AIA COURSE 2 OF 3 · 1.0 LU|HSW

AAC THREE-COURSE CURRICULUM

01 Fire, Thermal & Code Compliance

02 Structural Systems & Wind/Seismic Design

03 Sustainability, LEED & Total Cost of Ownership

AAC STRUCTURAL SYSTEMS

Wind, Seismic & Load-Bearing Design

IBC Chapter 21 · TMS 402-22 · ASCE 7-22 · Florida Building Code (8th Ed.)

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CEO of MHE Group • International AAC Expert • 3,000+ AAC Projects Worldwide

LEARNING OBJECTIVES — COURSE 2

1.0 LU|HSW

01 Identify the structural properties of AAC and its density/strength grade classifications per ASTM C1693 and TMS 402

02 Evaluate the MHE AAC Load-Bearing System for low-rise construction without a reinforced concrete frame, including wall, lintel, and bond beam detailing

03 Apply AAC wall and panel systems to ASCE 7-22 wind load requirements, including Florida High-Velocity Hurricane Zones (HVHZ) and Product Approval pathways

04 Evaluate AAC seismic applicability in SDC A–C per ASCE 7-22 Table 12.2-1 and TMS 402-22 Chapters 7 and 11; identify when separate steel/concrete lateral systems are required in SDC D and higher.

This program qualifies for AIA Continuing Education credit under Health, Safety & Welfare (HSW)

AAC STRENGTH GRADES & STRUCTURAL PROPERTIES

ASTM C1693 STRENGTH CLASSIFICATION

AAC-2

25–31 lb/ft³

f'AAC = 290–365 psi

Use: Non-load-bearing partitions, interior walls, lightweight cladding

AAC-4

31–44 lb/ft³

f'AAC = 580 – 725 psi

Use: Standard load-bearing walls, infill panels, most residential & commercial

AAC-6

44–50 lb/ft³

f'AAC = 870 – 1090 psi

Use: High-load structural walls, multi-story load-bearing, floor/roof panels

KEY DESIGN VALUES

Modulus of Elasticity (E)	650 × f'AAC (psi)
Modulus of Rupture (fr)	2.4 √f'AAC (psi)
Shear Modulus (G)	0.4 × E
Poisson's Ratio (v)	0.15–0.20
Creep Coefficient (ϕ)	~1.5 (long-term)
Thermal Expansion	4.5×10^{-6} /°F
Min. Cover to Rebar	3/4 in. (AAC cover)
Bond Strength (thin-joint)	Per ASTM C1660 / product data
Grout Strength (cores)	3,000 psi min.
Anchor Pull-Out (per TMS)	Varies — see ICC-ES

Per TMS 402-22 Chapter 11 (AAC Strength Design) and Chapter 7 (Seismic); product data/ESR where applicable

MHE AAC LOAD-BEARING SYSTEM — NO RC FRAME REQUIRED

AAC walls can carry gravity + lateral loads for low-rise buildings without an RC frame where permitted by project engineering and the product ESR — commonly applicable in SDC A/B; typical savings 15–25% of structural cost

FOUNDATION INTERFACE

Foundation may be RC slab/grade beam or AAC panel slab-on-grade over grade beams with airspace below. First course set in full-bed mortar. Anchors/dowels per ASCE 7-22 demand, TMS 402-22, product ESR, and project engineering.

THIN-JOINT WALL SYSTEM

AAC-4 (31 lb/ft^3) blocks, 8 in. min. thickness. Polymer thin-bed mortar at 3/32–1/8 in. joints. Staggered courses min. 4 in. overlap. Vertical cores at corners and openings.

VERTICAL REINFORCEMENT

#4–#6 deformed bars in grouted 3.5 in. dia. cores. Spacing per wind, seismic, ESR, and project engineering; closer spacing (e.g., 24 in. o.c.) commonly required in HVHZ. Standard hook at top into the bond beam.

BOND BEAM (HORIZONTAL)

U-shaped AAC blocks at every floor level and at top of wall. Two #4 bars min. Filled with 3,000 psi normal-weight grout. Provides continuous lateral diaphragm tie.

LINTEL SYSTEM

Precast AAC lintels or site-cast RC in AAC U-block forms. Spans to 12 ft clear (varies by load). Bearing min. 6 in. each side. Eliminates steel beams at openings.

WALL-TO-ROOF TIE

Anchor bolts or embedded straps into bond beam. Connects roof framing for continuous load path per IBC Chapter 21, TMS 402-22, and ASCE 7-22. Critical for wind uplift resistance.

WIND LOAD DESIGN — ASCE 7-22 & FLORIDA HVHZ

FLORIDA WIND SPEED ZONES — DESIGN WIND PRESSURES

Inland Florida (Zone 1)

Design Wind: 130–140 mph | Exposure Cat. C/D | Net Pressure: 25–35 psf

Standard IBC. AAC-4, 8-in. walls adequate

Coastal Florida (Zone 2)

Design Wind: 140–160 mph | Exposure Cat. D | Net Pressure: 35–50 psf

Vertical reinf. at 36 in. o.c. + bond beam

High-Velocity Hurricane Zone

Design Wind: 160–200+ mph | Exposure Cat. D | Net Pressure: 50–80+ psf

HVHZ — TAS 201/202/203 testing and NOA/product approval as applicable. Vertical reinforcement spacing per project engineering (commonly tighter in HVHZ).

Miami-Dade / Broward Counties

Design Wind: 185+ mph | Exposure Cat. D | Net Pressure: 70–100+ psf

Florida Product Approval mandatory. Enhanced detailing. NOA required.

AAC WIND RESISTANCE PERFORMANCE

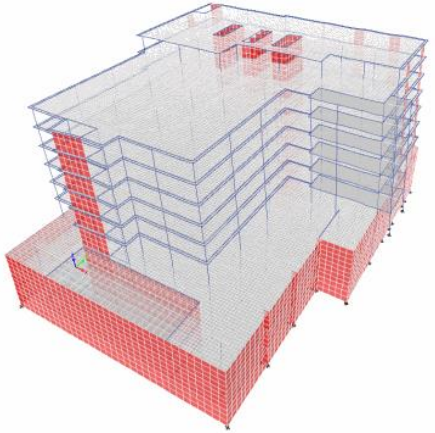
- Out-of-plane span: 8-in. AAC-4 commonly 10–14 ft floor-to-floor at 160 mph design wind — per product ESR
- TAS 201 Large Missile Impact: qualified AAC assemblies tested — see product NOA for scope
- TAS 203 Cyclic Wind Pressure: AAC assemblies qualified through 9,000-cycle regimen — confirm in NOA
- AAC walls behave as stiff monolithic elements under out-of-plane wind; design ductility per TMS 402-22
- In-plane shear capacity: per project engineering and product ESR
- Florida HVHZ: applicable TAS 201/202/203 testing and Miami-Dade NOA; ICC-ES ESR for non-HVHZ zones
- NOA (Notice of Acceptance) pathway: Miami-Dade County protocol for HVHZ compliance

★ **FLORIDA IMPACT: Where the specific AAC assembly holds an HVHZ NOA, it can satisfy HVHZ wall requirements with engineered detailing — verify NOA scope per product**

SEISMIC DESIGN — IBC / TMS 402 / ASCE 7-22

SEISMIC DESIGN CATEGORY (SDC) — AAC APPLICABILITY

SDC A	**Most of Florida, Texas Gulf Coast** ASCE 7-22 §11.7: minimum lateral force only	**Ordinary Reinforced AAC Masonry Shear Walls (R=2)** Reinforcement per TMS 402-22 Ch. 11	*See TMS 402-22 §7.4.4 & Chapter 11*
SDC B	**Parts of Southeast / Mid-Atlantic** NL per ASCE 7-22 Table 12.2-1	**Ordinary Reinforced AAC Masonry Shear Walls (R=2)** Engineered per TMS 402-22 Ch. 11; Risk Category and analysis govern height	*See TMS 402-22 §7.4.4 & Chapter 11*
SDC C	**Parts of South / Central US** 35-ft cap per ASCE 7-22 Table 12.2-1	**Ordinary Reinforced AAC Masonry Shear Walls (R=2)** Engineered per TMS 402-22 §7.4.4 and Ch. 11	*See TMS 402-22 §7.4.4 & Chapter 11*
SDC D	**Pacific Coast, Pacific NW, AK** NP as SFRS (ASCE 7-22 Tbl 12.2-1)	**AAC as nonparticipating/infill panels** Use separate steel/concrete lateral system unless approved engineered alternative	*See TMS 402-22 §7.4.4 & Chapter 11*



Florida is commonly SDC A/B — verify project SDC by site class, Risk Category, and ASCE 7-22 mapped values. Final wall height depends on TMS 402-22 Chapter 11 limits, Risk Category, wind demand, and product ESR. Engineering analysis and licensed PE review are required.

REINFORCED AAC PANEL SYSTEMS — STRUCTURAL APPLICATIONS

EXTERIOR BEARING WALL PANELS

DIMENSIONS & REINFORCEMENT

· Thickness: 8–12 in.

· Height: to 20 ft.

· Width: 24 in. std.

· Reinf: Factory welded mesh

STRUCTURAL CAPACITIES

· Axial capacity per TMS 402-22 Ch. 11

· Out-of-plane: M per TMS 402-22 Ch. 11

· Shear capacity per TMS 402-22 §11.3.4

· Uplift: Embedded anchors

Primary structural wall — load bearing + shear wall + weather barrier in one system

INTERIOR SHEAR WALL PANELS

DIMENSIONS & REINFORCEMENT

· Thickness: 6–8 in.

· Height: floor-to-floor

· Grouted cores: 32 in. o.c.

· Reinf: #4 vertical @ 32 in.

STRUCTURAL CAPACITIES

· In-plane shear: per ESR & engineering

· Moment transfer at base

· Chord force: rebar at edges

· Drag strut: bond beam

AAC shear walls may serve as engineered lateral elements in permitted SDC A/B and selected SDC C applications; verify ASCE 7-22 / TMS 402-22 limits and project design

FLOOR / ROOF PANEL DIAPHRAGM

DIMENSIONS & REINFORCEMENT

· Thickness: 8–12 in.

· Span: 8–20 ft.

· Width: 24 in. per panel

· Reinf: Pre-stressed wires

STRUCTURAL CAPACITIES

· Floor LL: 40–100 psf

· Roof LL: 20–40 psf

· Diaphragm shear via grout

· Bearing: 4 in. min.

Horizontal AAC panels can replace cast-in-place slabs/formwork — topping and diaphragm detailing per project engineering

CRITICAL CONNECTIONS & CONSTRUCTION DETAILING

WALL BASE CONNECTION

Reinforced slab edge or grade beam. Dowels from foundation extend into vertical cores — hook at bond beam or splice at mid-story. Development/lap/anchorage per TMS 402-22, product ESR, and project design. Prevents sliding and overturning in wind/seismic events.

PANEL-TO-PANEL VERTICAL JOINT

Tongue-and-groove profile on panel edges. Minimum 3/4 in. grout fill at joint. Provides shear transfer for diaphragm action. Reinforced joint option: #3 bar in grouted chase for moment continuity.

FLOOR / WALL INTERFACE

Bond beam at each floor level receives floor panel bearing. 4-in. min. bearing length. Grout all panel-to-bond beam joints. Mechanical anchor ties floor diaphragm to wall — critical for out-of-plane wind load transfer.

OPENING LINTELS

Precast AAC lintels or RC in AAC U-blocks. Bearing min. 6 in. each side. For spans >8 ft., engineer-designed. Vertical rebar at jambs on each side of opening — confined cores prevent local crushing under concentrated load.

WALL TOP — ROOF ANCHOR

Continuous top bond beam anchors roof system. Anchor bolts/straps sized and spaced per project engineering for ASCE 7-22 uplift demand and TMS 402-22 anchorage; spacing typically tightens in HVHZ. Continuous load path per FBC/IBC Chapter 21, TMS 402-22, and ASCE 7-22.

CONTROL JOINTS

Vertical control joints per manufacturer/ESR and project design. Typical max. 25 ft; closer spacing may be required in HVHZ/high-movement areas. Use backer rod + polyurethane sealant.

APPLICATION: MULTIFAMILY & MID-RISE — FLORIDA FOCUS

IBC CONSTRUCTION TYPE — AAC APPLICABILITY

Type I-A / I-B **Heights per IBC**	**AAC load-bearing + AAC floor/roof panels** *Fully non-combustible — best match for AAC*
Type II-A / II-B **4–11 stories**	**AAC exterior bearing walls, RC or steel frame** *Very common for Florida condos 4–6 stories*
Type III-A / III-B **3–5 stories**	**AAC exterior walls + wood floor/roof** *AAC perimeter, wood interior — hybrid system*
Type V-A / V-B **1–3 stories**	**AAC load-bearing, all-AAC or wood hybrid** *Single family, townhomes — MHE Load-Bearing System*

FLORIDA MULTIFAMILY STRUCTURAL CHECKLIST

- ✓ ICC-ES ESR report on file for AAC product used
- ✓ Grout strength: 3,000 psi minimum — tested per ASTM C476
- ✓ Special inspection per IBC 1705.4 — AAC masonry
- ✓ Wind load analysis per ASCE 7-22 (Exposure C or D per site Surface Roughness, §26.7)
- ✓ HVHZ Product Approval (NOA) if Miami-Dade / Broward
- ✓ Vertical reinforcement spacing per TMS 402-22, product ESR, wind/seismic demand, and project engineering
- ✓ Bond beam/collector at floor levels as required for diaphragm, bearing, and load path
- ✓ AAC mortar type: thin-bed polymer mortar per ASTM C1660 — no gaps
- ✓ Shear wall layout reviewed for aspect ratio, overturning, shear, and load path per TMS 402-22
- ✓ Roof-to-wall anchor design per ASCE 7 uplift demand (spacing/sizing per ASCE 7-22 demand and project engineering)

HOW TO SPECIFY AAC — ARCHITECT'S GUIDE

CSI MASTERFORMAT SPECIFICATION SECTIONS — Section 04 22 26 — AAC Masonry Units · Section 03 41 00 — Precast Structural AAC Panels

PART 1 — GENERAL	· Reference Standards: ASTM C1691, C1692, C1693, C1694, C1660, C476 · Submittals: ICC-ES ESR, data sheets, shop drawings, inspection plan · QA: Manufacturer-trained installer; special inspection per IBC 1705.4 · Delivery & Storage: Cover pallets; store dry; per manufacturer guidance
PART 2 — PRODUCTS	· AAC Grade: AAC-4.0 per ASTM C1693 (f'AAC ≥ 580 psi; ~31–44 lb/ft³) · Mortar: Thin-bed polymer per ASTM C1660 — 3/32–1/8 in. joints · Grout: Per project design; ASTM C476 where masonry grout specified · Reinforcement: ASTM A615 Gr. 60; corrosion protection per TMS 402
PART 3 — EXECUTION	· Substrate: Level ±1/8 in. per 10 ft.; first course in full Portland bed · Bond Pattern: Running bond, min. 1/4 overlap (4 in.); stagger joints · Core Grouting: Mechanical vibration; 8-in. lift max.; ASTM C476 · Inspection: Special inspector during rebar placement and grouting

MHE Group provides complete AAC specification templates for Section 04 22 26 and 03 41 00 — contact us for project-specific spec package

QUESTIONS & DISCUSSION

Course 2 of 3 — AAC Structural Systems & Wind/Seismic Design

PRESENTER CONTACT

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AIA CREDIT INFORMATION

Program Title:
AAC Structural Systems & Wind/Seismic Design

Credit Hours:
1.0 LU | HSW

Format:
Lecture / Lunch & Learn

Course in Series:
2 of 3

AIA Provider:
MHE Group (CES # 10149078)

REFERENCES

· TMS 402-22 / TMS 602-22 — Building Code & Specification for Masonry Structures

· IBC 2021 Chapter 21 — Masonry

· ASCE 7-22 — Minimum Design Loads

· ASTM C1660, C476, C1691, C1692, C1693, C1694

· Product-specific ICC-ES ESR — confirm current ESR for the specified AAC manufacturer (subject to renewal)

· Florida Building Code 8th Ed. — Wind/HVHZ; TAS 201/202/203 protocols

· FBC Chapter 19 (Concrete) + Chapter 21 (Masonry)