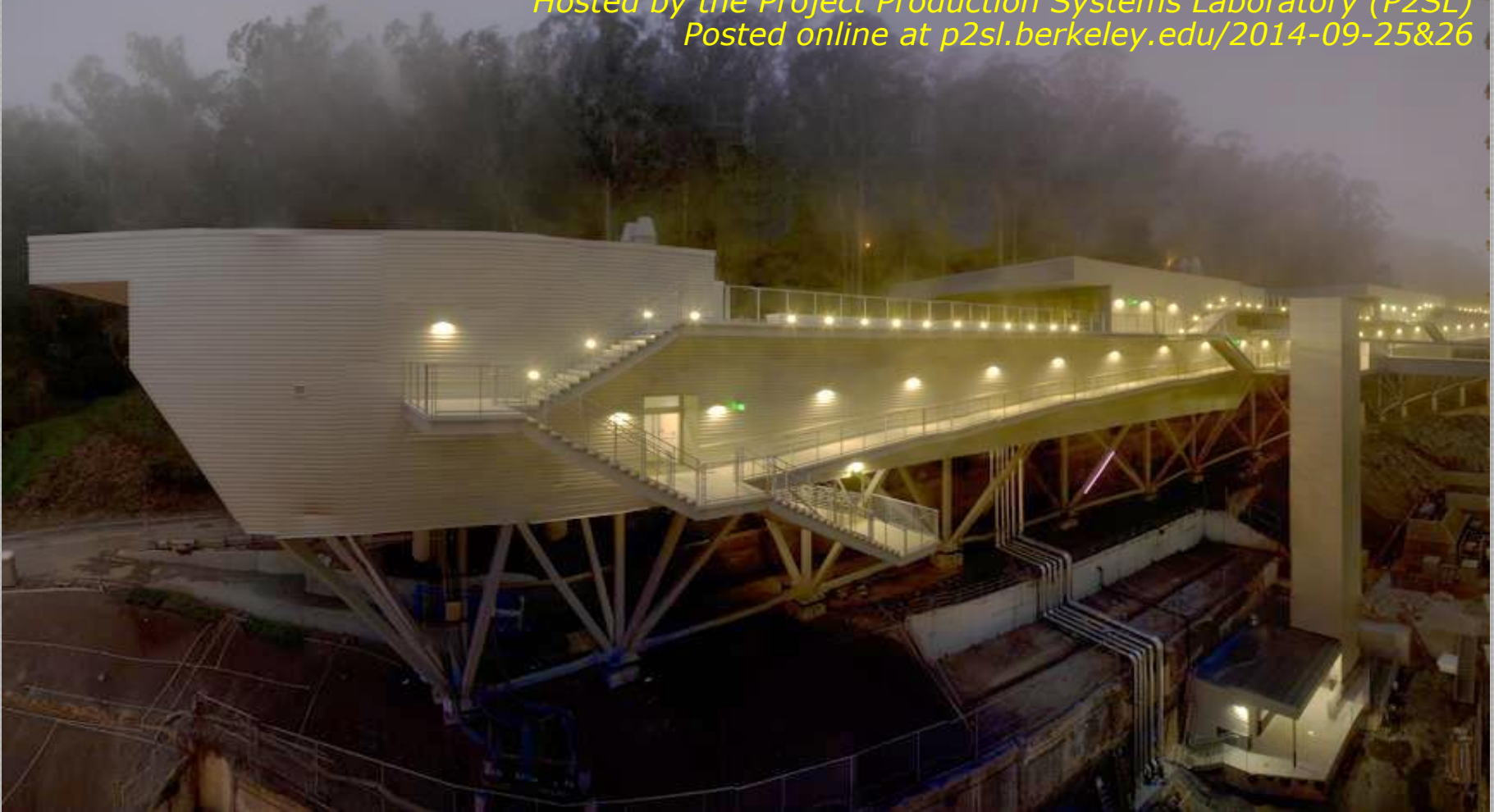


## PUBLIC SECTOR APPROACHES TO INCORPORATING LEAN PROCESSES

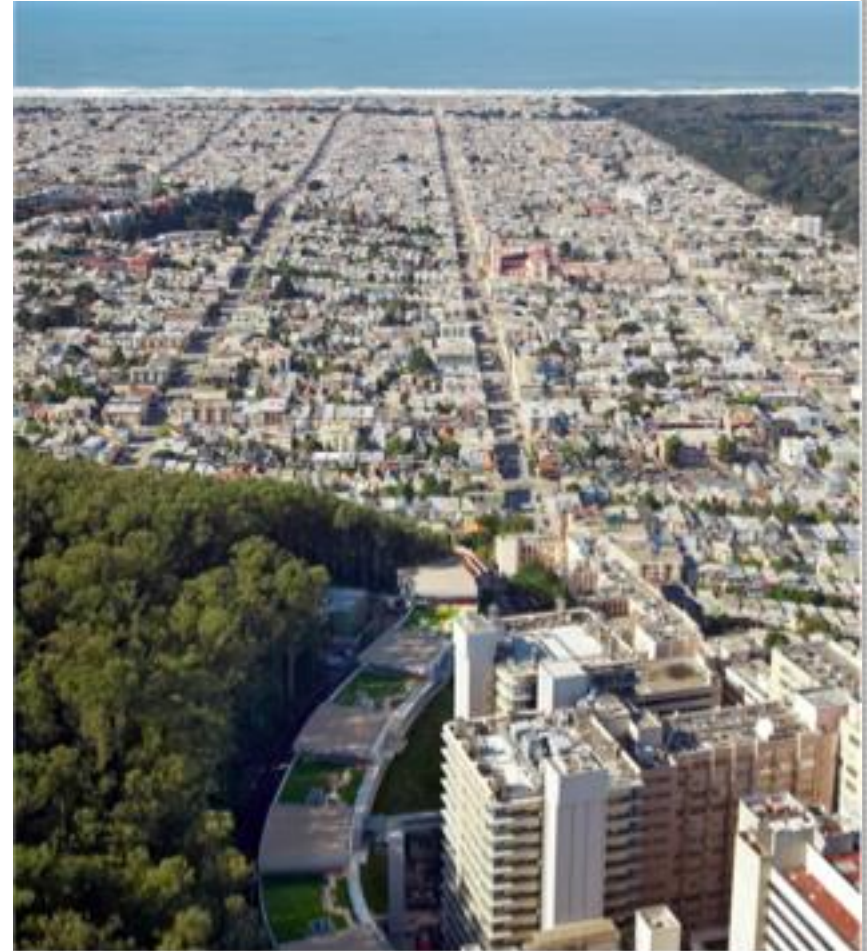
*Presented at the **Lean in Public Sector Construction Conference (LIPS 2014)**  
at the University of California, Berkeley, on Sept. 26, 2014.  
Hosted by the Project Production Systems Laboratory (P2SL)  
Posted online at [p2sl.berkeley.edu/2014-09-25&26](http://p2sl.berkeley.edu/2014-09-25&26)*



**Christine Haas**, Senior Counsel, UCSF, and Office of the General Counsel

# UCSF Use of Available UC Delivery Methods

1. Private (P3) – MB Neurosciences
2. **Best Value** DBB – many small projects
3. **Best Value LEAN** CM@Risk (w/ DB Prime Subs)
4. **Best Value LEAN** Design / Build (Performance-Based)
5. Modified Design / Build (not used)
6. Design Consultants & Joint Ventures (not used, open to appropriate use)
7. Multiple Prime (not used)
8. IPD (incorporated into **LEAN** approach)
- 9) **Best Value LEAN** JOC – (developed for some small projects)



# SMITH CARDIOVASCULAR RESEARCH BUILDING



# STEM CELL REGENERATION MEDICINE LABORATORY



# ROOF GARDEN OF STEM CELL REGENERATION LABORATORY



## Outcomes

- BOTH BUILDINGS COMPLETED 2010
- SMITH BUILDING FINISHED 3 MONTHS AHEAD OF SCHEDULE, >\$5M UNDER BUDGET, EXCELLENT QUALITY
- REGENERATION MEDICINE BUILDING FINISHED ON TIME (2 YEAR DESIGN & CONSTRUCTION), ON BUDGET, AND EXCELLENT QUALITY
- NO CLAIMS ON EITHER PROJECT
- REPEAT BUSINESS WITH GCs AND SUBS

## Current Lean Project Delivery Options – Major Projects

- CM@RISK w/DB SUBS FOR PARNASSUS SEISMIC PROGRAM (COMPLETION IN 2019)
  - Renewal and seismic retrofit of 2 80 – 100 year old buildings (110 KGSF, 147 KGSF)
  - 4 x 12 KGSF lab remodels
  - ~60 other much smaller projects being delivered traditionally for the most part
- PERFORMANCE DESIGN/BUILD (COMPLETION IN 2014)
  - 265 KGSF Mission Hall office building at Mission Bay
  - Possible Future 175 KGSF at San Fran General
  - Possible Future ~300 KGSF office building at Mission Bay

# CONTRACTUAL DELIVERY MODEL IMPROVEMENT

- PROGRAM INFORMATION: DATA-DRIVEN DESIGN PROCESS
- ENFORCEABLE PERFORMANCE SPECIFICATION
- PROPOSAL PROCESS
  - Better targeting of proposal features for selection process
  - Increased compensation to teams
  - Phased proposal process
    - Design
    - Production



# Mission Hall – Risk Management

- UCSF WANTED HIGH DEGREE OF CERTAINTY THAT THE BUILDING WOULD BE:
  - *Completed on time*
  - *Support the emerging research, teaching, and patient care community*
  - *Have a long-term value horizon*
- UCSF WAS WILLING TO TRADE CONTROL OF THE PROCESS FOR CERTAINTY OF OUTCOMES
- UCSF DECIDED TO EMPHASIZE PERFORMANCE OBJECTIVES THAT DELIVER LONG-TERM VALUE
- A PERFORMANCE-BASED DESIGN/BUILD DELIVERY MODEL WAS SELECTED TO ENGENDER INNOVATION IN DESIGN AND CONSTRUCTION

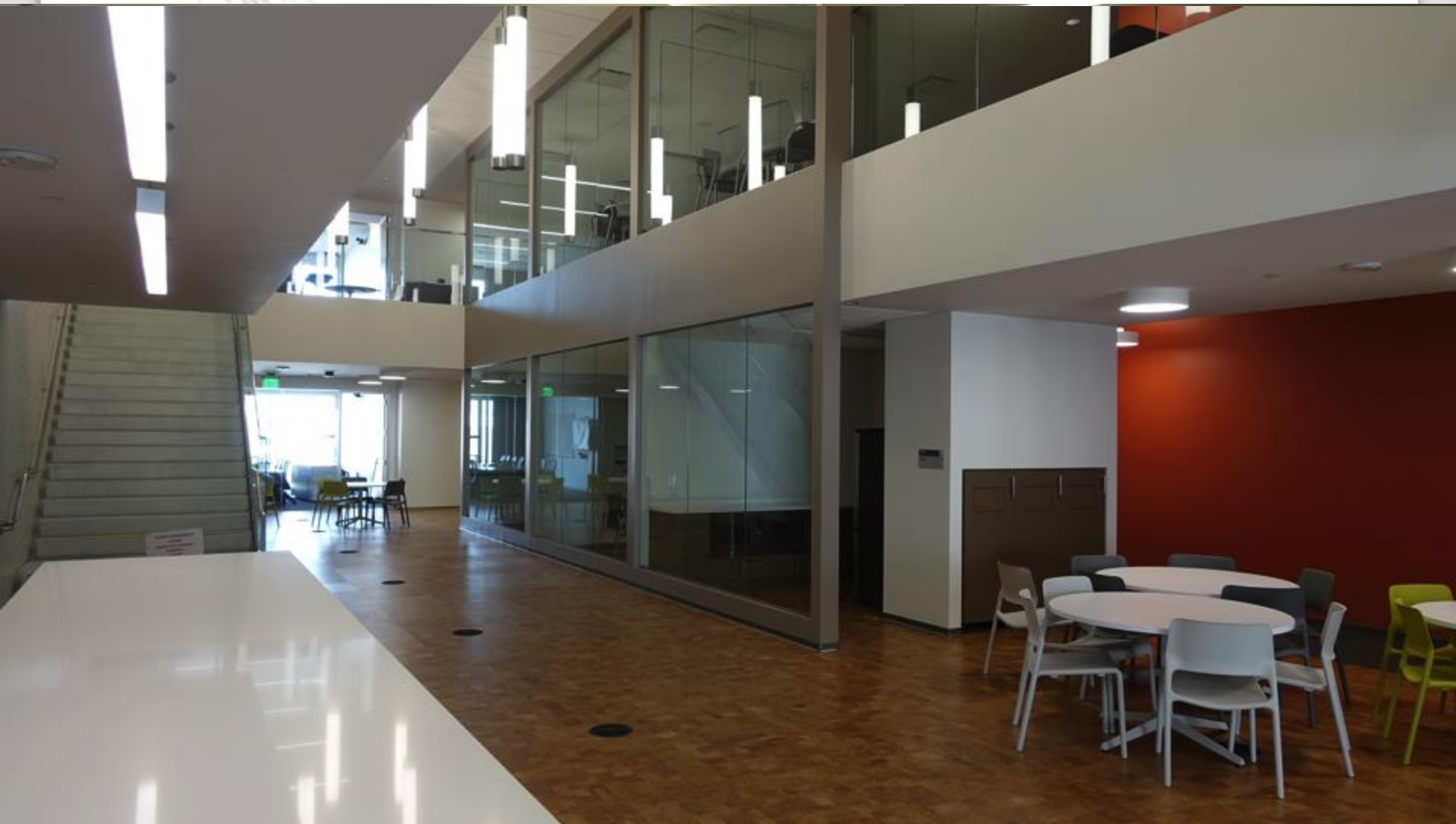


## Mission Hall – Project Outcomes

- MAKE READY WORK/MOVE TRAILER – SEPTEMBER 2012 THRU FEBRUARY 2013
- MAIN BUILDING AND LANDSCAPING –
- MARCH 2013 – SEPTEMBER 2014 – 18 MONTHS
- TEMPORARY CERTIFICATE OF OCCUPANCY & SUBSTANTIAL COMPLETION OCCURRED – SEPTEMBER 5, 2014
- NO CLAIMS



# LEAN Results Reflected in the Project



# LEAN Results Reflected in the Project



# LEAN Results Reflected in the Project



# LEAN Results Reflected in the Project



# Improvements to UCSF Contracts *and some lessons learned . . .*

LEAN CONTRACT PROVISIONS

FALL 2013 – FALL 2014



## LEAN Processes Successes Caused UCSF to Modify its Contracts: Practical Changes

- Acknowledgment of fostering collaboration and openness
- Require LEAN Processes Training and Contract Training among *all* team members prior to commencement of Work
- “Big Room” Requirement
- Information Center Meetings
- Principals Meetings
- Performance Incentive Program, based upon achieving schedule/cost milestones, quality metrics, safety, achieving measurable LEAN “best practices” successes. All Project Team members share in the PIP.
- Duty to first negotiate directly prior to initiating mediation, arbitration or litigation
- Second step: Claims Review Board, to avoid expense and delays attendant to claims resolution and intended to foster collaborative approach



# LEAN Processes Successes Caused UCSF to Modify its Contracts: “Best Value” Evaluation Questionnaire

- Experience with LEAN Construction methods and processes (15 pages maximum)
- Provide (2) copies of construction contracts containing Lean Construction methods and processes performed by you in the past five (5) years (confidential terms and conditions to be redacted). Provide full copies in electronic format (pdf compatible) only as an attachment in Appendix.
- Provide a listing of all LEAN project teams in which you have been a participant, the other team members with whom you have participated, and in what capacity(ies) for the past five (5) years.
- Provide examples of your implementation of the following Lean construction methods and processes, as applicable:
  - Built in Quality;
  - Eliminating waste while continually improving the project;
  - Set-Based Design;
  - Target Value Design;
  - 5S and Visual Management;
  - Continuous Cost Modeling;
  - Pull Planning;
  - Information Center Meetings;
  - Standardized Work;
  - Total Station Layout;
  - Just in Time;
  - Last Planner™ System construction management;
  - Takt-Time; and
  - Building Information Modeling (BIM) and computer-aided design.

## LEAN Processes Successes Caused UCSF to Modify its Contracts; LEAN Construction Key Provisions

- Contractor, in accordance with input from the University and its representatives, shall be responsible for developing and implementing the “best in class” standard for each of the LEAN Construction criteria, and will implement those subject to, and as finally approved by, the University Representative.
- Contractor shall be responsible for preparing the necessary documents relating to deployment of each of the below-referenced criteria as well as the bases for measuring the progress of each of the below, including the preparation of any and all measures and counter-measures so that each of the below-referenced criteria are performing as “best in class” throughout the duration of the Program and for its individual Projects, including ongoing measurable, and measured, improvement increases.



## UCSF's Quality Assurance/Quality Control Criteria Document

### Waste Elimination and Continuous Improvement Metrics

#### WHAT PROCESSES DOES THE PROGRAM USE FOR ELIMINATING WASTE?

- ALL CONTRACTOR AND SUBCONTRACTOR PARTICIPANTS PRACTICE WASTE ELIMINATION AND PREVENTION IN PROGRAM ACTIVITIES.
- CONTRACTOR AND SUBCONTRACTORS DO NOT ACCEPT THE *STATUS QUO*; RATHER, REFLECTS AND LEARN FROM PAST UNSUCCESSFUL PRACTICES.

#### WHAT DOES EVIDENCE LOOK LIKE?

- PROGRAM AND INDIVIDUAL PROJECT SAVINGS AND EFFICIENCIES OBVIOUS FROM ONGOING AND INTEGRATED WORK TO ELIMINATE WASTE.
- VISITORS REGULARLY REMARK ON EXCEPTIONALLY CLEAN AND ORDERLY SITES IN PROGRAM.

# UCSF's Last Planner System Metrics

## HOW DOES THE PROGRAM USE THE LAST PLANNER SYSTEM?

- CONTRACTOR AND SUBCONTRACTORS ACTIVELY PLAN TO IMPROVE PPC – THEIR GOAL IS 100%.
- CONTRACTOR AND SUBCONTRACTORS REQUIRE NEW MEMBERS TO LEARN AND PARTICIPATE IN LPS.
- CONTRACTOR AND SUBCONTRACTORS PREPARE AND SUBMIT THEIR WWP IN A TIMELY FASHION.
- CONTRACTOR AND SUBCONTRACTORS ARE EVALUATED BASED ON THEIR LPS PERFORMANCE.
- CONTRACTOR AND SUBCONTRACTORS EFFECTIVELY REMOVE PROGRAM CONSTRAINTS “TASKS MADE READY (TMR) AND PROPERLY COMPREHENDS THE TASKS ANTICIPATED (TA), BREAKDOWN AND OPERATIONS AND DESIGN PROCESS.

## WHAT DOES EVIDENCE LOOK LIKE?

- STEADILY, INCREASING PPC.
- CONTRACTOR AND SUBCONTRACTORS TAKE STEPS TO LEARN FROM, AND MINIMIZE, VARIANCES.
- PPC AND VARIANCES ARE PART OF PROGRAM AND INDIVIDUAL PROJECT EVALUATION.

# UCSF's Pull Planning Metrics

## HOW IS PULL PLANNING USED ON THE PROGRAM?

- PULL PLANNING IS USED FOR PLANNING ALL ACTIVITIES, NOT JUST DESIGN AND CONSTRUCTION.
- ALL CONTRACTOR TEAM MEMBERS INCLUDING SUBCONTRACTORS REQUIRE PLANNING AND COMMITMENTS TO BE BASED ON A PULL PLAN SESSION.
- CONTRACTOR AND SUBCONTRACTOR MANAGEMENT REQUIRE PULL PLANNING TO BE PERFORMED PRIOR TO MAKING COMMITMENTS.

## WHAT DOES EVIDENCE LOOK LIKE?

- ALL CONTRACTOR AND SUBCONTRACTORS' TRADE FOREMEN AND PROJECT MANAGERS CONDUCT PULL PLANNING WITHOUT ASSISTANCE FROM SPECIALIST OR COACH.
- COST SAVINGS AND PRODUCTION EFFICIENCIES FROM PULL PLANNING ARE SUBSTANTIAL.



## UCSF's Target Value Design/ Target Cost Metrics

### HOW IS THE PROGRAM USING TARGET BUDGETS AND ESTIMATES?

- CONTRACTOR AND SUBCONTRACTORS TARGET BUDGET CLUSTERS SUPPORTED BY ENHANCED ESTIMATE DETAIL.
- ALL PROGRAM PERSONNEL ARE AWARE OF PROGRESS TOWARDS TARGET COST FOR THE PROGRAM AS WELL AS ITS INDIVIDUAL PROJECTS.

### WHAT DOES EVIDENCE LOOK LIKE?

- A MECHANISM AND VISUAL DISPLAY IS IN PLACE TO EVALUATE THE DESIGN AGAINST THE BUDGET FOR THE PROGRAM AND EACH INDIVIDUAL PROJECT.
- SCHEDULED, ONGOING REVIEWS TRACK ACHIEVEMENT OF TARGETS FOR THE PROGRAM AND EACH INDIVIDUAL PROJECT.
- SCOPE AND COSTS ARE KEPT TIGHTLY ALIGNED THROUGH FREQUENT ESTIMATE UPDATES AND RECONCILIATIONS FOR THE PROGRAM AND EACH INDIVIDUAL PROJECT.



# UCSF's Building Information Modeling Metrics

## HOW DOES THE PROGRAM USE BIM?

- DATABASE FOR “AS-BUILT” USE BY PROGRAM AND INDIVIDUAL PROJECTS.
- CONTRACTOR LEADS BIM USE AND ENSURES INTEROPERABILITY WITH UNIVERSITY AND OTHER DESIGN PROFESSIONALS.
- DIGITAL PROTOTYPING AND CONSTRUCTION SIMULATION BY CONTRACTOR AND ITS SUBCONTRACTORS FOR THE PROGRAM AND EACH OF ITS PROJECTS.

## WHAT DOES EVIDENCE LOOK LIKE?

- CONTRACTOR DEVELOPS DATABASE OF PARTS AND DEVICES IN BIM.
- OPERATIONS AND MAINTENANCE USE MODEL PREPARED BY CONTRACTOR RATHER THAN MANUALS.
- No RFIs.
- CHANGE ORDERS ARE ONLY FROM UNIVERSITY SCOPE CHANGE REQUESTS.
- USE OF BIM TO TRACK PROGRESS AND COMPLETION BY CONTRACTOR AND SUBCONTRACTORS.
- BIM ACTIVELY USED BY CONTRACTOR TEAM AS PART OF THEIR PROCESS.
- COORDINATION AND CLASH DETECTION/ AVOIDANCE PERFORMED BY CONTRACTOR AND SUBCONTRACTORS IN REAL TIME.

## UCSF's Standardized Work Metrics

### WHAT PROCESSES DOES THE PROGRAM USE FOR IMPLEMENTING STANDARDIZED WORK?

- ALL CONTRACTOR AND SUBCONTRACTOR PERSONNEL WRITE AND USE STANDARDIZED WORK.
- CONTRACTOR'S AND SUBCONTRACTORS' TRAINING AND KNOWLEDGE OF THE RELEVANT STANDARDIZED WORK IS UNDERSTOOD BEFORE A TASK IS BEGUN.
- THE CONTRACTOR AND SUBCONTRACTORS USE STANDARDIZED WORK CONTINUALLY FOR CONTINUOUS IMPROVEMENT AND WASTE ELIMINATION ON THE PROGRAM.

### WHAT DOES THE EVIDENCE LOOK LIKE?

- SAVINGS AND EFFICIENCIES ARE OBVIOUS FROM THE USE OF STANDARDIZED WORK BY CONTRACTOR AND SUBCONTRACTORS FOR THE PROGRAM AND ITS INDIVIDUAL PROJECTS.
- ALL KEY TASKS FOR THE PROGRAM HAVE STANDARDIZED WORK.



## UCSF's 5s and Visual Management Metrics

### WHAT PROCESSES DOES THE PROGRAM USE FOR IMPLEMENTING 5S AND VISUAL MANAGEMENT?

- CONTRACTOR'S AND SUBCONTRACTORS' 5S AND VISUAL MANAGEMENT PROCESSES ADD TO THE SAFETY, QUALITY AND PRODUCTIVITY OF THE PROGRAM AND EACH PROJECT.
- CONTRACTOR, SUBCONTRACTORS' LEADERSHIP AND BEHAVIORS SUPPORT 5S IMPLEMENTATION THROUGHOUT THE PROGRAM.
- CI OPPORTUNITIES ARE MADE CLEARER BY CONTRACTOR AND SUBCONTRACTORS' 5S AND VISUAL MANAGEMENT.

### WHAT DOES EVIDENCE LOOK LIKE?

- CONTRACTOR AND SUBCONTRACTORS PERSONNEL IMPLEMENT 5S CHANGES REGULARLY AS CI IDEAS.
- CONTRACTOR AND ALL SUBCONTRACTORS PERSONNEL PUT NEW STANDARDS IN PLACE AS IMPROVEMENTS ARE MADE AND CONTRACTOR CONSTANTLY IMPROVES IDEAS FOR VISUAL MANAGEMENT TECHNIQUES.



## UCSF's Built In Quality Metrics

### WHAT PROCESSES DOES THE PROGRAM USE FOR IMPLEMENTING BUILT IN QUALITY?

- CONTRACTOR AND SUBCONTRACTORS RECEIVING INSPECTION DOES SAMPLE TESTING ON ROBUST PARTS DELIVERED.
- CONTRACTOR AND SUBCONTRACTORS USING STANDARDIZED WORK AND 5S THROUGHOUT THE PROGRAM.
- DESIGN AND ERROR- PROOFING DEVICES USED BY CONTRACTOR AND SUBCONTRACTORS ON PROGRAM ENABLE RIGHT FIRST TIME WORK.

### WHAT DOES EVIDENCE LOOK LIKE?

- NO REWORK BY CONTRACTOR OR SUBCONTRACTORS IS SEEN ON PROGRAM'S SITES.
- CONTRACTOR AND SUBCONTRACTORS' PARTS ARRIVE CORRECTLY, THE FIRST TIME.
- CONTRACTOR AND SUBCONTRACTORS ARE CLEAR ON HOW TO PERFORM THEIR RESPECTIVE JOBS AND THE QUALITY REQUIRED
- CONTRACTOR AND SUBCONTRACTORS USE STOP --CALL --WAIT PROCESSES THAT TRIGGER ROBUST PROBLEM SOLVING AND ENABLE ROOT CAUSE ANALYSIS.

## UCSF's "Just In Time" Metrics

### WHAT PROCESSES DOES THE PROGRAM USE FOR IMPLEMENTING JUST IN TIME?

- ALL PARTS ARRIVE ON TIME TO THE PLAN FOR EVERY PART SCHEDULE, BE IT PUSH OR PULL.
- WORK IS UNDERWAY TO REDUCE INVENTORY AND BATCH SIZES TO REDUCE LAYDOWN AREA SIZE AND INCREASE FLEXIBILITY.

### WHAT DOES EVIDENCE LOOK LIKE?

- LAYDOWN AREAS ARE ORGANIZED; CLEAR TO SEE AND REDUCING IN SIZE.
- MORE FREQUENT DELIVERIES OF SMALL BATCH SIZES ARE SCHEDULED AND CONSOLIDATED TO REDUCE TRANSPORTATION COSTS.

## Legal Next Steps

- INCORPORATE LEAN IN OUR JOB ORDER CONTRACTS
- INCORPORATE LEAN IN OUR NEW HYBRID ELEVATOR, MAINTENANCE, MODERNIZATION AND UNIT PRICE CONTRACT
- SLIM DOWN CONTRACTS THAT UCSF USES TO JUST THE MINIMUM PAGES NECESSARY
- IMPLEMENT CONTRACT MANAGEMENT SOFTWARE SYSTEM
- PREACH, PRACTICE AND LIVE THE LEAN PHILOSOPHY



***Questions?***

