Angelus BLOCK CO., INC. Since 1946

THE FUTURE OF CONCRETE MASONRY

with **Bob Wyckhuyse**

&

Adam Eldred

CHECKING ALL THE BOXES

- ✓ Aesthetic Evolution
- ✓ Sustainability & EPDs
- ✓ Energy Efficiency
- ✓ Resilience
- ✓ Durability & LCA
- ✓ BIM Integration & Modern Design Tools

EVOLUTION OF CMU AESTHETICS

DESIGN FLEXIBILITY

Textures

Precision

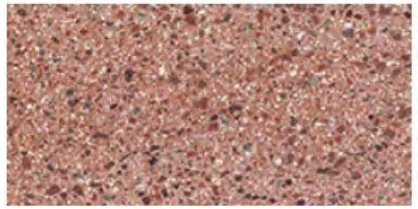
Split Face

Burnished

Shotblast

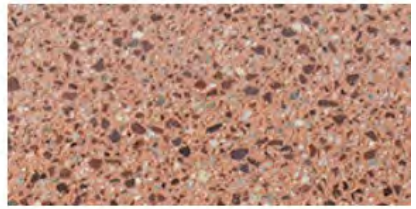
DESIGN FLEXIBILITY

Colors

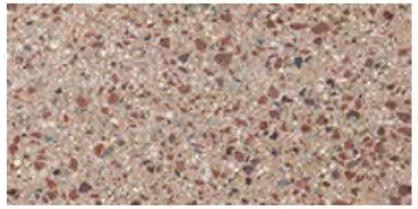


Auburn

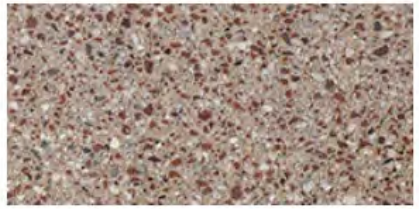
Canyonbluff



Carnival



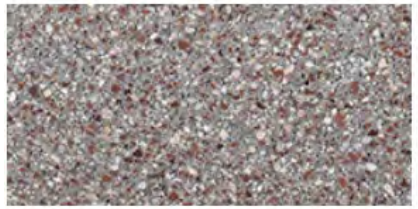
Driftwood



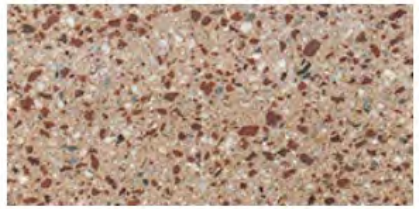
Dusty Brown

Glacier White

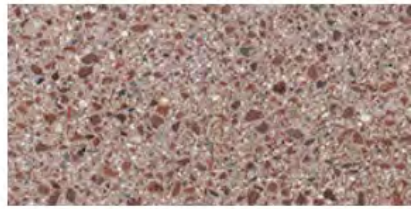
See Exclusions†



Greystone



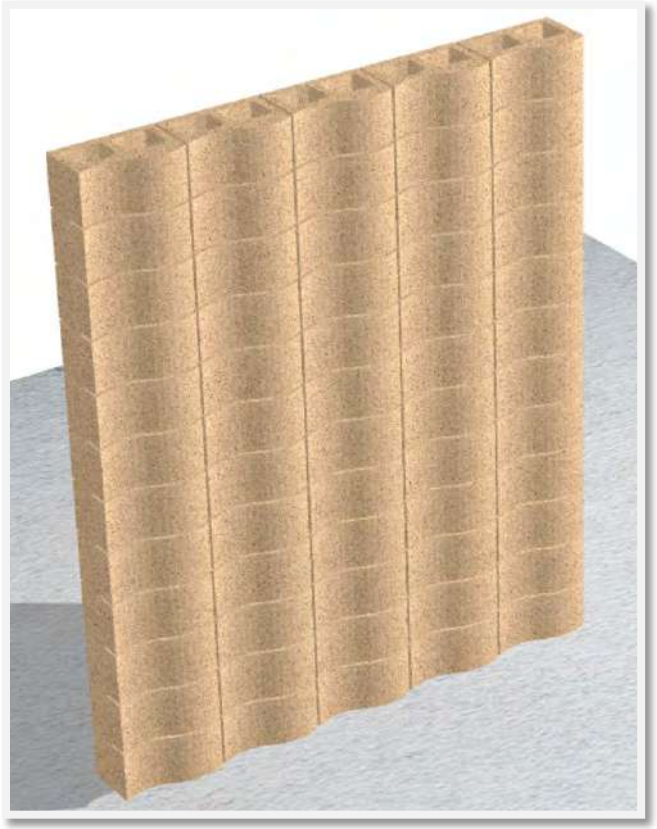
Harvest



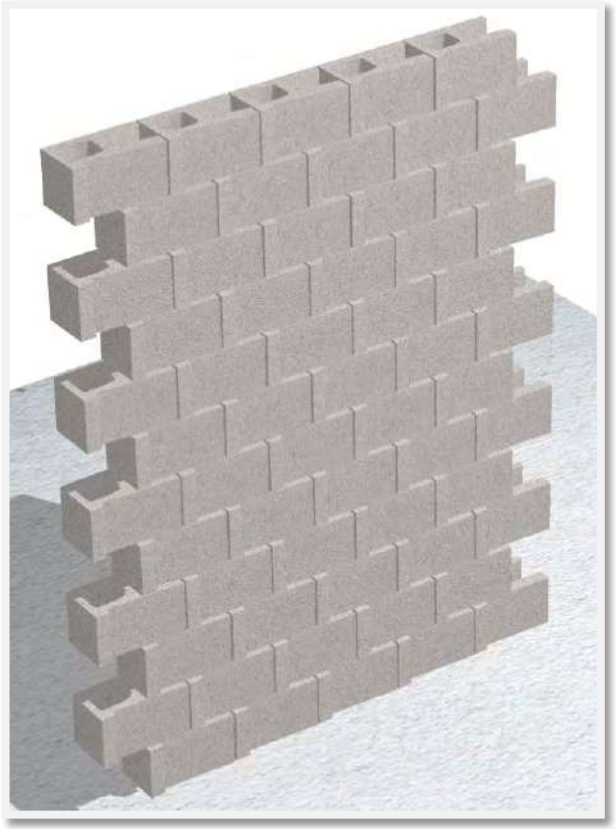
Ladera Brown

DESIGN FLEXIBILITY

Projection & Shadow



Sine Block



Spade Block

Neptune Marina Del Rey

Neptune Marina Del Rey

Neptune Marina Del Rey

Del Oro High School

Del Oro High School

Del Oro High School

Advanced Water Purification Facility

Advanced Water Purification Facility

Advanced Water Purification Facility

SUSTAINABILITY

LEADING THE WAY IN SUSTAINABILITY

Low Carbon CMU

- Angelus Block Co. was the first manufacturer to publish an EPD for concrete masonry to the North American Product Category Rule
- One of the first CMU manufacturers to fully convert to type 1L cement
- CarbonKind™ CMU consistently produces industry leading GWP reductions to this day

Angelus BLOCK CO., INC. Since 1946

ENVIRONMENTAL IMPACTS

Declared Product:

CMU: Medium Weight Concrete Masonry Units • Sun Valley Plant

Density Factor: 1954 kg / m^3

Compressive strength: 2000 PSI

Declared Unit: 1 m^3 of concrete formed into manufactured concrete masonry product (CMU)

Global Warming Potential (kg CO_2-eq)	**157**
Acidification Potential (kg SO_2-eq)	**0.64**
Eutrophication Potential (kg N-eq)	**0.12**
Smog Creation Potential (kg O_3-eq)	**14.6**
Ozone Depletion Potential (kg CFC-11-eq)	**2.56E-6**

Material Composition: Aggregate (natural), Cinder, Portland Limestone Cement, Aggregate (recycled concrete), Batch water

CarbonKind™ by Angelus Block

Compared to CMHA U.S. Industry Average

U.S. Industry Average GWP[3]	Angelus Block Average MW GWP	
Average 244	160	-34%

CarbonKind™ by Angelus Block

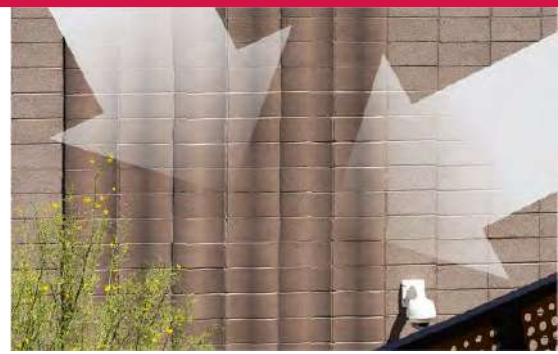
Compared to Carbon Leadership Forum Baseline

2021 CLF Materials Baseline[1]		
CLF Baselines	CLF GWP	Angelus MW Mean GWP
Typical	370	160 -57%
Baseline	545	-71%

2023 CLF Materials Baseline Appendices[2]		
CLF Baselines	Angelus MW Mean GWP	
257	160	-38%

CARBON SEQUESTRATION

- Research began around 2020
- Demonstrates carbon sequestration rates of dry-cast concrete products (CMU)



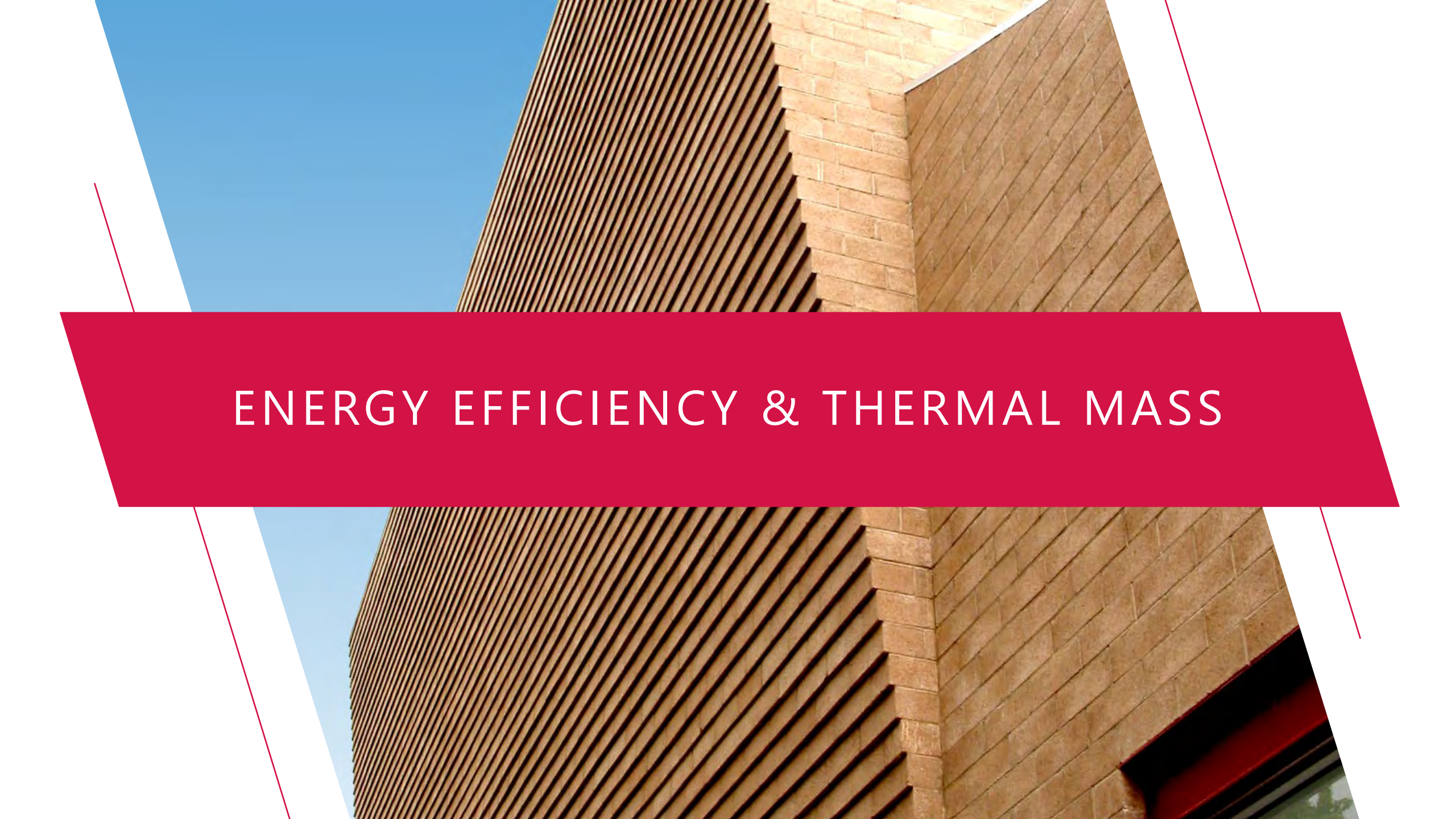
2022 ASTM: Conceptual Test Protocols for Measuring Carbon Sequestration of Manufactured Dry-Cast Concrete Products

Test at	Average CO_2 uptake (lb/cu ft)	LCA Module
4 weeks	1.25	A1-A3
2 years	2.93	B1

0.79 lbs.	of absorbed CO_2 per typical net volume of an 8x8x16, which equates to:
0.89 lbs.	of absorbed CO_2 per square foot of wall
100,000 sq. ft.	example wall area of a project
89,124 lbs.	**of absorbed/sequestered CO_2 *in the first 2-years* after CMU manufacture**

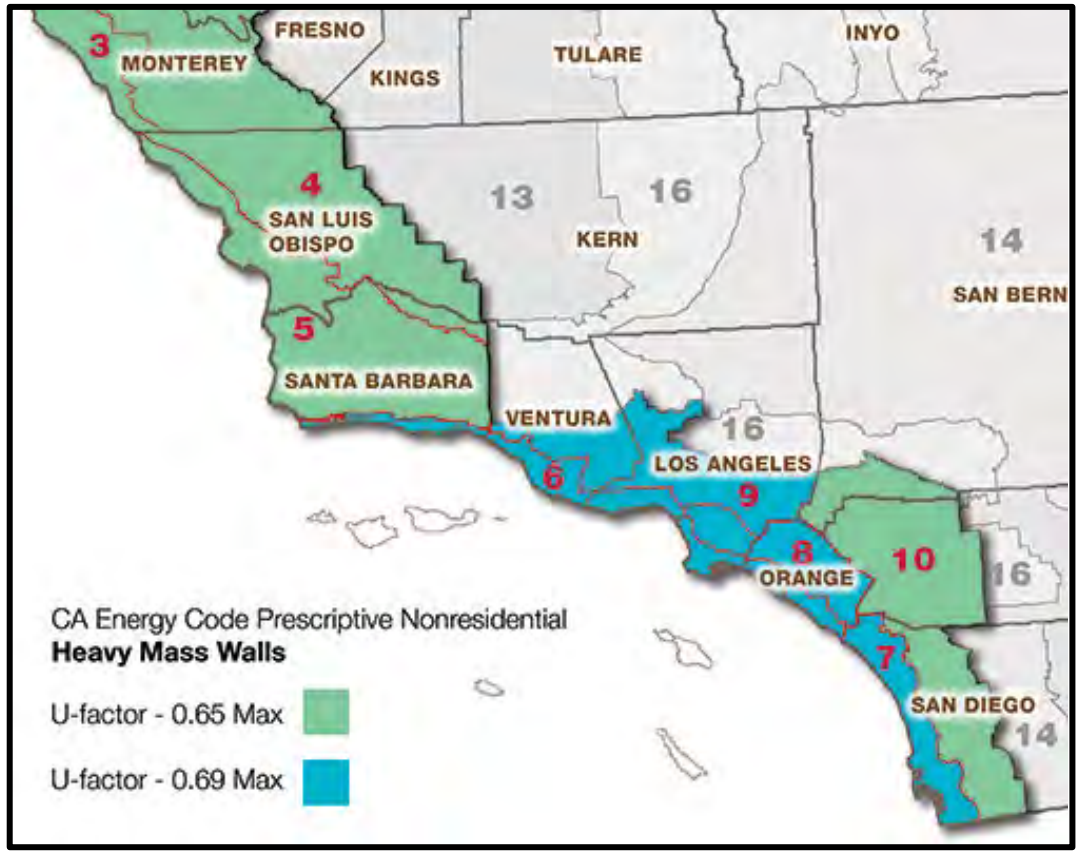
LIFE CYCLE BENEFITS

- Low-impact extraction of aggregates from local sources
- Local production & delivery
- Extremely low maintenance
- Multiple functions in one system
- Long service life
- 100% recyclable
- Reusable



ENERGY EFFICIENCY & THERMAL MASS

Title 24 – California Energy Code

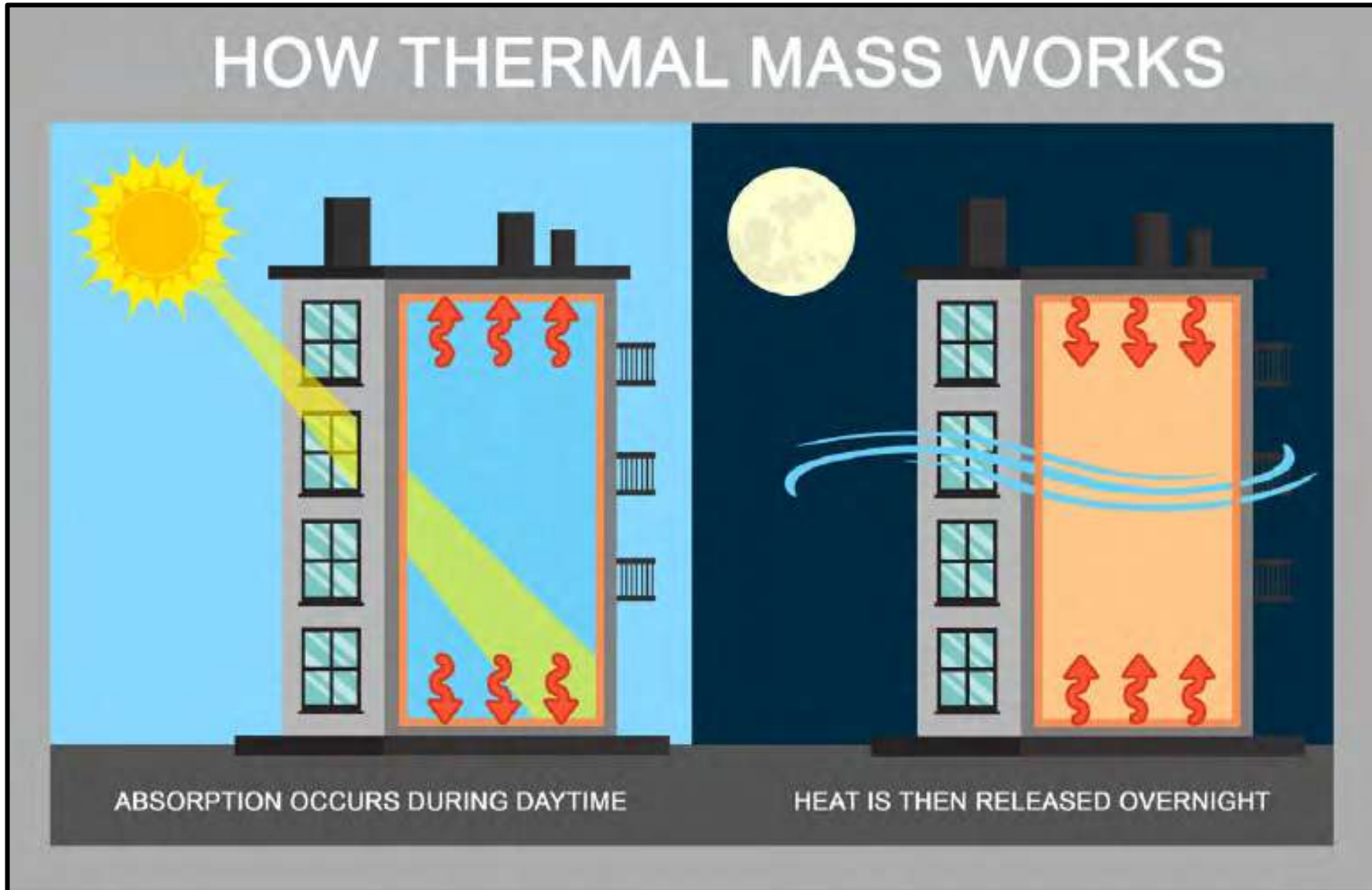


Southern California Climate Zones

- The California Energy Code outlines the prescriptive approach for building envelopes in section 140.3 based on designated climate zone
- Misconceptions regarding the performance of heavy mass walls are extremely common
- We commonly encounter the comparison of R-values of heavy mass walls (CMU) to R-values of studded walls with insulation

THERMAL MASS

- Higher R-values are always better right?
  - It's not that simple…
- Heavy mass walls (CMU) have a unique property called **thermal mass** that typical high R-value insulation in framed walls do not have
- Thermal mass in masonry walls moderates the day/night temperature swings and reduces heat flow to the interior, which reduces air conditioning loads inside the building.



RESILIENCE

DESIGNING FOR RESILIENCE

- Fire Resistance
- Passive survivability
- Earthquake Resistance
- Blast & Ballistic Resistance
- Flood Resistance
- Wind Resistance

FIRE RESISTANCE

FIRE RESISTIVE RATINGS

- Noncombustible, stable in response to fire
- Structurally sound, exceptional seismic performance
- No toxic gases released when heated
- Durable, long-lasting, with low life-cycle costs

		Partial Grouted			Solid Grouted[1]		
CMU ASTM C90 Wt. Classification		NW	MW	LW	NW	MW	LW
Nominal Width	4	<1 Hour	<1 Hour	1 Hour	1 Hour	1 Hour	1 Hour
	6	1 Hour	1 Hour	1 Hour	3 Hours	3 Hours	3 - 4 Hours[2]
	8	1 Hour	1 Hour	2 Hours	4 Hours	4 Hours	4 Hours
	10	2 Hours	2 Hours	2 Hours	4 Hours	4 Hours	4 Hours
	12	2 Hours	2 Hours	2 - 3 Hours[2]	4 Hours	4 Hours	4 Hours

STORM SHELTER & DEBRIS IMPACT

Debris Impact Facility Texas Tech University

Test No.	Wall/Roof System	Source	Sample Description	Missile Size	Missile Speed (mph)	Damage Description
1	Reinforced Masonry Unit (CMU) (Wall)	TTU	8 in. CMU reinforced with concrete and #4 rebar in every cell; truss type horizontal reinforcement was placed every 16 in.	2x4 in. 15 lb	100.0+	The target was impacted over 30 times with the design missile.
				2x4 in. 15 lb	116.0	Wall remained intact; no stress cracks in block nor joints could be found. Missile splintered on impact
				2x4 in. 15 lb	121.0	Minor surface indention (1/8 in.)
2	Reinforced Masonry Unit (CMU) (Wall)	TTU	8 in. CMU reinforced with grout filled in every cell	2x4 in. 12.5 lb	98	No damage was observed. The impact point was at the joint between cells.

Storm Shelters

- Reference FEMA P-361
- ICC 500

Tests have demonstrated excellent resistance to impacts of wind-borne objects. Projectiles that penetrate stud-based walls are stopped by solid grouted concrete masonry walls.

SEISMIC

THIS SLIDE IS INCOMPLETE

THIS IS WHERE THE SEISMIC PERFORMANCE OF CMU STRUCTURES WILL BE DISCUSSED WITH REFERENCE TO TMS STUDY & ENGLEKIRK SHAKE STUDIES

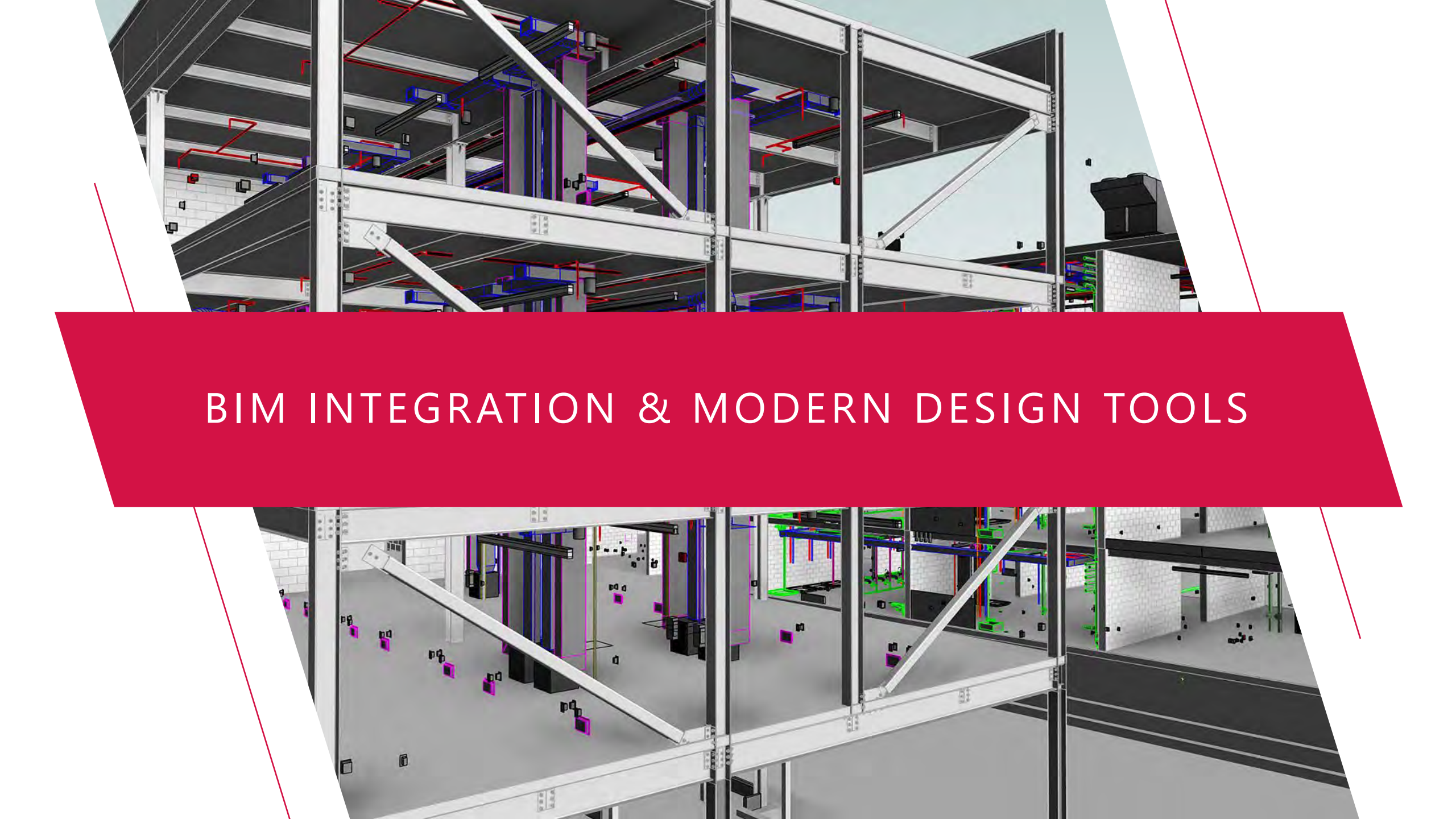
IMAGES OF SHAKE TABLE

DURABILITY, MAINTENANCE, & LONG TERM SAVINGS

LCA SLIDE

THIS SLIDE IS INCOMPLETE

EXAMPLE OF LIFETIME COST OF MASONRY AND BENEFITS WHEN COMPARED WITH OTHER CONSTRUCTION METHODS



BIM INTEGRATION & MODERN DESIGN TOOLS

HOW WE SUPPORT THE MODERN DESIGNER

www.AngelusBlock.com	Dozens of technical articles on all the topics discussed here today, masonry code references, LEED and other sustainability strategies and much more
3D Unit Library & BIMsmith Marketplace	1,000's of digital assets of our products in every size, color, texture, and configuration—100% free to everyone and can be exported to SketchUp
MasonryiQ	Incredible Revit plugin developed by Tom Cuneio—we sponsor licenses for architects to make designing with CMU easier and more efficient
Support Team	Customer service is a huge priority for us—we have an incredible team of architectural reps, stop by our booth and say hello

CONCLUSION SLIDE

THIS SLIDE IS INCOMPLETE

CONCLUSION BULLET POINTS WILL BE HERE

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