FINE TUNING RADIANT SYSTEMS:

Challenges and Lessons Learned from Commissioning Large-scale Commercial Buildings

REDCAR ANALYTICS

Symposium on Optimizing Radiant Systems

Wednesday, October 23rd, 2019

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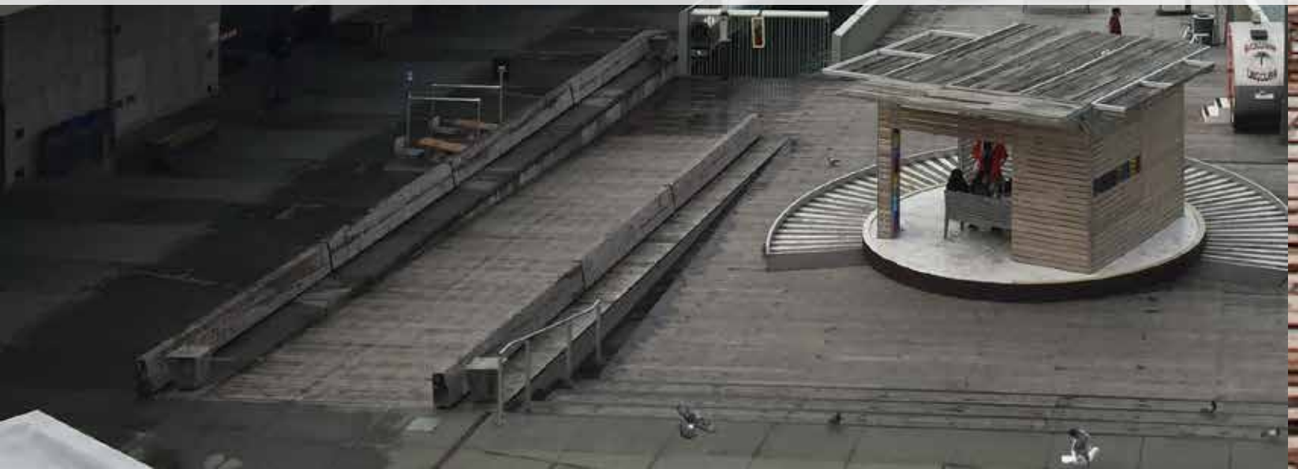
redcaranalytics.com

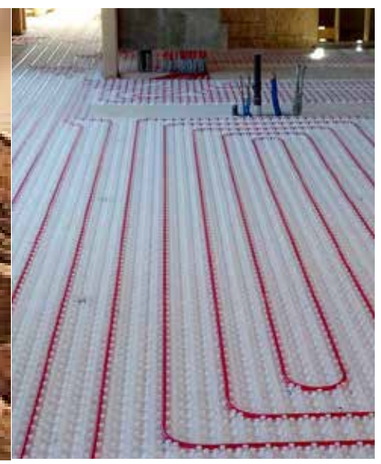
Commissioning experience + 10 years

10 In-slab Radiant Projects

Highlights:
Exploratorium
David Brower Center



Where are we now?



Constant Flow …..Constant Temperature
Constant Flow …… Varying Temperature
Varying Flow…. Constant Temperature
Valve ON/OFF……. Valve Modulating
2 pipe…… 4 pipe
Primary Pump….. Circulating Pump


Share Your Story
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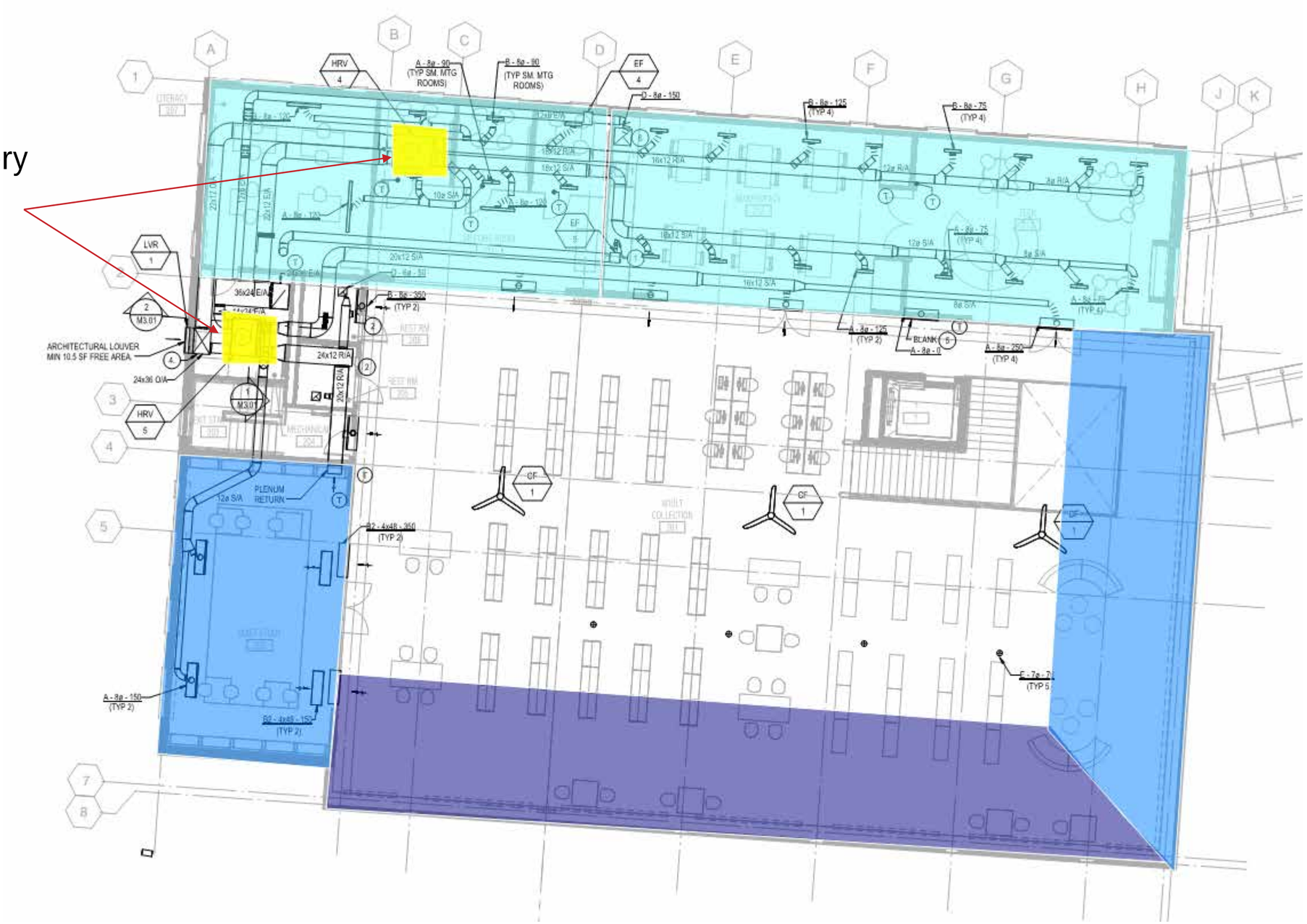
25,000 ft² Library located in East Bay

Performance Goal: ZNE Target

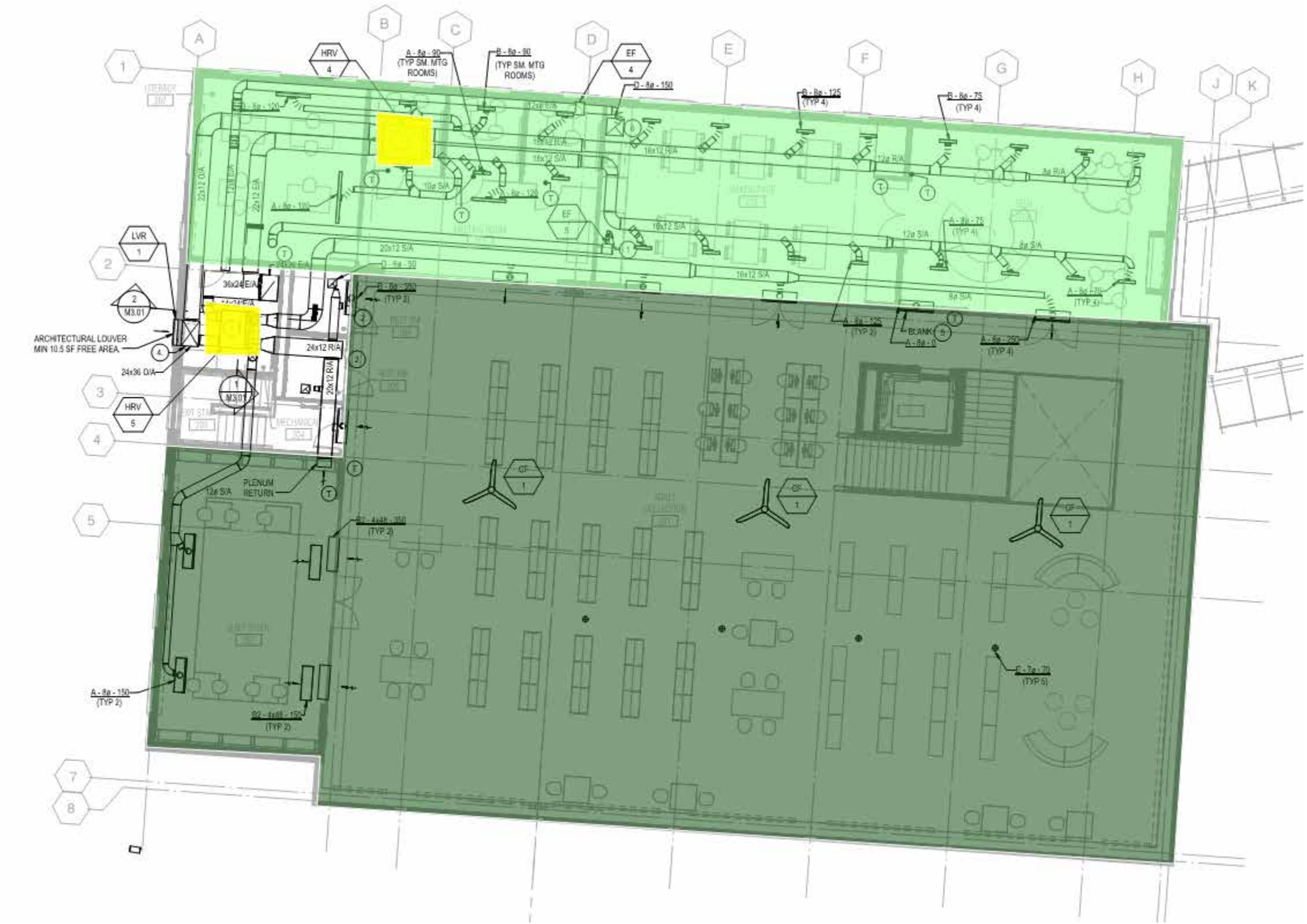
System: In-Slab Radiant, Heat Recovery Ventilators (HRVs), Natural Ventilation Ceiling Fans, Automated Shading

Natural Ventilation Zones

Heat Recovery Ventilators



Heat Recovery Ventilator Zones



Radiant Zones

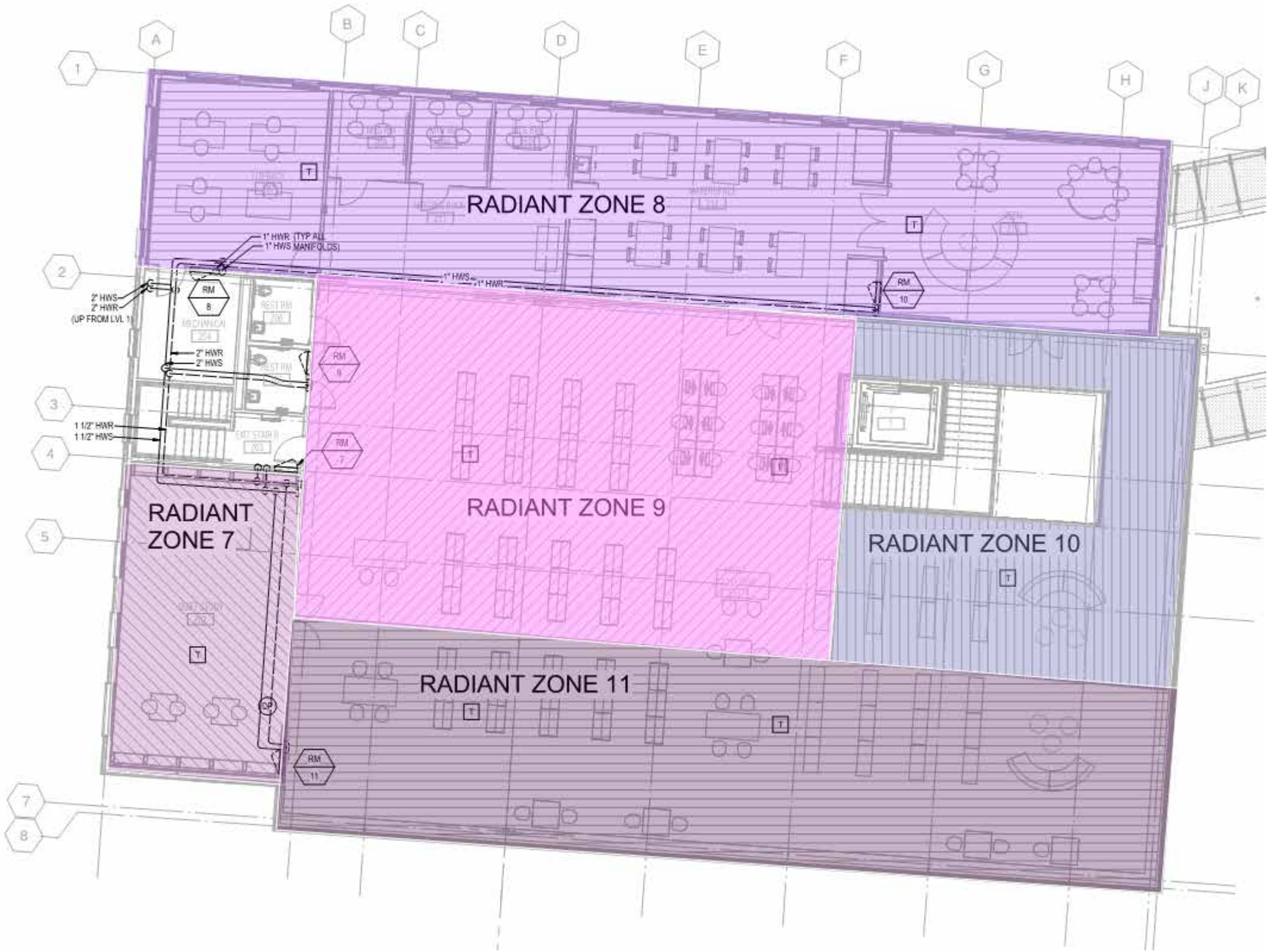
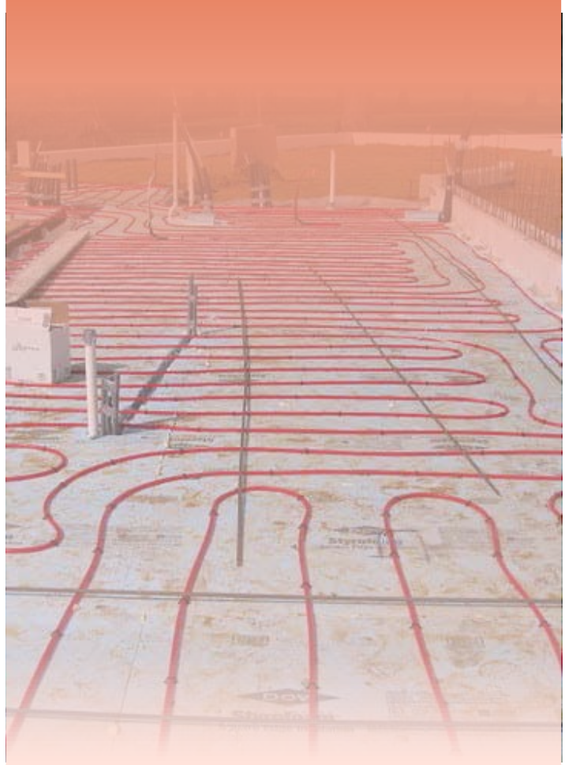


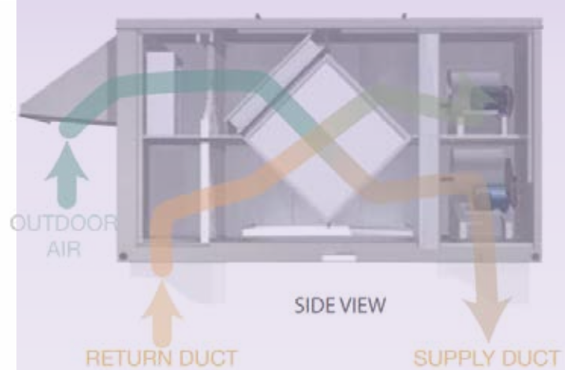
Diagram of Systems

Radiant



Heating

Mechanical Ventilation (HRVs)

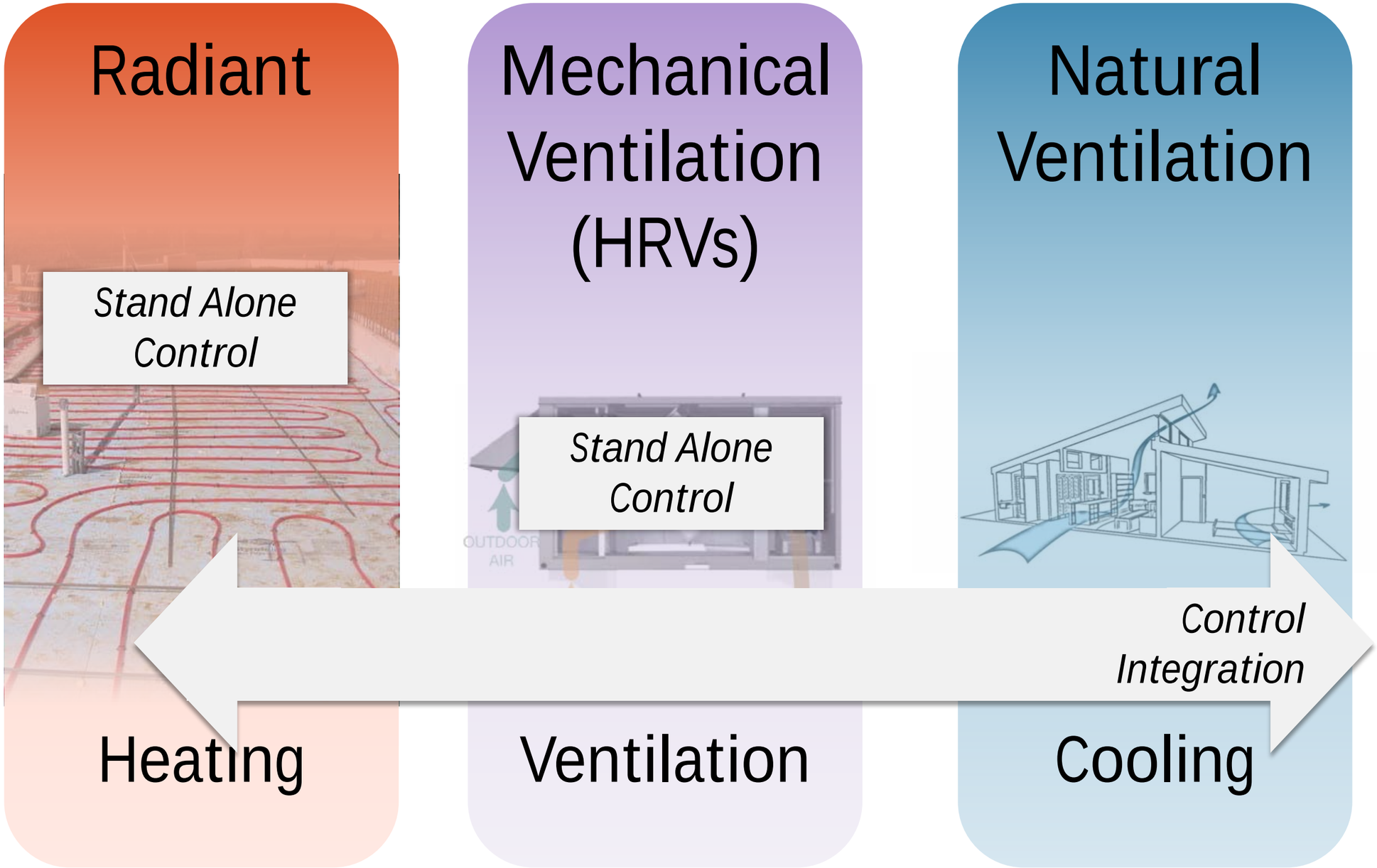


Ventilation

Natural Ventilation

Cooling

Diagram of Systems



58,000 ft^2 Library located in East Bay

Performance Goal: ZNE Target

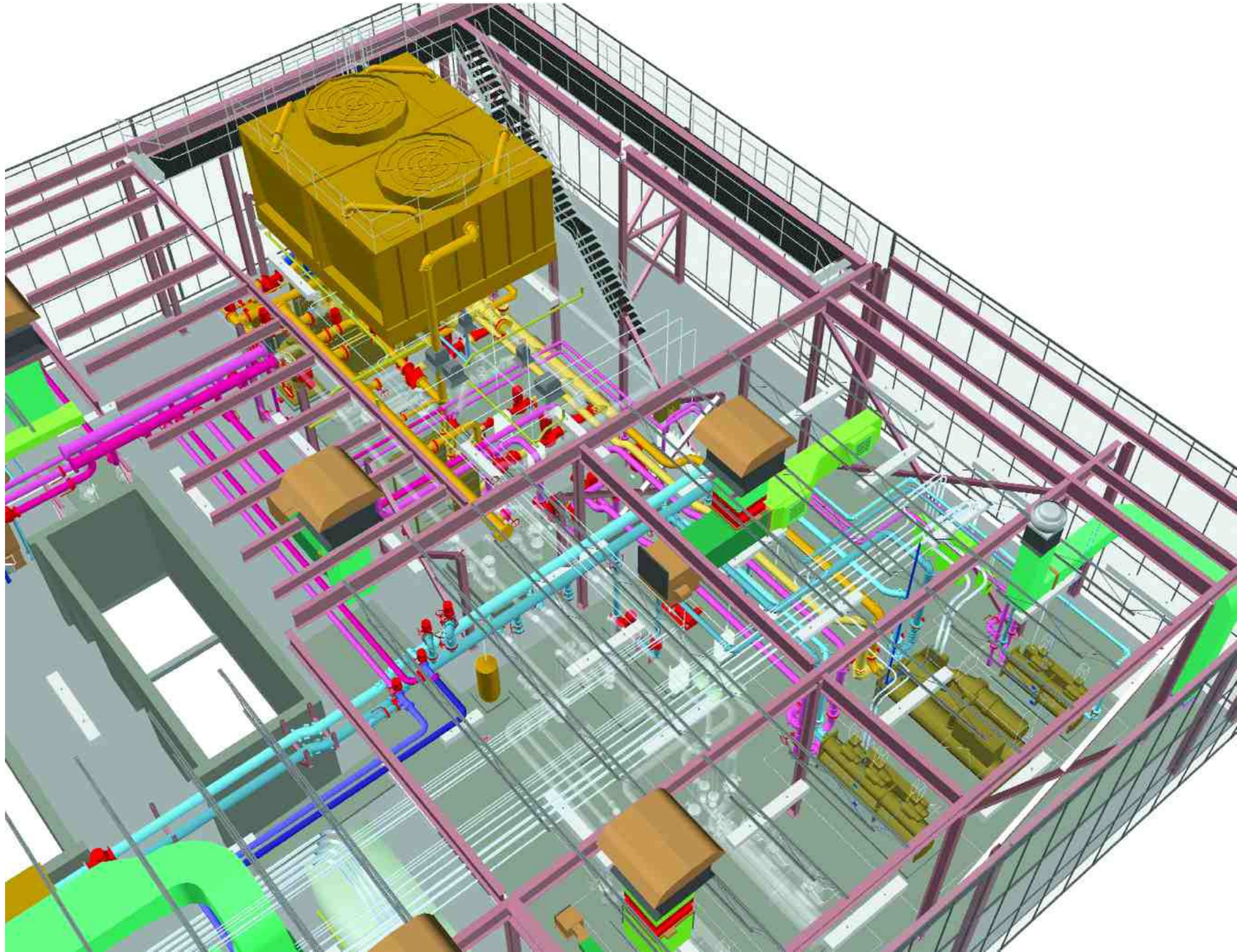
System: In-Slab Radiant, Dedicated Outside Air System (DOAS), Ceiling Fans, Automated Shading, Lighting Integration to HVAC.

Dedicated Outside Air System (DOAS)

Radiant +DOAS	Standard VAV
Ventilation	Heating + Cooling
Warm	Morning Warm up
On at Night	Unoccupied Schedule
Supplemental Cooling	Primary Cooling
Little Temp Setback	Temperature Setback
Dehumidification?	

Basis of Design

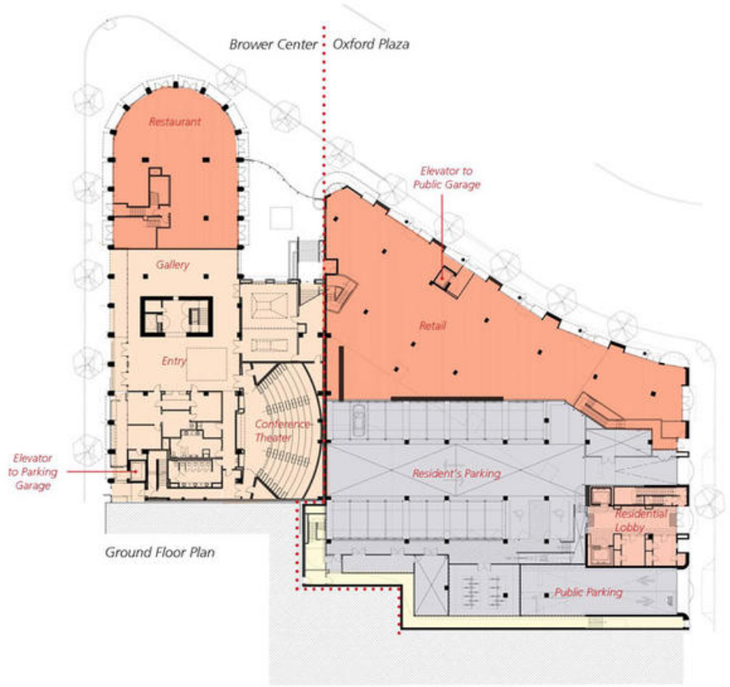
- More important than EOR realize
- Needs to provide the “Why”
- Include with Sequence of Operations
- Updated through construction and into Occupancy



David Brower Center, Berkeley CA 46,000ft^2

Performance: LEED Platinum

System: In-Slab Radiant Heating, Under Floor Air Distribution (UFAD), Operable Windows



12 Months On Going Commissioning

TABS Radiant Cooling Design and Control in North America: Results from Expert Interviews

A Study within the "Optimizing Radiant Systems for Energy Efficiency and Comfort" Project

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Prepared for

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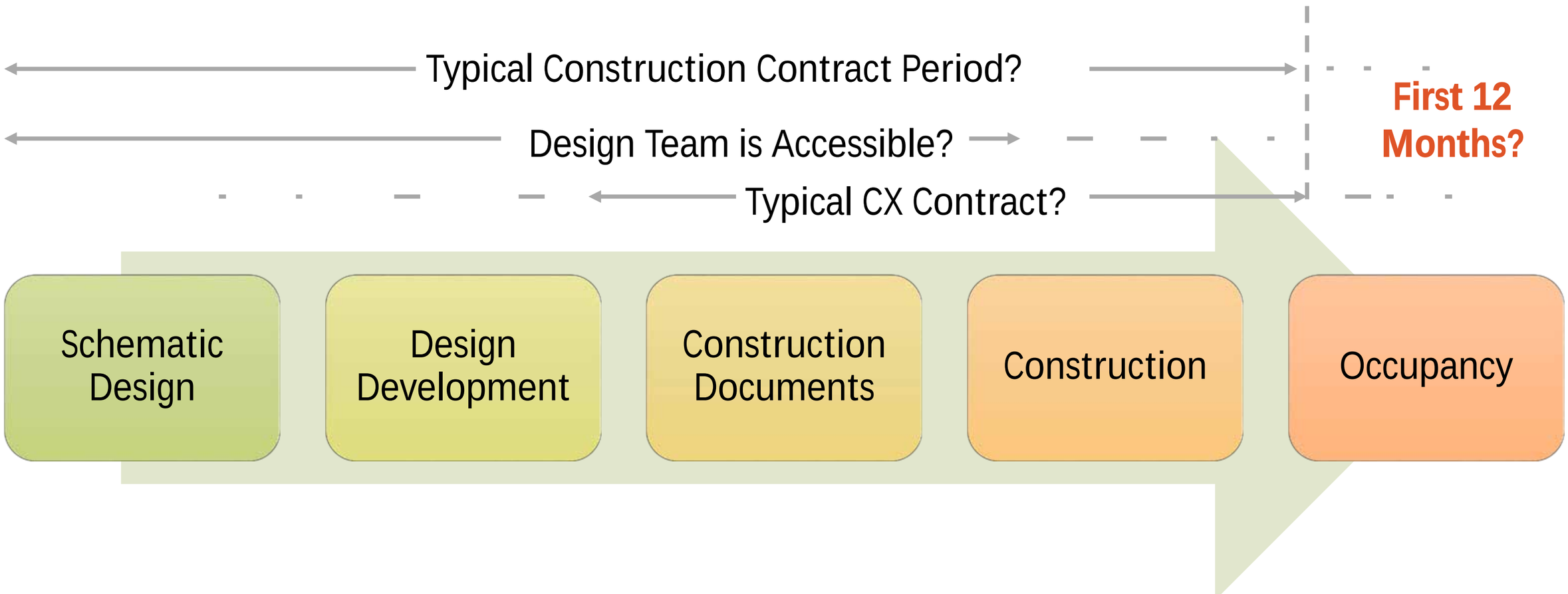
EPC-14-009
CEC Manager: Jackson Thatch

June 2017

Typical Construction Contracting Timeline



Training

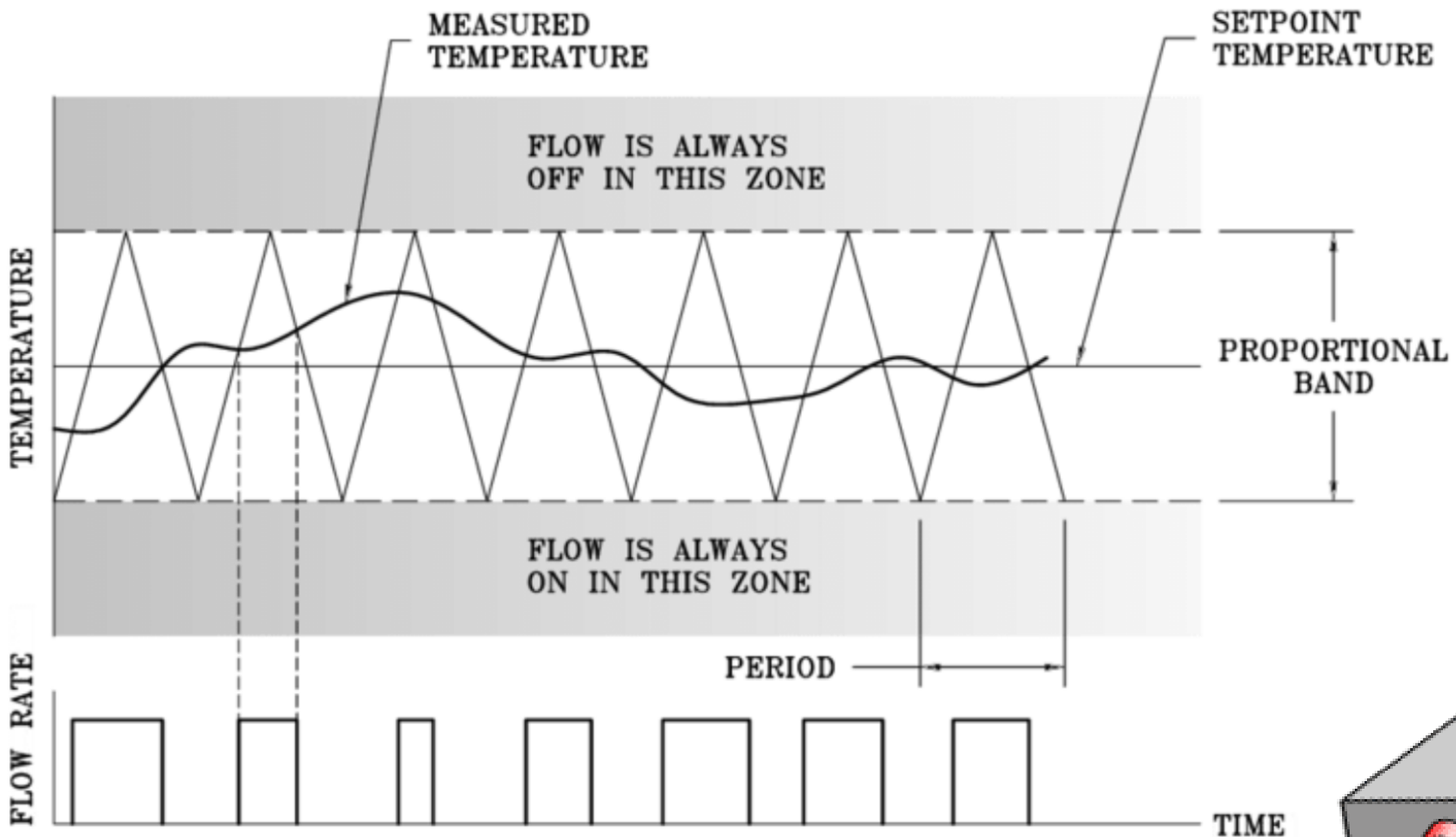
- More than just Equipment, System Level is a must!
- Design Intent = EOR
- Don’t forget building users
- Repeat after occupied

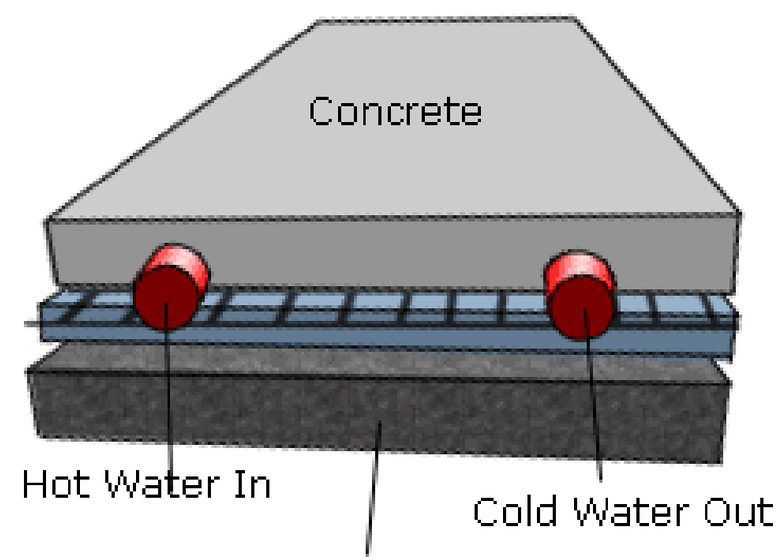
Lab located in East Bay
80,880ft^2

Performance: LEED Platinum

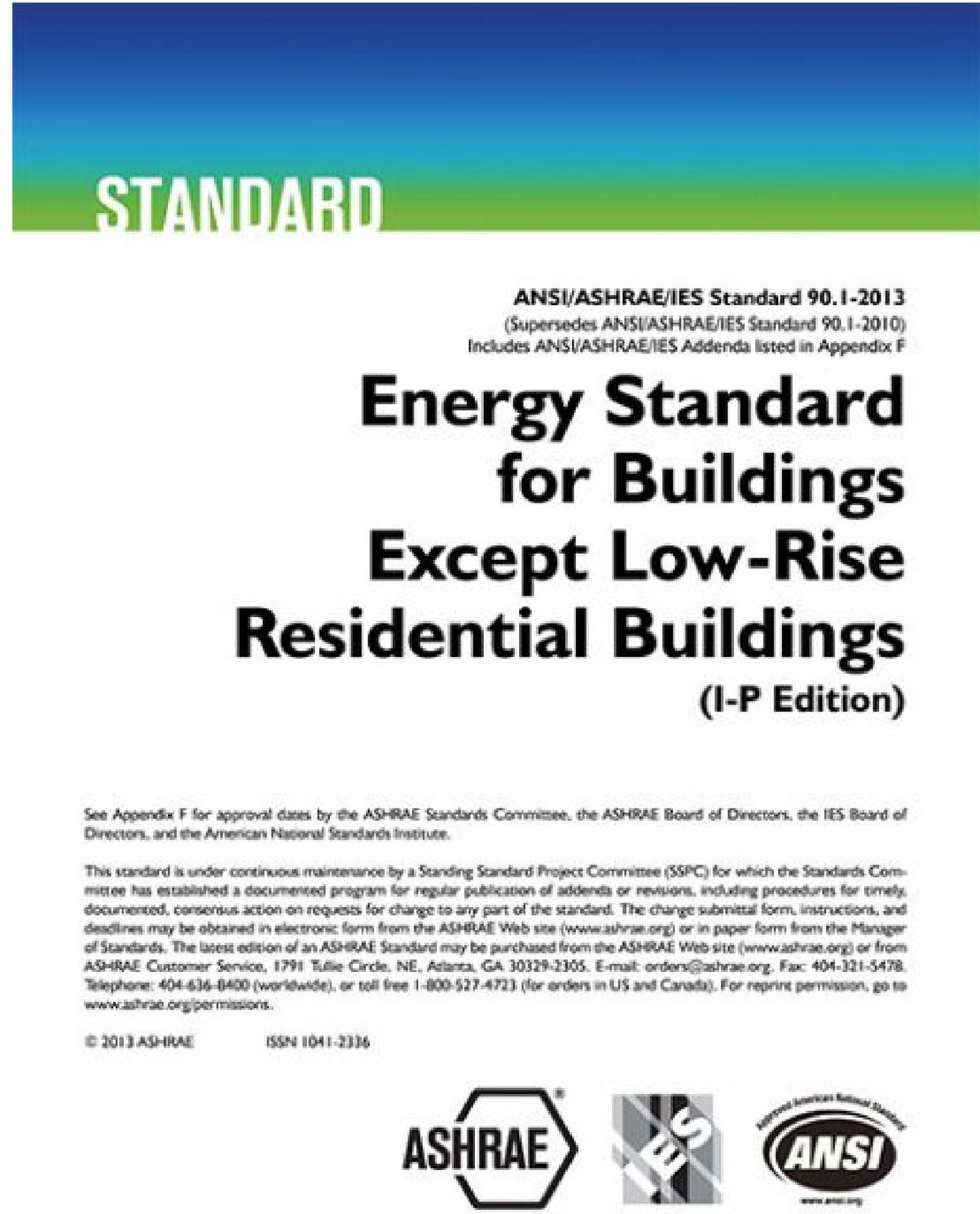
System: In-Slab Radiant Heating and Cooling, Chilled Beams, DOAS with D/X, Ceiling fans, Lighting Integrated to HVAC, Fan Coil units

Pulse Width Modulation used to Control Slab Temperature





- Benefits from Standardization
- More + Accessible information
- Don’t forget the instrumentation!
- Keep it simple!



STANDARD

ANSI/ASHRAE/IES Standard 90.1-2013
(Supersedes ANSI/ASHRAE/IES Standard 90.1-2010)
Includes ANSI/ASHRAE/IES Addenda listed in Appendix F

Energy Standard for Buildings Except Low-Rise Residential Buildings

(I-P Edition)

See Appendix F for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, the IES Board of Directors, and the American National Standards Institute.

This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE Web site (www.ashrae.org) or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE Web site (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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Where are we going?

What is the “standard radiant system configuration” which will scale in construction markets to make radiant HVAC a plug-and-play option?

What building-blocks in HVAC controls should be created today for future radiant systems?

Are radiant systems the best system to meet our CA 2030 ZNE goal?

The future is not a place you get to go. It's a place you get to create.

Questions?

Thank you!

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