Code-Compliant Wood Design Across the Continuum of Care for Senior Living

Presented by Greg Gauthreaux and Stuart Lachs

PERKINS EASTMAN

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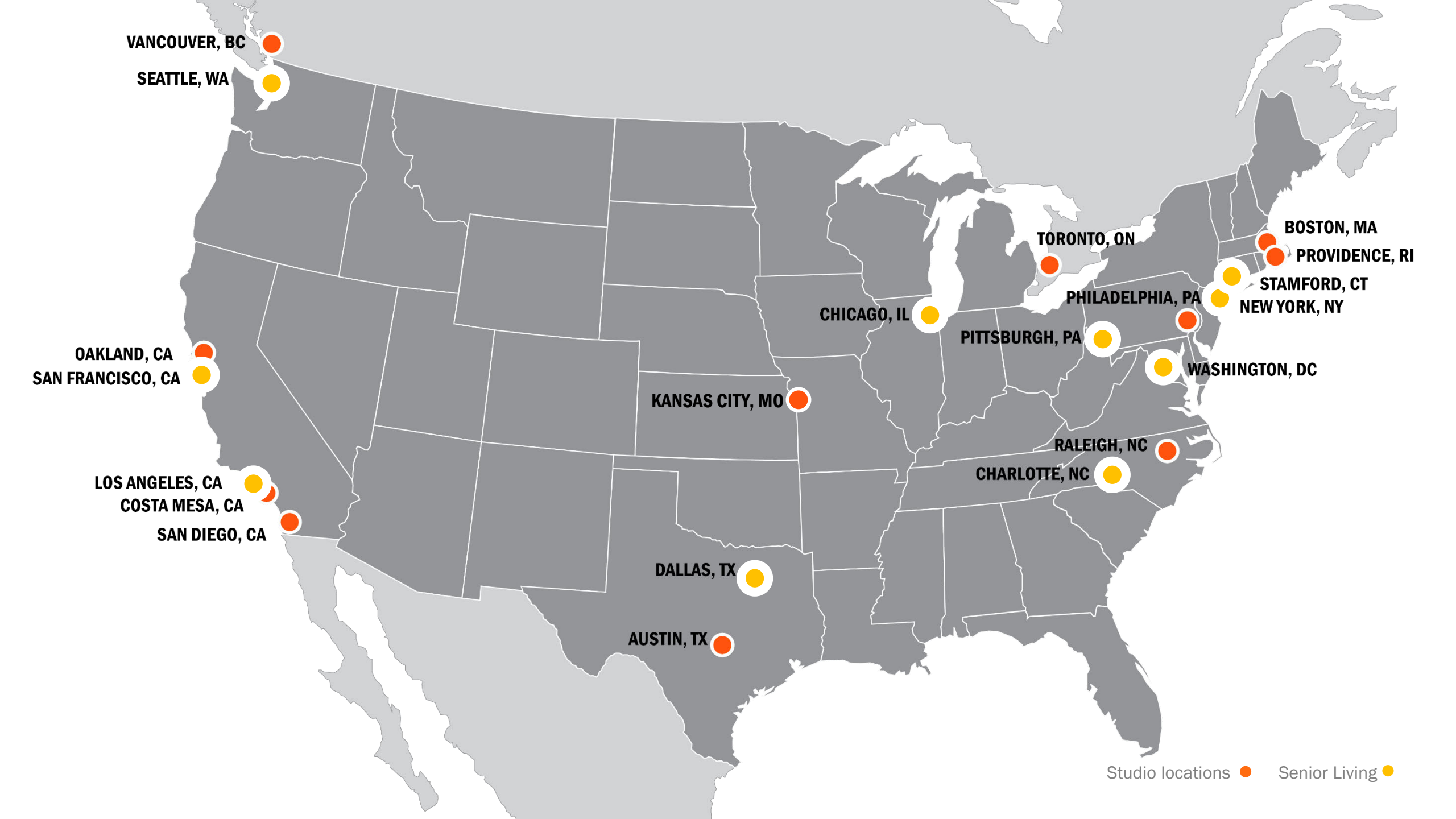
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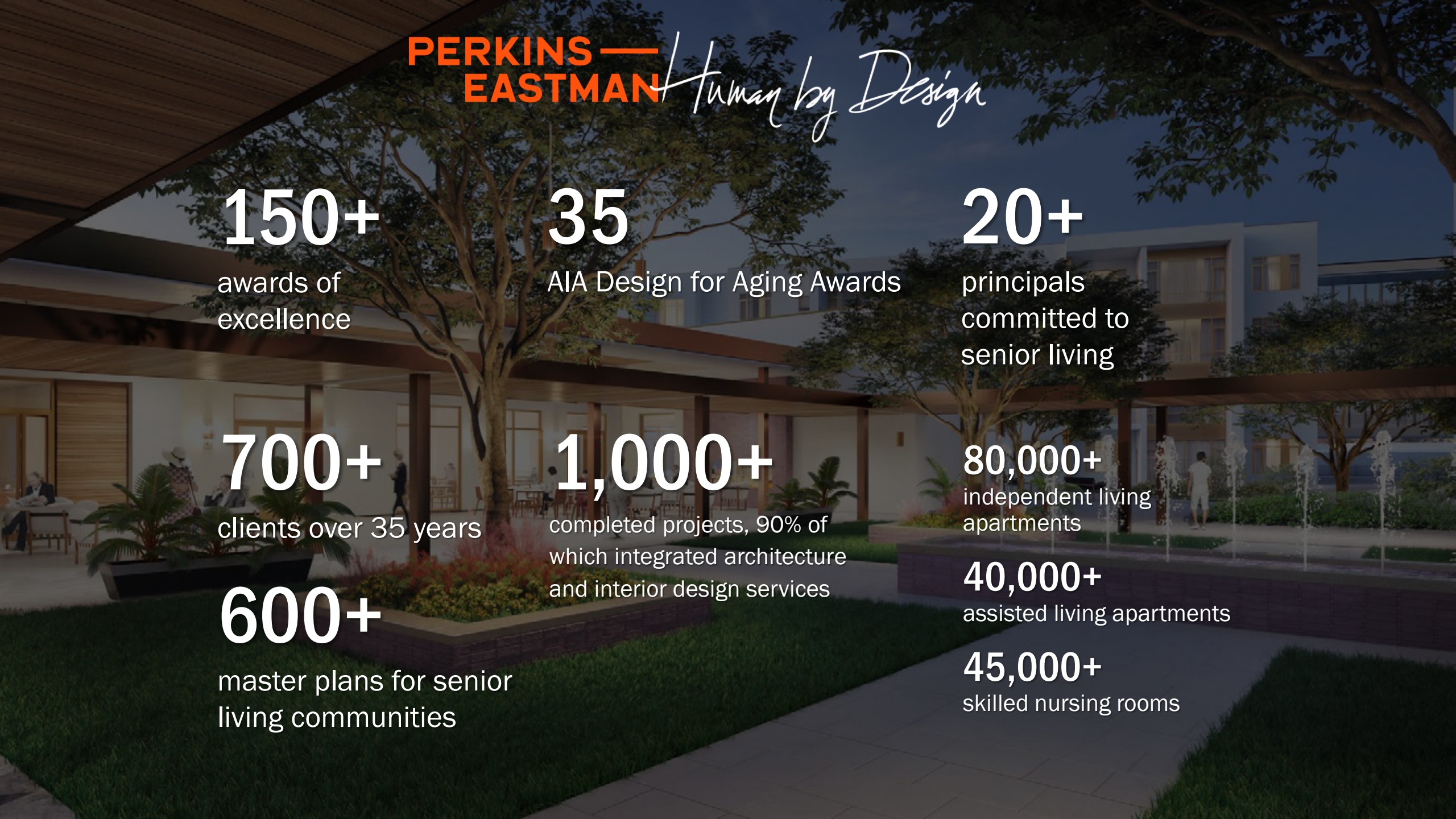
Studio locations
Senior Living



PERKINS EASTMAN

Human by Design

150+
awards of excellence

35
AIA Design for Aging Awards

20+
principals committed to senior living

700+
clients over 35 years

1,000+
completed projects, 90% of which integrated architecture and interior design services

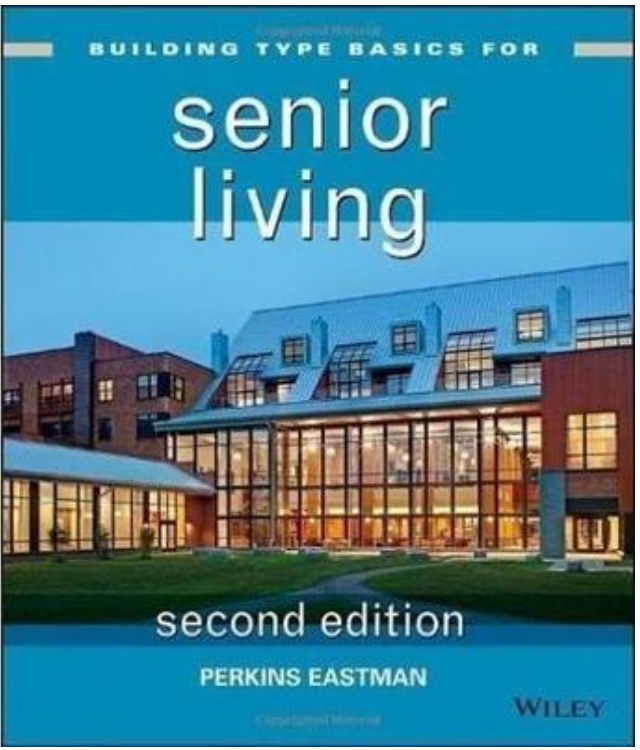
80,000+
independent living apartments

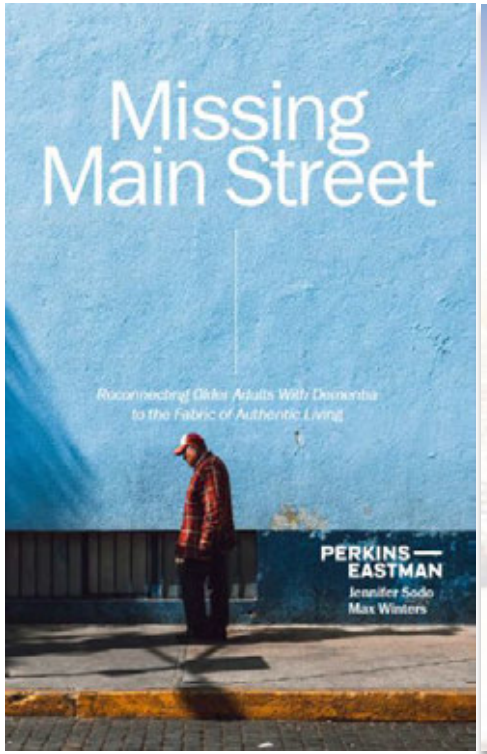
40,000+
assisted living apartments

600+
master plans for senior living communities

45,000+
skilled nursing rooms

Thought Leadership





TECH-AGE
Artificial intelligence, robotics, virtual reality, home automation

AGING IN THE COMMUNITY
Decentralized care and services

THIRD ACT
An alternative definition of retirement focused on lifestyle and continued engagement

PARADIGM SHIFTS
Climatic, financial, and political changes affecting the world

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The Power of Convergence

Human by Design

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

AIA Approved Continuing Education

Course Description

As the U.S. population ages, demand for affordable senior housing continues to grow. But with the different levels of care that can be provided at these facilities, designers may wonder how they are classified under the International Building Code (IBC). This course provides an exploration of the unique features and goals of senior living communities, common occupancy groups, and where wood construction is permitted within the IBC. We will address special considerations such as how to meet fire and acoustic performance requirements with wood assemblies. Additionally, we will delve into the benefits of using off-site, modular construction to more rapidly meet this growing demand with high-quality wood construction.

Learning Objectives

1. Gain insights into current trends for senior living that prioritize the physical and emotional health of residents and caregivers through thoughtful design choices, including biophilic elements.

2. Learn to identify and classify different types of senior housing facilities based on occupancy group under the International Building Code (IBC).

3. Identify and mitigate challenges related to fire resistance ratings and fire separation requirements in wood wall and floor/ceiling assemblies in senior housing projects.

4. Explore how off-site construction can support health, safety, and welfare through improved building quality, reduced construction timelines, and more consistent performance.

What is Senior Living

Changing the Perception and Experience of Aging.

Common types of Senior Living

Life Plan Community

Common types of Senior Living

Life Plan Community

Senior Living Trends

Population + housing demands

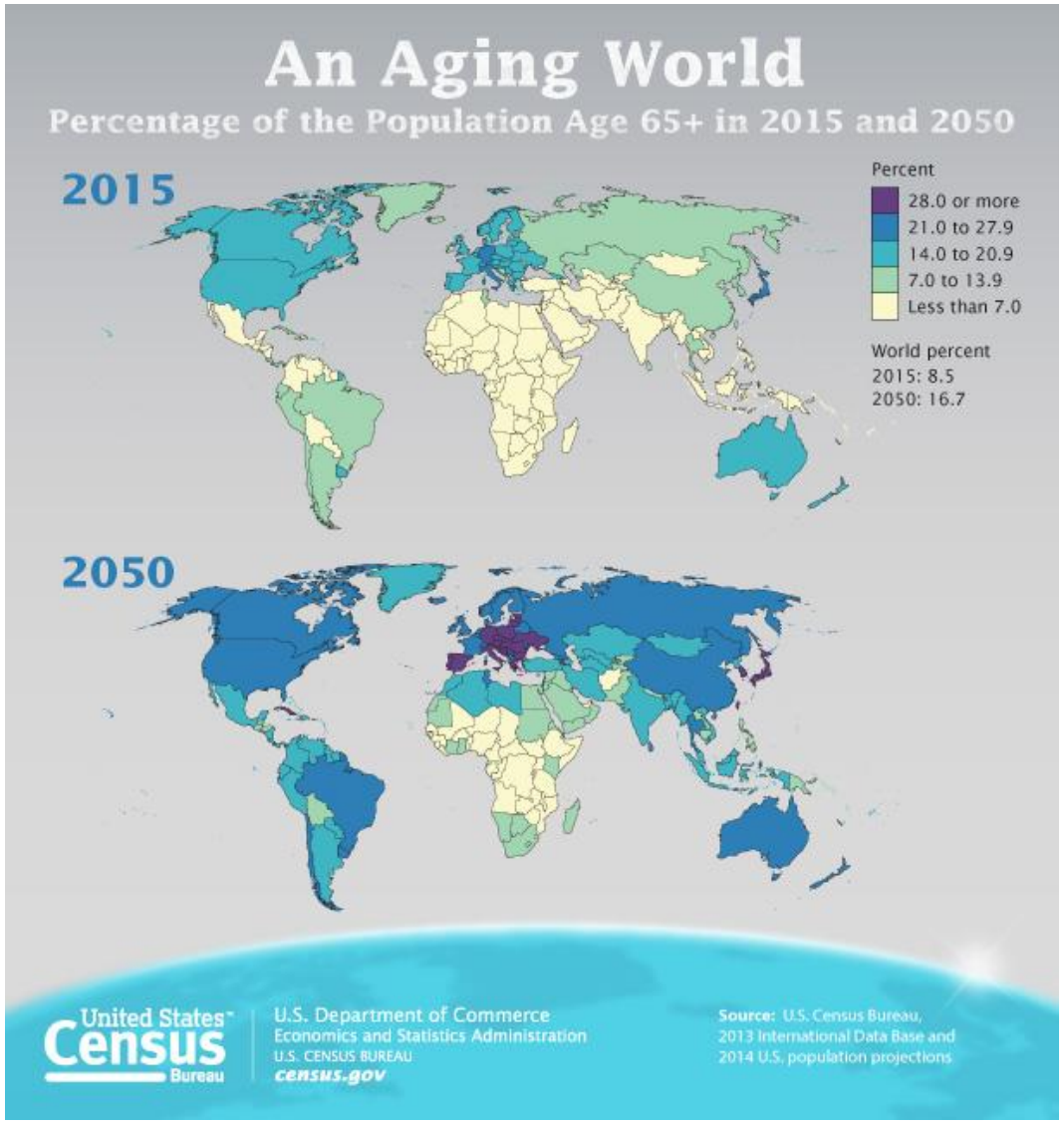
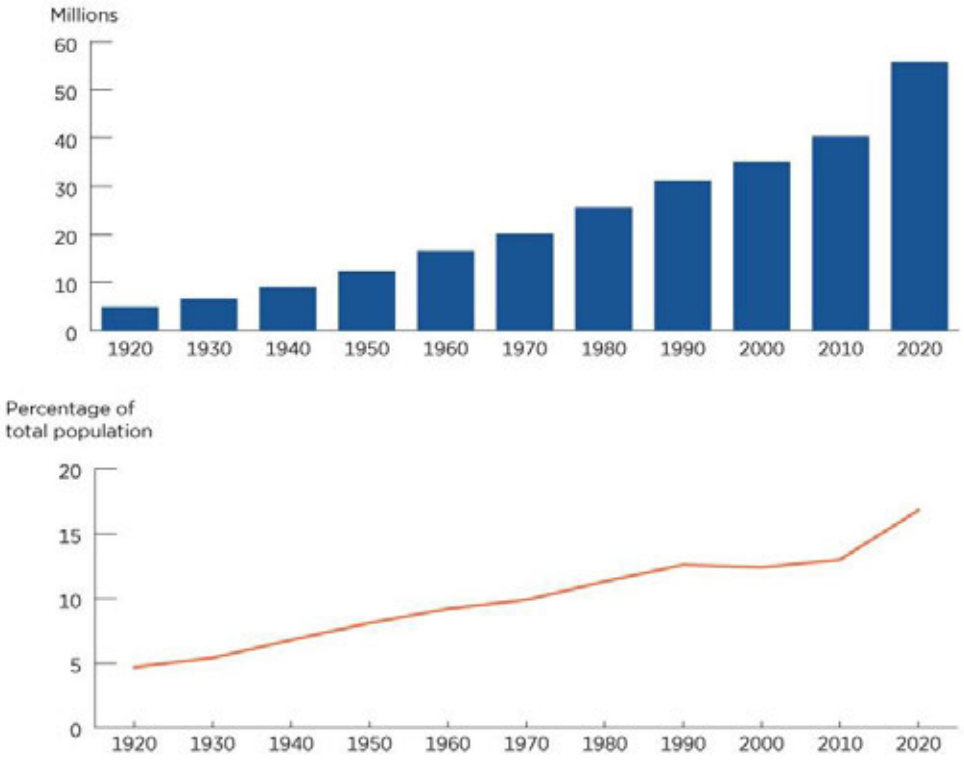


Figure 1.
Population 65 Years and Over by Size and Percentage of Total Population: 1920 to 2020



Note: For information on data collection, confidentiality protection, nonsampling error, and definitions, refer to <https://www2.census.gov/programs-surveys/decennial/2020/technical-documentation/complete-tech-docs/demographic-and-housing-characteristics-file-and-demographic-profile/2020census-demographic-and-housing-characteristics-file-and-demographic-profile-techdoc.pdf>.

Source: U.S. Census Bureau, Decennial Census of Population, 1900 to 2000; 2010 Census Summary File 1, and 2020 Census Demographic and Housing Characteristics File (DHC).

Senior Living Trends

Population + housing demands

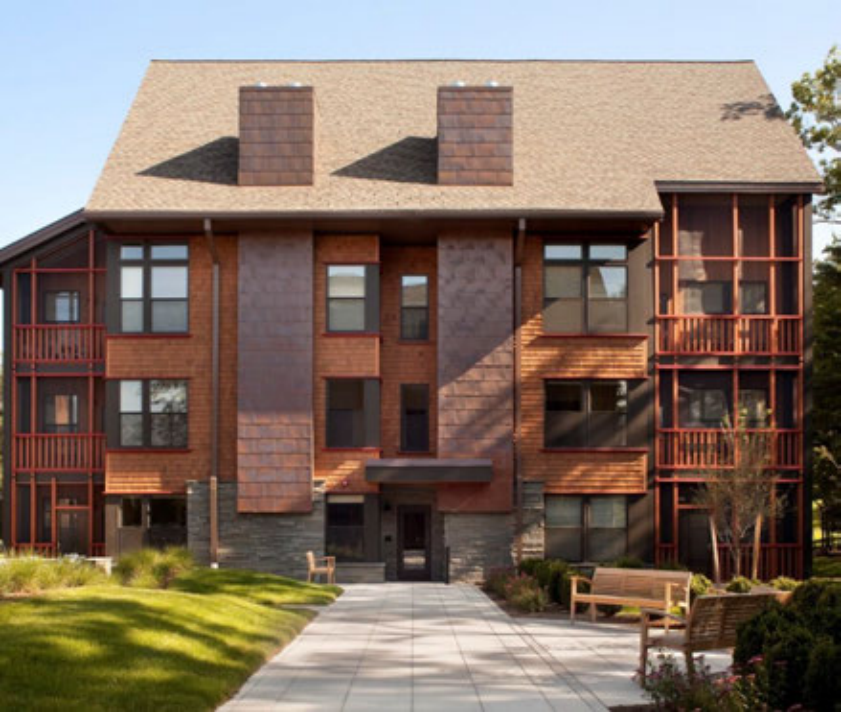
Today's Active Adults Over 50:

- Control 70% of all disposable income
- Represent the third-largest economy in the world
- 46% of affluent boomers have net worth exceeding $2 million
- Expected to inherit $8.4 trillion by 2030
- Often wealthier in retirement
- 95% of household purchasing decisions are made by women

Senior Living Trends

Population + housing demands

- Boomers account for $1 out of every $4 spent on home purchases and renters will spend $500 billion on rent in the next five years
- In 2017, the home equity of homeowners age 62+ was valued at $6.3 trillion
- By 2035 the population over 65 will have **doubled and will be living longer**



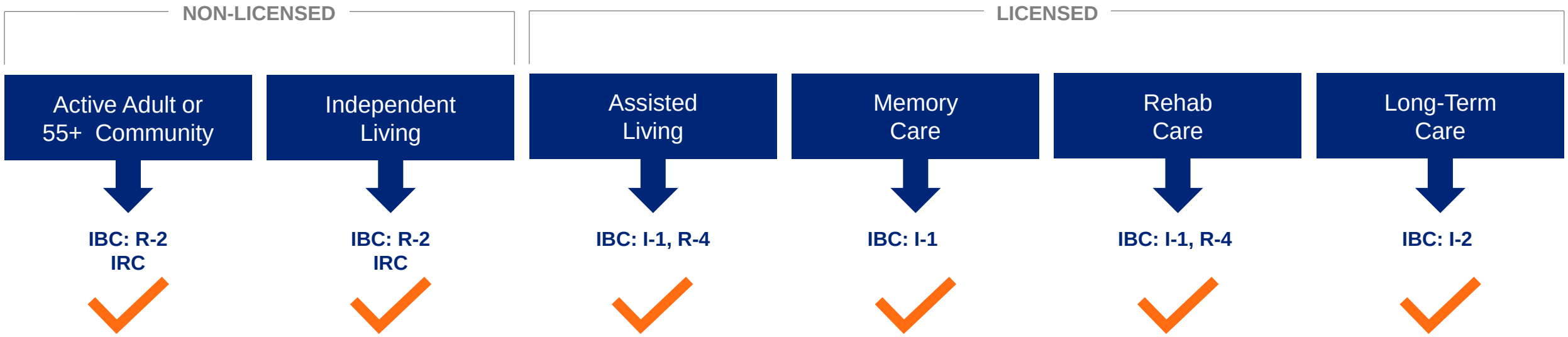
Places for living

Inspired by Hospitality


Resident-centered care

Common types of Senior Living

Full Continuum of Care



Wood Construction in Senior Living?

Senior Living and the IBC

Maximum Area Limitations (SF per floor)

Assisted Living & Memory Care

Skilled Care

***note NFPA limitation of 22,500 SF per smoke compartment**

55+, Active Adult, Independent Living

***Assuming multi-family**

TABLE 506.2

ALLOWABLE AREA FACTOR (A_t = NS, S1, S13R, S13D or SM, as applicable) IN SQUARE FEET[a, b]

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION											
		Type I		Type II		Type III		Type IV				Type V	
		A	B	A	B	A	B	A	B	C	HT	A	B
I-1	NS[d, e]	UL	55,000	19,000	10,000	16,500	10,000	54,000	36,000	18,000	18,000	10,500	4,500
	S1	UL	220,000	76,000	40,000	66,000	40,000	216,000	144,000	72,000	72,000	42,000	18,000
	SM	UL	165,000	57,000	30,000	49,500	30,000	162,000	108,000	54,000	54,000	31,500	13,500
I-2	NS[d, f]	UL	UL	15,000	11,000	12,000	NP	36,000	24,000	12,000	12,000	9,500	NP
	S1	UL	UL	60,000	44,000	48,000	NP	144,000	96,000	48,000	48,000	38,000	NP
	SM	UL	UL	45,000	33,000	36,000	NP	108,000	72,000	36,000	36,000	28,500	NP
I-3	NS[d, e]	UL	UL	15,000	10,000	10,500	7,500	36,000	24,000	12,000	12,000	7,500	5,000
	S1	UL	UL	60,000	40,000	42,000	30,000	144,000	96,000	48,000	48,000	30,000	20,000
	SM	UL	UL	45,000	30,000	31,500	22,500	108,000	72,000	36,000	36,000	22,500	15,000
I-4	NS[d, g]	UL	60,500	26,500	13,000	23,500	13,000	76,500	51,000	25,500	25,500	18,500	9,000
	S1	UL	121,000	106,000	52,000	94,000	52,000	306,000	204,000	102,000	102,000	74,000	36,000
	SM	UL	181,500	79,500	39,000	70,500	39,000	229,500	153,000	76,500	76,500	55,500	27,000
M	NS	UL	UL	21,500	12,500	18,500	12,500	61,500	41,000	26,625	20,500	14,000	9,000
	S1	UL	UL	86,000	50,000	74,000	50,000	246,000	164,000	102,500	82,000	56,000	36,000
	SM	UL	UL	64,500	37,500	55,500	37,500	184,500	123,000	76,875	61,500	42,000	27,000
R-1[h]	NS[d]	UL	UL	24,000	16,000	24,000	16,000	61,500	41,000	25,625	20,500	12,000	7,000
	S13R												
	S1	UL	UL	96,000	64,000	96,000	64,000	246,000	164,000	102,500	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	184,500	123,000	76,875	61,500	36,000	21,000
R-2[h]	NS[d]	UL	UL	24,000	16,000	24,000	16,000	61,500	41,000	25,625	20,500	12,000	7,000
	S13R												
	S1	UL	UL	96,000	64,000	96,000	64,000	246,000	164,000	102,500	82,000	48,000	28,000
	SM	UL	UL	72,000	48,000	72,000	48,000	184,500	123,000	76,875	61,500	36,000	21,000

Senior Living and the IBC

Maximum Height Limitations (# of stories)

Assisted Living & Memory Care

Skilled Care

55+, Active Adult, Independent Living

***Assuming multi-family**

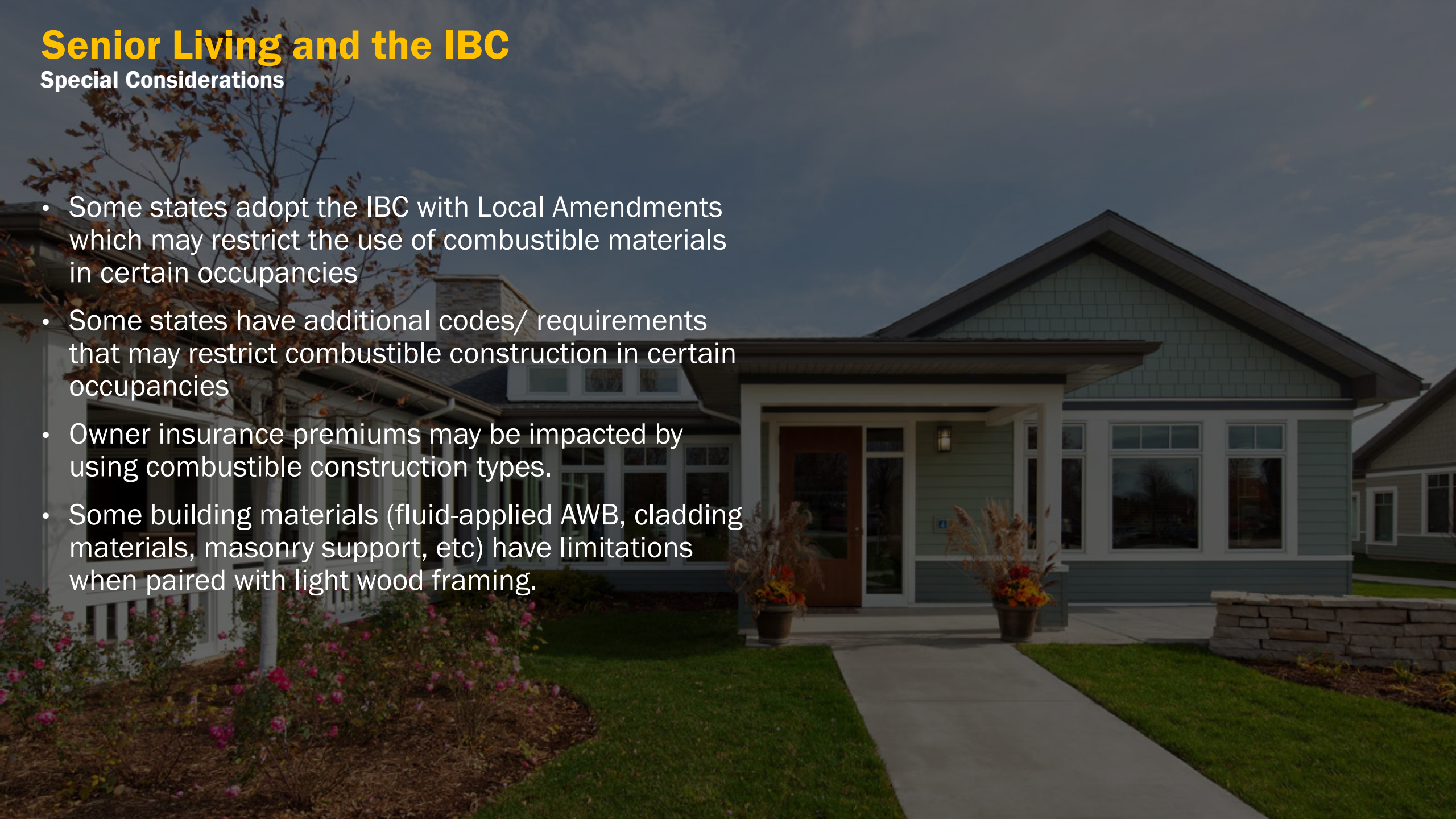
TABLE 504.4

ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE[a, b]

OCCUPANCY CLASSIFICATION	See Footnotes	TYPE OF CONSTRUCTION											
		Type I		Type II		Type III		Type IV				Type V	
		A	B	A	B	A	B	A	B	C	HT	A	B
I-1 Condition 1	NS[d, e]	UL	9	4	3	4	3	4	4	4	4	3	2
	S	UL	10	5	4	5	4	10	7	5	5	4	3
I-1 Condition 2	NS[d, e]	UL	9	4	3	4	3	3	3	3	4	3	2
	S	UL	10	5				10	6	4			
I-2	NS[d, f]	UL	4	2	1	1	NP	NP	NP	NP	1	1	NP
	S	UL	5	3				7	5	1			
I-3	NS[d, e]	UL	4	2	1	2	1	2	2	2	2	2	1
	S	UL	5	3	2	3	2	7	5	3	3	3	2
I-4	NS[d, g]	UL	5	3	2	3	2	3	3	3	3	1	1
	S	UL	6	4	3	4	3	9	6	4	4	2	2
M	NS	UL	11	4	2	4	2	4	4	4	4	3	1
	S	UL	12	5	3	5	3	12	8	6	5	4	2
R-1[h]	NS[d]	UL	11	4	4	4	4	4	4	4	4	3	2
	S13R	4	4									4	3
	S	UL	12	5	5	5	5	18	12	8	5	4	3
R-2[h]	NS[d]	UL	11	4	4	4	4	4	4	4	4	3	2
	S13R	4	4	4								4	3
	S	UL	12	5	5	5	5	18	12	8	5	4	3

Senior Living and the IBC

Special Considerations



- Some states adopt the IBC with Local Amendments which may restrict the use of combustible materials in certain occupancies
- Some states have additional codes/ requirements that may restrict combustible construction in certain occupancies
- Owner insurance premiums may be impacted by using combustible construction types.
- Some building materials (fluid-applied AWB, cladding materials, masonry support, etc) have limitations when paired with light wood framing.

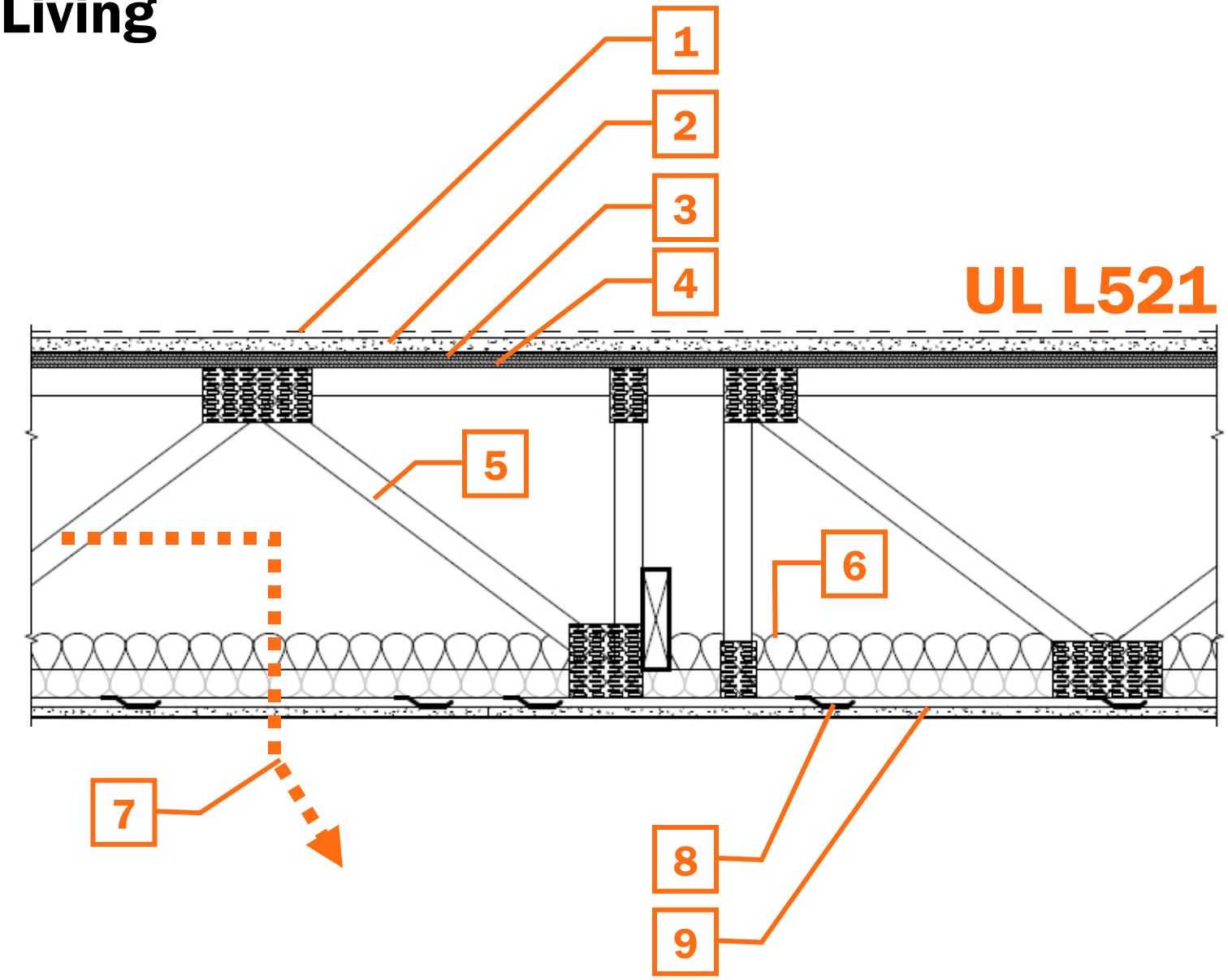
Wood Construction in Senior Living

Lessons + Best Practices

Wood Construction in Senior Living

Floor-Ceiling Assemblies

1. Floor Finish
2. Gypsum Underlayment
   - ¾” min, 1 ½” recommended
3. Acoustic underlayment
4. Subfloor (plywood/ OSB)
5. Wood Truss (18”-24” typ)
6. Cavity Insulation (NFPA 13)
7. Penetrations + Dampers
8. Resilient Channels
9. Type X gyp-board

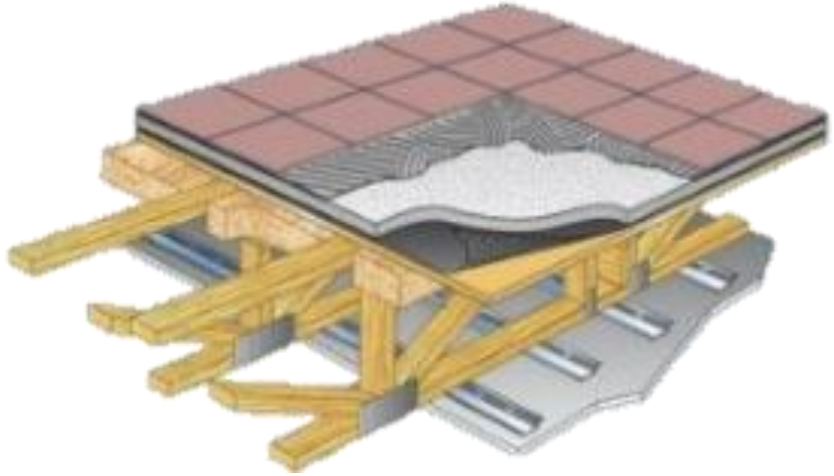


UL L521

Wood Construction in Senior Living

STC + IIC Considerations

- **STC = airborne sounds …easy!**
- **IIC = impact/vibration sounds…complicated!**
- **Current market demands higher STC & IIC ratings**
  - Floors
  - Demising Walls
  - Corridor Walls
  - Interior Unit Walls
- **Manage Client Expectations**
  - Residents transitioning from SFH
  - Nothing is “soundproof”
- **Without the data, it doesn’t exist**
  - Tested assemblies w/ all layers



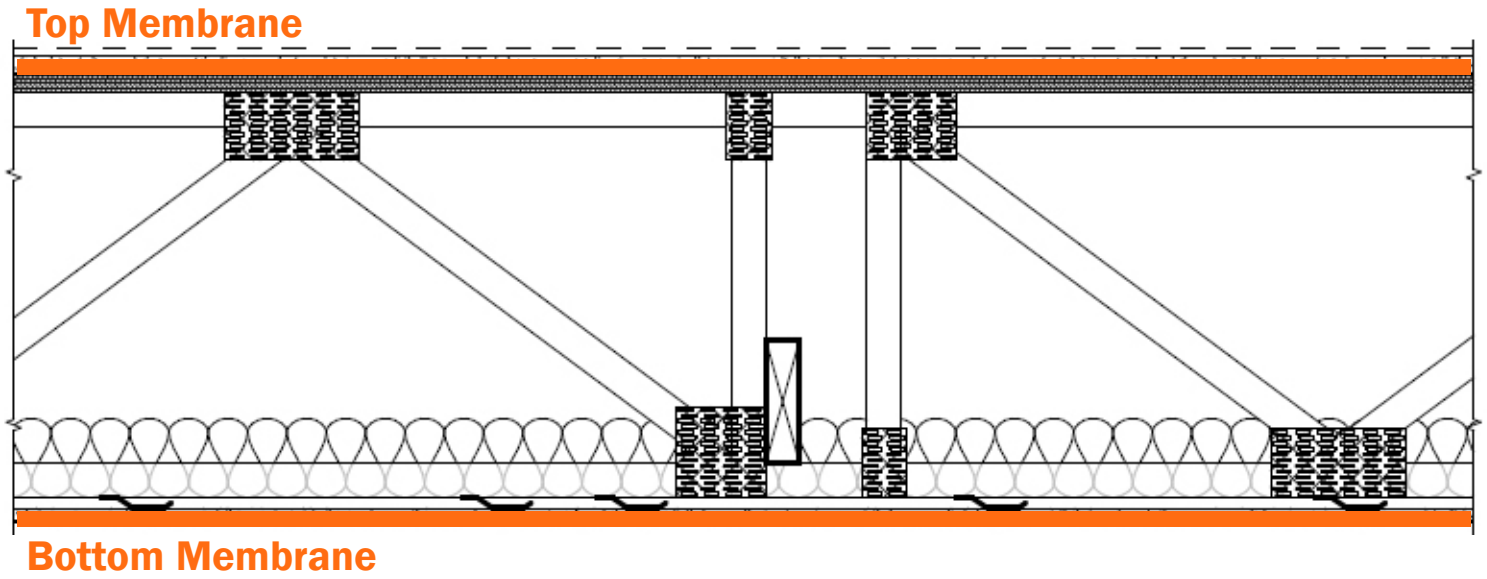
Floor Covering	STC	IIC
Sheet vinyl	62	53
Cushioned vinyl	62	55
Carpet and pad	62	81
Ceramic tile	62	54
Engineered wood laminate	61	55

Note: above assemblies include ¼” sound attenuation mat
Code minimum IIC = 50 (55+ recommended)
Code minimum STC = 50 (55+ recommended)

Wood Construction in Senior Living

Floor-Ceiling Assemblies

- **Must maintain membrane continuity**
  - Radiation dampers at diffusers
  - Fire Dampers at duct penetrations
  - Surface-mounted light fixtures (or rated enclosures)
  - Check area limitations for membrane penetrations (100 sq inches per 100 sq feet)
  - Double top plate required to avoid membrane gaps
  - Depression at roll-in showers



Wood Construction in Senior Living

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  - Double top plate required

Wood Construction in Senior Living

Floor Assemblies + Supporting Structure

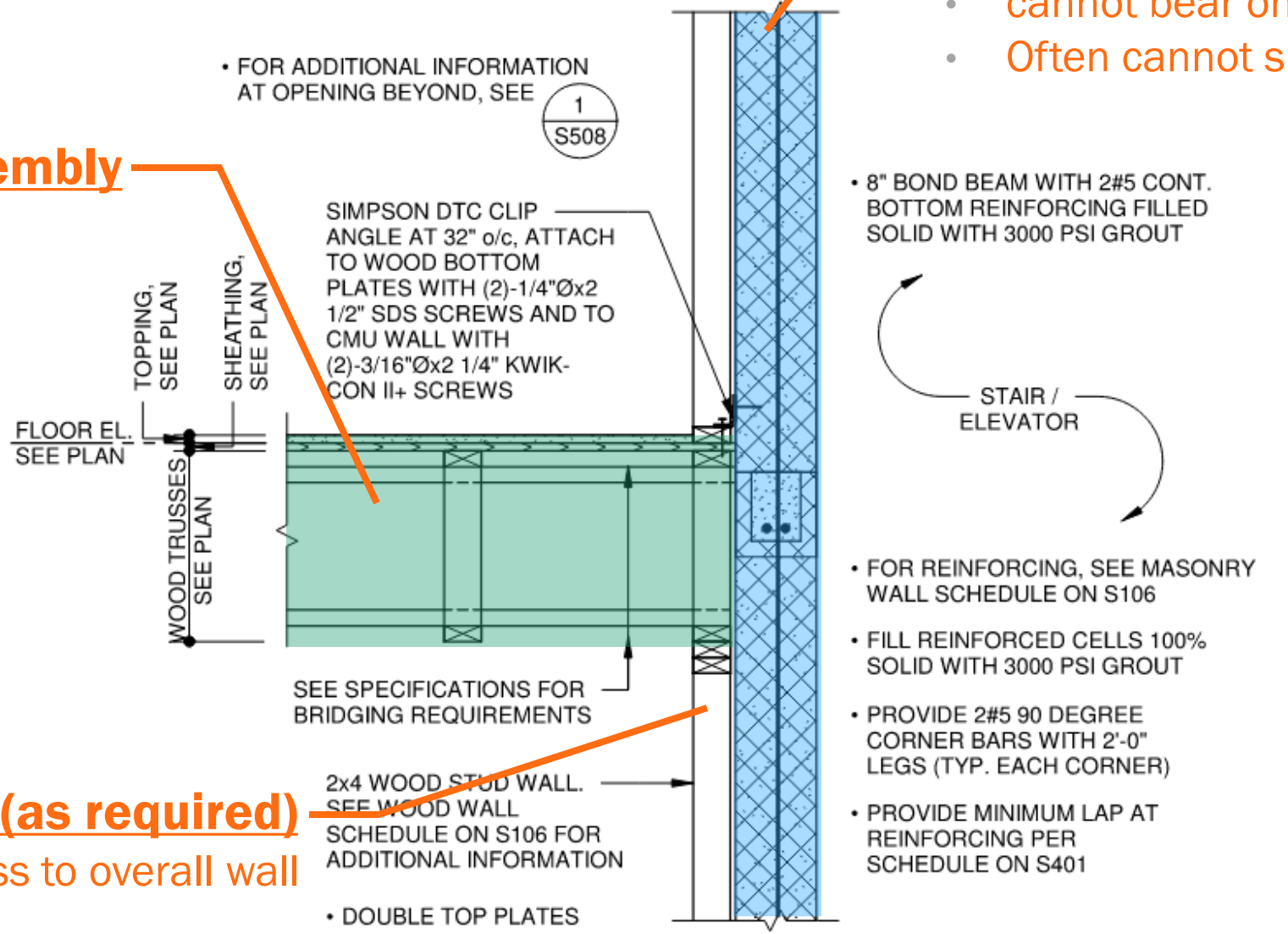
Wood Construction in Senior Living

Floor Assemblies + Supporting Structure

2hr Fire Barrier

- Must be continuous
- cannot bear on 1hr floor.
- Often cannot support floors.

1hr Floor Assembly



Bearing Wall (as required)

- Adds thickness to overall wall assembly
- Requires 1hr rating (review with AHJ)

Wood Construction in Senior Living

Floor Assemblies + Supporting Structure

Wood Construction in Senior Living

Floor Assemblies + Supporting Structure

- **Review rating strategy w/ AHJ**
  - 1-hour wall with 1-sided protection
- **8” ADA rule at stair doors within CMU walls**
  - Solution: Add header to cover 18” span to achieve clearance requirements

Wood Construction in Senior Living

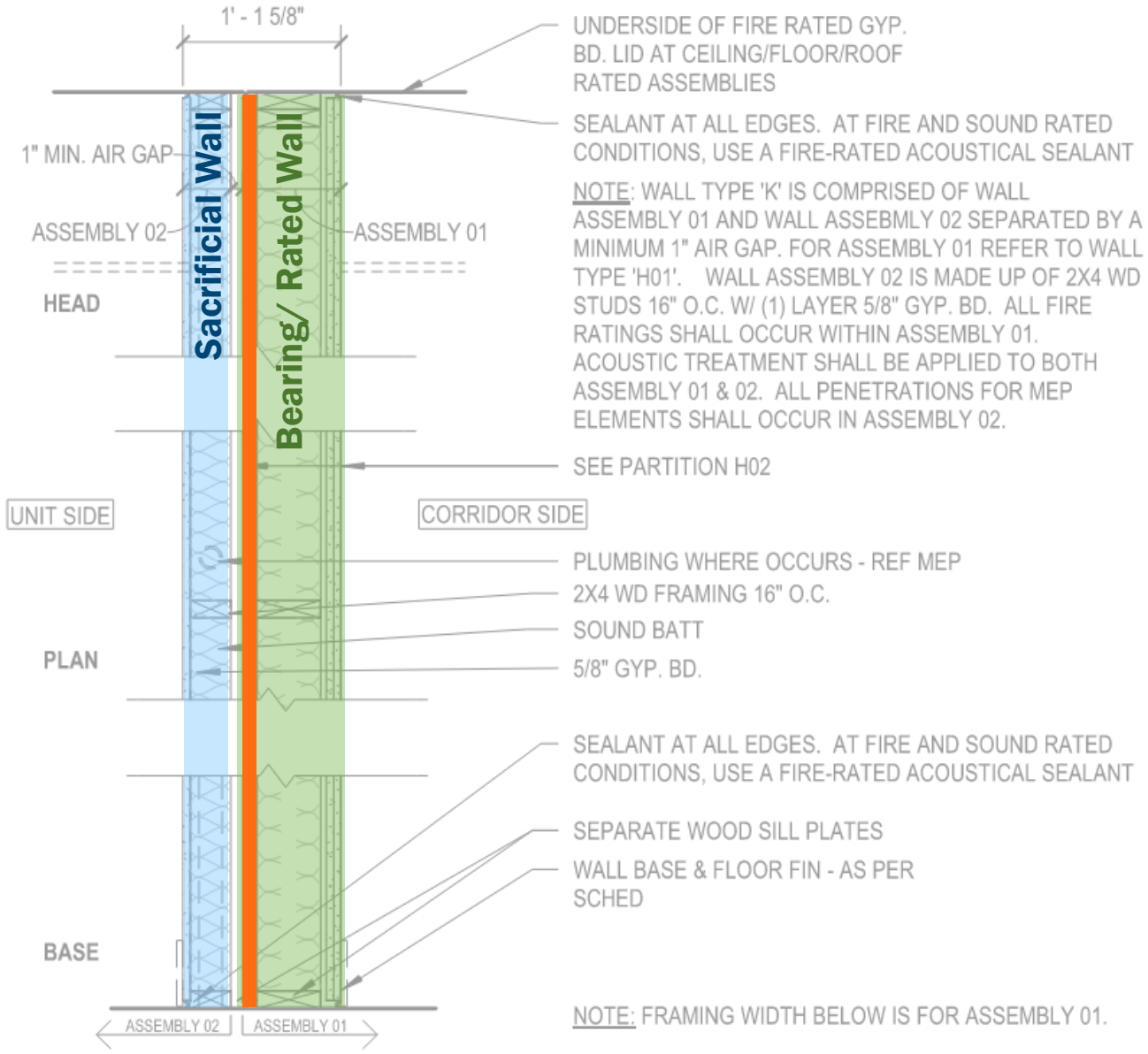
Floor Assemblies + Supporting Structure

- **Review rating strategy w/ AHJ**
  - 1-hour wall with 1-sided protection
- **8” ADA rule at stair doors within CMU walls**
  - Solution: Add header to cover 18” span to achieve clearance requirements

Wood Construction in Senior Living

Wall Assemblies + Construction Sequencing

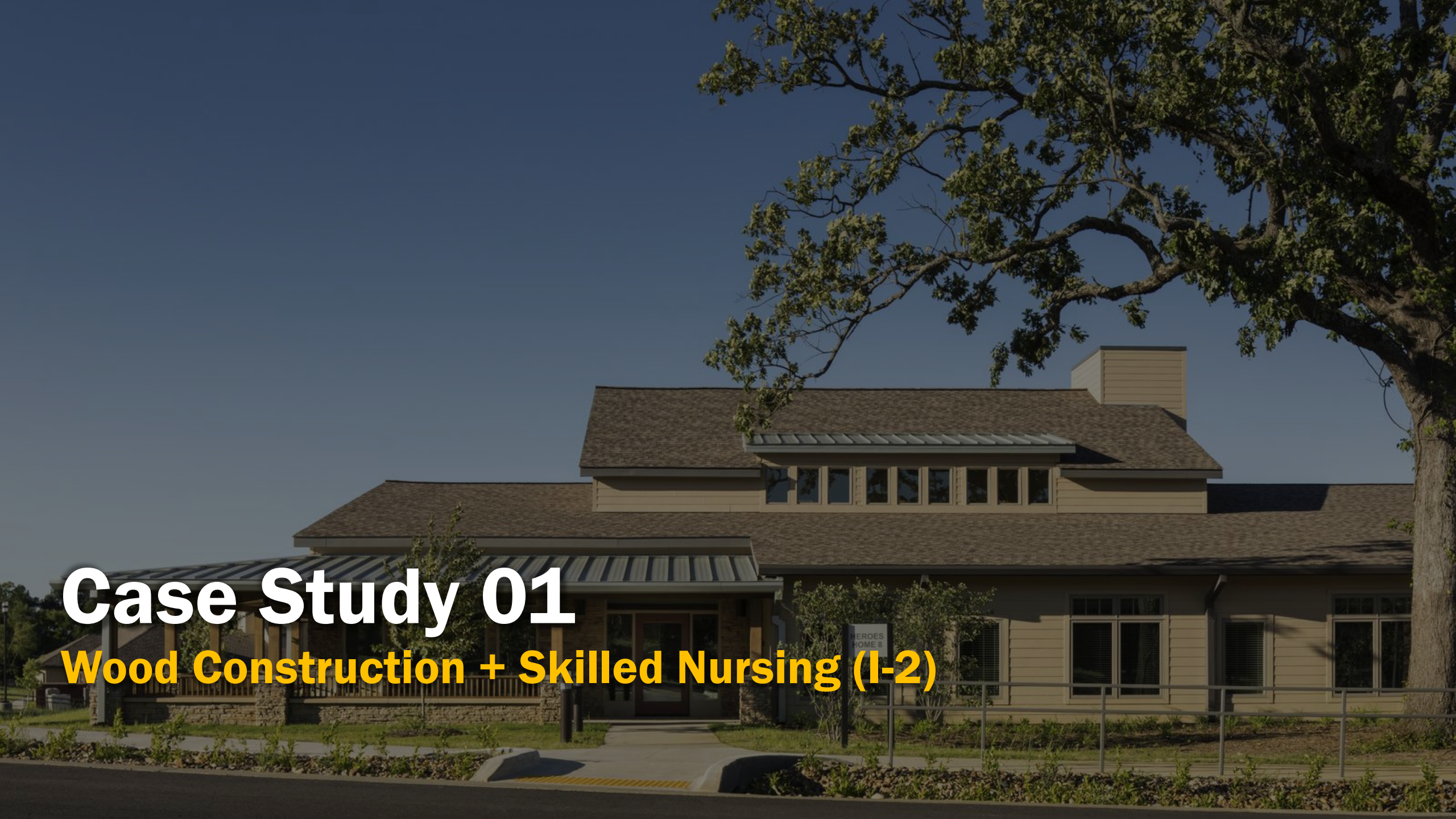
- **Managing Sound and Fire continuity**
- **Sacrificial wall to improve acoustics and rating continuity**
- **Concealed layers present sequencing issue**
  - Remobilizing trades to finish work
  - Consider plywood/OSB/glass-mat in lieu of paper-faced products (guaranteed RFI if you don't!)
  - Review UL assemblies for compliance



Wood Construction in Senior Living

Thermal Bridging + Framing density

- **Cavity insulation effectiveness**
  - Reduced by 63% with steel framing
  - Reduced by 14-18% with wood framing
- **Energy Code requirements**
  - Increased demand for continuous insulation
  - 2021: Zone 5: R13 + 7.5ci or R20 + 3.8ci
  - 2025: Zone 5: R11 + R10ci or R19 + R5ci or R21 + R4ci
- **Framing density considerations**
  - Larger openings = larger framing members
  - Consider u-factor, or performance approach

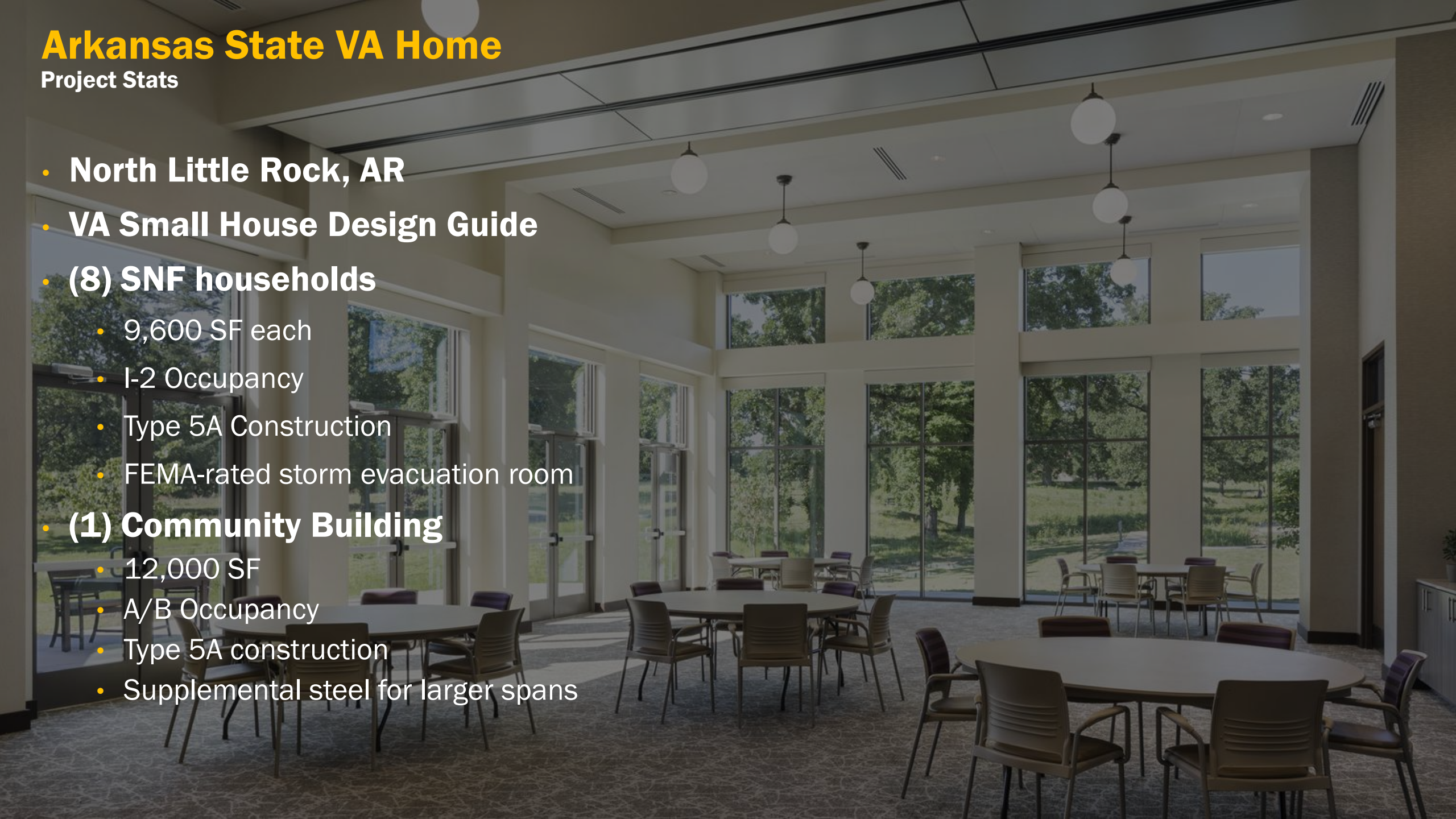


Case Study 01

Wood Construction + Skilled Nursing (I-2)

Arkansas State VA Home

Project Stats



- **North Little Rock, AR**
- **VA Small House Design Guide**
- **(8) SNF households**
  - 9,600 SF each
  - I-2 Occupancy
  - Type 5A Construction
  - FEMA-rated storm evacuation room
- **(1) Community Building**
  - 12,000 SF
  - A/B Occupancy
  - Type 5A construction
  - Supplemental steel for larger spans

Arkansas State VA Home

Overall Site Plan

Arkansas State VA Home

Overall Site Plan

Arkansas State VA Home

Typical Floor Plan - Household

- Resident Unit
- Commons
- Assisted Bathing
- Staff Support
- Building Support
- Circulation

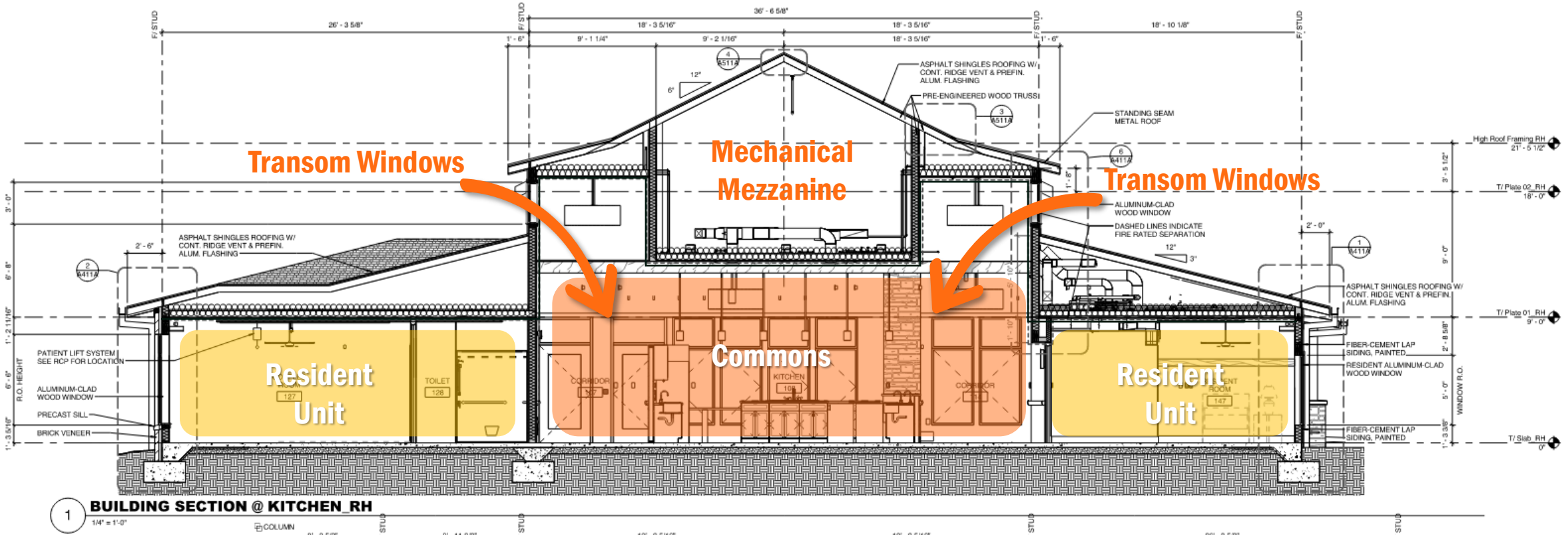
Arkansas State VA Home

Community Building – Floor Plan

- Commons
- Therapy
- Staff Support/ Admin
- Building Support
- Circulation

Arkansas State VA Home

Building Section - Household

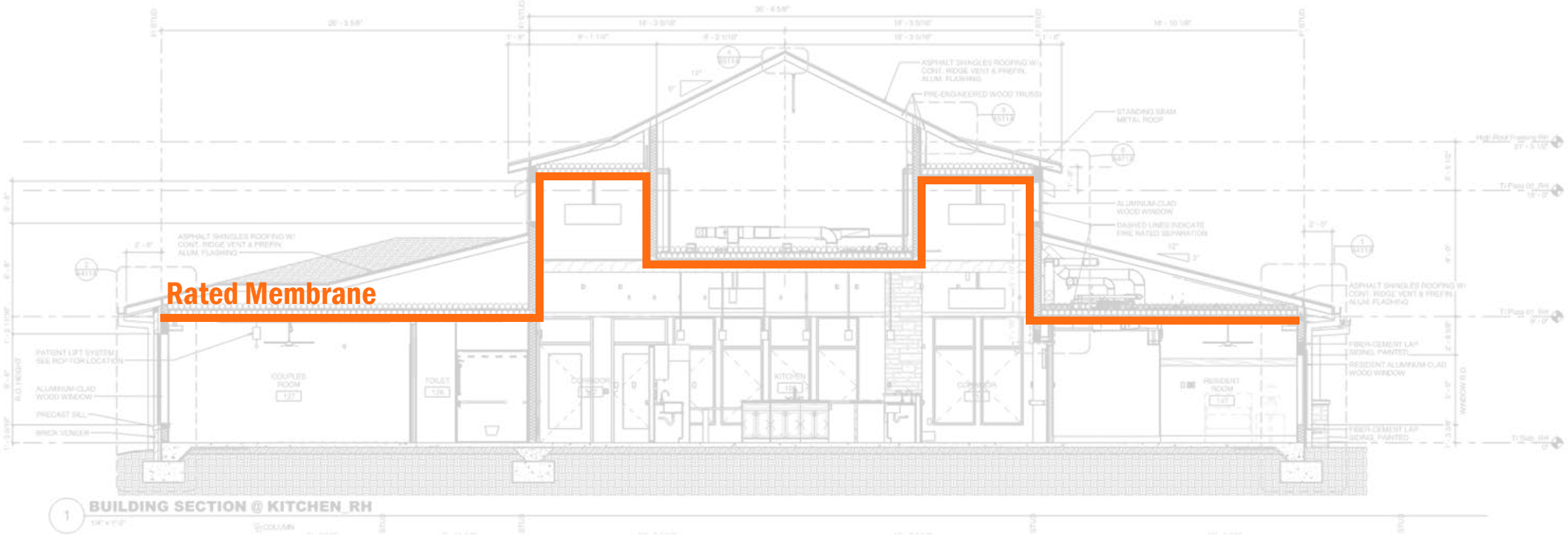


Arkansas State VA Home

PSL Headers + Transom Framing

Arkansas State VA Home

Building Section - Household



Arkansas State VA Home

Household Construction Process

Arkansas State VA Home

A new home for Veterans

Arkansas State VA Home

A new home for Veterans

Arkansas State VA Home

A new home for Veterans

Arkansas State VA Home

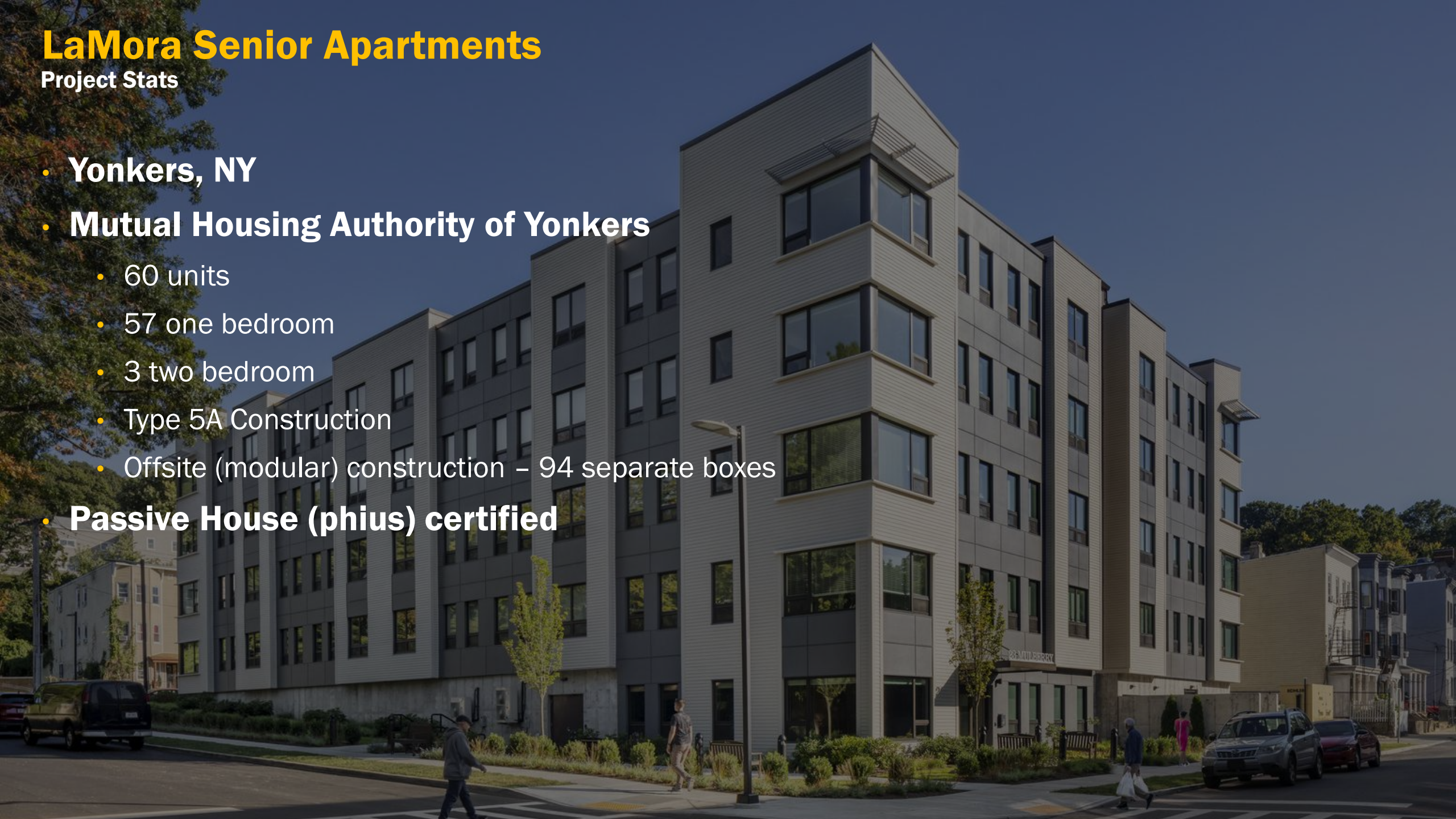
A new home for Veterans

Case Study 02

Modular Construction & Passive House

LaMora Senior Apartments

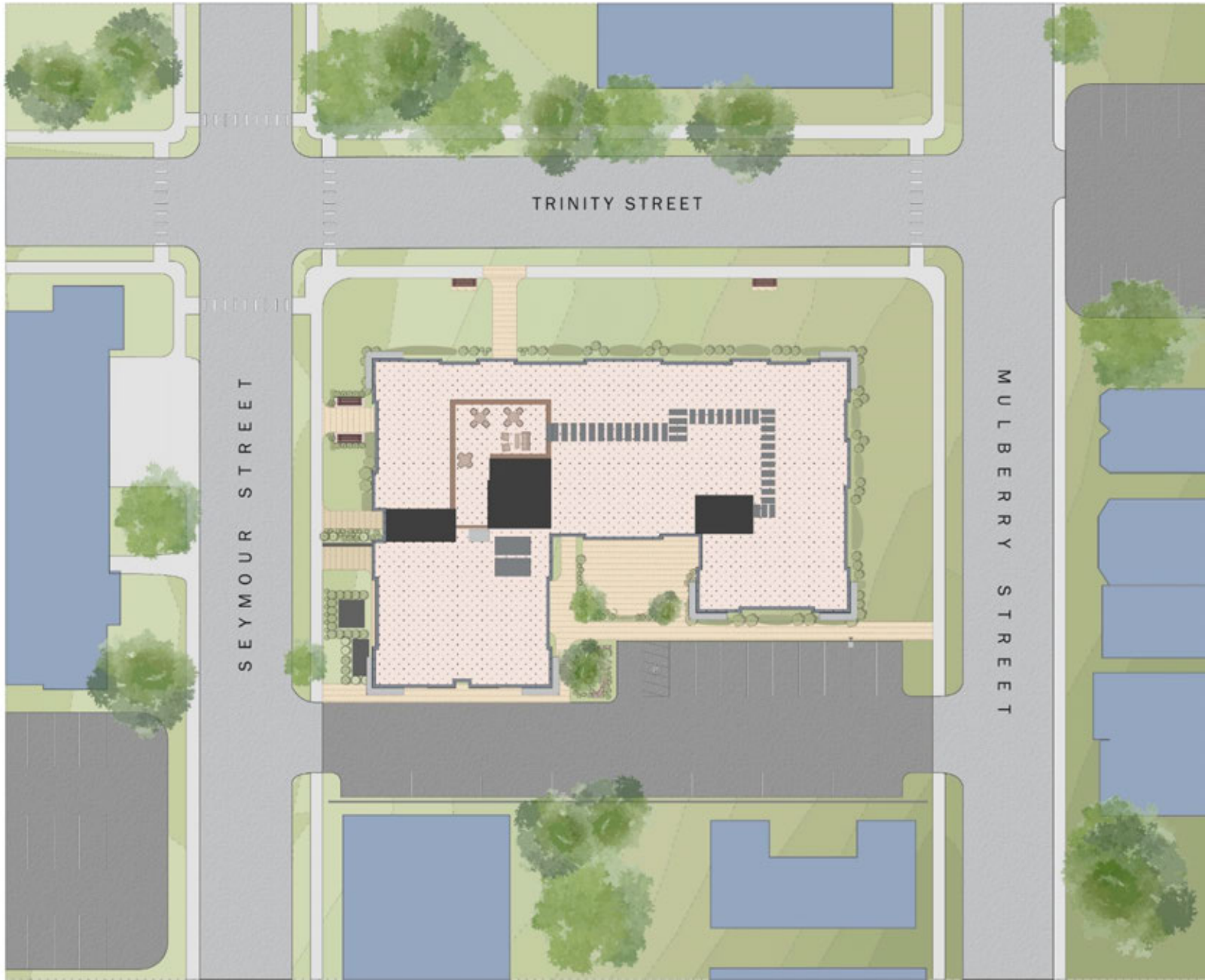
Project Stats



- **Yonkers, NY**
- **Mutual Housing Authority of Yonkers**
  - 60 units
  - 57 one bedroom
  - 3 two bedroom
  - Type 5A Construction
  - Offsite (modular) construction – 94 separate boxes
- **Passive House (phius) certified**

LaMora Senior Apartments

Site Plan



LaMora Senior Apartments

Typical Floor Plan

What is Modular Construction?

Modular construction is a process in which a building is constructed off-site, under controlled plant conditions:

Modular construction uses the same materials and designing to the same codes and standards as conventionally built facilities – but in about half the time. Buildings are produced in “modules” that when put together on site, reflect the identical design intent and specifications of the most sophisticated site-built facility – without compromise. Construction of modular buildings occurs simultaneously with site work, allowing projects to be completed in half the time of traditional construction.

Reduced Construction Schedule:

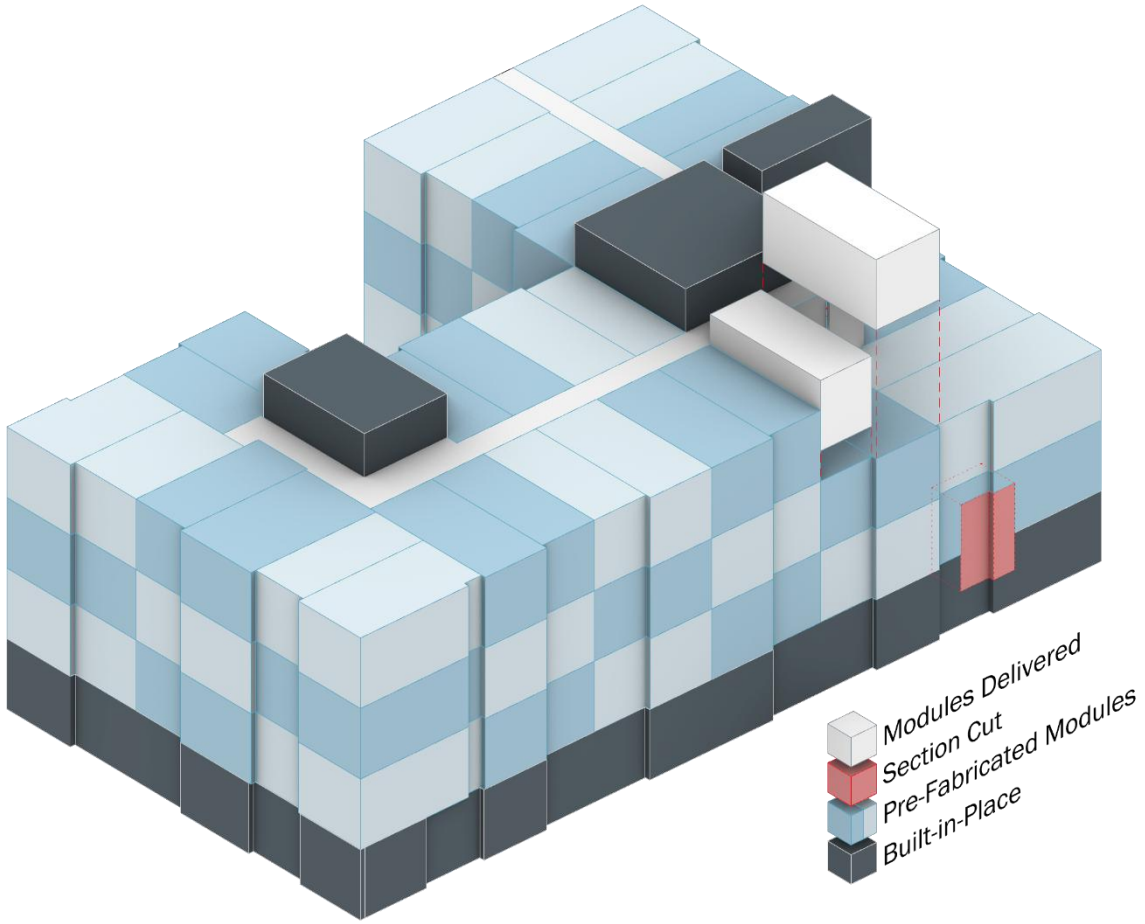
Because construction of modular buildings can occur simultaneously with the site and foundation work, projects can be completed 30% to 50% sooner than traditional construction.

Elimination of Weather Delays:

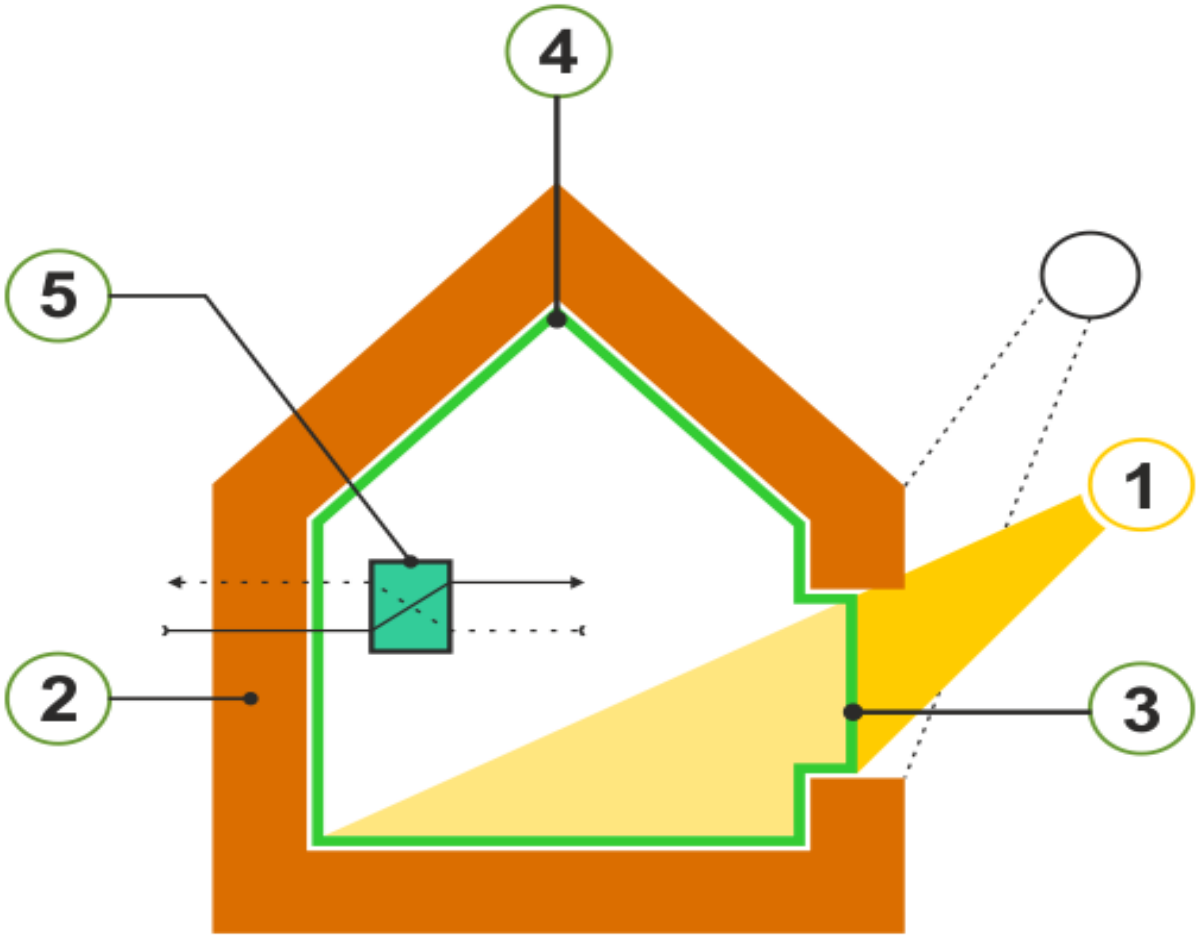
60 - 90% of the construction is completed inside a factory, which mitigates the risk of weather delays. Buildings are occupied sooner, creating a faster return on investment.

Built to Code with Quality Materials:

Modular buildings are built to meet or exceed the same building codes and standards as site-built structures, and the same architect-specified materials used in conventionally constructed buildings are used in modular construction projects – wood, concrete and steel.



What is Passive House?



Passive House Design Principals

1. Super Insulated Envelope
2. Airtight Construction
3. High-Performance Glazing
4. Eliminate/Reduce Thermal Bridging
5. Energy Recovery Ventilation

LaMora Senior Apartments

Off-Site Fabrication

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Off-Site Fabrication

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Completed module ready for delivery to jobsite

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Placement of the boxes

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Placement of the boxes

LaMora Senior Apartments

Placement of the boxes

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Sealing the mate joints

❶ Exposed marriage joints prior to sealing and concealment behind fireproof sheathing (green)

❷ Typical marriage joint w/air sealing tape over foamed joints

❸ Typical belly band at podium with Airtight Tape being applied

❹ Completed air barrier (prior to ZIP-R cladding / insulation / weather barrier install)

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Modules in place. Mate joints being sealed

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Applying the Exterior Cladding

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Modular, Passive House, Affordable, Senior Living

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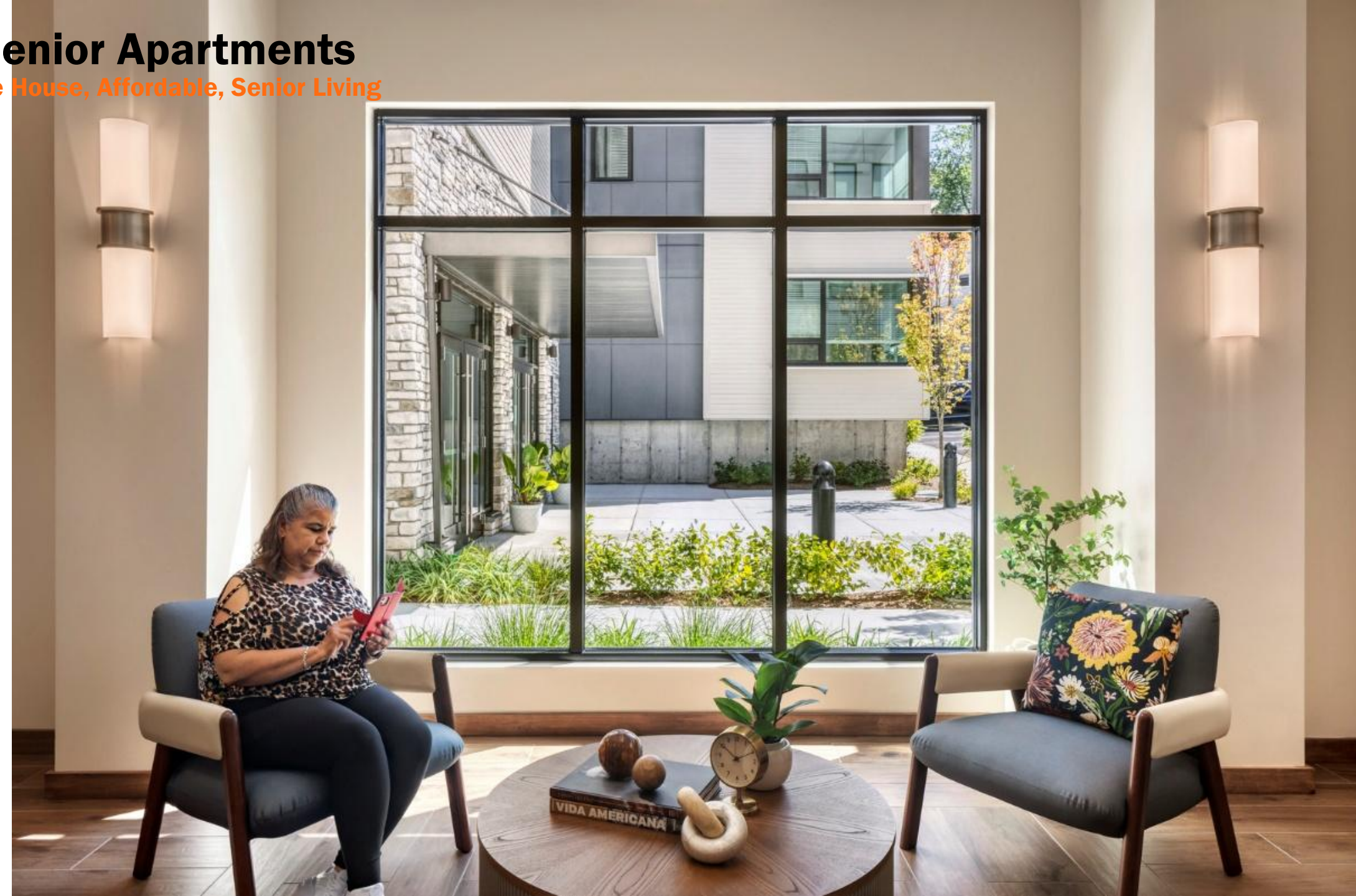

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Modular, Passive House, Affordable, Senior Living

LaMora Senior Apartments

Modular, Passive House, Affordable, Senior Living

Photograph by Andrew Rugge. Copyright Perkins Eastman

Wood Construction in Senior Living

Conclusions

- Cost effectiveness
- Speed to market
- Sub-market familiarity
- Material availability
- Maintenance simplicity
- Easily tailored to client demands


Thank you

QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

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