METRICS OF PUBLIC OWNER SUCCESS

in Lean Design, Construction, and Facilities Operations and Maintenance

Presented to P2SL Lean In the Public Sector
September 26, 2014

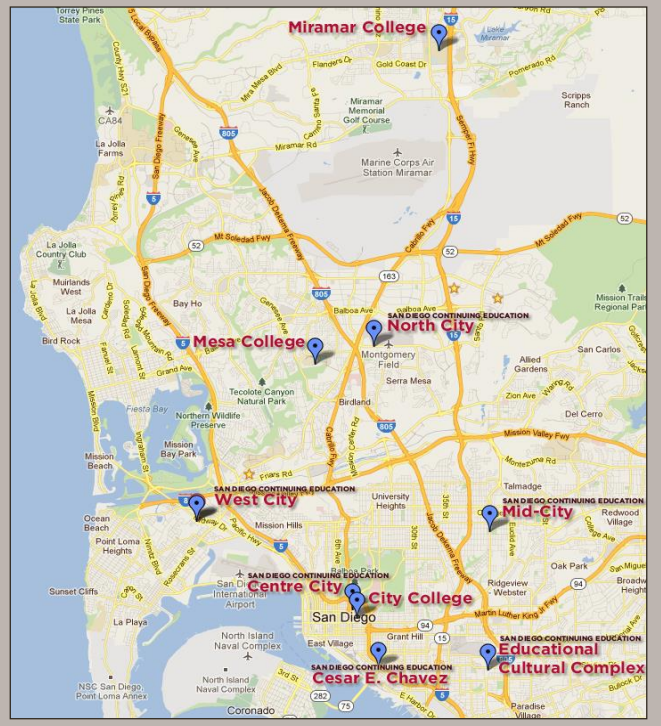
Wouldn't It Be Nice If You Could...

- Average Savings of $900,000 on each of 15 projects
- Reduce Average Schedule Delay by 56 days
- Enhance Sustainability Objectives by 44%
- Reduce Facilities Maintenance Costs by 53%

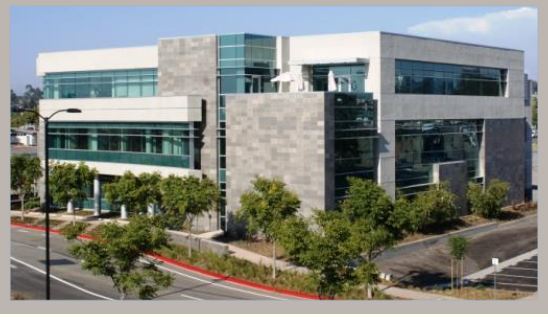
San Diego Community College District (SDCCD)

Overview

- **The Second Largest Community College District in California – Serving 130,000 students**
- **Sixth Largest in Nation**
- **Three Colleges - City, Mesa and Miramar**
- **Six Continuing Education Campuses**
- **District Square Footage - 2,218,031**
- **$1.555 B Locally Approved Capital Bonds**



City College



Mesa College

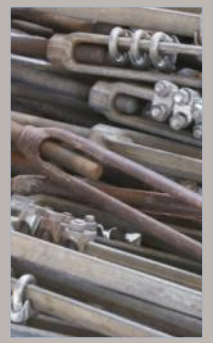
Miramar College

Continuing Education

San Diego Community College District

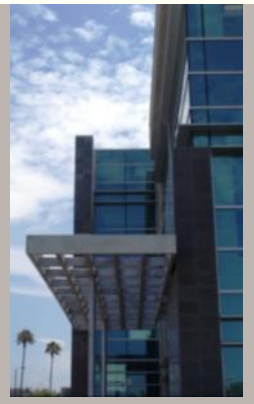
Why Go Lean?

- Reduced operating budgets of **$46 million** in past four years (-16%)
- Increased build environment footprint of 1.6 million square feet (+80%)
- Capital funding from locally approved and funded general obligation bonds
- Reduce waste, create greater value



San Diego Community College District

About the District (Current State)



Square Footage

(As of September 2012)

Buildings = 2,560,187 gross square feet

Parking = 377,712 gross square feet

Current Acres of Landscape = 199.2

Current Utilities Consumption

Electric = $4,119,936

Gas = $334,632

Water = $790,322

Total = $5,244,890

San Diego Community College District

About the District (Future State)

Projected Square Footage

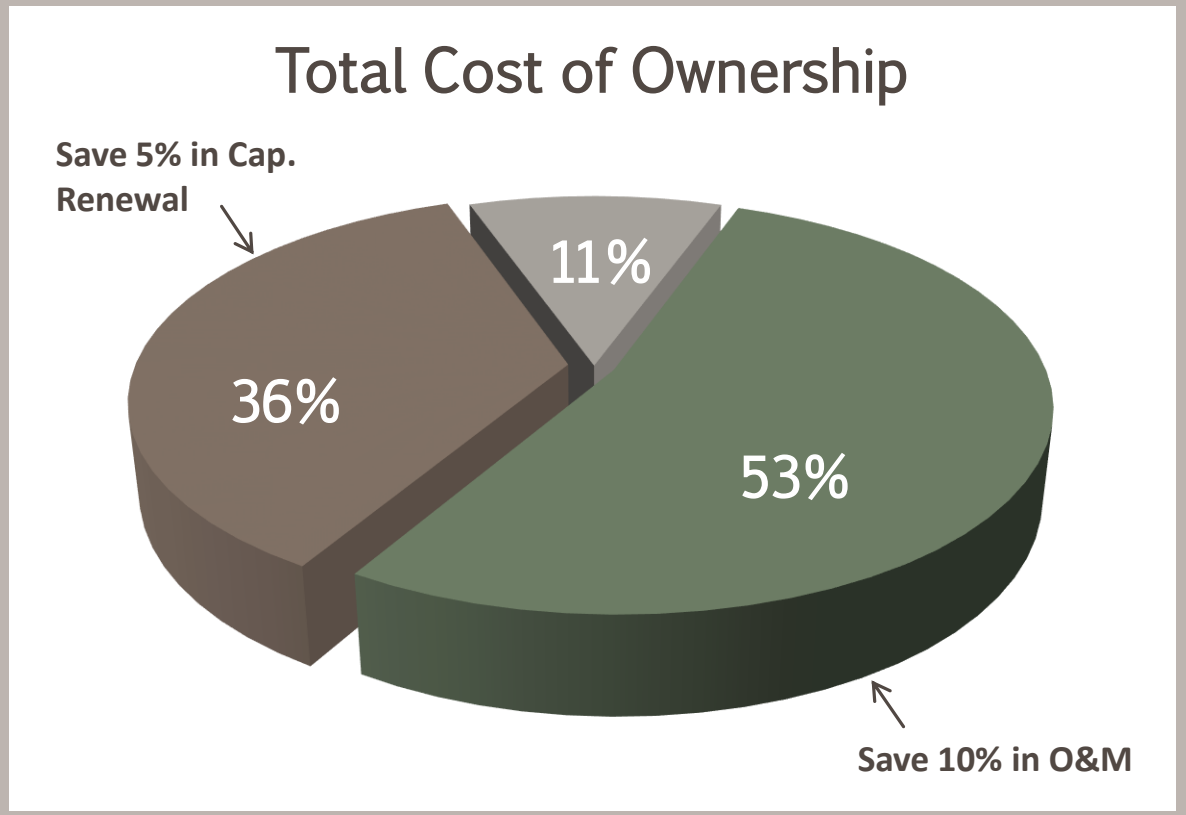
- Additional Building GSF = 720,608
- Total Building GSF = 3,280,795
- Additional Parking GSF = 279,265
- Total Parking GSF = 1,372,622

Grand Total GSF = 5,653,290

Total Cost of Ownership

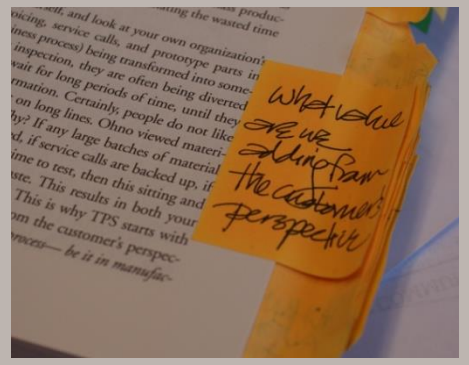
- 50-year design life
- 100,000 square foot classroom building
- Design and construction cost - $30 million
- Capital Renewal: 2% of current replacement value (APPA benchmark)
- O&M Budget $5.69/square foot
- Inflation: 3%

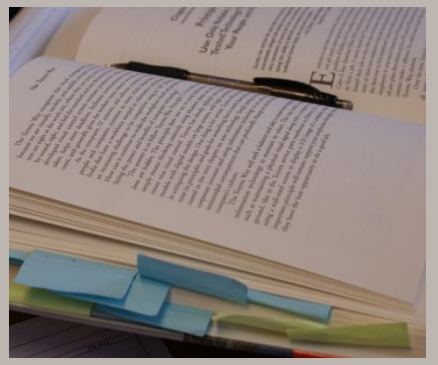
Total Cost of Ownership

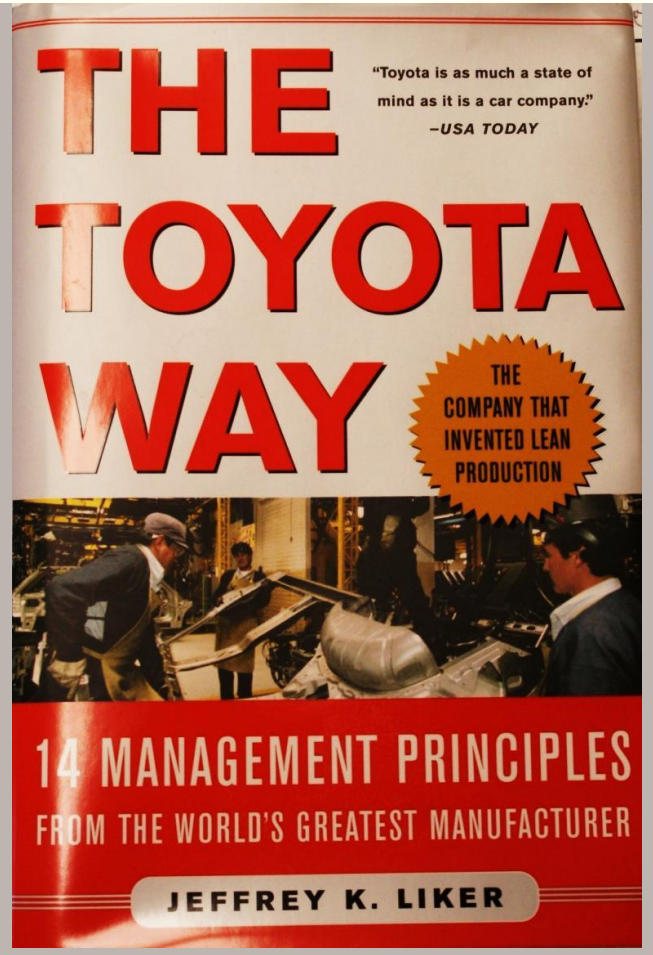


Savings			
D&C:	$30M	Total	NPV
Cap. R.:	$101M	$ 5M	$1.1M
O&M:	$149M	$15M	$3.4M
Total:	$280M	$20M	$4.4M

Practicing the Toyota Way Business Principles







Early (and continued) Attitudes Toward Lean

Credit: Lean Construction Institute

- We've tried that.
- We already do that.
- We don't need it.
- It won't work here.
- We don't build cars.
- We're different.
- The other guy needs it, not me.
- We're doing well, so why change?

Design-Build Statute in California for CCS

- As of January 1, 2008, Community Colleges can use design build under SB614.
  - Must be at least $2.5M in value
  - Requires project-specific Board resolution
- Need to evaluate the project based on five minimum criteria.
  - Price (10%)
  - Technical Experience (10%)
  - Life cycle cost over 15 years (10%)
  - Skilled Labor Force (10%)
  - Safety Record (10%)

Design-Build Scoring Criteria and Weight

	1	2	3	4	5	6	7		
	TECHNICAL EXPERTISE / 20%	DESIGN EXCELLENCE/ 20%	LIFE CYCLE COST/ 10%	SKILLED LABOR FORCE AVAILABILITY/ 10%	PRICE/ 20%	COMMITMENT TO DIVERSITY/ 10%	SAFETY RECORD / 10%	TOTAL	RANK
Point Value	200	200	100	100	200	100	100	1000	
FIRM									
Balfour Beatty	193	190	90	100	200	77	100	950	1
McCarthy Construction	198	193	96	100	180	76	85	928	2
Hensel Phelps	188	188	85	100	180	82	95	918	3
TB Penick	183	178	95	100	180	74	95	904	4
PCL Construction	174	171	92	100	180	82	100	899	5
Davis Reed Construction	156	171	86	100	200	75	90	878	6
Swinerton	164	173	80	100	160	93	100	870	7
Rudolph and Sletten	166	174	78	100	190	76	85	869	8
Turner Construction	171	178	73	100	160	74	100	856	9
Harper	158	164	75	100	180	67	95	839	10
Tilden-Coil	171	148	68	100	180	69	100	836	11
CW Driver	174	175	91	100	180	0	100	820	12

Integrated Project Delivery Charter

Integrated Project Delivery Charter

SDCCD North City Campus Parking Structure

We, the Design Build Team for the SDCCD North City Campus Parking Structure, will be utilizing the Integrated Project Delivery (IPD) model for the design and construction of this project to integrate the people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste and maximize efficiency through all phases of design, fabrication, and construction.

We, the undersigned, agree to achieve this mission by implementing the following objectives:

- **Mutual Respect and Trust** – we agree to foster an environment that promotes collaboration, and we are committed to working as a team in the best interests of the project.
- **Mutual Benefit and Reward** – we agree to a shared contingency and a shared savings to breakdown the silo mentality and reward a "what's best for the project" behavior.
- **Collaborative Innovation and Decision Making** – we agree to a team decision making structure where major decisions are made objectively and unanimously.

Legacy Building Services

NTD Architecture

Defining Values for SDCCD

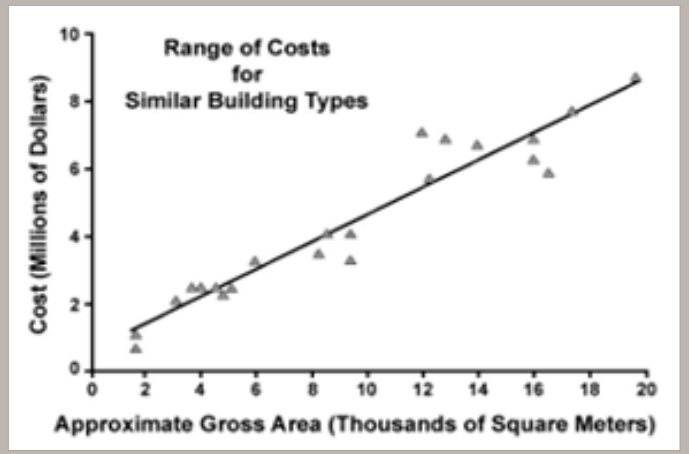
- Enhance the student experience
- Flexibility in design to accommodate future changes in pedagogy
- Lower total cost of ownership
- Highly energy efficient buildings
- Reduce maintenance and operations costs
- Meet or exceed sustainability objectives

Use of Lean Tools in Capital Project Delivery

1. Target Costing
2. A3 Problem Solving and Reporting
3. Set-Based Design
4. Value Stream Mapping
5. Building Information Modeling (BIM)
6. The Last Planner™ System

Target Costing - Project Budget Development

- Space Programming
- Space Efficiency
- Targeted Cost Per Sq. Ft.



BUILDING		SPACE DESCRIPTION	2024 ASF	Quantity	Extended 2024 ASF	Extended 2007 ASF	Variance	2007 Room Nos., Comments
	Life Sciences	32-Seat Dry Lecture/Lab-Biology	1,600	x 1.0	1,600	836	764	*supplements* A202
		32-Seat Wet Lab-Biology/Botany	1,728	x 1.0	1,728	1,092	636	*supplements* A210
		32-Seat Wet Lab-Biotech/Microbiology	1,728	x 3.0	5,184	2,048	3,136	*supplement* A204, A231
		32-Seat Wet Lab-Physiology/Anatomy	1,728	x 3.0	5,184	1,834	3,350	*supplement* A226, A206
		32-Seat Lecture/Dry Lab-Life Science (computer)	1,600	x 1.0	1,600	1,053	547	*supplements* A207
		Prep/Stg/Lab Tech Rm (1 per 2 wet labs; 7 wet labs total)	800	x 4.0	3,200	1,232	1,968	*supplement* A203, A205, A226A
		Storage	1,200	x 1.0	1,200	0	1,200	*supplements* A206A, A209, A211
		Marine Biology/Oceanography Lab	500	x 1.0	500	0	500	Aquarium
		Microbiology Culture/Autoclave Room	200	x 1.0	200	0	200	
		Biology/Anatomy Dissection Room	200	x 1.0	200	0	200	
					20,596	**8,095**	**12,501**	
	Physical Sciences	32-Seat Wet Lab-Chemistry	1,728	x 4.0	6,912	3,018	3,894	M201, M202, M203
		Chemistry Lab Instrument Room (1 per 2 labs)	250	x 2.0	500	180	320	M220
		Chem. Prep/Storage/Lab Tech Rm (1 per 2 labs)	800	x 2.0	1,600	1,337	263	M216, M217, M218
		Hazardous Chemicals Storage Room	175	x 1.0	175	120	55	M219
		32-Seat Lecture/Dry Lab-Physics, Physical Science, Geography, Geology	1,600	x 4.0	6,400	2,014	4,386	M204, M205
		40-Seat Lecture/Dry Lab-Geography	2,000	x 1.0	2,000	0	2,000	
		Physics/Physical Science/Astronomy Prep/Stg/Lab Tech Rm	1,600	x 1.0	1,600	1,059	541	M214, M215, M215A
		32-Seat Computer Lab-GIS, Physics, Chemistry	1,600	x 2.0	3,200	0	3,200	
		100-Seat Planetarium	2,500	x 1.0	2,500	0	2,500	
					24,887	**7,728**	**14,659**	

A3 Problem Solving – Risk/Benefit Analysis

THEME: **Mesa College Math & Sciences Building Risk-Benefit Analysis**
Early Bidding of Caissons / Site Utilities / Surveying Packages

To: Richard Burkhart
From: Diane Malone
Date: May 11, 2011

BACKGROUND:

- New Mesa Math & Sciences Building original construction completion date as published in Request for Proposal (RFP) was January 2013. The estimated DSA review / approval time was proposed to be seven (7) months with intake date of Jun 1, 2010 and stamp-out date of February 1, 2011.
- Construction completion date was revised based on significant DSA comments received December 17, 2010. DSA projected approval date moved to about March 1, 2011. Received Facilities Management approval for early Steel procurement package which was approved on March 10, 2011 Board and target to bid remainder of packages to be approved at April 14, 2011 Board with project Substantial Completion date of June 6, 2013.
- DSA resubmittal package delivered to DSA on February 22, 2011 and significant structural comments resulted in new projected DSA approval date of April 15, 2011. This presented another significant project delay and Facilities Management considering strategy of bidding out Caissons / Site Utilities package for July 7, 2011 Board approval. Remaining trades would bid to receive approval at August 25, 2011 Board. New substantial completion date August 9, 2013.

CURRENT CONDITIONS:

- Current McCarthy schedule shows substantial completion date of August 9, 2013[1]. This is based on DSA stamp out on approximately May 20, 2011 and Caissons / Site Utilities / Surveying bid packages out to bid by May 17th ready for July 7th Board approval.
- DSA stamp out delayed to May 2 – 13, 2011 timeframe; pushes Caissons / Site Utilities / Surveying bid package approval to July 7, 2011 Board and substantial completion date to August 9, 2013. Result is *occupancy could not occur before start of Fall Semester 2013.*
- DSA comments for all disciplines received Tuesday, April 12, 2011 and architect/engineer/trades have been meeting with DSA this week and last. Stamp out is projected by 5/20/11. Bidding of Caissons / Site Utilities / Survey package as originally scheduled in SDCCD Bid Planning Schedule will not jeopardize integrity of bid as structural comments have been received and reviewed[2,3].
- Mesa College rejects proposal to occupy during a semester and occupancy is targeted for December 2013. To reach this goal, substantial completion by August 9, 2013 is necessary to equip building by December, per FFE PM. Delay of Caisson package would push to August 25, 2011 Board and substantial completion date to September 30, 2013, compromising occupancy prior to start of Spring Semester 2014.
- Cost impacts to Mesa budget of $2.14M have already been realized[4]. Occupancy delay to June 2014 would be additional $2M.
- Group Delta informed SDCCD that caissons do not have to go into formational soils full depth and proposes re-design for substantial savings.

ROOT CAUSE ANALYSIS:

- Schedule presented to McCarthy at RFP did not include sufficient DSA review / approval time.
- Project Structural Engineer made incorrect wind load classification assumption resulting in several extra weeks added to prepare DSA backcheck set – issue could have been mitigated by conferring with DSA in advance.
- Late clarification from DSA required all structural moment calculations to be recalculated.
- DSA intake was delayed one month.
- Geotechnics input received in March and vetting with Gafcon/SDCCD would allow earlier implementation.

TARGET CONDITION:

- Occupy Math & Sciences Building in December 2013 to avoid additional $2.17M in project escalation costs[4].

IMPLEMENTATION PLAN:

- Assumptions are 1) DSA approval by June 9, 2011, at the latest; 2) DSA stamped set could be issued with final addendum; 3) Caissons/Site Utilities/Survey trades bid early and all remaining trades bid after DSA stamp-out[5].
  - Caisson/ Utilities/Survey Bid Schedule:
    - Advertise — May 17, 24
    - Bid Walk /DSA stamp set out — May 26
    - Last RFI/Question — June 3
    - Final Addendum — June 9
    - Bids Opened — June 16
    - Board Agenda Due — June 17
    - Board Date — July 7
  - Remaining Trades Bid Schedule:
    - Advertise — July 5, 12
    - Bid Walk — July 13
    - Last RFI/Question — July 20
    - Final Addendum — July 27
    - Bids Opened — August 3
    - Board Agenda Due — August 5
    - Board Date — August 25
  - **Substantial Completion August 9, 2013**

  Note: If advertisement occurs after 5/17/11 and DSA stamp-out after June 9, 2011, project approval would slip to August 25 Board, substantial completion date to September 30, 2013, jeopardizing December 2013 occupancy.
- Caisson package would be bid as a lump sum based on unit pricing, allowing re-design of caisson depths prior to McCarthy projected NTP date on 7/8/11 with updated formational soils information. Unit pricing strategy would provide a solid apples-to-apples bid based on current design, and allow either added or deducted lengths per the actual field measured conditions. The bid form would be structured as follows:

  Unit Price - 3'-0" diameter caissons $_____ per LF (to be filled in by the bidder)
  Engineer's Estimate x ____XXXX____ LF (per Hope's current drawings)
  Subtotal 3'-0" diameter caissons..... $_____

  Unit Price - 4'-0" diameter caissons $_____ per LF (to be filled in by the bidder)
  Engineer's Estimate x ____YYYY____ LF (per Hope's current drawings)
  Subtotal 4'-0" diameter caissons..... $_____
  Allowance – (team recommends 4-8% of CM's estimate, based on potential for changes..... $ ZZZZZZ
  Total bid..... $_____
- The Unit Price spec section will refer to the unit price entries on the bid form, and stipulate that the numbers entered by bidder shall be used to determine both deductive and additive values to the contract, based on actual caisson lengths required by field conditions, verified by the structural and/or geotechnical engineer. The Unit Price spec will also note the points from which measurements shall be taken.

FOLLOW UP:

- Facilities Management review/approval. Review bid dates and bid form with SDCCD Contracts Specialist.
- Review allowance with District Construction Manager and Vice Chancellor[6].

Footnotes

1. McCarthy Bidding of Piers & Utilities White Paper, 4/19/11, including updated 5/11 McCarthy schedule.
2. A|DWRB DSA back-check update emails dated 4/19/11, 5/4/11 & 5/10/11
3. DSA Scanning policy
4. Cumming cost escalation estimate
5. SDCCD 5/5/11 Bid Planning Schedule CY2011
6. McCarthy suggested allowances (see WC 003, 014, 029 for early pkg.)

A3 Problem Solving – HVAC Design

A3 No	Title/Theme			Champion	Collaborator	Additional Collaborators		Sponsor	Customer Group	Sign-off
M-001	HVAC System Comparison: Chilled Water AHU, Package DX AC Units and GSHP's			David Dopudja	Don Harrisberger	Jim Horan				
	Discipline	Element	Date Opened	Path Forward Date	Category	*A3 Status*				
	Mechanical	HVAC Systems	12/7/2010	12/13/2010	N/A	Idea Development	Sponsor Identified	A3 Development	Customer Accepts	Integration

Section 1 - Background - Relevance of the topic to CPR Objectives & Values

Comparison of HVAC system options to determine which option has lowest life cycle cost and provides greatest benefit to the facility. Responding to the challenge to improve efficiency, increase reliability, reduce maintenance and help achieve LEED Silver. A facility of this size is typically served by a chilled water (CHW) system with central plant, underground distribution piping and 4-pipe (CHW/HW) air handling units. This analysis will compare the CHW system to systems based on package direct expansion (DX) rooftop air conditioning units and ground source heat pumps (GSHP).

- For the CHW system, heating hot water (HW) is supplied by boilers and pumps in the central plant via underground distribution piping.
- Heating for the package DX system is provided by gas furnaces within the rooftop package units.
- In the GSHP system, heating is provided by the heat pump cycle of the GSHP units. The GSHP system uses a closed loop system of plastic pipe buried in the ground (ground coupled) to allow heat transfer between the earth and fluid flowing through the pipes. This closed loop system transitions to metal pipe within the building(s) where it is connected to the condenser/evaporator heat exchangers in each GSHP unit.

Section 2 - Current Condition

Two 15,000 SF facilities located in San Diego CA. Life cycle cost analysis is for a period of 15 years using a .75% discount rate, a 2% escalation rate and a 1.2% inflation rate. Average energy rates of $0.09 / Kwh and $ 0.61 / therm are used.

Section 3 - Analysis

SHOULD CRITERIA

	Mechanical System Options	Schedule	First Cost	Life Cycle Cost	Efficency	Sustainability	Creativity/Innovation	Flexibility	Community	Maintenace	Total
	HVAC System										
1	Split System	+	+	0	0	0	0	+	0	0	3
2	Package System	+	+	0	0	0	0	+	0	0	3
3	HHW &CHW/ AHU, FCU	0	0	+	+	+	+	0	+	+	6
4	Ground Source Heat Pump	0	0	+	+	+	+	0	0	+	5
5	Water Source Heat Pump	0	0	0	+	+	0	0	0	0	2

+ Meets "Should" Criteria
0 Does Not Meet "Should" Criteria

Section 3 - Analysis

Option	Advantages
Chilled Water (Base Option)	1. Much longer equipment life 2. Much more energy efficient and existing CUP 3. Better temperature control and ability to use 100% OSA 4. Much better zoning options (ability for CO_2 zoning) 5. Much less noise disturbance (chiller and condenser noise distanced from sensitive areas or communities) 6. Less maintenance of equipment outside of CUP
Package/Split DX AC Units (Alternate 1)	1. More available 2. Much less UG distribution piping required (none)
Ground Source Heat Pumps (Alternate 2)	1. More energy efficient 2. Less utilities required (no gas required for heating) 3. More efficient (water source vs. air source) 4. More innovative (LEED point possible) 5. Much less sophisticated maintenance and operation than CHW

Section 4 - Unresolved Issues - Identify any problems or constraints that still exist

Need analysis of existing central plant capacities. Need further input from owner in the weighting of advantages.

Section 5 - Recommendations

Based on the current information at hand the option of chilled and hot water air handlers served by central plant is recommended.

Section 6 - Path Forward/Follow-up

1. Provide existing CUP capacities- Owner
2. Analyze existing CUP capacities - Don Harrisberger
3. Review weighting of advantages with Owner and entire team - Don Harrisberger
4. Confirm CHW (or final HVAC choice) meets budget - Dustin Smith
5. Proceed with /implement CHW (or final HVAC choice) - Don Harrisberger

A3 Problem Solving – Structural System Design

A3 No	Theme / Title			Champion	Collaborator	Additional Collaborators	Sponsor	Customer Group	Sign-off
S-001	Structural System Selection Comparison			Aldrin Orue	Jorge Rivera	Patrick Meek			
	Discipline	Element	Date Opened	Path Forward Date	Category	*A3 Status*			
	Structural	Framing	12/7/2010	12/13/2010	N/A	Idea Development	Sponsor Identified	A3 Development	Customer accepts	Integration

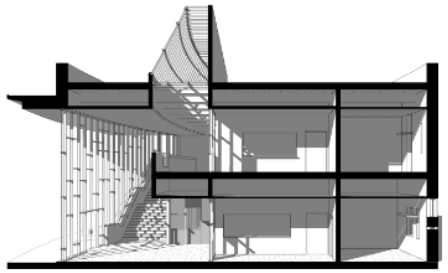
Section 1 - Background - Relevance to Project

Comparison of structural system options to determine which option is the most appropriate and efficient for the facility while meeting project goals of cost, schedule, and aesthetics.

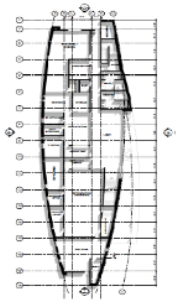
Section 2 - Current Condition

Two-story 15,000 SF facility located in San Diego CA with an open high bay lobby area. A facility of this size and type is typically constructed of a steel frame system due to the many advantages of steel as noted in the following sections below. A comparison analysis with other structural systems will be performed to make sure that advantages from other systems are not overlooked and properly evaluated.

Section 2 - Current Condition - Design



3D Section



Level 1 Floor Plan

Section 3 - Analysis

SHOULD CRITERIA

	Structural System Options	Construction Schedule	Flexibility	Durability (Life Cycle)	Cost	Sustainability	Sound Atuniation	Floor Vibration	Total
	Structural System								
1	Steel System	+	+	+	+	+	+	+	7
2	Concrete System	0	0	+	0	+	+	+	4
3	Masonry System	0	0	+	+	+	0	0	3
4	Wood	+	0	0	+	0	0	0	2

+ Meets "Should" Criteria
0 Does Not Meet "Should" Criteria

Section 3 - Analysis

Option	Advantages
Steel	1. Lower Cost 2. More Flexible (modifications and attachments) 3. Faster Erection Time 4. Lighter System 5. Much More Accommodating in Architectural Design 6. More Durable Material 7. Better Sound and Floor Vibration Qualities 8. Easier Construction
Concrete / Masonry	1. Shorter Lead Time Required to Erect Superstructure 2. Much More Durable Material 3. Much More Thermal Mass 4. Much More Sustainable (Due to Local Resources) 5. Much Better Sound and Floor Vibration Qualities
Wood	1. Much Easier Construction 2. Shorter Lead Time 3. Much Lighter System

Section 4 - Unresolved Issues - Identify any problems or constraints that still exist

Need structural analysis to determine preliminary steel member sizes to confirm steel option.

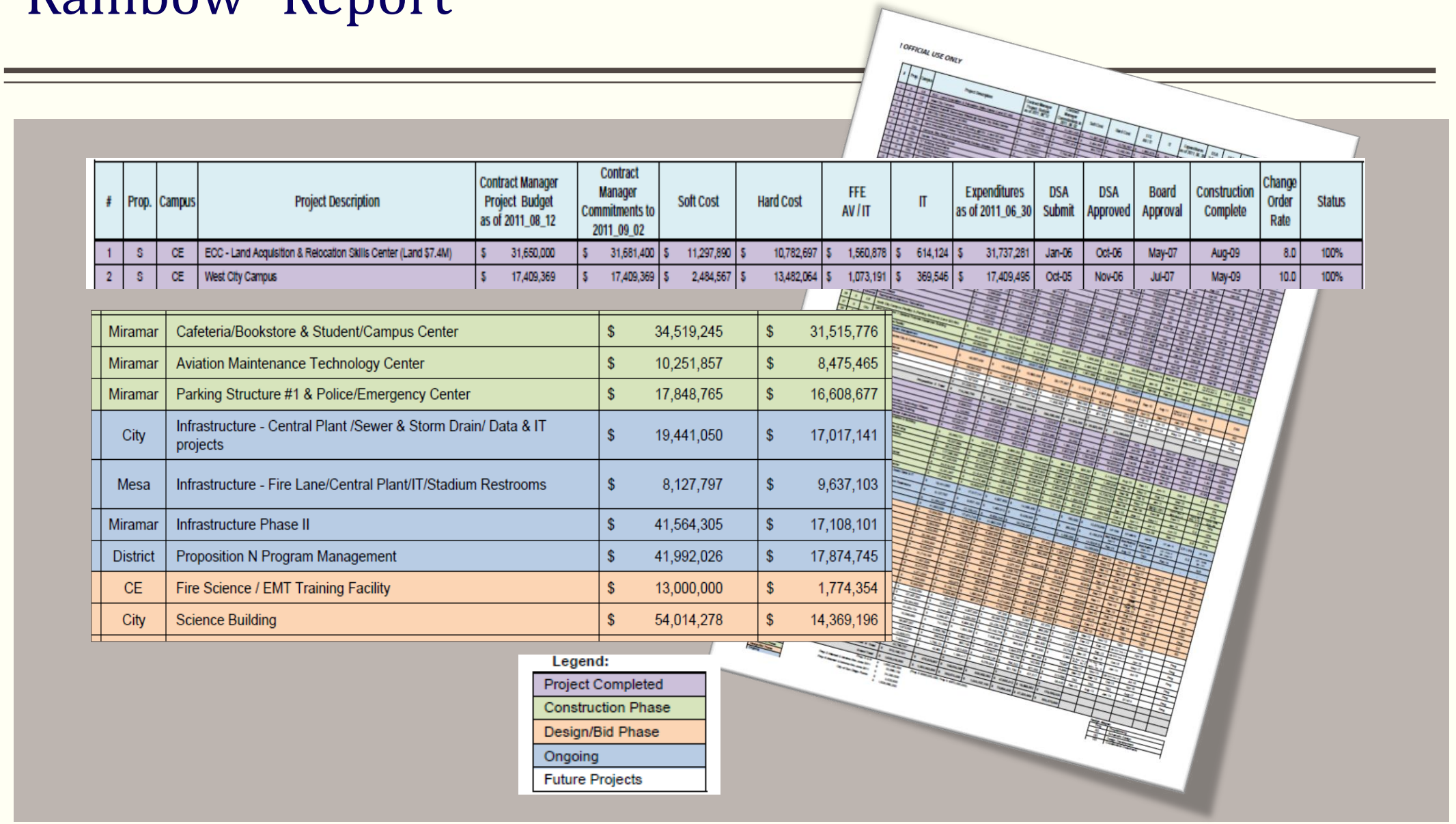
Section 5 - Recommendations

Based on the current information at hand the option of a steel structural system is recommended.

Section 6 - Path Forward/Follow-up

1. Structural analysis to determine preliminary steel member sizes- Aldrin Orue
2. Confirm structural steel member sizes with budget - Dustin Smith
3. Confirm structural system selection with entire team and approve A3- Aldrin Orue
4. Incorporate/proceed with structural steel design- Aldrin Orue

“Rainbow” Report



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#	Prop.	Campus	Project Description	Contract Manager Project Budget as of 2011_08_12	Contract Manager Commitments to 2011_09_02	Soft Cost	Hard Cost	FFE AV / IT	IT	Expenditures as of 2011_06_30	DSA Submit	DSA Approved	Board Approval	Construction Complete	Change Order Rate	Status
1	S	CE	ECC - Land Acquisition & Relocation Skills Center (Land $7.4M)	$ 31,650,000	$ 31,681,400	$ 11,297,890	$ 10,782,697	$ 1,560,878	$ 614,124	$ 31,737,281	Jan-06	Oct-06	May-07	Aug-09	8.0	100%
2	S	CE	West City Campus	$ 17,409,369	$ 17,409,369	$ 2,484,567	$ 13,482,064	$ 1,073,191	$ 369,546	$ 17,409,496	Oct-05	Nov-06	Jul-07	May-09	10.0	100%

Miramar	Cafeteria/Bookstore & Student/Campus Center	$ 34,519,245	$ 31,515,776
Miramar	Aviation Maintenance Technology Center	$ 10,251,857	$ 8,475,465
Miramar	Parking Structure #1 & Police/Emergency Center	$ 17,848,765	$ 16,608,677
City	Infrastructure - Central Plant /Sewer & Storm Drain/ Data & IT projects	$ 19,441,050	$ 17,017,141
Mesa	Infrastructure - Fire Lane/Central Plant/IT/Stadium Restrooms	$ 8,127,797	$ 9,637,103
Miramar	Infrastructure Phase II	$ 41,564,305	$ 17,108,101
District	Proposition N Program Management	$ 41,992,026	$ 17,874,745
CE	Fire Science / EMT Training Facility	$ 13,000,000	$ 1,774,354
City	Science Building	$ 54,014,278	$ 14,369,196

Legend:

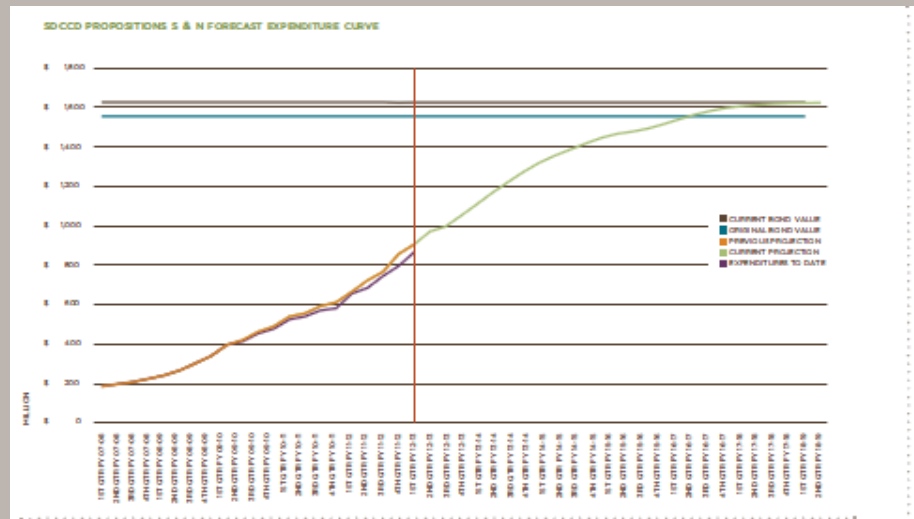
- Project Completed
- Construction Phase
- Design/Bid Phase
- Ongoing
- Future Projects

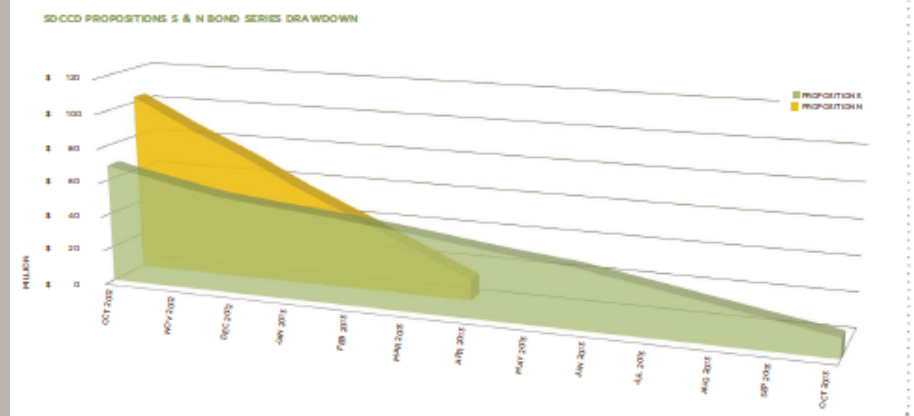
San Diego Community College District

Monthly Program A3 Report

San Diego Community College District

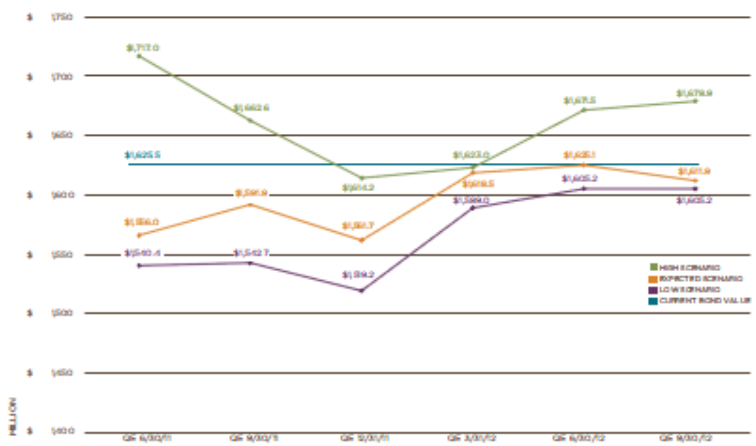
Monthly Program A3 Report





SDCCD PROPOSITIONS S & N EXPENDITURES AT A GLANCE

PROP	BUDGET	$ COMMITTED	% COMMITTED	$ SPENT	% SPENT
S	$719,700,555.00	$618,734,751.00	85.97%	$539,910,855.00	75.02%
N	$905,811,241.00	$625,023,527.00	69.00%	$385,655,411.00	42.58%
TOTAL	$1,625,511,796.00	$1,243,748,278.00	76.51%	$925,566,266.00	56.94%

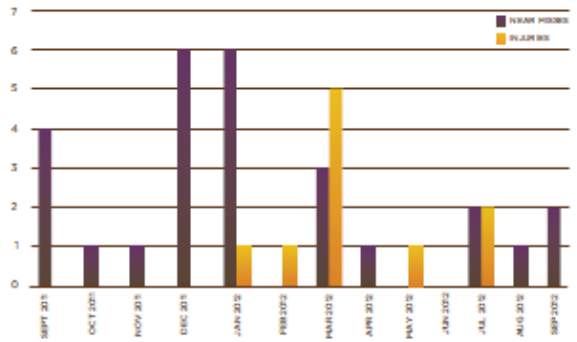


SAN DIEGO CITY COLLEGE · SAN DIEGO MESA COLLEGE · SAN DIEGO MIRAMAR COLLEGE · SAN DIEGO CONTINUING EDUCATION

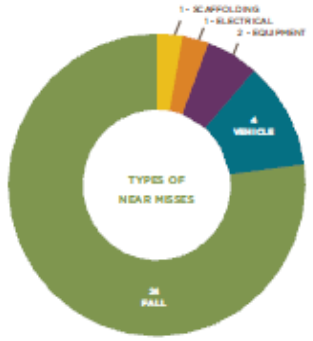
San Diego Community College District

Monthly Program A3 Report

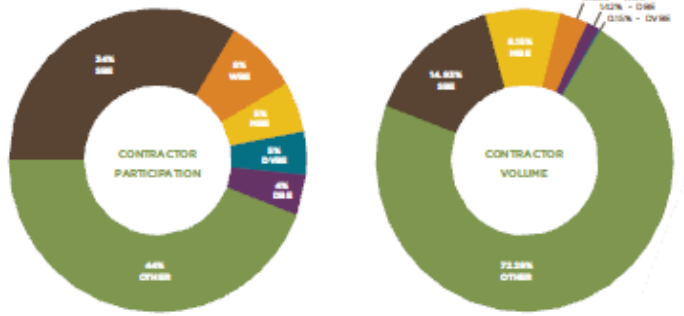
SDCCD PROPOSITIONS S & N SAFETY
NEAR MISSES & INJURIES



SDCCD PROPOSITIONS S & N SAFETY



SDCCD PROPOSITIONS S & N OUTREACH

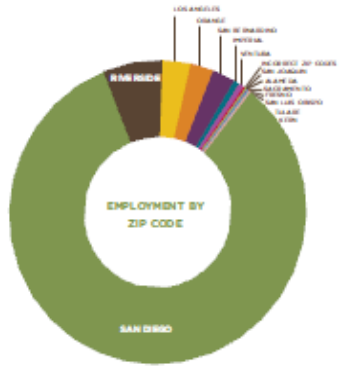


SMALL BUSINESS ENTERPRISE (SBE) - WOMAN-OWNED BUSINESS ENTERPRISE (WBE) - MINORITY BUSINESS ENTERPRISE (MBE)
DISABLED VETERAN BUSINESS ENTERPRISE (DVBE) - DISADVANTAGED BUSINESS ENTERPRISE (DBE)

SDCCD PROPOSITIONS S & N FF&E/IT EXPENDITURES
RECENTLY COMPLETED AND ONGOING PROJECTS

PROP	CAMPUS	PROJECT	FF&E BUDGET	FF&E EXPENDITURES	IT BUDGET	IT EXPENDITURES
x	City	Land Acquisition + General Purpose Classroom Building (Land $21.8M)	$ 2,339,816	$ 7,174	$ 1,185,000	$ 782,764
x	Mesa	Student Services Facility	$ 2,475,937	$ 526,534	$ 1,183,526	$ 735,181
x	CE	North City Campus	$ 1,434,736	$ 0	$ 1,140,021	$ 34,177
N	City	Humanities & Business Technology Building	$ 4,156,833	$ 0	$ 1,981,000	$ 31,291
N	City	Science Building	$ 3,350,731	$ 18,546	$ 1,000,000	$ 0
N	Mesa	Math and Science Building	$ 6,607,258	$ 44,991	$ 2,162,184	$ 66,448
N	Miramar	Aviation Maintenance Technology Center	$ 1,187,851	$ 344,508	$ 202,800	$ 60,884
N	Miramar	College Service Center	$ 258,957	$ 44,989	$ 118,000	$ 55,656
N	Miramar	Library/Learning Resource Center	$ 3,400,000	$ 2,359,678	$ 1,225,000	$ 1,124,569
N	Miramar	Cafeteria/Bookstore & Student/Campus Center	$ 1,165,290	$ 25,479	$ 850,000	$ 131,746
N	Miramar	Heavy Duty Advanced Transportation Technology Center	$ 900,000	$ 0	$ 148,050	$ 0
N	Cont.Ed.	Clairemont/ Linda Vista - Land Acquisition & Building (Land $1.8M)	$ 1,103,702	$ 0	$ 935,297	$ 302,577
N	Cont.Ed.	Educational Cultural Complex - Phase IIB Wing	$ 1,305,388	$ 0	$ 516,500	$ 137,882

SDCCD PROPOSITIONS S & N LABOR COMPLIANCE

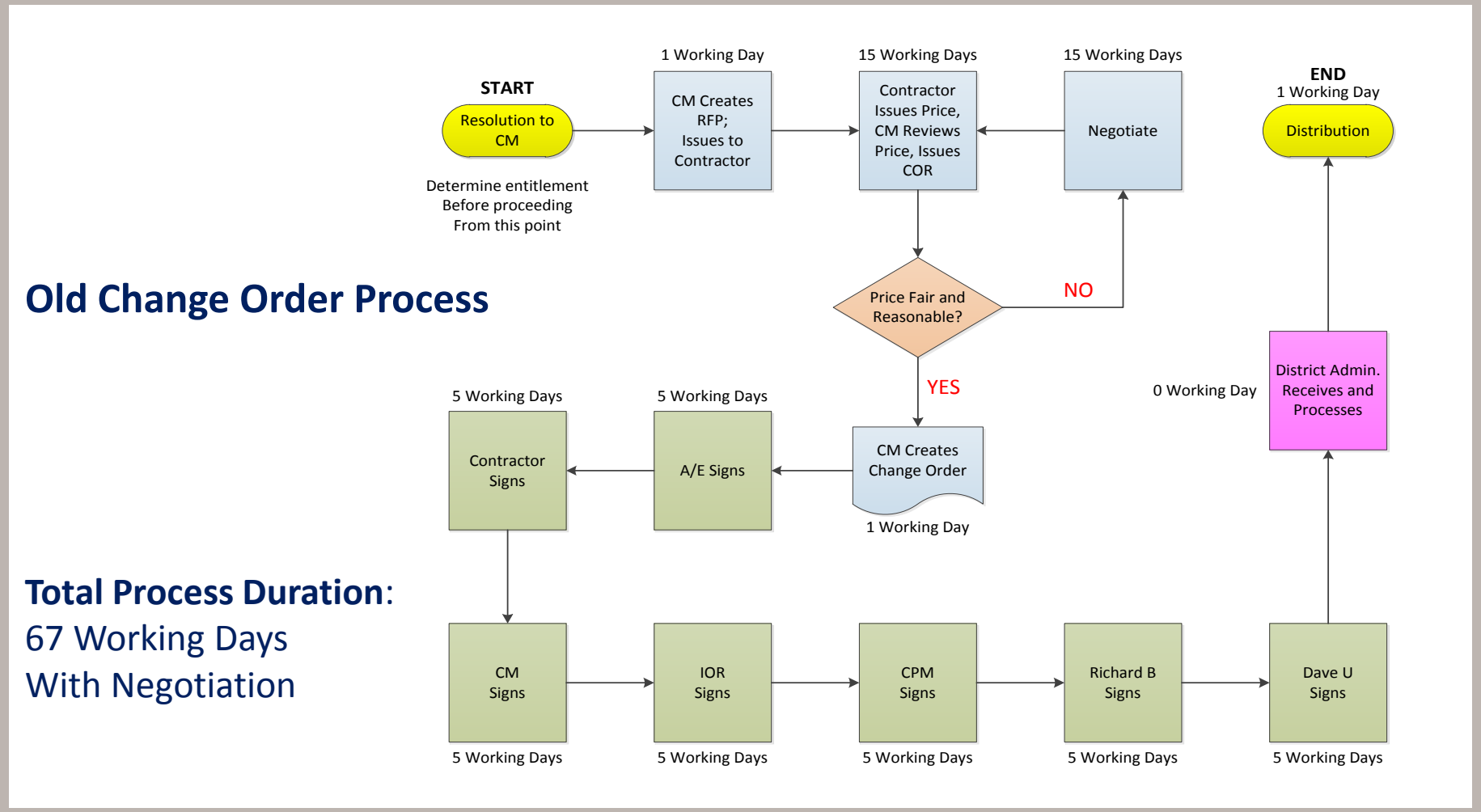


ZIP LIST NAME	TOTAL HOURS	AREA PERCENT
SAN DIEGO COUNTY	227,282.45	83.83%
RIVERSIDE COUNTY	17,611.35	6.47%
LOS ANGELES COUNTY	8,290.50	3.04%
ORANGE COUNTY	6,928.25	2.54%
SAN BERNARDINO COUNTY	5,790.00	2.09%
IMPERIAL COUNTY	1,799.00	0.66%
VENTURA COUNTY	1,419.00	0.53%
INCORRECT ZIP CODES	723.50	0.27%
SAN JOAQUIN COUNTY	447.50	0.16%
ALAMEDA COUNTY	443.00	0.16%
SACRAMENTO COUNTY	408.00	0.15%
FRESNO COUNTY	193.50	0.07%
SAN LUIS OBISPO COUNTY	68.00	0.02%
TULARE COUNTY	43.00	0.02%
KERN COUNTY	9.00	0.00%
TOTAL	272,192.45	100.0%*

*ROUNDED

- PAGE 3 -

Value Stream Mapping – Change Order Process



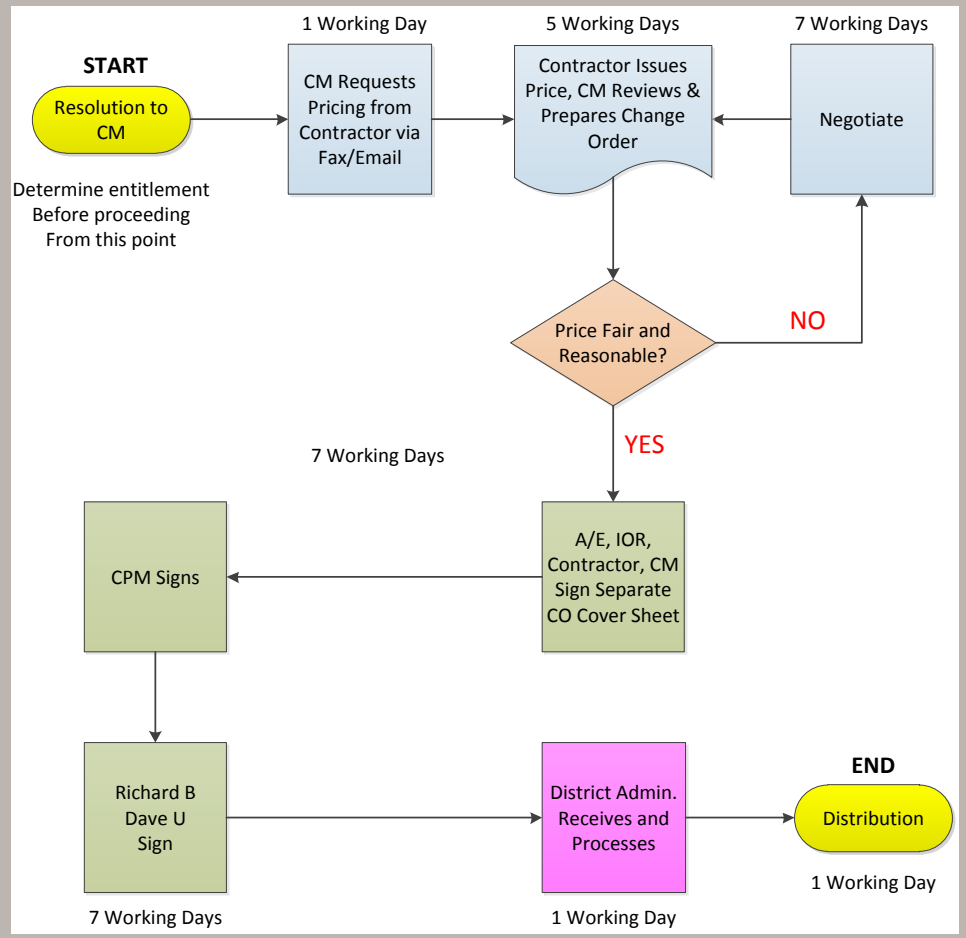
Old Change Order Process

Total Process Duration:
67 Working Days
With Negotiation

Value Stream Mapping – Change Order Process

New Change Order Process
Effective January 2011

Total Process Duration:
28 Working Days
With Negotiation



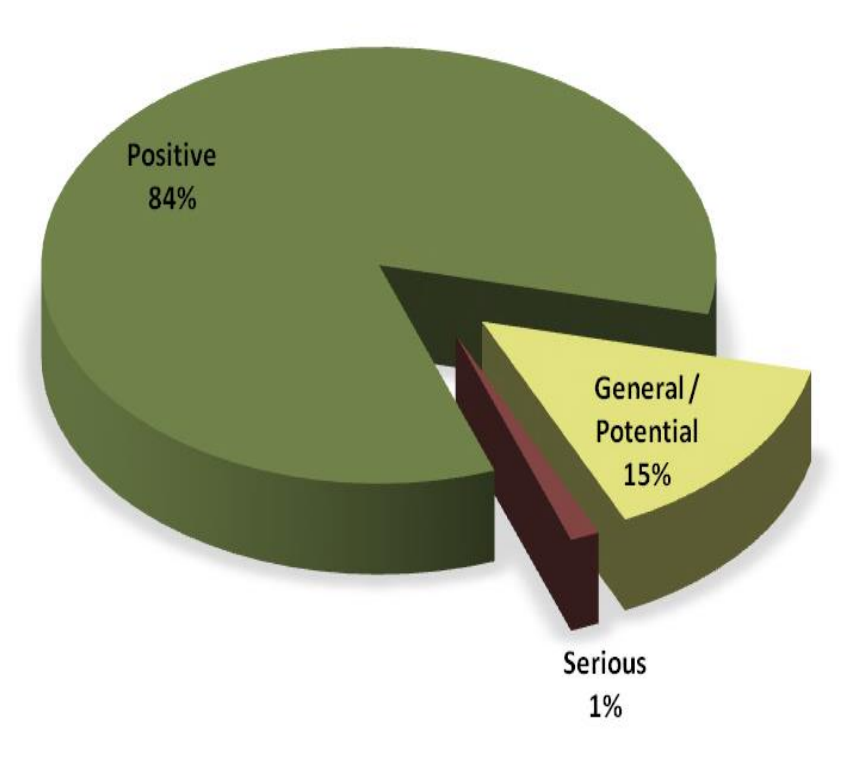
BIM Standards

http://public.sdccdprops-n.com/Design/SDCCD%20-%20Building%20Design%20Standards/SDCCD%20BIM%20Standards%20Version%202.pdf

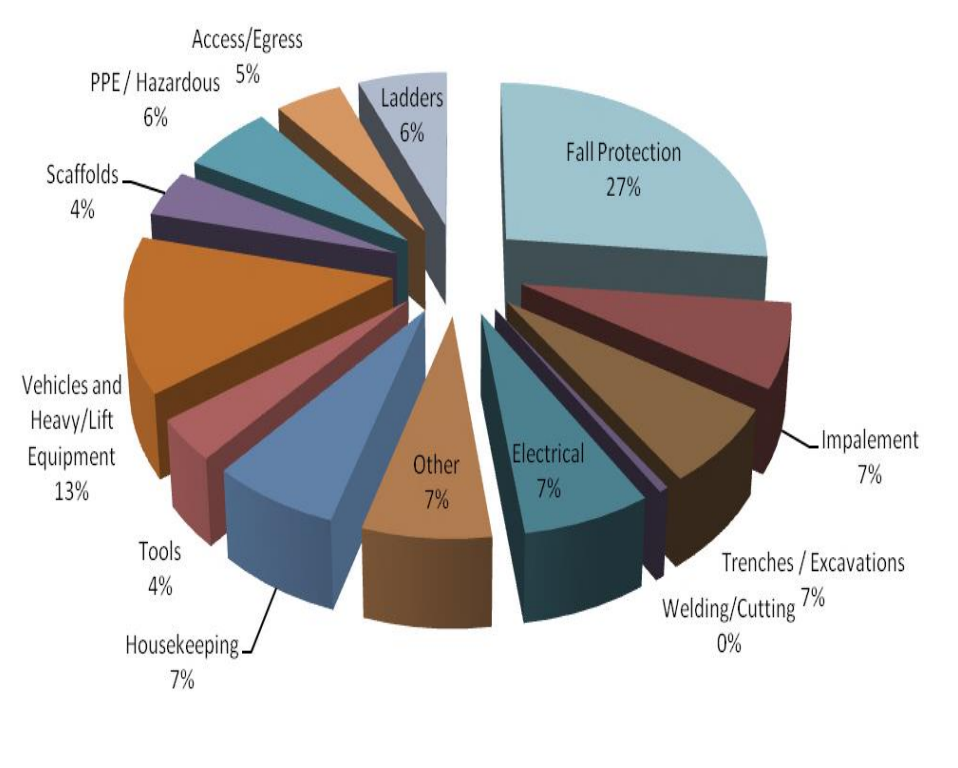
Safety – Root Cause Analysis of Repeated Incidents

City College Campus Safety Report – February 2012

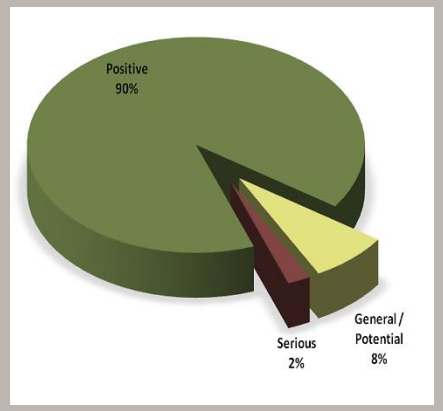
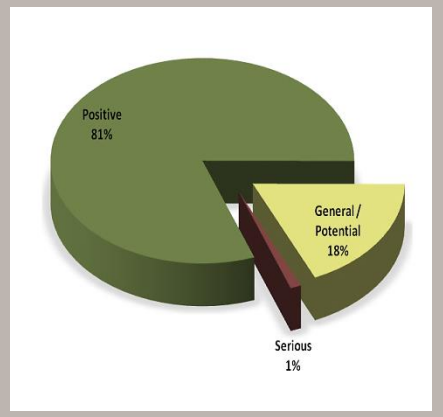
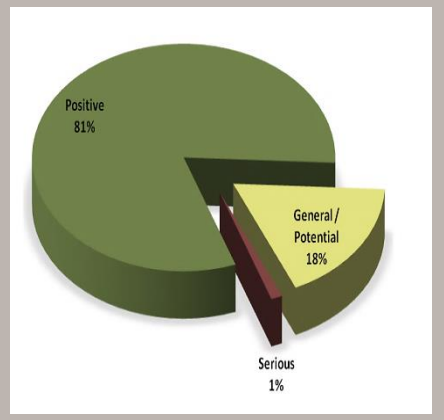
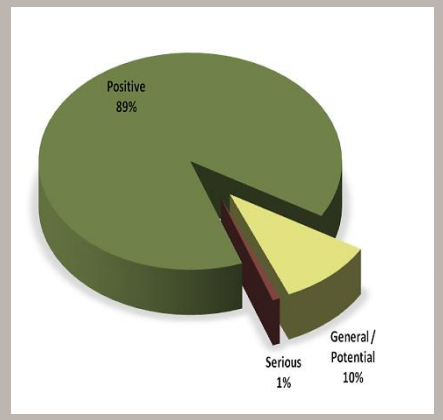
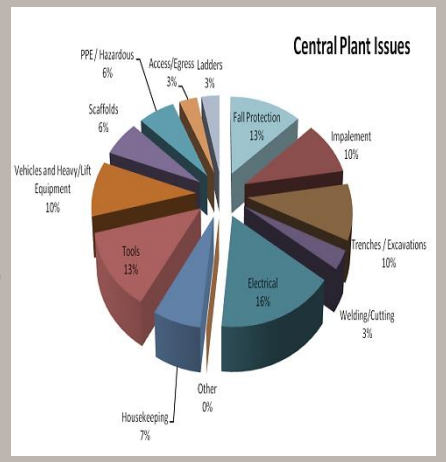
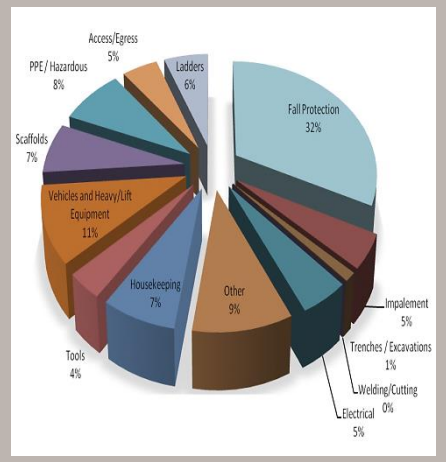
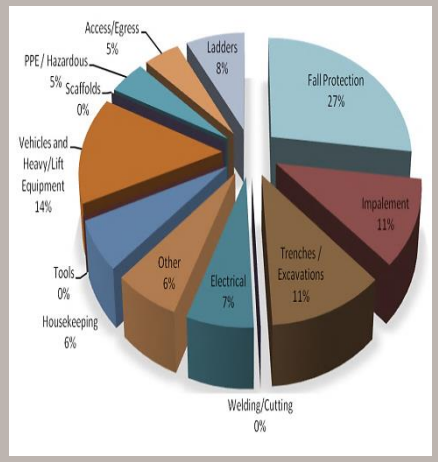
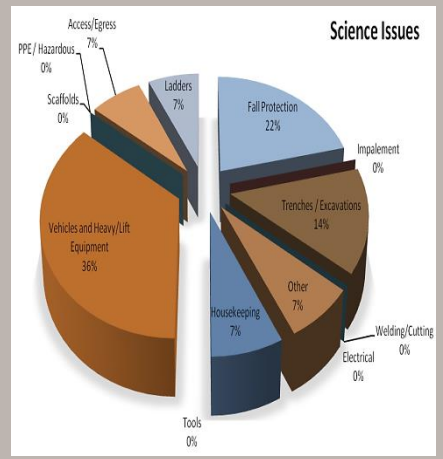
Overall Safety Comments



Overall Safety Issues



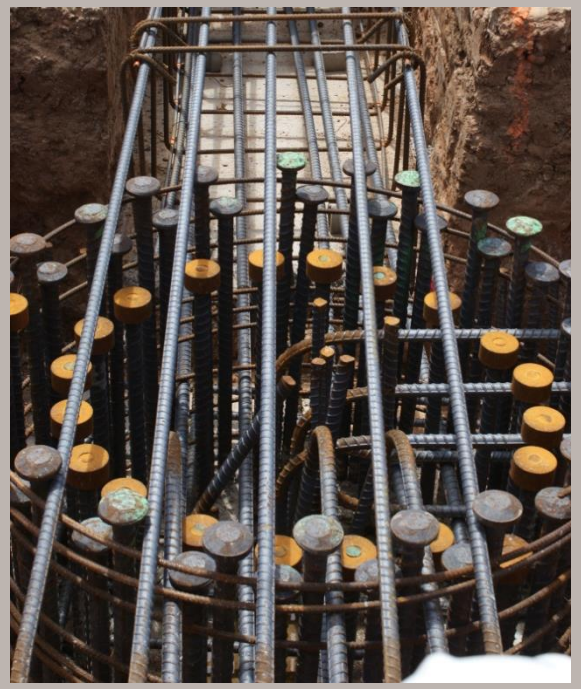
Safety – Root Cause Analysis of Repeated Incidents

	Central Plant	Math & Social Science	Business & Humanities	Science
Safety Comments				
Safety Issues				

Safety – Root Cause Analysis of Repeated Incidents

- Required fall protection refresher training
- Enhanced training for spotters
- Enhanced focus on safety culture

Genchi Genbutsu

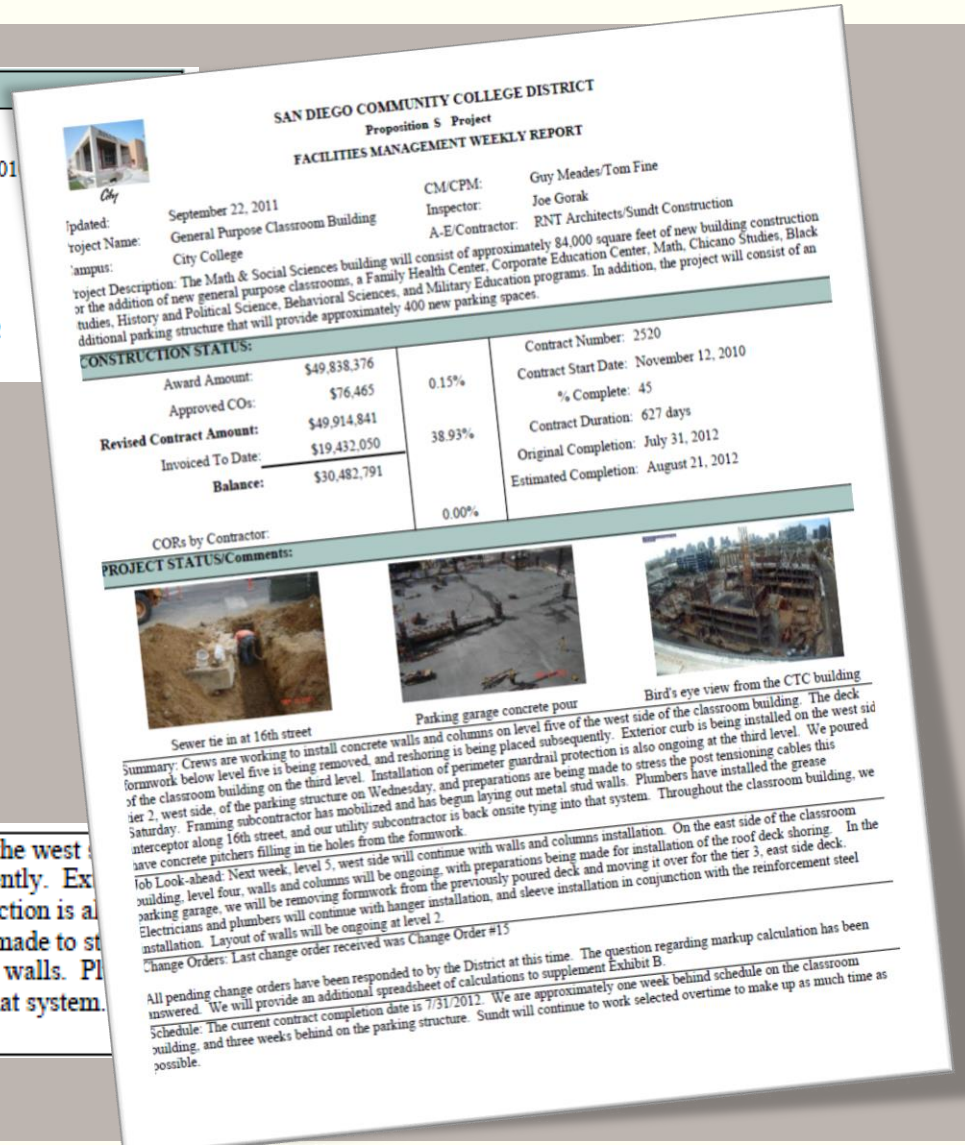


Hourensou

CONSTRUCTION STATUS:				
Award Amount:	$49,838,376		Contract Number:	2520
Approved COs:	$76,465	0.15%	Contract Start Date:	November 12, 201
Revised Contract Amount:	$49,914,841		% Complete:	45
Invoiced To Date:	$19,432,050	38.93%	Contract Duration:	627 days
Balance:	$30,482,791		Original Completion:	July 31, 2012
			Estimated Completion:	August 21, 2012
CORs by Contractor:		0.00%		

Parking garage concrete pour

Summary: Crews are working to install concrete walls and columns on level five of the west
formwork below level five is being removed, and reshoring is being placed subsequently. Ex
of the classroom building on the third level. Installation of perimeter guardrail protection is a
tier 2, west side, of the parking structure on Wednesday, and preparations are being made to st
Saturday. Framing subcontractor has mobilized and has begun laying out metal stud walls. Pl
interceptor along 16th street, and our utility subcontractor is back onsite tying into that system.
have concrete pitchers filling in tie holes from the formwork.



SAN DIEGO COMMUNITY COLLEGE DISTRICT

Proposition S Project

FACILITIES MANAGEMENT WEEKLY REPORT

Updated: September 22, 2011 CM/CPM: Guy Meades/Tom Fine

Project Name: General Purpose Classroom Building Inspector: Joe Gorak

Campus: City College A-E/Contractor: RNT Architects/Sundt Construction

Project Description: The Math & Social Sciences building will consist of approximately 84,000 square feet of new building construction for the addition of new general purpose classrooms, a Family Health Center, Corporate Education Center, Math, Chicano Studies, Black Studies, History and Political Science, Behavioral Sciences, and Military Education programs. In addition, the project will consist of an additional parking structure that will provide approximately 400 new parking spaces.

CONSTRUCTION STATUS:

Award Amount:	$49,838,376		Contract Number:	2520
Approved COs:	$76,465	0.15%	Contract Start Date:	November 12, 2010
Revised Contract Amount:	$49,914,841		% Complete:	45
Invoiced To Date:	$19,432,050	38.93%	Contract Duration:	627 days
Balance:	$30,482,791		Original Completion:	July 31, 2012
			Estimated Completion:	August 21, 2012
CORs by Contractor:		0.00%		

PROJECT STATUS/Comments:

Sewer tie in at 16th street

Parking garage concrete pour

Bird's eye view from the CTC building

Summary: Crews are working to install concrete walls and columns on level five of the west side of the classroom building. The deck formwork below level five is being removed, and reshoring is being placed subsequently. Exterior curb is being installed on the west sid of the classroom building on the third level. Installation of perimeter guardrail protection is also ongoing at the third level. We poured tier 2, west side, of the parking structure on Wednesday, and preparations are being made to stress the post tensioning cables this Saturday. Framing subcontractor has mobilized and has begun laying out metal stud walls. Plumbers have installed the grease interceptor along 16th street, and our utility subcontractor is back onsite tying into that system. Throughout the classroom building, we have concrete pitchers filling in tie holes from the formwork.

Look-ahead: Next week, level 5, west side will continue with walls and columns installation. On the east side of the classroom building, level four, walls and columns will be ongoing, with preparations being made for installation of the roof deck shoring. In the parking garage, we will be removing formwork from the previously poured deck and moving it over for the tier 3, east side deck. Electricians and plumbers will continue with hanger installation, and sleeve installation in conjunction with the reinforcement steel installation. Layout of walls will be ongoing at level 2.

Change Orders: Last change order received was Change Order #15

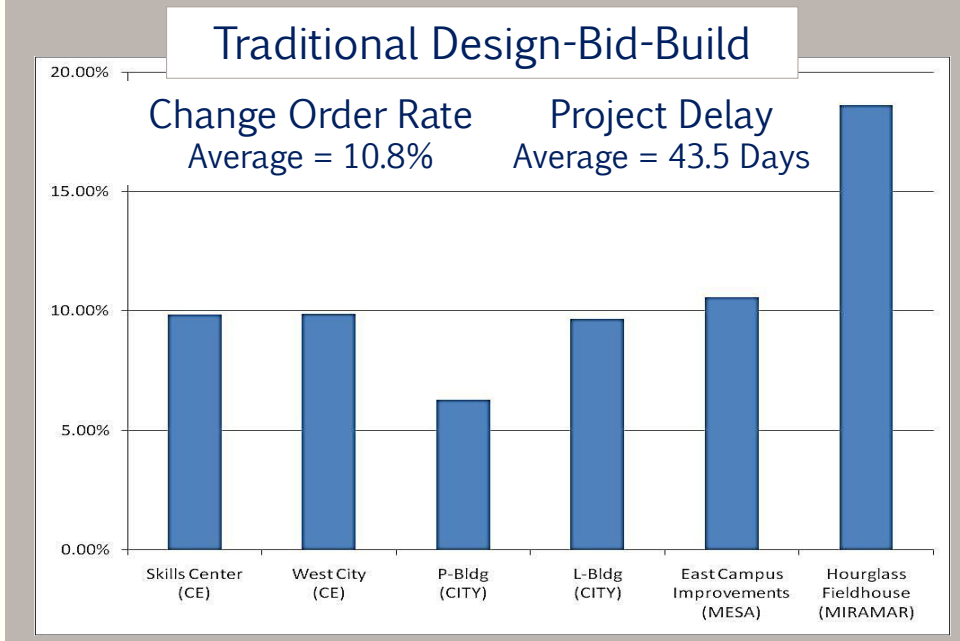
All pending change orders have been responded to by the District at this time. The question regarding markup calculation has been answered. We will provide an additional spreadsheet of calculations to supplement Exhibit B.

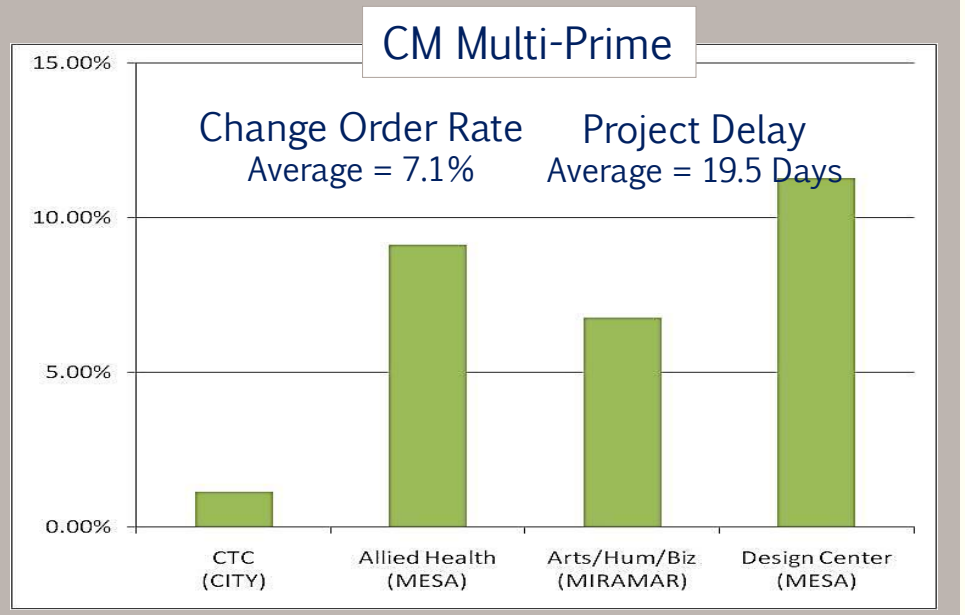
Schedule: The current contract completion date is 7/31/2012. We are approximately one week behind schedule on the classroom building, and three weeks behind on the parking structure. Sundt will continue to work selected overtime to make up as much time as possible.

Is Critical Path Method Scheduling Obsolete?

San Diego Community College District

Schedule Performance – Pre-Lean





Schedule Performance

- SDCCD Experience:
  34 Major Projects with CPM Scheduling
  4 (**12**%) finished on time

Last Planner® System Principles

1. All plans are forecasts and all forecasts are wrong. The longer the forecast the more wrong it is. The more detailed the forecast, the more wrong it is.
2. Plan in greater detail as you get closer to doing the work.
3. Produce plans collaboratively with those who will do the work.
4. Reveal and remove constraints on planned tasks as a team.
5. Make reliable promises.
6. Learn from breakdowns.

Pull Planning Design Phase

San Diego Community College District

Pull Planning Workshop

A PROJECT CASE STUDY WITH LAST PLANNER®

Project Background

- $78M Construction Budget (and growing)
- Being delivered via Construction Manager Multiple Prime (20+ trade contractors)
- Original Schedule Construction Duration – 24 months
- Current status – Construction complete; 19 months late
- Pre-cast and Cast-in-Place Elements

9/14/11

- Pull planning coach's first session
- CM had used "pull planning" at beginning of project
  - A P6 consultant led the sessions
  - Wrote activities on stickies
  - No predecessor or constraints
  - Not used after the initial 2 sessions
- Created a P6 schedule and handed it out.
- Now very far behind.

12/8/11

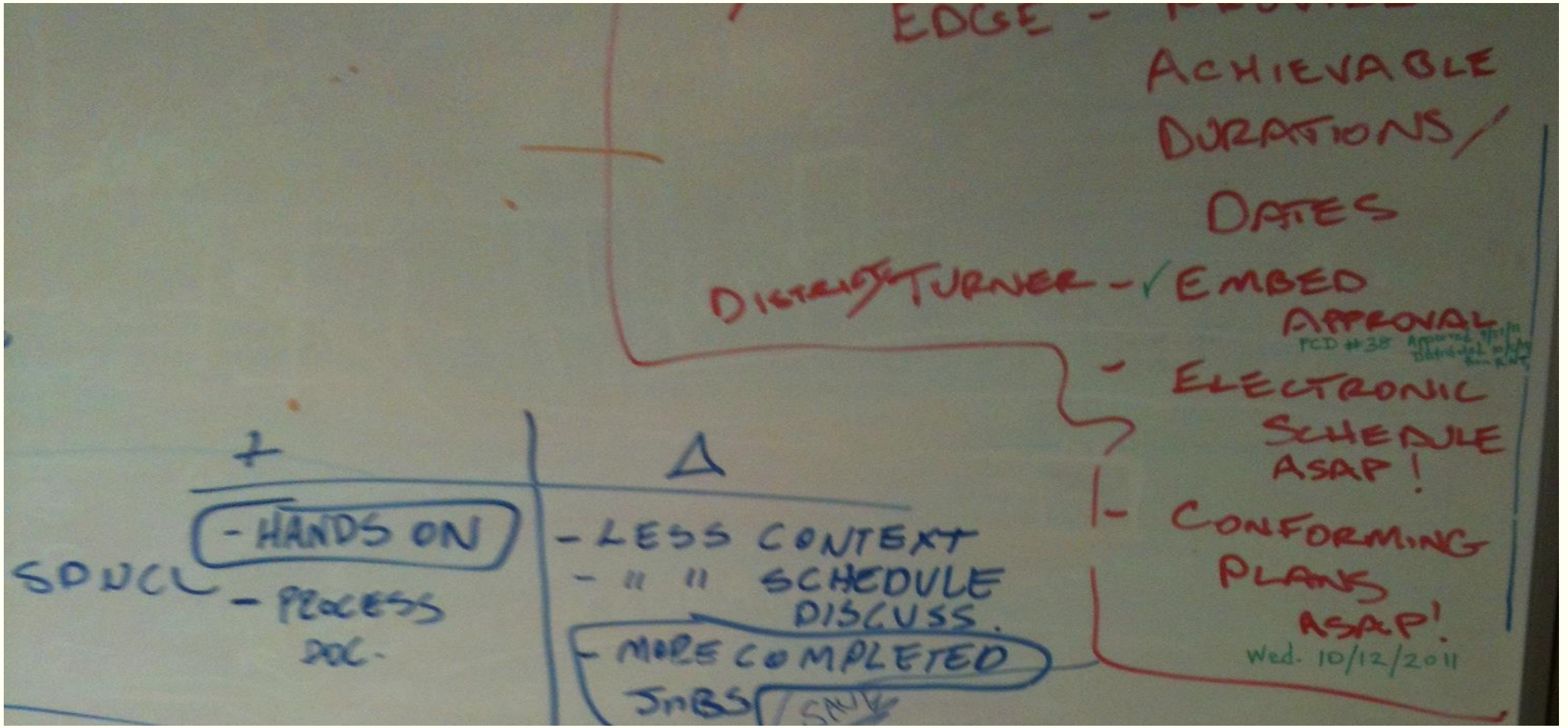
- PPC of 79%. However a pour had been missed.
- VARIANCE reason was Concrete Prime asked a Hot RFI a couple of days before pour 2B and even though there was a same day response by the designer the changes needed in the forms delayed the pour (which will now ripple through the WWP).
- Concrete Prime says the reason they sent the RFI late was they didn't notice the need for clarification.
- The mitigation measure per Concrete Prime is that they will more carefully think through the plans earlier and try to catch these things sooner using the 6 week look-ahead feature of the WWP.
- This lesson was discussed for all to learn.

Weekly Work Planning

1/4/12

- Lessons reinforced/clarified:
- Commitments can be re-negotiated but with whole group's awareness/agreement and must be reflected in the tags on the board (in front of the whole group) or it's a miss.
- PPC sweet spot is 75-90%. Above 90% the group is not challenging itself enough and you need to see where you can get more efficient and pull out time. You've established a reliable flow.
- We're at 89% today.

Lots of Misses and Lack of Coordination

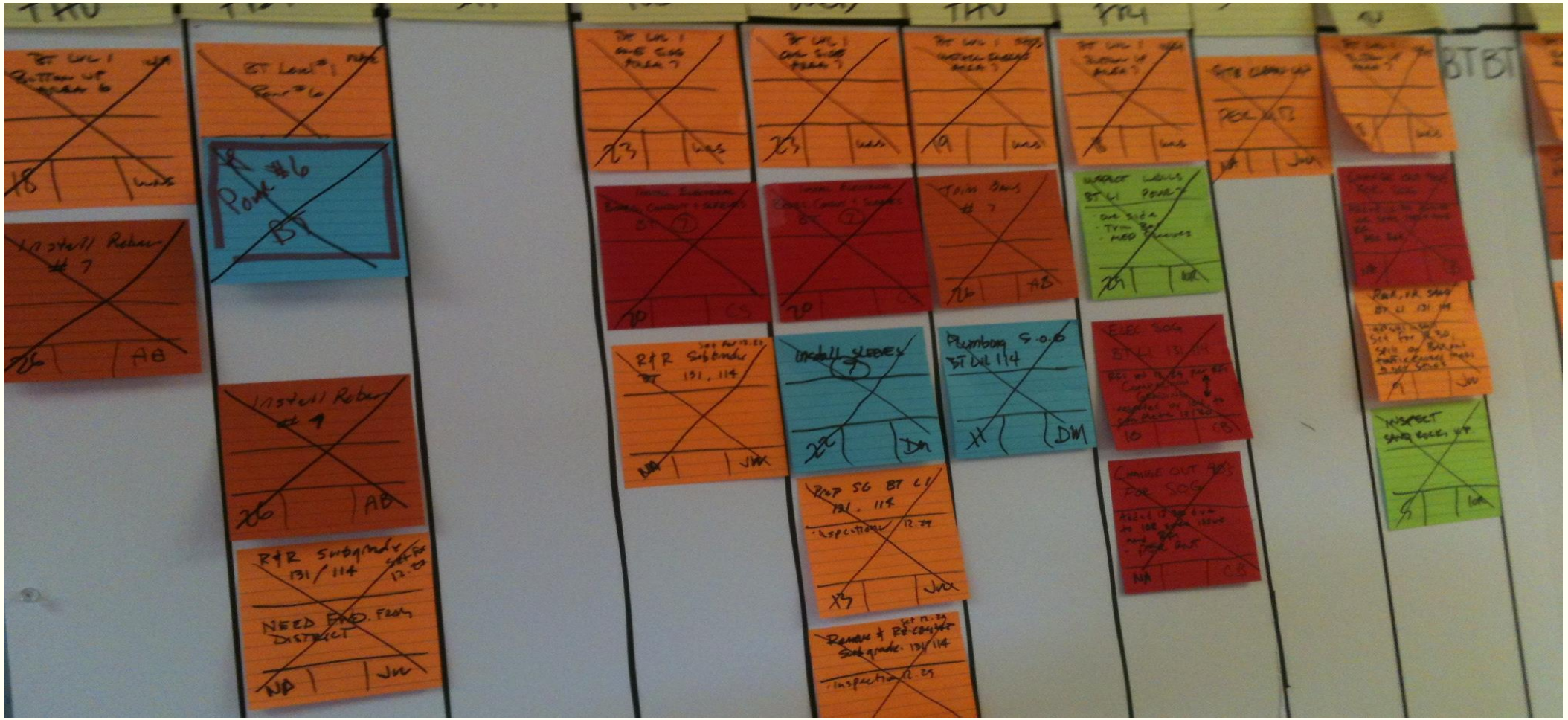


Cramped Space

3/15/12

- Concrete Prime Contractor terminated for default for failure to perform by SDCCD Board
- Surety bond called
- Former Subcontractor engaged as new Prime Contractor

Early WWP


THU
FRI
BT BT
Point #6
BT
Install Rebar
#7
AB
R&R Subgrade
131, 114
NEED END. FROM DISTRICT
NA
JW
Install SLEEVES
Plumbing S.O.G
BT LVL 114
DM
Rep SG BT LVL 114
Inspection
JW
Remove & Re-Compact Subgrade 131/114
Inspection
ELEC SOG
BT LVL 131
CS
INSPECT SLAB EDGE, BT

San Diego Community College District

Pull Planning in Action

November 2012

- CM contract expires
  - not renewed by District
- New CM selected 11/1/12
  - 11/6/12 new CM starts mobilizing
  - 11/19/12 Completely mobilized
  - 11/16/12 prior CM starts demobilizing
  - Final demob 11/30/12
- Existing P6 schedule predicts 11/30/13 completion

January 2013

- After weeks of analysis new CM's Supt declares the P6 projected 11/30/13 completion is not possible
  - Abandons P6 entirely – logic too flawed
- Coaching Supt and PE on how to facilitate the WWP sessions
- Supt's analysis moved to Excel
  - P6 and WWP info merged for comparison
  - Striving to get his head around the details

1/28/13

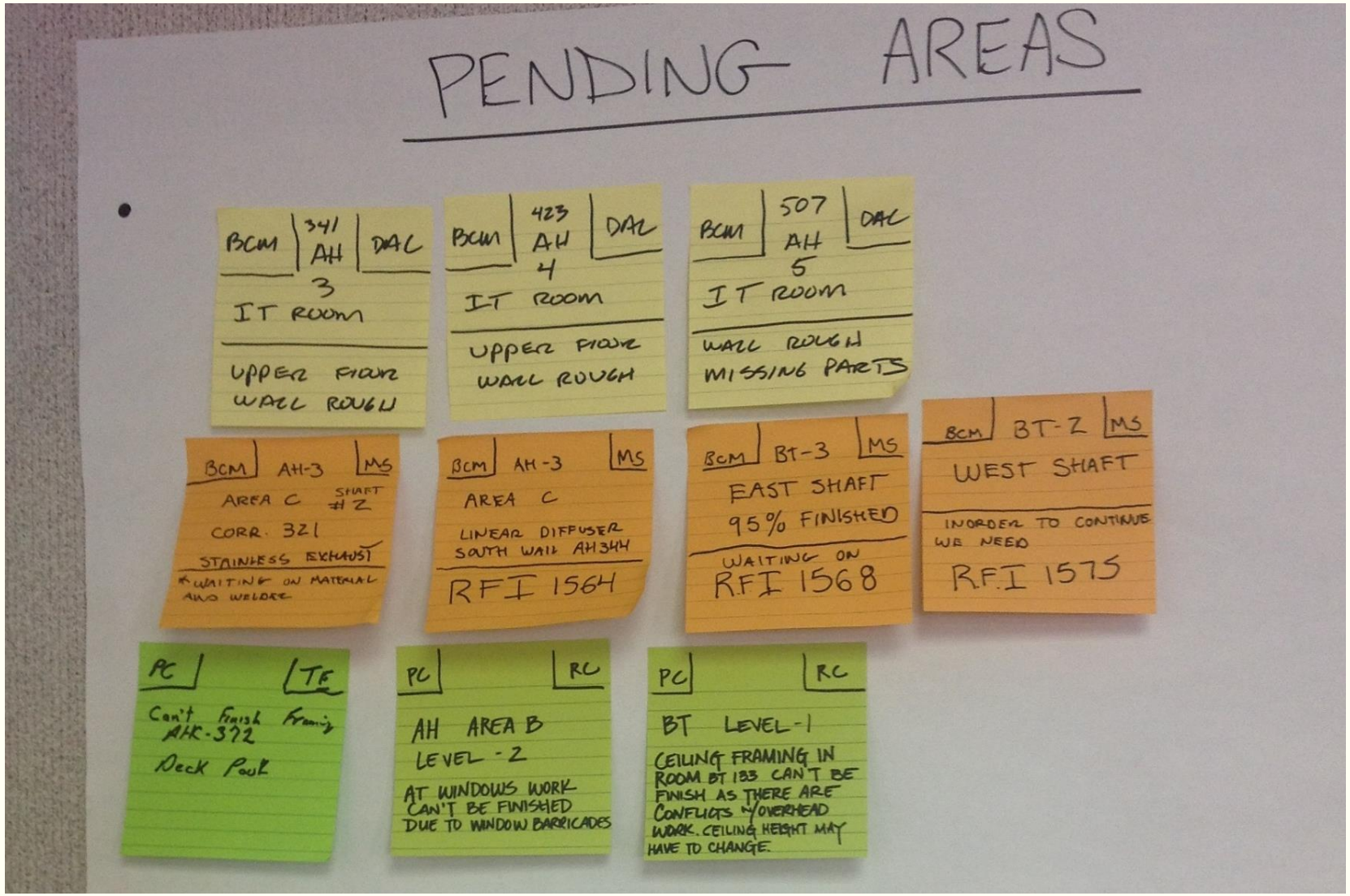

USS
Hang T-Bar
Grid
Walls Painted
USS
Drop Ceiling
Tiles
All OH Complete
Inspected
Point
Finish
Start
AH-3
Set Finish
Ceiling Heights
& Walls @ AH3
Start
Restroom Finish
Complete
Paint &
Tile
BCM
Under Floor
H&W Rough
AH 3
START
8
AHE
L3
Restroom Finish
Complete
Paint &
Tile
AHE
L4
Restroom Finish
Complete
Paint &
Tile
AHE L3-W
Install Fixtures
END
AHE L3-E
Install Fixtures
END
AHE L4
Install Fixtures
START
AH4
Set Finish
Ceiling Heights
& Walls @ AH4
Start
USS
Drop Ceiling
Tiles
All OH Complete
Inspected
Fire Finish
Work Complete
All Life Safety Systems
Complete (Tile Cleared)
AHE
L2
Restroom Finish
Complete
Paint &
Tile
AHE
Underfloor
Complete
Floor Layout
6
BCM
Under Floor
H&W Rough
AH-3
START
4
AH-3
Set Finish
Ceiling Heights
& Walls @ AH3
Start
USS
Hang T-Bar
Grid
Walls Painted
AHE L3-W
Install Fixtures
START
AHE L3-E
Install Fixtures
END
AHE L4
Install Fixtures
START
AH4
Set Finish
Ceiling Heights
& Walls @ AH4
Start
USS
Drop Ceiling
Tiles
All OH Complete
Inspected
8
AHE
L3
Restroom Finish
Complete
Paint &
Tile
BCM
Under Floor
H&W Rough
AH 3
START
8
AHE L3-E
Install Fixtures
END
Fire Finish
Work Complete
All Life Safety Systems
Complete (Tile Cleared)
AHE L3-W
Underfloor
Electrical
START
6
USS
Drop Ceiling
Tiles
Fire Finish
Work Complete

Pull Planning – 6 Week Look-Ahead

5/21/13

- Coaching emergency
  - 6:30 am call for 8:00 meeting
- District again concerned team won't meet 12/31/13 target date
- Last Planners: What's Working? Not Working?
  - Missing tags (85% of tags not using predecessors/constraints)
  - Milestones not on WWP so not goal-directed
  - Getting stuck on sequences and too many loose ends

Moved WWP to each Floor



Current Status

- Original Contract Completion Date: February 2013
- Structural Substantial Completion: September 2013
- Substantial Completion of Buildings: April 2014
- Substantial Completion of Site Work: August 2014 (19 months late)

Team Comments on Benefits of Pull Planning

- “Pull planning exposed the weakness of the early prime concrete contractor.”
- Pull planning is here to stay.
- Had to figure out constraint tags.
  - We could count on each other to put a final decision to bed.
  - The people to make these decisions were sitting in the room.
- Accountability to go to the meetings.
- “This makes so much more sense.”
- Visually, it’s easier to understand.
- Takes more time, but we got more efficient.
- The approach of “Just finish an area on the board” was a good idea.
- This process helped build trust.

Team “Delta” Comments

- “There was a lack of coordination with the primes.
- They hadn’t done pull planning before.
- There was no thorough follow-up to prevent schedule slippage.
- No consequence when primes missed promised dates.
- No accountability ceated a lax attitude toward pull planning process.
- Early CM should have asked: “How can we pick dates up?” Not just let dates slide.
- Early CM did not consistently require identification of predecessors and constraints.

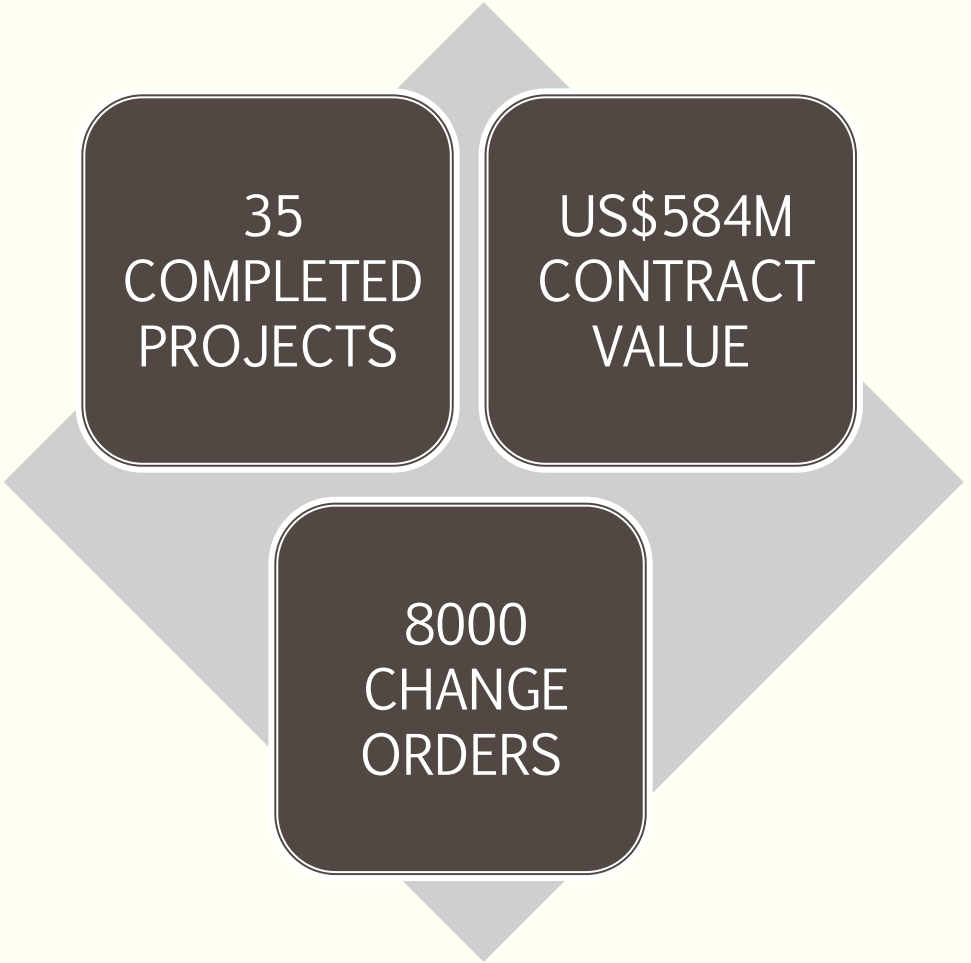
METRICS DISCUSSION

Wouldn't It Be Nice If You Could...

- Average Savings of $900,000 on each of 15 projects
- Reduce Average Schedule Delay by 56 days
- Enhance Sustainability Objectives by 44%
- Reduce Facilities Maintenance Costs by 53%

The Compelling Need for A Different Model

By the Numbers – The Database



Selected Metrics

Metric	Definition of Metric	Lean Principle(s) Evaluated
Total Project Change Order Rates	% of change order costs of total project construction costs	Waste reduction
Change Orders caused by errors and omissions (as % of project construction costs)	% of change order costs due to errors and omissions of total project construction costs	Waste reduction, collaboration
Project Schedule Performance	Number and % of projects meeting the original contract completion date	Waste reduction, flow, enhanced communication and collaboration

Selected Metrics

Metric	Definition of Metric	Lean Principle(s) Evaluated
Project Target Value Design	Number and % of projects meeting the published target budget	Value generation, waste reduction
Sustainability Value Generation	Number and % of projects that exceeded LEED Silver certification	Owner-defined value generation
Annual Maintenance Costs	Annual total maintenance costs divided by the square footage in the portfolio	Waste reduction, process improvement; value generation

Methodology

- Review of nearly 8000 change orders for 2008 – January 31, 2014
- Evaluated 35 completed projects (20 without BIM and lean; 15 with BIM and lean)
- Construction value of these projects: $584,731,760
- 11 projects using target costing; 6 have reached GMP

Change Order Rates with/without BIM and Lean

	Number of Projects (n)	Total CO Rate (%)	Errors & Omissions CO Rate (%)	Ratio of Errors & Omissions Rate/Total CO Rate
Without BIM or Lean	20	7.73	2.99	0.33
With BIM and Lean	15	4.43	1.88	0.36

Change Order Analysis

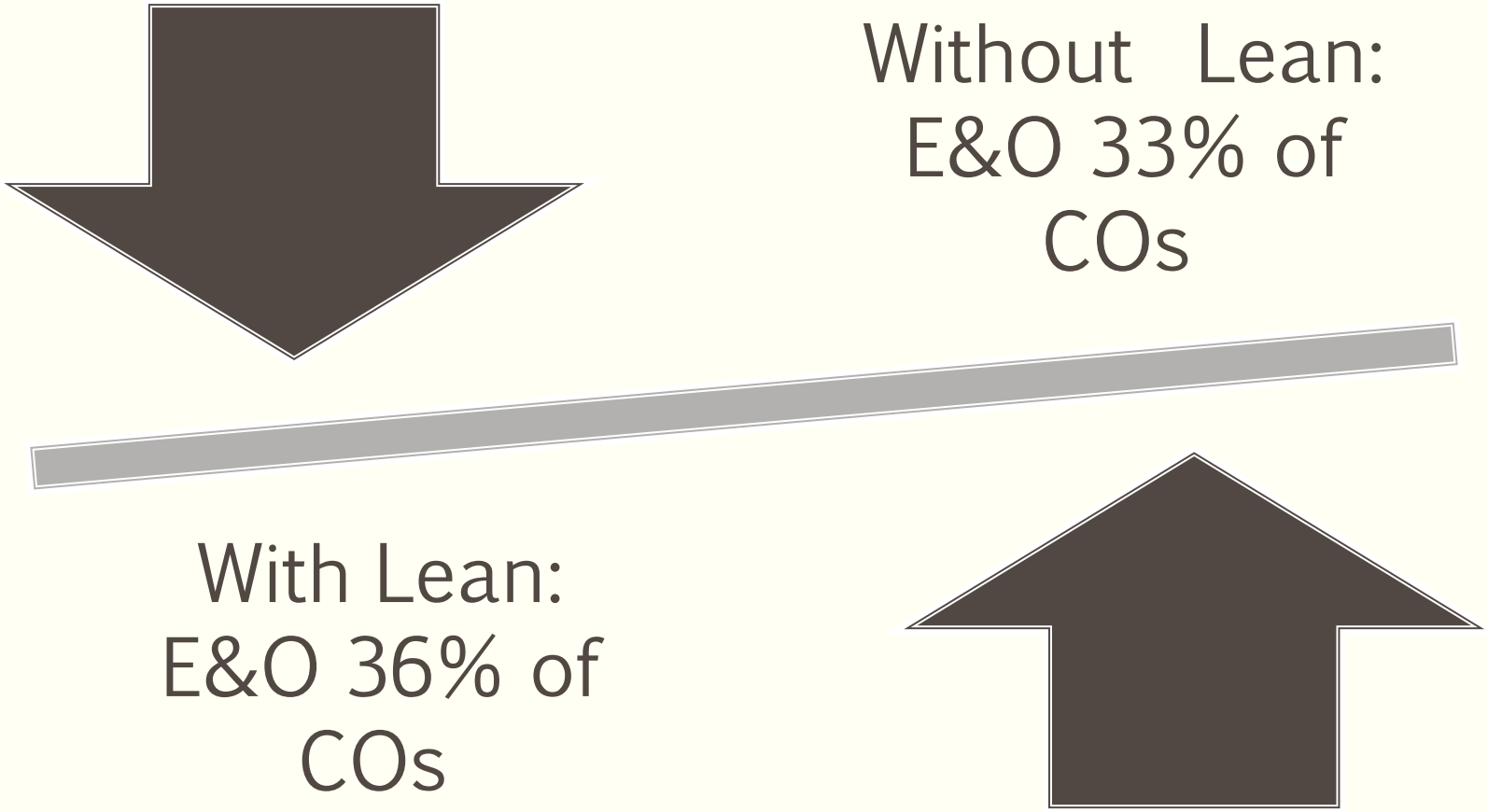
Pre-Lean

- 7.73% Total COs
- 2.99% E&O COs

Post-Lean

- 4.43% Total COs
- 1.88% E&O COs

Interesting Finding



Change Order Rates – New Construction vs. Renovation

	Number of Projects (n)	Total CO Rate	Errors & Omissions CO Rate	Ratio of Errors & Omissions Rate /Total CO Rate
New Construction				
Without BIM or Lean	13	7.54%	3.04%	0.305
With BIM and Lean	13	4.38%	1.90%	0.355
Renovation				
Without BIM and Lean	7	8.00%	2.90%	0.367
With BIM and Lean	2	4.80%	1.79%	0.388

Who is on Time?

Pre-Lean

- 1/19 (5%)

Post-Lean

- 3/15 (20%)

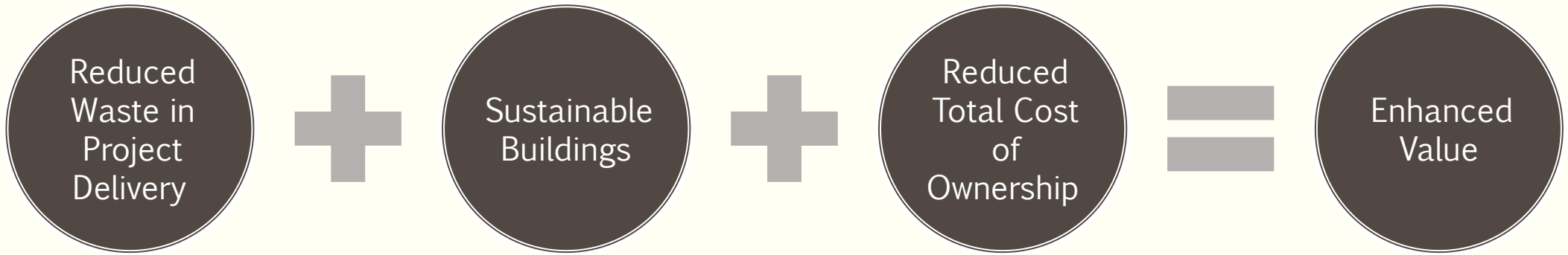
San Diego CCD Schedule Impacts – Lean (with BIM) vs. No Lean or BIM (20 projects)

Average Delay (All Contract Types)

Lean w/ BIM: 25 days (n=8)

Pre-Lean w/o BIM: 80 days (n=12)

Public Owner Benefits



Target Value Design

- Six projects evaluated
- Range of GMP: $4,707,408 to $50,423,353
- Average: $21,768,648
- 5/6 (83%) met target budget
- Averaged 7% under targer budget

Target Value Design – Root Cause Analysis

- Lack of contemporaneous estimating and exclusion of specialty trades from early participation in project resulted in project exceeding target budget
- Counter measure: All subsequent projects required presentation of budget first

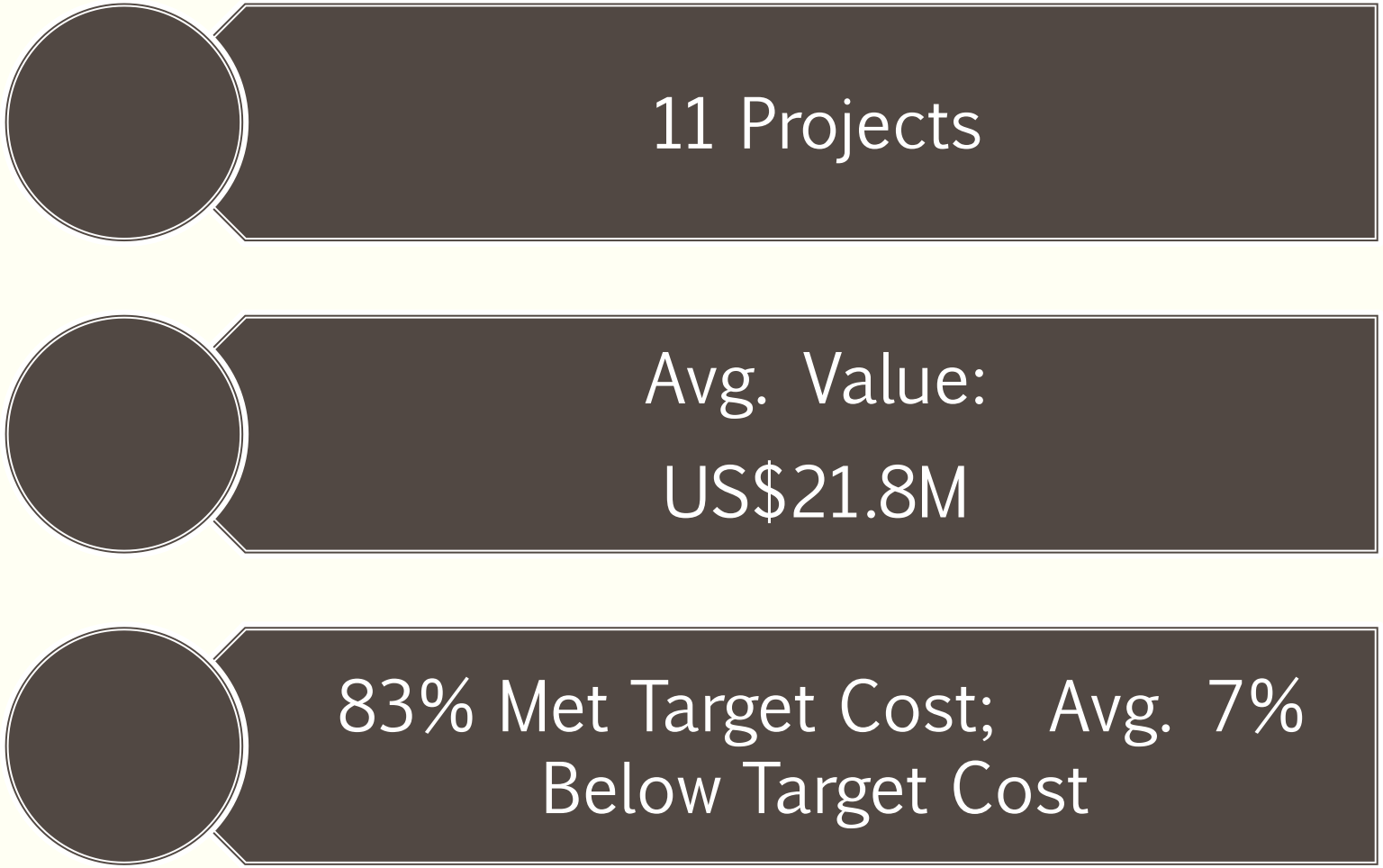
SDCCD Values

- Enhance the student experience
- Flexibility in design to accommodate future changes in pedagogy
- Lower total cost of ownership
- Highly energy efficient buildings
- Reduce maintenance and operations costs
- Meet or exceed sustainability objectives

Potential Sustainability Features

- Higher building energy efficiency
- Extensive use of daylighting
- Use of natural ventilation tied to EMS
- Reduced water consumption
- Use of reclaimed water for irrigation, flushing
- Solid flooring without need for stripping and waxing

Target Costing



Sustainability as a Core Value
LEED Gold Projects

20%	Direct Contract with Architect
26%	Post-Lean
44%	Target Value Design

Value Generation – LEED Certification Level

	Number of Projects	Number of Projects Exceeding LEED Silver Goal	% of Projects Exceeding LEED Silver Goal
Without BIM or Lean	9	5	55
With BIM and Lean	25	10	40
Direct Contracts with Architect	22	11	50
Target value design with Design-Builder	12	4	33

Value Generation – LEED Certification Level

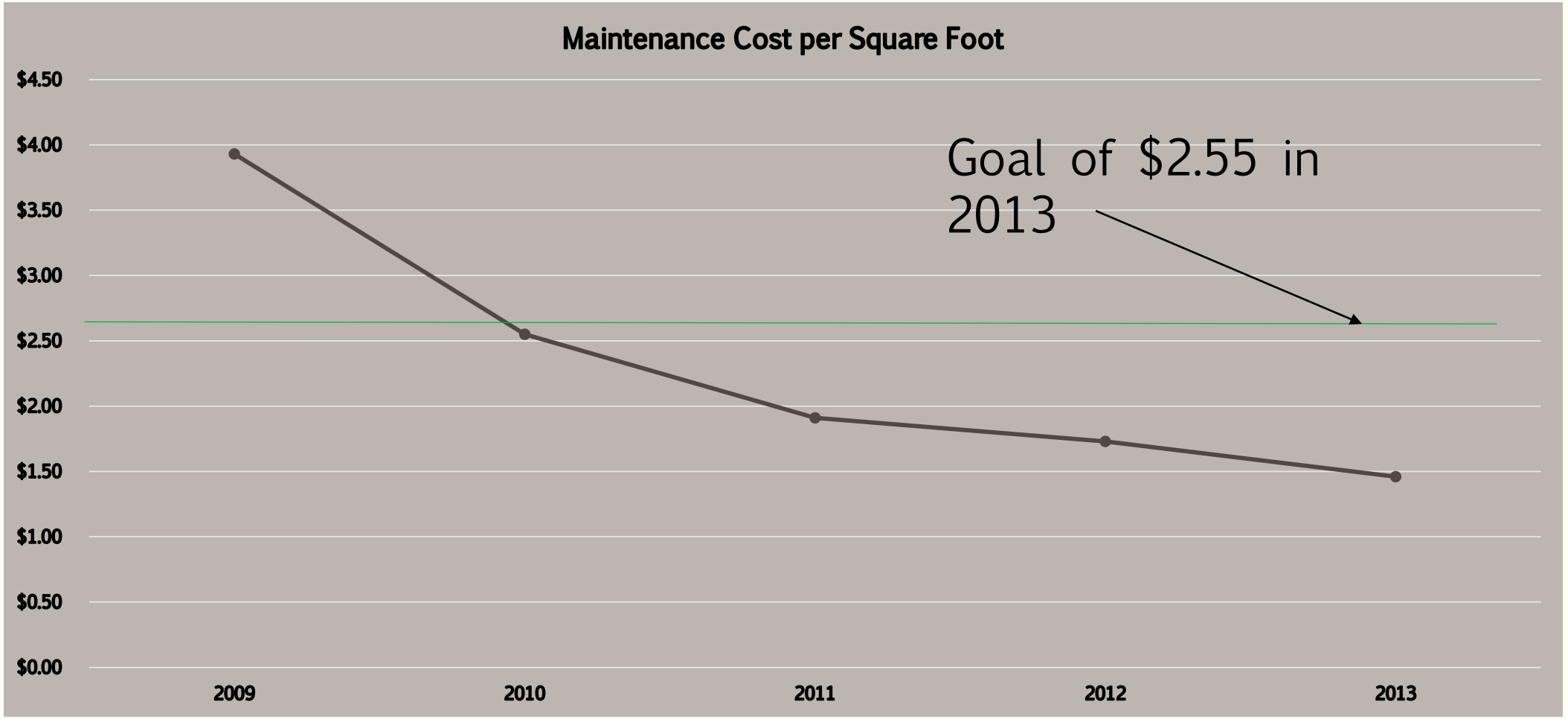
	Number of Projects (LEED v2)	Number of Projects (LEED v3)	Number of Projects Exceeding LEED Silver Goal (LEED v2)	Number of Projects Exceeding LEED Silver Goal (LEED v3)	% of Projects Exceeding LEED Silver Goal (LEED v2)	% of Projects Exceeding LEED Silver Goal (LEED v3)
Without BIM or Lean	9	0	5	NA	56%	NA
With BIM and Lean	14	14	4	4	29%	29%
Direct Contract with Architect	21	5	9	1	42%	20%
Target value design with design-builder	1	9	0	4	0%	44%

San Diego Community College District (SDCCD)

Potential Cumulative Savings - $25,863,512

	FISCAL YEAR								FY 09/10
Custodial	**FY09**	**FY10**	**FY11**	**FY12**	**FY13**	**FY14**	**FY15**	**FY16**	**Avg. Salary**
Custodial Forecast H/C	104	113	132	149	162	173	189	191	**$ 58,643**
Cust Forecast Salary	$ 6,098,855	$ 6,650,098	$ 7,769,004	$ 8,731,333	$ 9,504,832	$ 10,169,255	$ 11,098,158	$ 1,227,172	
Custodial Adj H/C	77	82	88	100	122	130	140	147	**45**
Custodial Adj Budget	$ 4,497,197	$ 4,782,522	$ 5,187,077	$,878,320	$ 7,150,669	$ 7,622,296	$ 8,208,826	$ 8,597,611	
Delta	$ 1,601,658	$,867,576	$ 2,581,927	$ 2,853,013	$,354,162	$ 2,546,959	$,889,331	$ 2,629,561	**$ 19,324,187**
				Hold HC Flat until projection exceeds current HC					**$ 13,273,027**
Maintenance									
Maint Forecast H/C	45	50	57	64	69	73	79	80	**$ 76,457**
Maint Forecast Salary	$ 3,440,546	$ 3,793,010	$ 4,344,262	$ 4,857,286	$ 5,245,685	$ 5,579,036	$ 6,044,656	$ 6,108,880	
Maintenance Adj H/C	29	32	37	41	45	47	51	52	**28**
Maint Adj Salary	$ 2,236,355	$ 2,465,457	$ 2,823,770	$ 3,157,236	$ 3,409,695	$ 3,626,373	$ 3,929,027	$ 3,970,772	
Delta	$ 1,204,191	$ 1,327,554	$,520,492	$ 1,700,050	$ 1,835,990	$ 1,952,663	$ 2,115,630	$ 2,138,108	**$ 13,794,676**
				Hold HC Flat until projection exceeds current HC					**$ 12,590,485**

Maintenance Costs (2009-2013)



Value as Reduced Maintenance Costs

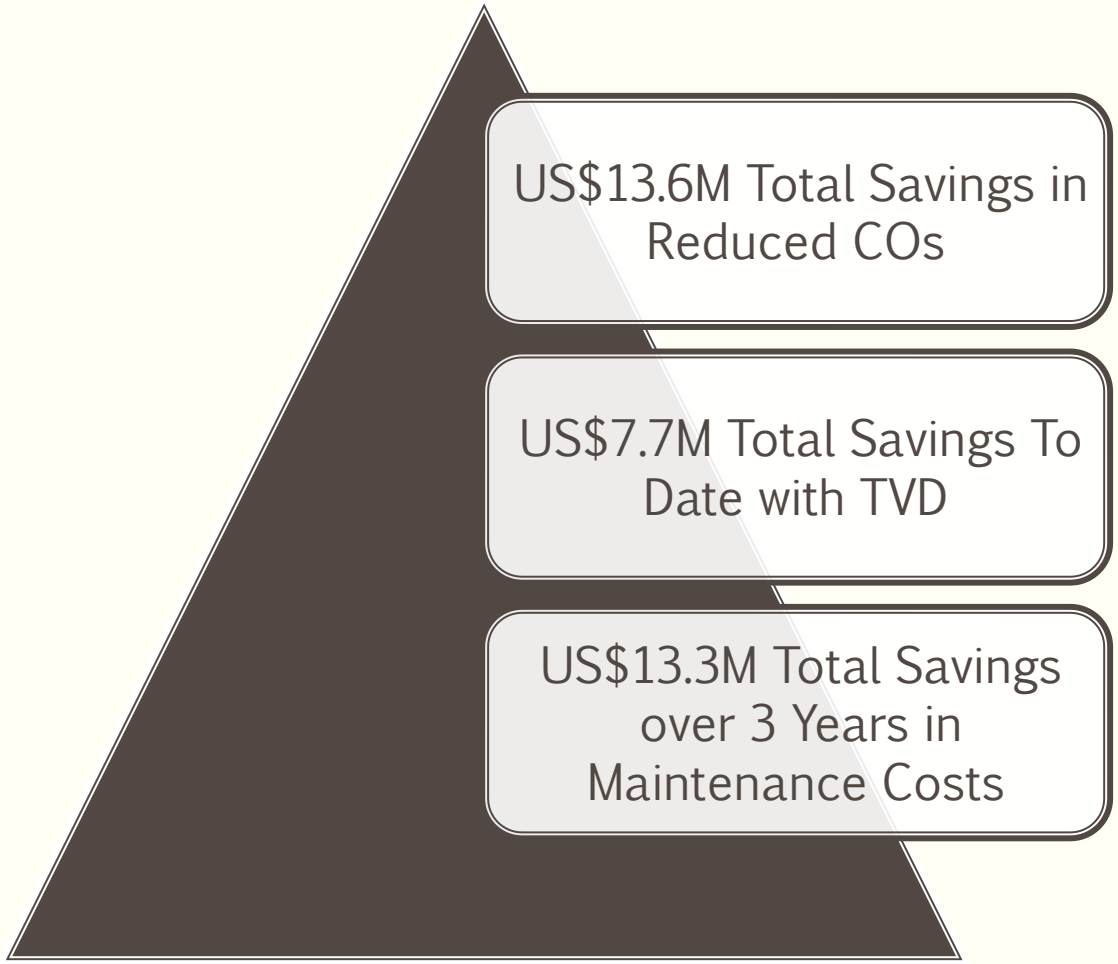
Benefits to SDCCD Using Lean

Benefit	SDCCD Metric	SDCCD Experience
Reduced waste associated with change orders	Total and error & omission change orders as % of total construction cost	Total change orders reduced from 7.73 to 4.46% on average; $13.6M estimated savings; average cost savings of $900,000 per project
Improved schedule performance	% of projects that completed within contractual completion date	Project schedule performance improved using BIM and Lean, but using critical path method scheduling only 20% of projects completed on time; this prompted abandonment of CPM scheduling and requirement to use the Last Planner® System
Meeting programmatic requirements and enhancing value with a constrained budget	# of projects that met target value design budget	Used target value design to enhance value and meet the target budget in 83% of the projects included in this study

Benefits to SDCCD Using Lean

Benefit	SDCCD Metric	SDCCD Experience
Enhanced value generation through more sustainable buildings	# of buildings that exceeded LEED Silver certification	Using BIM and Lean improved this by a factor of 45% and using target value design improved this by a factor of 100% from projects where none of these tools were used.
Enhanced value generation through lower operational and maintenance costs	Maintenance cost per square foot	Major factor in helping reduce annual square footage maintenance costs from $3.73 to $1.46 over a 3-year period

US$34.6 Million of Waste Eliminated



Assessment of Lean Behaviors at SDCCD

	Lean Principles																
SDCCD implemented practices	Value to the Customer	Reduction of Waste	Leadership	Teamwork	Collaboration	Transparency	Trust Building	Leanring	Continuous Improvement	Goal-Driven Behaviors	Systemic Thinking/Behavior	Construction Projects as Production Systems	Use of Pull	Promotion of Flow	Use of Small Batches	Continuously Adjust Planning	Clear Goals & Metrics
Owner Use of Lean Principles	✔			✔	✔		✔	✔	✔	✔	✔			✔	✔	✔	
Staff Training in Lean Behaviors	✔		✔	✔	✔		✔	✔		✔	✔	✔	✔			✔	✔
Required Use of BIM	✔	✔		✔	✔	✔			✔		✔	✔				✔	✔
Design Builder Selection Criteria	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔
Value Defined by Stakeholders	✔		✔	✔		✔			✔	✔	✔						✔
RFPs Request IPD Behaviors	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Reduction in Change Orders		✔										✔		✔	✔		
Reduction in Errors & Omissions	✔	✔				✔			✔		✔	✔		✔		✔	
Last Planner® System Required	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Use of Target Value Design	✔	✔		✔	✔			✔	✔	✔	✔					✔	✔
LEED-certified sustainablility	✔		✔						✔	✔	✔	✔					✔
FM Benchmarking & Goal Setting	✔	✔		✔		✔			✔	✔	✔			✔		✔	✔
Training FM Staff in Lean	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔			✔		✔	✔
Reduction in maintenance costs	✔	✔		✔	✔	✔		✔	✔	✔	✔			✔		✔	✔

Questions?

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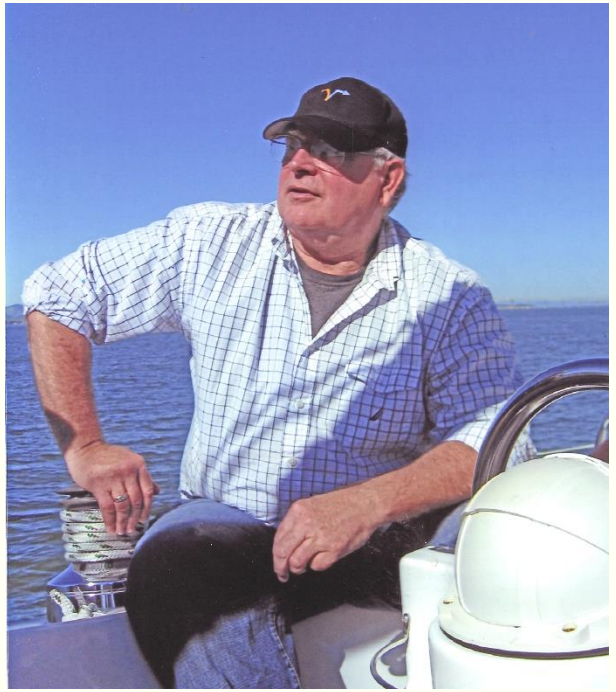

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