bay
- **Garage Parking Stalls**: 350
- **Site Parking Stalls**: 168
- **Parking Efficiency Garage**: 410 SF/Car
- **Parking Efficiency Site**: 375 SF/Car
- **Market Range Garage Cost/Stall**: $20,000-$25,000/Stall
- **Market Range Building Cost/SF**: $200-$220/SF
**The Tools: Deep Dive**

**Option 3A.1**

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<th>Description</th>
<th>Details</th>
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<tr>
<td>Total Construction Cost</td>
<td>$49,233,000</td>
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<tr>
<td>Garage Cost/Stall</td>
<td>$18,191/Stall</td>
</tr>
<tr>
<td>Office Cost/SF</td>
<td>$198.07/SF</td>
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<tr>
<td>Office SF</td>
<td>175,000 SF</td>
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<tr>
<td>Garage Parking Stalls</td>
<td>365</td>
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<tr>
<td>Site Parking Stalls</td>
<td>114</td>
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<tr>
<td>Total Parking Stalls</td>
<td>479</td>
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<tr>
<td>Parking Efficiency (Garage)</td>
<td>320 SF/Stall</td>
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[Cost Model Diagram]

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The Tools: Deep Dive

Cost Model

Option 4D

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### Cost Model

#### Option 4E

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Total Construction Cost</td>
<td>$45,003,000</td>
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<tr>
<td>Garage Cost/Stall</td>
<td>$18,301/Stall</td>
</tr>
<tr>
<td>Office Cost/SF</td>
<td>$186.00/SF</td>
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<tr>
<td>Office SF</td>
<td>157,000 SF</td>
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<tr>
<td>Garage Parking Stalls</td>
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<td>Site Parking Stalls</td>
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<td>Parking Efficiency (Garage)</td>
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</tbody>
</table>

The Tools: Deep Dive
The Tools: Deep Dive

Option 4F.1

Cost Model
The Tools: Deep Dive

Option 4F

Cost Model
The Tools: Deep Dive

Option 4G

Cost Model

Total Construction Cost: $49,127,000
Garage Cost/Stall: $18,672/Stall
Office Cost/SF: $181.24/SF

Office SF: 175,000 SF
Garage Parking Stalls: 515
Site Parking Stalls: 27
Total Parking Stalls: 542
Parking Efficiency (Garage): 320 SF/Stall
The Tools: Deep Dive

Cost Model

Option 5C
The Tools: Deep Dive

Confirm budget and program

Alignment of DB Team and Owner: Cost, program and design approach

### CDOT Headquarters
Denver, CO
January 27, 2016
Conceptual Cost Modeling

<table>
<thead>
<tr>
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<th>Option 1A</th>
<th>Option 2A</th>
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**Metrics**

- **Site Area**: 2.96 Acres, 2.96 Acres, 2.96 Acres, 2.96 Acres, 2.96 Acres, 2.96 Acres, 2.96 Acres
- **Office Footprint**: 30,000 SF, 30,000 SF, 30,000 SF, 30,000 SF, 25,000 SF, 25,000 SF, 25,000 SF
- **Office SF**: 175,000 SF, 175,000 SF, 175,000 SF, 175,000 SF, 175,000 SF, 175,000 SF, 175,000 SF
- **Office**: 7 Story, 7 Story, 7 Story, 7 Story, 7 Story, 7 Story, 7 Story
- **Garage Cost/Stall**: 5 Story, 2 Bay, 5 Story, 2 Bay, 6 Story, 3 Bay, 5 Story, 2 Bay, 6 Story, 3 Bay
- **Garage Parking Stalls**: 350, 350, 411, 758, 350, 402, 750
- **Site Parking Stalls**: 168, 116, 107, 67, 107, 116, 75
- **Parking Efficiency Garage**: 410 SF/Car, 375 SF/Car, 375 SF/Car, 375 SF/Car, 375 SF/Car, 375 SF/Car, 375 SF/Car
- **Parking Efficiency Site**: 375 SF/Car, 375 SF/Car, 375 SF/Car, 375 SF/Car, 375 SF/Car, 375 SF/Car, 375 SF/Car
- **Market Range Garage Cost/Stall**: $20,000-$25,000/Stall
- **Market Range Building Cost/SF**: $200-$220/SF
The Tools: Deep Dive

Target Value of Design
The Tools: Deep Dive

Timely decisions with all stakeholders
Awareness of decisions by all stakeholders
Consensus and understanding of decision
The Tools: Deep Dive

Cluster Meeting

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The Tools: Deep Dive

Example: Precast Design

Cluster Meeting

ARCHITECTURE
PRECAST TRADE PARTNER
JED
STRUCTURAL

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The Tools: Deep Dive

Focused problem solving

Cluster Meeting

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Alignment of cost and design with no value engineering phase
The Tools: Deep Dive

Last Planner
## The Tools: Deep Dive

**Level of Development**

<table>
<thead>
<tr>
<th>CDOT HEADQUARTERS AND REGION 1 OFFICE BUILDING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONCEPT</strong></td>
</tr>
<tr>
<td><strong>STATE</strong></td>
</tr>
<tr>
<td><strong>C CIVIL</strong></td>
</tr>
<tr>
<td>Target Value / Estimate</td>
</tr>
<tr>
<td>Site Plan</td>
</tr>
<tr>
<td>Utilities</td>
</tr>
</tbody>
</table>

| **SCHEMATIC DESIGN**                           |
| **STATE** | **CODE** | **ENTIT** | **DB** |
| **L LANDSCAPE**                                |
| Target Value / Estimate | 200 | 200 | 200 | 200 |
| Site Plan | 100 | 100 | 300 | 300 |
| Landscape Plan | 100 | 100 | 300 | 300 |
| Hardscape Plan | 100 | 100 | 300 | 300 |
| Details | 100 | 100 | 300 | 300 |

| **DESIGN DEVELOPMENT**                         |
| **STATE** | **CODE** | **ENTIT** | **DB** |
| **S STRUCTURE**                                 |
| Target Value / Estimate | 200 | 200 | 200 | 200 |
| Narrative | 200 | 200 | 200 | 200 |
| System Descriptions | 200 | 200 | 200 | 200 |
| Live Loads | 200 | 200 | 200 | 200 |
| Dead Loads | 200 | 200 | 200 | 200 |
| Material Strength | 200 | 200 | 200 | 200 |
| Foundation Plan | 200 | 200 | 200 | 200 |
| Structural Plans | 200 | 200 | 200 | 200 |
| Precast Elements | 200 | 200 | 200 | 200 |
| Miscellaneous Metal Items | 200 | 200 | 200 | 200 |

| **CONSTRUCTION DOC**                           |
| **STATE** | **CODE** | **DB** |
| **A ARCHITECTURE**                             |
| Target Value / Estimate | 200 | 200 | 200 | 200 |

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The Tools: Deep Dive

Guided team on what was important to focus on at each milestone

Defined how developed the information needed to be

<table>
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</thead>
<tbody>
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<tr>
<td>Site Plan</td>
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<td>Utilities</td>
<td></td>
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<tr>
<td>Specifications</td>
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<td>Site Plan</td>
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<td>Hardscape Plan</td>
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<td>Specifications</td>
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<td>Target Value / Estimate</td>
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<td>Specifications</td>
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Level of Development
The Tools: Deep Dive

Pull Plan
The Tools: Deep Dive

- Understanding of workflows
- Identified known constraints
- Consensus of milestones and overall schedule
- No assumptions

Pull Plan
## Project: CDOT  
**Design Cycle: Design Development**

<table>
<thead>
<tr>
<th>Work Item</th>
<th>Task / Action to be taken</th>
<th>Firm Customer / Requestor</th>
<th>Individual Performer</th>
<th>Firm Assigned To</th>
<th>Discipline</th>
<th>Due date</th>
<th>Estimated Effort</th>
<th>Task Status</th>
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</thead>
<tbody>
<tr>
<td>72</td>
<td>Energy final analysis report and alternatives selection</td>
<td>MKK/RNL</td>
<td>LM</td>
<td>Ambient</td>
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<td>6/22/16</td>
<td>7d</td>
<td>In Progress</td>
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<td>300</td>
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<td>CDOT</td>
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<td>8/22/16</td>
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<td>101</td>
<td>Finalize GMP Exhibits</td>
<td>PT</td>
<td>JED</td>
<td></td>
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<td>7/18/16</td>
<td>1d</td>
<td>Not Started</td>
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<td>231</td>
<td>Key Sub Interviews Start</td>
<td>PT</td>
<td>JED</td>
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<td>7/13/16</td>
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<tr>
<td>98</td>
<td>Receive Sub Bids</td>
<td>PT</td>
<td>JED</td>
<td></td>
<td></td>
<td>6/30/16</td>
<td>1d</td>
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<td>JED</td>
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<td>6/28/16</td>
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<td>7/25/16</td>
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<td>Review FP concept w/ Den Fire for Prelim approval</td>
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<td>Fire</td>
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<td>11</td>
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<td>RF</td>
<td>MM</td>
<td></td>
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<td>RF</td>
<td>MM</td>
<td></td>
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<td>7/22/16</td>
<td>10d</td>
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<td>Receive 1st city eng. Comments</td>
<td>RF</td>
<td>MM</td>
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<td>7/1/16</td>
<td>1d</td>
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<td>6/30/16</td>
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## The Tools: Deep Dive

### Living document of the Pull Plan

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<thead>
<tr>
<th>Work Item</th>
<th>Task / Action to be taken</th>
<th>Firm Customer / Requestor</th>
<th>Individual Performer</th>
<th>Firm Assigned To</th>
<th>Discipline</th>
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### Accountability

### Captures progress

**Work Register**
The Tools: Deep Dive

Focus on what matters
Builds Consensus
Accountable

2017 Regional Conference
“Progressive Design Build: Improving the Process”
May 12, 2017
The Tools: Deep Dive

SECTION 1 – Issue/Background

$45 Million Budget; 2.98 Acre Site; 175,000 SF Program; 515 Parking spaces (per RFP)

SECTION 2 – Problem Statement/Current Condition

- Construction Budget based on $156 / SF office building. Based on current market conditions this did not yield a building solution that was workable on the current site and acceptable to CDOT.
- Parking study showed a need for 825 vehicles vs RFP’s 515 vehicle requirement.
- Program exceeds 175,000 SF by 14,000 SF.
- Due to site constraints, structured parking is a substantial necessity

SECTION 3 – Future State/Target Condition

CDOT’s acceptance of Concept Design

SECTION 4 – Root Cause Analysis

545mm Concept

SECTION 5 – Proposal

- Identify final parking quantities: Client input and pricing/massing comparisons
- Design site to maximize surface parking and minimize structure parking
- Adjust per stall areas to 320 SF/space (in structured parking)

PROGRAM

- Coordinate with CDOT to reduce ancillary spaces (i.e. storage)
- Revise space standards relative to industry standards
- SITE
  - Optimize building & structured parking layout /footprint efficiency (see attached progression of options)
  - Derive a design to meet height limit

CONSTRUCTION BUDGET

- Create a simple building geometry to drive efficiency in systems
- Explore tilt-wall and bar joist for cost/design
- Utilize target-value design for building systems

SECTION 6 – Confirmation / Check Results

- Client accepted a total parking count of 515 (150 Fleet, 365 other) on Feb. 2.
- PSA requires 365 spaces but PSA will be modified so structured parking is not required

PROGRAM

- Program was adjusted to 173,400 SF on Feb. 23.

SITE

- CDOT approved a 5 story building & 4 story structured parking solution on Feb. 18 (Concept 5A)

CONSTRUCTION BUDGET

- CDOT approved moving into Schematic Design with a $48.4 million solution while continuing to evaluate the budget and wait on site appraisal for potential funds to be added to the construction budget.

SECTION 7 – Follow-up (Act)

Verify Parking, Program, Site and Construction Budget at end of Schematic Design
Focus on the real issue (not always the most obvious)

Think through all the possible outcomes

Documents decisions
The Tools: Deep Dive

Conditions of Satisfaction:
- Treat each other with respect
- Exceptional teamwork
- High quality the first time – no rework
- Continuous improvement – Reflection meetings throughout project
- Open communication throughout project
- Collaboration with all our teams (consultants and subcontractors)
- Innovation through our processes
  - Last Planner in Design
  - BIM practices – LENS and other
  - A3 problem solving
- Drive financial value to the client
- Reduce RFI’s through our D/B delivery
- Deliver to CDOT
  - Deliver significant improvement to their everyday workplace
  - Safety by design
  - Provide a nice public space
  - Review original presentation at every milestone to make sure we are hitting the over-arching points
- Be Profitable
The Tools: Deep Dive

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Alignment of project goals
The Tools: Deep Dive

Platform for open dialogue: What worked / what did not

Reflection Meetings
The Tools: Deep Dive

Continuous Improvement

Reflection Meetings
The Tools: Deep Dive

Project Introduction
Overview of goals
Expectation of members

Onboarding
The Tools: Deep Dive

Communication of project goal

Alignment of personalities with project goals

Onboarding
Current Project Status

Last Planner in Construction
Current Project Status

Site Activities
TARGET VALUE DESIGN AND OTHER COMMUNICATION TOOLS FOR THE DESIGN BUILD TEAM … A CASE STUDY

Use tools that bring value to the project

Make the tools flexible

Maintain open dialogue

Make continues improvement

Summary
TARGET VALUE DESIGN AND OTHER COMMUNICATION TOOLS FOR THE DESIGN BUILD TEAM … A CASE STUDY

Chad Headlee - JE Dunn
Carl Hole, AIA – RNL