

Welcome to the *Climate-Safe Infrastructure* Webinar Series

Supporting AB2800 and the Work of California's Climate-Safe
Infrastructure Working Group

May 15, 2018 | 12-1pm



Hosts



Juliette Finzi Hart | USGS

Co-Facilitator of CSIWG's work

Email: jfinzihart@usgs.gov



Susi Moser | Susanne Moser Research & Consulting

Co-Facilitator of CSIWG's work

Email: promundi@susannemoser.com

AB 2800 (Quirk): Purpose

Examine how to integrate scientific data concerning projected climate change impacts into state infrastructure engineering, including oversight, investment, design, and construction.



AB 2800 (Quirk): Scope of Assessment and Recommendations

The working group shall consider and investigate, at a minimum, the following issues:

- (1) **informational and institutional barriers** to integrating climate change into infrastructure design.
- (2) **critical information needs** of engineers.
- (3) **selection of appropriate engineering designs** for different climate scenarios.



The *Climate-Safe Infrastructure* Webinar Series

Purpose

- Hear from others elsewhere with relevant experience and expertise.
- Hear from CSIWG members.
- Educate and engage with interested stakeholders on climate change and infrastructure issues.

Sample of Webinar Topics

- What climate science can offer
- Various sectoral perspectives
- Processes of changing engineering standards and guidelines
- Holistic infrastructure planning and management
- Financing climate-safe infrastructure
- And others...

INFRASTRUCTURE WEEK

14-21 May 2018



**AGU
100**
ADVANCING EARTH
AND SPACE SCIENCE

THE BRIDGE

CONNECTING SCIENCE AND POLICY



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[GUIDELINES](#)

MAY 14, 2018

Infrastructure Helps Us, But Who's Helping Infrastructure?

Posted by [Annika Deurlington](#)

A Couple of Housekeeping Items



- Please type your questions for presenters into the chat box
- We will try to answer as many as possible after the presentations
- Answers to remaining questions will be posted on the website

Building the Future: Challenges & Opportunities in the Building Sector



Chester Widom
CSIWG Member
California State Architect
CA Dept. General Services



Jennifer Goldsmith-Grinspoon
Physical Scientist
Building Science Branch
Risk Management Directorate of FEMA



Leslie Chapman-Henderson
President and CEO
Federal Alliance for Safe Homes
FLASH



CHESTER A. WIDOM, FAIA

STATE ARCHITECT

Climate Safe Infrastructure Working Group Webinar
April 15, 2018

DESIGN AND CONSTRUCTION OVERSIGHT:

STRUCTURAL, FIRE & LIFE SAFETY, ACCESS

- 72 Community College Districts
 - 114 Campuses
 - 204 Projects (2016 – 2017)
- 1,084 K–12 School Districts
 - 9,292 Campuses
 - 2,876 Projects (2016 – 2017)
- Essential Service Buildings
 - 7 Projects (2016 – 2017)

Incremental projects not included

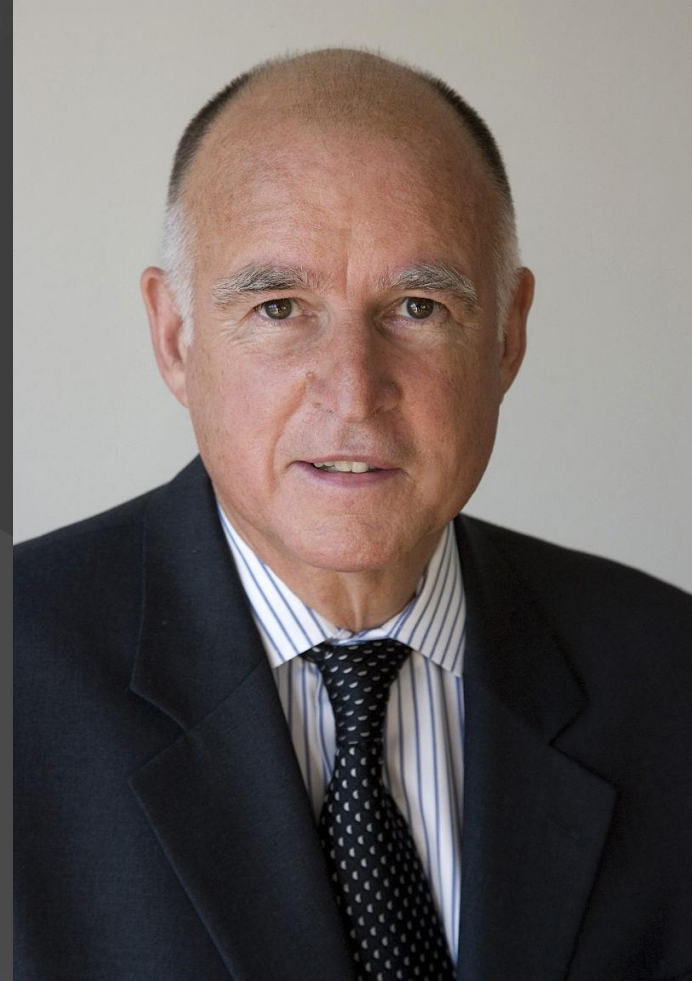


K-12/COMMUNITY COLLEGES: CONSTRUCTION COST

- ⦿ 2011 – 12 Through 2015 – 16: \$4.2 B to \$6.2 B
- ⦿ 2016 – 17: \$6.7 B
- ⦿ 2017 – 18 (Estimated) \$8.5 B
- ⦿ December 2017 – April 2018
(Average / Month): \$1.0 B

GOVERNOR BROWN ON CALIFORNIA GOING GREEN

In his 2015 inaugural address, the Governor announced his goal to double the efficiency of existing buildings by 2030.







ES
N

POTENTIAL STATEWIDE ENERGY SAVINGS FOR SCHOOLS

10,000 Campuses x 5 Buildings/Campus

50,000 Buildings

\$3k Per Bldg. / Year

x 10 Years

\$1.5 BILLION

7x7x7 | **DESIGN ENERGY WATER**
7 ARCHITECTS 7 SCHOOLS 7 INNOVATIONS



<http://7x7x7designenergywater.com>

CHANGING THE CONVERSATION

◎ Impact of Design

- Education
- Energy & Water Conservation

◎ Reaching Zero Net Energy

- Is it possible?
- At what cost?

◎ Cost vs. Investment

- Some benefits are hard to calculate/quantify
- Must protect investment (**Resiliency**)


7x7x7 FIRMS


- ◎ WRNS Studio
- ◎ Hamilton+Aitken
- ◎ HGA
- ◎ DLR Group
- ◎ Ehrlich Architects
- ◎ Lionakis
- ◎ Aedis Architects

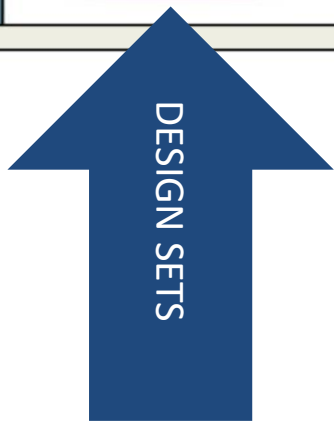


Process – Set logs

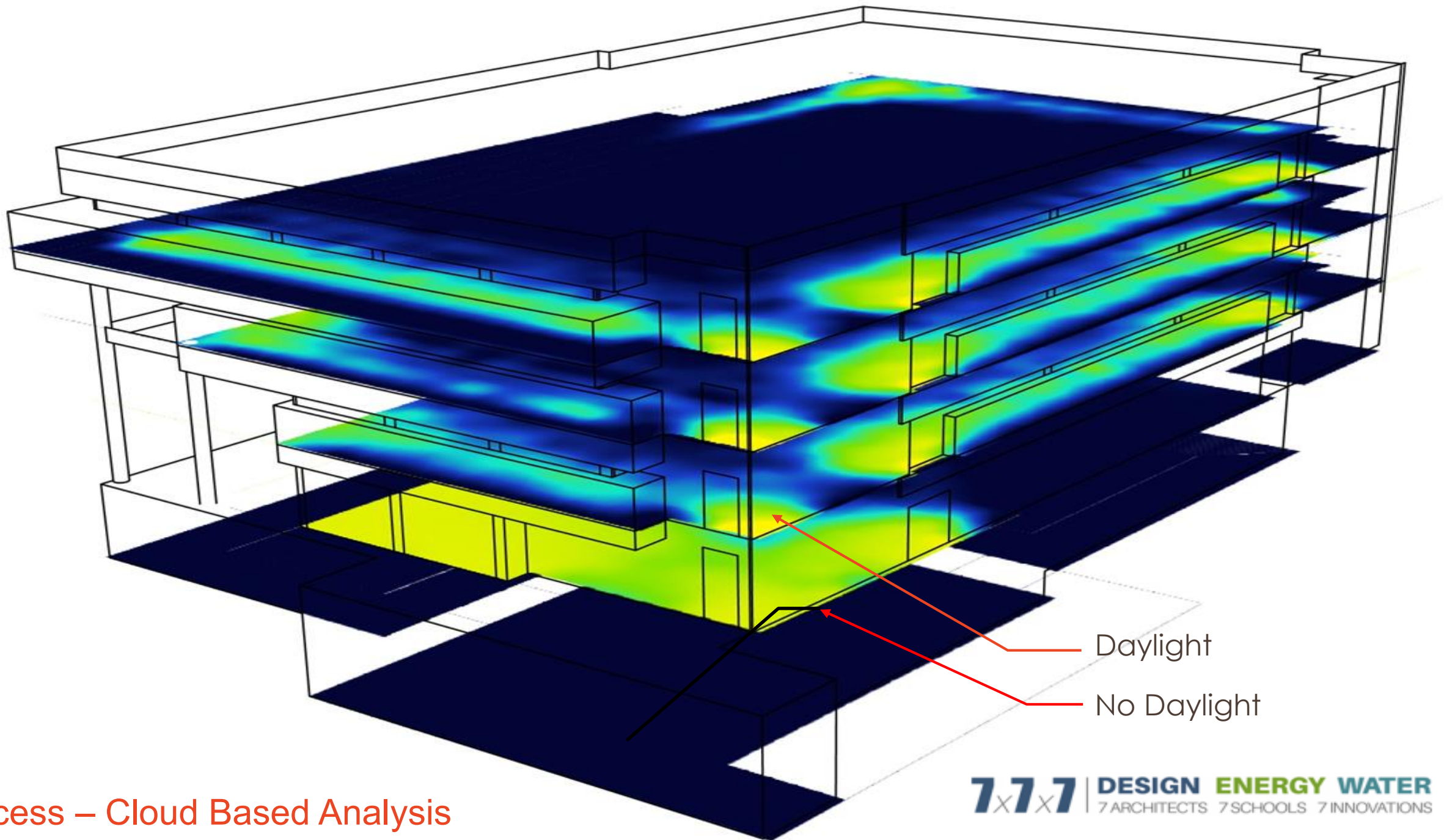
DESIGN SETS		CRITERIA																			
		OVERALL					HUMAN EXPERIENCE				PHASING				COST						
ID	Description	HITORIC INTEGRITY	REPRESENTATIVE	STATE-OF-THE-ART LEARNING ENVIRONMENT	PROGRAM EFFICIENCY	SPATIAL QUALITY	MAXIMIZE INTERACTION & COLLABORATION	FLEXIBLE LEARNING ENVIRONMENT	NATURAL DAYLIGHT & VENTILATION	HUMAN COMFORT & CONTROL	LEVEL OF DISRUPTION	DURATION OF CONSTRUCTION	STRUCTURAL INTEGRITY	ADA	INFRASTRUCTURE						
1	SET A	MINIMUM	+	-	-	-	-	0	-	-	0	+	0	0	0	0	0	0	++	-	3
2	SET B	OFFICE ON PERIMETER	+	0	0	0	+	0	0	-	0	-	0	+	+	0	-	-	0	0	2
3	SET C	COLLABO INFORMAL GATHERING	+	++	++	++	++	++	+	+											



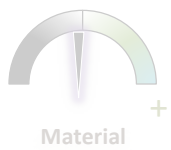
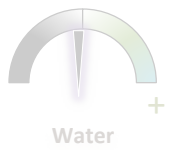
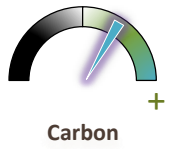
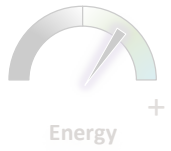
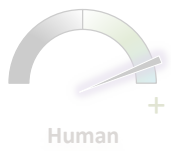




Process – Set log



Process – Cloud Based Analysis

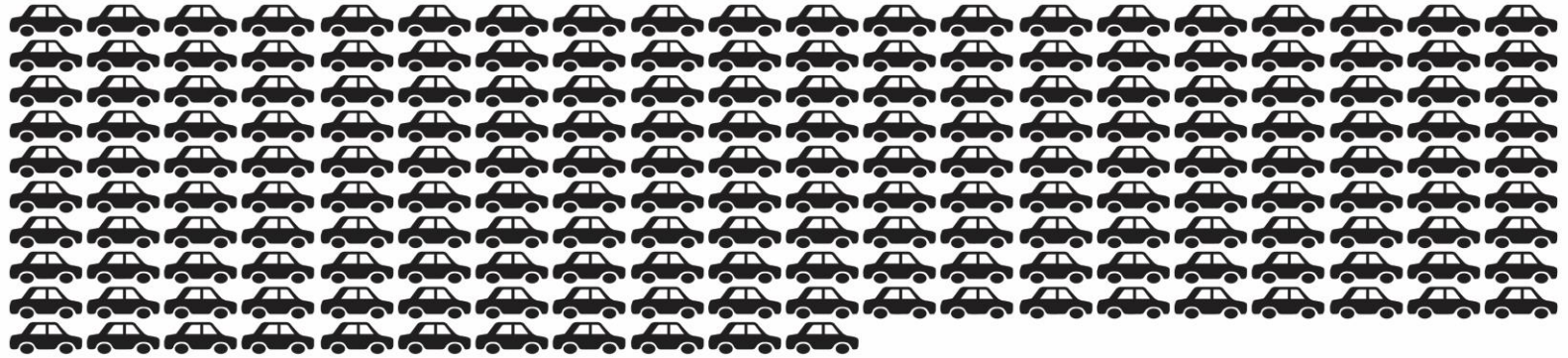


EXISTING



2 MILLION LBS CO2

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191 Passenger Cars

EFFICIENT



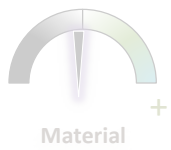
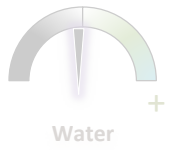
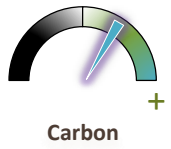
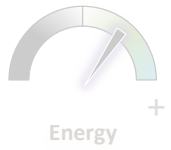
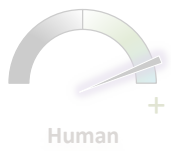
1.2 MIL. LBS CO2

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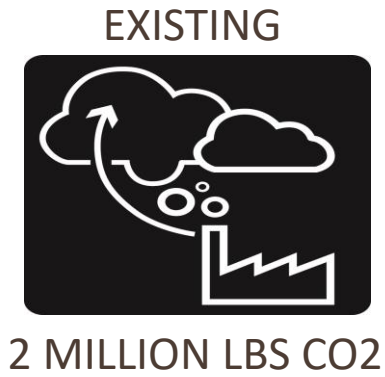


115 Passenger Cars

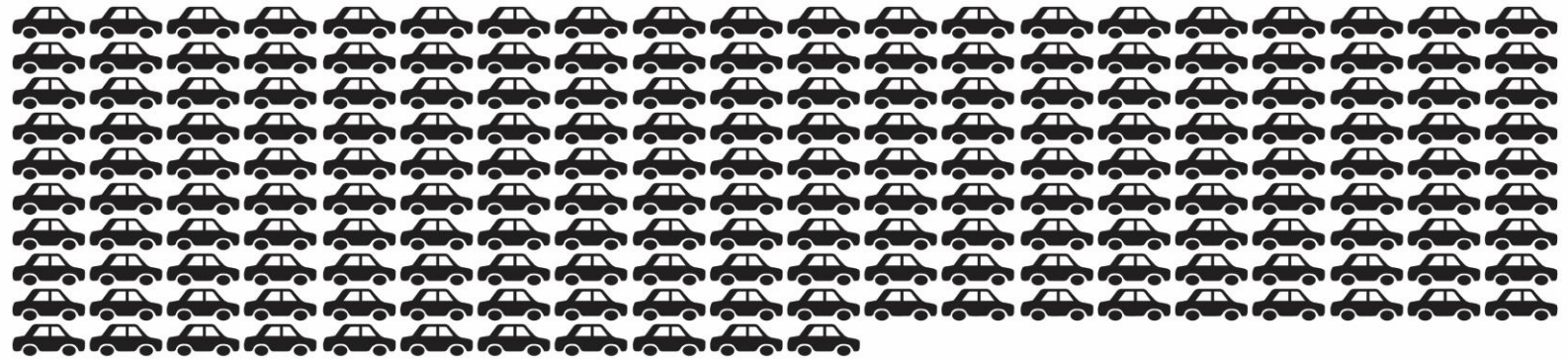
Carbon – Emissions



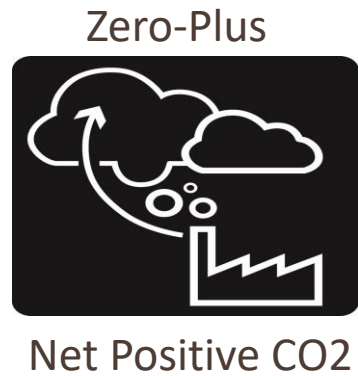
Carbon – Emissions



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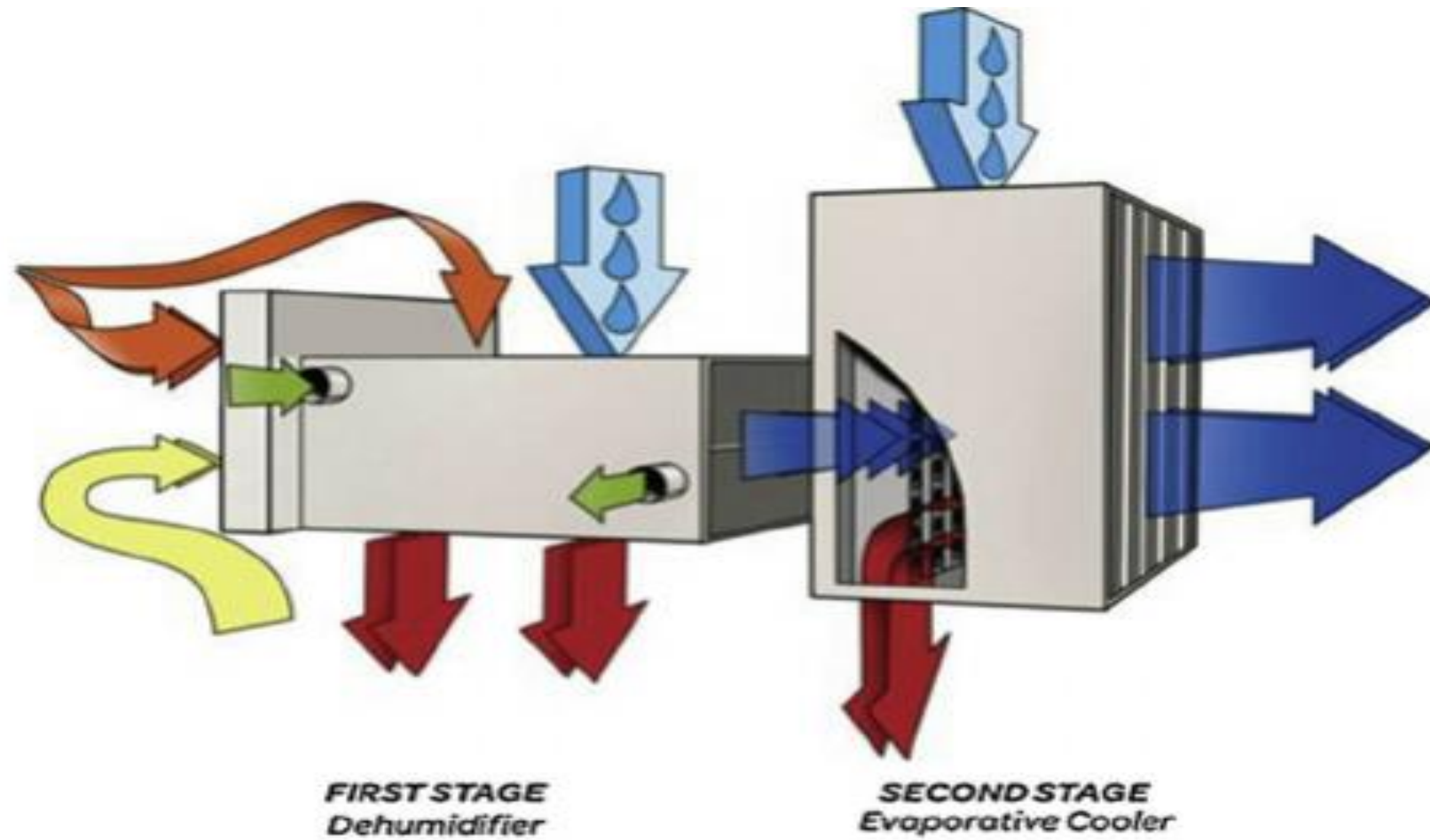
191 Passenger Cars



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200+ Passenger Cars



Water	Liquid desiccant
Outdoor air	Supply air
Return air	Exhausted air

Solar Assisted Desiccant Cooling System

ENGAGE DECISIONMAKERS, ACADEMIA AND THE ARCHITECTURAL COMMUNITY

- ◎ **San Diego:** *The New School of Architecture*
- ◎ **Los Angeles:** *West Los Angeles College*
- ◎ **San Luis Obispo:** *Cal Poly*
- ◎ **Berkeley:** *University of California*
- ◎ **Sacramento:** *The Crest Theatre*

CHANGING THE CONVERSATION

◎ Impact of Design

- Education
- Energy & Water Conservation

◎ Reaching Zero Net Energy

- Is it possible?
- At what cost?

◎ Cost vs. Investment

- Some benefits are hard to calculate/quantify
- Must protect investment (Resiliency)

SCHOOL PROJECT FUNDING:

TIME IS MONEY

- ◎ K-12 Construction Funding
 - State School Facilities Bond
 - Prop 51 (2016) Auth. Remaining: **\$5.8 B**
 - Local School Facilities Bonds
 - 2002 – 2017 Auth. Remaining: **\$39.0 B**
 - **Total Bonds: \$44.8 B**
- ◎ **Current Construction Inflation Rate: 5% to 8.6%**
- ◎ **Escalation at 5% Per Year: \$2.2 B**
- ◎ **Monthly Escalation: \$186.7 M**

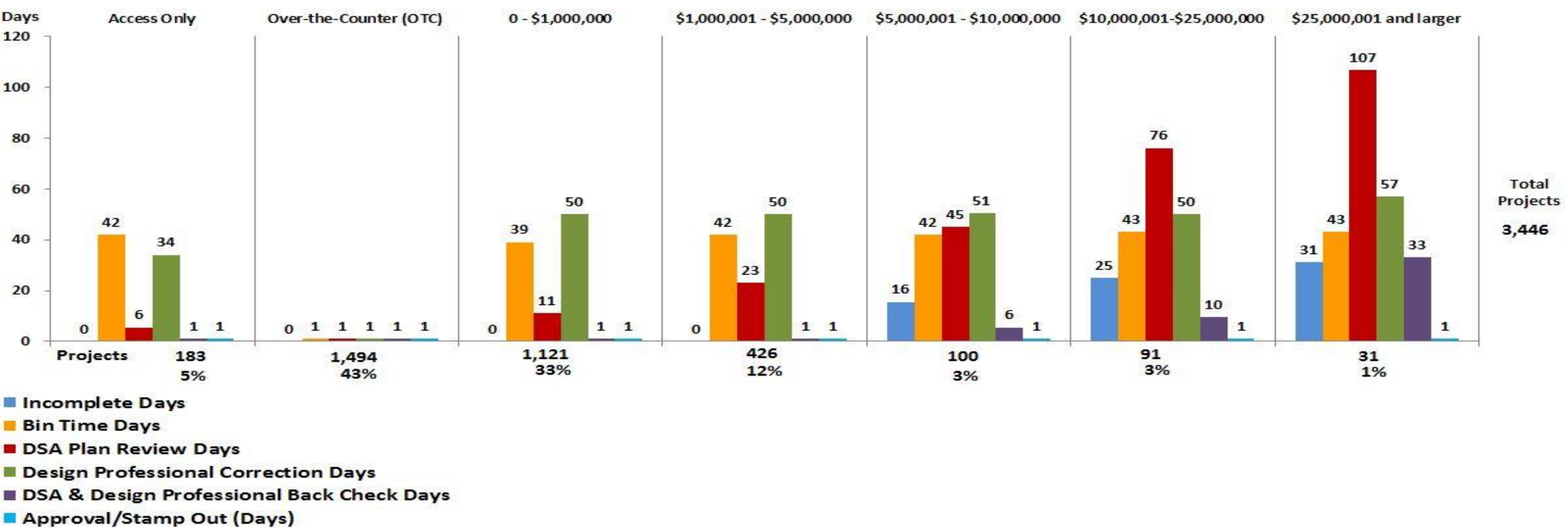
PROJECT DEVELOPMENT TIME REDUCTION

- ◎ Design & Funding
 - > Districts
 - > CDE
 - > OPSC
- ◎ DSA Review
 - > Bin Time
 - > Intake
 - > Plan Review
 - > Back Check
 - > Construction Oversight
- ◎ Construction
 - > Constructor
 - > Design Team
 - > DSA

MEDIAN PROCESSING DAYS

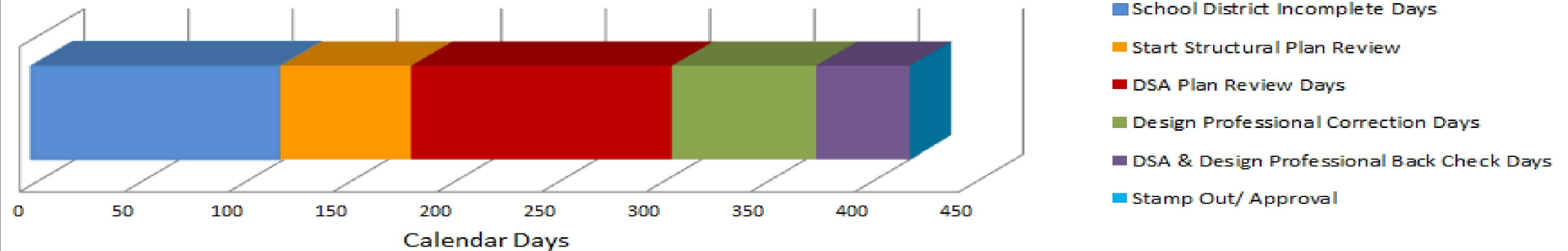
Statewide Median Processing Days

Projects Approved 07/01/16 through 06/30/17



LARGE SIZE PROJECT EXAMPLE: LOS ANGELES REGION

SANTA MONICA COMMUNITY COLLEGE



Project Cost: **\$74,185,000.00** Project Status: **Finished Structural Back Check**

Project Type: **col (Community Coll** DSA App #: **03-116182**

OTC: **No**

App #	Project	Application Received Date	Complete Submittal Date	School District Incomplete Days	DSA Bin Time Days	Start Structural Plan Review	Finish Structural Plan Review/Return of Comments	DSA Plan Review Days	Start Structural Back Check	Design Professional Correction Days	Finish Structural Back Check	DSA & Design Professional Back Check Days	Stamp/ Approval Date	Stamp Out Approval
03-116182	SANTA MONICA COMMUNITY COLLEGE	03/05/15	07/02/15	119	63	09/03/15	01/06/16	125	03/15/16	69	04/29/16	45	04/29/16	1

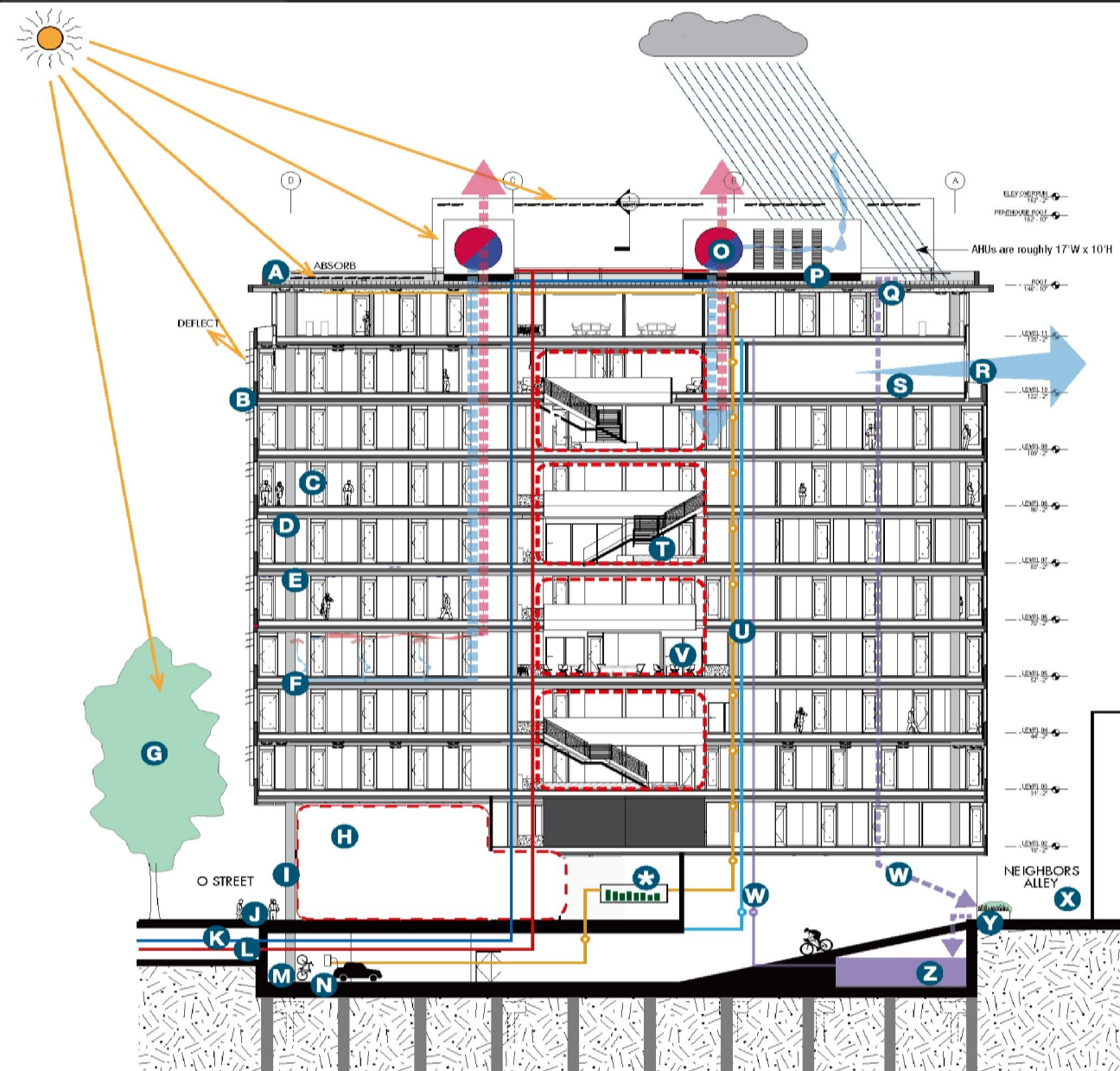
SANTA MONICA COMMUNITY COLLEGE

- ◎ \$74,185,000 @ 9%: \$6,676,650 / Year
 - > \$770,383 / 6 Wk. (Bin)
- ◎ \$74,185,000 @ 5%: \$3,709,250 / Year
 - > \$427,990 / 6 Wk. (Bin)
- ◎ \$74,184,000 @ 5%: \$3,709,250 / Year
 - > \$4,288,502 / 422 Days
(Incomplete, Bin, DSA, A&E)

“O” STREET STATE OFFICE BUILDING



"O" STREET STATE OFFICE BUILDING



- A ONSITE RENEWABLES** 388 kW PV array produces over 20% of the project's energy use
- B EXTERNAL SHADING** Reduces glare, thermal discomfort, and cooling energy use
- C DAYLIGHT AND VIEW** Open office benefits from external shading to reduce glare while increasing the number of hours with daylight and views
- D THERMAL MASS** Exposed post-tensioned concrete structure provides enhanced thermal comfort and energy savings
- E RADIANT CONDITIONING** Passive chilled sails and perimeter radiant heat deliver efficient enhanced comfort
- F DISPLACEMENT VENTILATION** Underfloor air system provides flexibility, efficiency and additional fresh air over code
- G ENHANCED MICROCLIMATES** Preserved trees and light colored paving reduce urban heat island effect
- H MARKETPLACE LOBBY** Two-story space allows for thermal buffering, heat stratification and connectivity
- I OUTDOOR CONNECTION** Large doors allow easy access to the interior ground floor spaces
- J TRANSIT FRIENDLY** Entrance and retail reinforces connection to street and light rail hub
- K CENTRAL PLANT COOLING** Chilled water metering from CUP supply
- L CENTRAL PLANT HEATING** Hot water metering from CUP steam tunnel connection
- M BIKE FRIENDLY** Commuter facilities include 100 secure racks and 14 showers
- N EV CHARGING** (2) 240v and (18) 120v chargers in parking garage; another (6) 240v and (54) 120v in parking lot
- O HEAT RECOVERY** Enthalpy recovery wheel transfers sensible and latent energy from ventilation exhaust to supply
- P EXCEPTIONAL AIR QUALITY** Electrostatic filters provide high filtration to 100% outside air with reduced energy and maintenance
- Q RECLAIMED WATER** Rooftop collection of rainwater and air handler condensate
- R DAYLIGHT AND VIEWS** North open office features glare-free daylight and view to Capitol grounds and mountains
- S INTEGRATED FITNESS** 10th floor suite dedicated to staff exercise and wellness provides exceptional views to State Capitol grounds
- T ACTIVE WORKPLACE HUBS** Departmental connecting stairs in "Mother Lode" one of three sets of compelling elevator alternatives in building, promoting interaction
- U PLUG LOAD MONITORING** Circuit power metering at each floor
- V DEMAND CONTROL VENTILATION** Meeting rooms respond to occupant load
- W WATER METERING** Separate tracking used for harvested and reused water.
- X PEDESTRIAN CONNECTION** Landscape enhancements on Neighbors Alley and the Garden Mews contribute to the neighborhood
- Y STORMWATER FEATURES** Alley way planters filter stormwater and provide code-mandated detention
- Z GREYWATER RE-USE** 25,000 gallon tank collects rainwater and AHU condensate, augmenting greywater day tank to supply toilets
- * OCCUPANT FEEDBACK** Dashboard for performance metrics and data analytics

“O” STREET STATE OFFICE BUILDING

◎ Design Build Construction Contract

- Stipulated Contract Sum: \$231,605,230
- Initiation of Project Process: August 2016
- Notice to Proceed: February 2018
- Scheduled Construction Start: October 2018
 - Actual Construction Start: July 2018
- Scheduled Occupancy: May 2022
 - Anticipated Occupancy: November 2021

◎ Design Bid Build Construction Contract

- Scheduled Occupancy: November 2023

“O” STREET STATE OFFICE BUILDING

◎ Design Build Construction Contract

➤ Stipulated Contract Sum: \$231,605,230

◎ Escalation

➤ Escalation @ 5% Per Year: \$9,684,000

➤ Escalation Per Month: \$807,000

➤ Escalation Per Day: \$27,000

➤ Anticipated Total Escalation: \$15,333,000



“ Partners in the Design and Construction of Great
Resilient Schools ”



*Improving How We Building in the Face of Weather and Natural
Disasters*

Leslie Chapman-Henderson
Tuesday, May 15, 2018

BACKGROUND



- *Mission - Strengthening Homes and Safeguarding Families*
- *Strategy - Create awareness and demand for mitigation by establishing a social norm*
- *Goal - Foster community resilience through action*

- 1998 – Volunteer committee of emergency managers, insurers, meteorologists, and organizations dedicated to strengthening homes and safeguarding families
- Today – Nonprofit coalition of more than 100 academic, corporate, nonprofit, and government partners



- Non-profit corporation & subsidiary/consultancy
 - App developers
 - Architects
 - Attorney
 - Big Data experts
 - Building code experts
 - Emergency managers
 - Engineers
 - Floodplain manager
 - Futurists
 - Insurance/Financial services experts
 - Meteorologists
 - National News - Bureau Chief/Correspondent
 - Policy expertise
 - Product manufacturers
 - Video producers
 - Walt Disney Company “Imagineer”

THE FLASH TEAM





The Blueprint for Safety™ disaster-resistant construction education program was developed in 1999 to improve building practices and introduce the market to new techniques.

Targeted two distinct audiences:

1. Professionals – architects, building officials, engineers, home builders, home inspectors, insurance adjusters, subcontractors, and construction managers, who are engaged in residential construction activities for new, retrofitting, or remodeling; and,
2. Consumers – individuals building a new home, purchasing an existing home or residing in an older home, and prospective homeowners.

Project elements - Professionals

1. Training – curriculum delivery and reinforcement on the multi-peril 'Blueprint for Safety' construction techniques for wind, water, wildfire, and hail were delivered through the classroom.
2. Technical Support – free, ongoing technical support was available to all trainees. Additional printed materials, newsletters, and technical resources supported the ongoing learning and subsequent use of the techniques by the trainees.



CONTRACTOR'S FIELD MANUAL Volume III



Project Elements - Consumers

1. Outreach – expositions, fairs, home shows, targeted messaging, news media outreach, etc.
2. Technical Support – free, toll-free telephone hotline for consumer questions, building support, etc.



CONTRACTOR'S FIELD MANUAL

Volume III



Project Outcomes/Observations

1. Blueprint helped mainstream innovative wind-resistant building practices and build public acceptance of same.
2. Nearly all of the suggested practices are now part of minimum building codes.
3. Progress can be slow, yet effective, if we drive the messaging across key audiences and garner public support.
4. Market-based programs, e.g. the insurance industry *Fortified* initiative offer additional beyond-code practices today.



CONTRACTOR'S FIELD MANUAL

Volume III



Can we apply this approach to climate resilience?



Option One – “Beyond Code” Climate Resilience Pilot Program

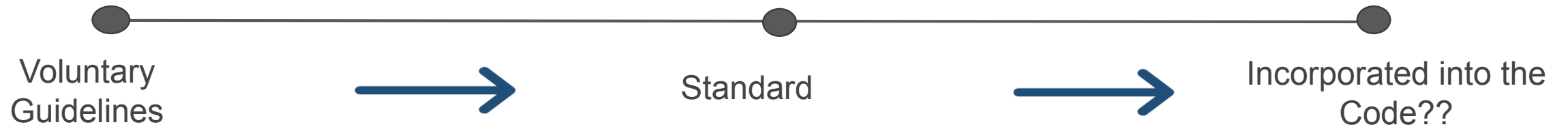
1. Form a blue-ribbon committee of building and design professionals along with subject matter experts.
2. Create prescriptive protocols for building with climate and disaster resilience in mind.
 - Focus first on flooding to harness opportunity intersection between sea level rise and flooding events.
 - Emulate any best practices used in NY and NJ following Superstorm Sandy

Option Two – Consider Establishing Voluntary Guidelines

Development Process

1. ICC staff coordinates with relevant industry on the scope
2. Call for Committee and Board appointment process
3. Start with a language draft (*starting from a “clean sheet of paper” can be a challenge*)
4. Committee meets each month for two hours via conference call (*agenda is to review the current draft and make revisions*)
5. Draft is updated by ICC staff and becomes the basis for review during the next call.
6. Once the committee is done with their work, the draft is posted for comment per CP-33
7. Committee reviews public comments and completes the guideline
8. ICC posts the new, voluntary “guideline”

EVOLUTION OF BUILDING CODES



This process is critical as it is the most widely used. It is familiar to the ICC members (65,000). And, they are the professionals most relevant to successful implementation.



Leslie Chapman-Henderson
Leslie@FLASH.org
Twitter: @LCHenderson & @FederalAlliance
Facebook.com/FederalAlliance
YouTube.com/stronghomes

Mitigation Saves



Natural Hazard Mitigation Saves:
Interim 2017 Report
Jennifer Goldsmith-Grinspoon
May 15, 2018



FEMA

Background

- Two types of analysis
 - Federal mitigation grants
 - Beyond code requirements scenarios
- Hazards studied:
 - Riverine flooding
 - Coastal flooding
 - Hurricane wind
 - Earthquake
 - Fire at the wildland-urban interface



SMART INVESTING
MITIGATION SAVES



FEMA

Some of the mitigation measures analyzed in the grants sample:

- Grants for riverine flood mitigation – acquire or demolish flood-prone buildings
- Grants for wind mitigation – Safe Rooms
- Grants for earthquake mitigation- bracing ceilings in hospitals and structural retrofit of existing buildings
- Grants to mitigate fire at the wildland urban interface – creation of defensible space



FEMA

New construction to exceed requirements of the 2015 International Codes

- For riverine and hurricane flooding: build new structures higher than required by the 2015 IBC
- For hurricane winds, build new homes to comply with the IBHS FORTIFIED Home Hurricane standards
- For resistance to earthquakes, build new buildings stronger and stiffer than required by the 2015 IBC
- For fire resistance in the wildland-urban interface, build new single family dwelling to comply with the 2015 IWUIC



Natural Hazard Mitigation Saves



Natural Hazard Mitigation Provides the Nation \$6 in Benefit for Every \$1 Invested

National Benefit-Cost Ratio (BCR) Per Peril

**BCR numbers in this study have been rounded*

Overall Hazard Benefit-Cost Ratio

Beyond Code Requirements

\$4:1

Federally Funded

\$6:1



Riverine Flood

\$5:1

\$7:1



Hurricane Surge

\$7:1

Too few grants



Wind

\$5:1

\$5:1



Earthquake

\$4:1

\$3:1



Wildland-Urban Interface Fire

\$4:1

\$3:1

This Interim Study quantified a number of benefits from mitigation, including reductions in:

- Future deaths, nonfatal injuries, and PTSD
- Repair costs for damaged buildings and contents
- Sheltering costs for displaced households
- Loss of revenue and other business interruption costs to businesses whose properties are damaged
- Loss of economic activity in the broader community
- Loss of service to the community when fire stations, hospitals, or other public buildings are damaged
- Insurance costs other than insurance claims
- Costs for urban search and rescue



FEMA

The Costs and the Benefits

- Property
- Additional Living Expenses & Sheltering
- Insurance
- Casualties & PTSD
- Indirect Business Interruption

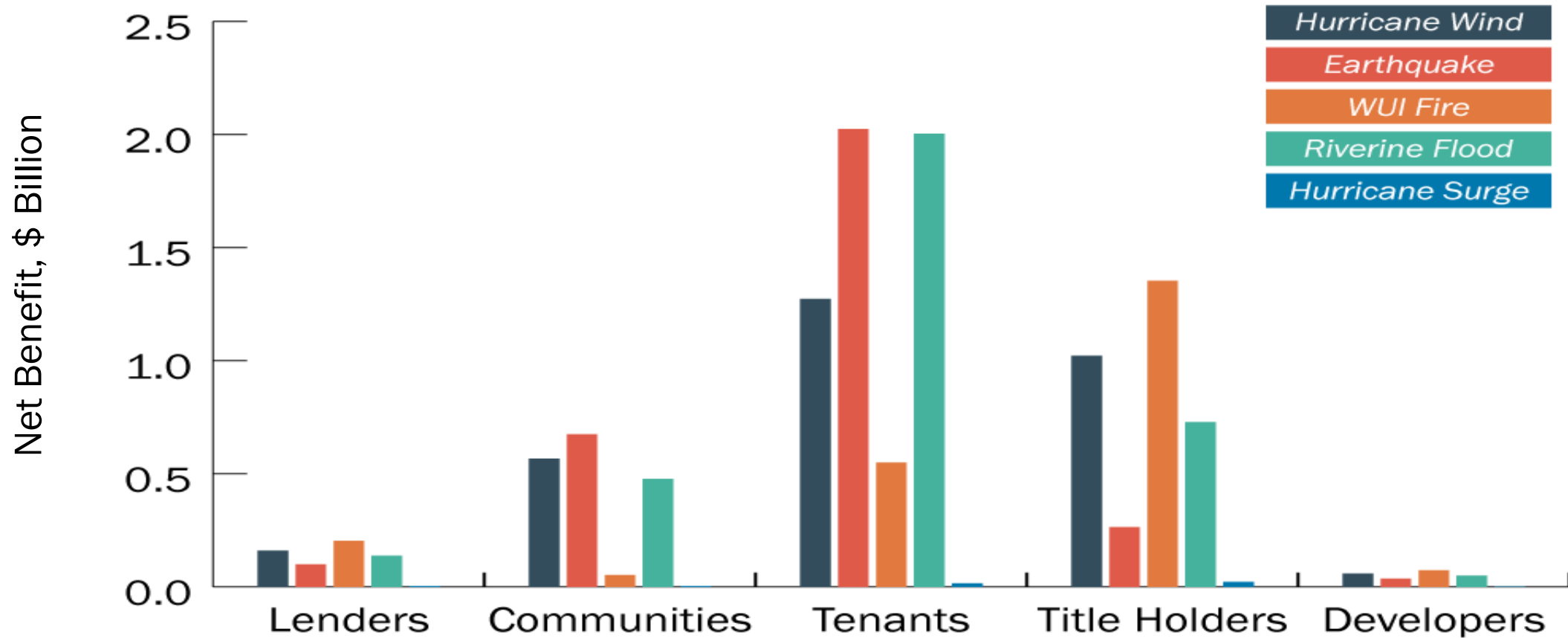


SMART INVESTING
MITIGATION SAVES



FEMA

Stakeholders



SMART INVESTING
MITIGATION SAVES



FEMA

Contact Info



Jennifer Goldsmith-Grinspoon

Building Science Branch, FEMA HQ

Jennifer.Goldsmith-Grinspoon@fema.dhs.gov



FEMA

Building the Future: Challenges & Opportunities in the Building Sector



Chester Widom
CSIWG Member
California State Architect
CA Dept. General Services



Jennifer Goldsmith-Grinspoon
Physical Scientist
Building Science Branch
Risk Management Directorate of FEMA



Leslie Chapman-Henderson
President and CEO
Federal Alliance for Safe Homes
FLASH

Thank you!

- The ***Climate-Safe Infrastructure*** Webinar Series continues at least through July 2018
- Upcoming webinars:
 - Financing the Future – 3-part series –
 - re:focus partners, Zoffnass Program for Sustainable Infrastructure and International Resilience Center **May 17, 12pm – 1pm PST**
- Track webinars and progress of CSIWG at:
<http://resources.ca.gov/climate/climate-safe-infrastructure-working-group/>
- Questions: Joey Wall - Joseph.Wall@resources.ca.gov