QUALITY

Presented by:
Jeff Pietz, Project Manager
PCL Construction Services, Inc.

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“Providing a quality product that meets expectations the first time, every time”
QUALITY CONTROL

WHY WE DO IT

Safety  Schedule  Client  Morale  Cost Control
HOW DO WE DO IT?
QUALITY ABSOLUTES

Owner Expectations Meeting

Field Pre-Installation Walk-through

Scope Quality Analysis (SQA)

Transparency Regarding Quality
Quality projects start with understanding requirements

Review contract, drawings, and specifications

Identify unique requirements and concerns

First Step
Know the Deal
Before carrying a number into a bid we recap key quality requirements with the subcontractor. Goal is to provide a bid where all quality elements have been carried by the prime and the subcontractors.
Partnering meeting with Owner

Execute subcontracts with key and unique project requirements written in as line items

Develop project SQA (Scope Quality Analysis) plans that outline each scope of work

Meet with subcontractors prior to construction to review their SQA
Precon meeting with Owner prior to each major scope to review:

- Safety
- Schedule
- Approach of work
- Tolerances
- Inspection and testing hold points
- Mockup or materials
**Scope Quality Analysis (SQA)**

<table>
<thead>
<tr>
<th>DESCRIPTION OF TASKS/STEPS</th>
<th>SPEC SEC./PARAGRAPH</th>
<th>SPECIFICATION REQUIREMENT/ MANUFACTURERS RECOMMENDATIONS</th>
<th>QUALITY RISKS</th>
<th>QA/QC CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape and Finish GWB panels ready for paint using automatic taping tools, hand tools, and joint compound</td>
<td>None Provided</td>
<td>Level 4 Finish</td>
<td>Provide a level 4 finish</td>
<td>Superintendent and Project Engineer will visually inspect work as it progresses to make sure Level 4 finish is achieved. Progress Photos documenting progress/finishing.</td>
</tr>
<tr>
<td>Inspect level of GWB finish with painter and foreman for final acceptance before priming</td>
<td>None Provided</td>
<td>Level 4 Finish</td>
<td>Painter begins priming before level 4 finish is completed</td>
<td>Walk walls ready for primer with NWP foreman and IG foreman the level of finish is achieved before priming.</td>
</tr>
<tr>
<td>Allow painter to prime installed GWB</td>
<td>None Provided</td>
<td>Level 4 Finish</td>
<td>Begin painting over primer once primer is complete without touch-up</td>
<td>Coordinate with painters and tapers on sides walls will be primed and followed up with touch-up.</td>
</tr>
<tr>
<td>Touch-up any GWB as needed after the primer has been installed to meet final decoration standards</td>
<td>None Provided</td>
<td>Level 4 Finish</td>
<td>Begin painting over primer once primer is complete without touch-up</td>
<td>Walk walls with finisher after priming identifying areas for touch-up.</td>
</tr>
<tr>
<td>Inspect GWB for final acceptance</td>
<td>None Provided</td>
<td>Level 4 Finish</td>
<td>Begin painting over primer once primer is complete without touch-up</td>
<td>Walk walls ready for 1st coat of paint with NWP foreman and IG foreman to ensure the level of finish is achieved before completing painting.</td>
</tr>
</tbody>
</table>

**Final Protection Measures:** Finished walls will be painted. Once walls have been finished all crews will be notified that nothing is to be set against the walls. Take pictures of walls as they are completed documenting time.
Field Engineering Inspections

- iPad hold-point check sheets
- Take pictures
- Get signoffs
- Confirm sampling and testing has occurred
NON CONFORMANCES

1. Non-Conformance Report (NCR)
   All issues entered into BIM 360 Field

2. Quality Incident Report (QIR)
   NCR > $2,500 impact or 1+ day on critical path

3. Lessons Learned
   QIR or other topic that provides valuable information to other PCL’ers
NCR LOG

Why do we do it?

- Track open deficiencies
- Correct issues before they get forgotten
- Transparency with owner and subs (cloud based)
- Tracking trends
# QUALITY INCIDENT REPORT

## 5701115 - Potala Tower Mixed-Use Project

<table>
<thead>
<tr>
<th>Company</th>
<th>PCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>D - QIR</td>
</tr>
<tr>
<td>Author</td>
<td>Josh Miller (<a href="mailto:jmiller@pcl.com">jmiller@pcl.com</a>)</td>
</tr>
<tr>
<td>Date Created</td>
<td>08 Feb 2018 1:28 PM</td>
</tr>
<tr>
<td>Author's Company</td>
<td>PCL</td>
</tr>
<tr>
<td>Root Cause</td>
<td>Materials/Mfg Item - MM Procurement Error</td>
</tr>
</tbody>
</table>

### Description
During the first jump of the tower crane it was discovered one of the embeds (shoe templates) was installed in the wrong orientation. This caused the jump to become delayed (jumped Wednesday compared to Sunday) as the strut length had to change, requiring multiple engineers to look at and re-approve. Work could not commence until approved by Morrow, AAI (third party) and CKC (EoR). The embed showed up multiple days late, requiring a rush install as it had to get in before rebar installation could occur.

### Location
- Site
- Tower Crane

### Additional Properties for ID 003163
- Incident: Approved as-built layout of shoe, requiring added strut length and recalculation of forces by engineer
- CSI Code (6 digits): 01 00 00
- Estimated $ Value: 20000
- Identified By: C - Field
- Reoccurrence Prevention: Material onsite ahead of time, QC of layout, installation, and after the pour to ensure
QUALITY INCIDENT REPORT

Rework: PCL Direct Equipment Cost  
Rework: PCL Direct Labor Costs (Hourly)  
Rework: PCL Direct Material Cost  
Rework: PCL Indirect Cost (Pay to Sub)  
Rework: PCL Overhead Costs (GC's)  
Rework: PCL Project Staff Costs (Salary)  
Rework: Subcontractor Cost  
Schedule Impact (days)  
Total Loss Amount ($)  
Incident Date  
Priority  
Clarification needed  
Root cause

accurate placement
0
0
0
2182
0
0
17818
4
20000
16 Dec 2017
QIR
Medium
[ ]
MM Procurement Error
INTERNAL COST CONTROL

Quality Incident Reports (QIR’s)

- Help track trends
- Entered on BIM 360 Field
- Note the cost code affected (detailed)

In 2017 the Seattle District had $479k in QIR costs
QIR TREND ANALYSIS

COST

NUMBER OF INCIDENTS

- Product Protection Failure
- Work Plan Failure
- Work Error
- Buy-out Error
- Failure in Doc Control
- Procurement Error
- Design Coordination
- Communication/Info Failure
- Behavioral
- Design Errors & Omissions
RECOGNITION AND FEEDBACK

- Monthly Subcontractor Surveys
- Monthly Subcontractor Evaluations
- Owner Surveys
- Quality Crew of the Month
- Quality Subcontractor of the Month
TECHNOLOGY

- 3D Modeling
- 360 Degree Cameras
- Laser Scanning
- Drone Inspections
3D MODELING

• Allows us to check for MEP conflict

• Workers can view model in the field to confirm:
  - Dimensions
  - Embeds
  - Penetrations
3D MODELING
360 DEGREE CAMERA
360 DEGREE CAMERA
LASER SCANNING

DESIGN DRAWING LOCATION OF SLOPED WASTE TRUNK CONFLICTS WITH DUCT. IF RE-Routing BELOW Duct, NEED TO CONSIDER LOW HEIGHT CLEARANCE OVER LONG DISTANCE TO EXISTING CONNECTION
LASER SCANNING
LASER SCANNING
DRONE INSPECTION
QUESTIONS?