

High Performance Based Design for the Building Envelope

Architectural Committee

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Attributes and Sub Attributes

- Energy
- Water Penetration
- Water Vapor Management
- Air Tightness
- Service Life
- Acoustics



Demand Models

- Climate zone
- Energy loss
- Wetting
- Condensation, Mold, Corrosion
- Outdoor Noise, Indoor Quietness

Benchmarks-Metrics

- Kbtu/ft²/yr, U-Factor (Btu/ft²°F hr), SHGC
- ASTM E 331, ASTM E1105, AAMA 501.1 AAMA 501.2
Leakage at xx /psf
- Moisture meter, Moisture Content Equivalent % RH
- Vapor pressure In. Hg, ASTM E 96
- ASHRAE Standard 160
- ASTM E 2178, ASTM E 2357, ASTM E 273, ASTM E 783,
ASTM E1186
- Years of Service Life
- Composite Outdoor-Indoor Transmission Class - OITCc

Outcomes-Standards

- Energy used per year, Energy transfer /ft²/hr
- Air Leakage / ft² of enclosure at a given pressure
- PSF from Pressure Test
- % Relative Humidity Moisture Content Equivalent
- Pass/Fail ASHRAE Standard 160
- Years of Service Life
- OITC_c

Outcomes-Standards

- Energy transfer $\text{Btu}/\text{ft}^2 \cdot \text{F} \cdot \text{hr}$
- Roofs
- Walls
- Floors
- Fenestration U-Factors, SHGC

Outcomes-Standards

- Energy used per year, Energy transfer /ft²/hr

System Type and Characteristics	Low Baseline ASHRAE 90.1-2004	Medium High Performance Benchmark ASHRAE 90.1-2010 P+	High Performance Benchmark 50% AEDG P++	Future/Higher Performance Benchmark NZEB
Whole Building CZ 1&2	59-62	45-48	36-38	25-28
Whole Building CZ 3 & 4	52-59	40-45	32-36	26-30
Whole Building CZ 5 & 6	50-65	43-50	34-40	28-33
Whole Building CZ 7 & 8	65-81	50-62	40-50	30-35

Outcomes-Standards

- Air-Tightness cfm/ft² @ 75 Pa

Metric(s)	Sub-Metric	System Type and Characteristics	Low	Medium	High
ASTM E 2357, ASTM E 273, ASTM E 783, ASTM E1186	cfm/ft ² @ 0.3" w.g. (75 Pa)	Opaque Assemblies	< 0.03 cfm/ft ² @ 75 Pa	< 0.015 cfm/ft ² @ 75 Pa	< 0.1 cfm @ 75 Pa
ASTM E 283, ASTM E 783, ASTM E1186	cfm/ft ² @ 6.24 psf (300 Pa)	Fenestration	< 0.06 cfm/ft ² @ 300 Pa	< 0.03 cfm/ft ² @ 300 Pa	< 0.06 cfm @ 300 Pa
ASTM E 283, ASTM E 783, ASTM E1186	cfm/ft ² @ 6.24 psf (300 Pa)	operable fenestration	0.4 cfm/ft ² @ 300 Pa	< 0.3 cfm/ft ² @ 300 Pa	< 0.2 cfm @ 300 Pa
ASTM E 779, ASTM C1060, ASTM E1186, USACE test protocol	cfm/ft ² of building enclosure @ 1.57 psf (75 Pa)	Whole Building	0.4 cfm/ft ² @ 75 Pa	> 0.25 cfm/ft ² @ 75 Pa	> 0.10 cfm/ft ² @ 75 Pa

Outcomes-Standards

Interior Sound Level Goal	Exterior Sound Level at the Site (LDN)			
	< 65 dB	65 dB - 70 dB	70 dB - 75 dB	> 75 dB
Baseline (NC-35 or higher)	OITC _c 30	OITC _c 30	OITC _c 30	OITC _c 35
Standard (NC-30 to NC-35)	OITC _c 30	OITC _c 30	OITC _c 35	OITC _c 40
Quiet (NC-25 to NC-30)	OITC _c 30	OITC _c 35	OITC _c 40	OITC _c 45
Very Quiet (NC-25 or lower)	OITC _c 35	OITC _c 40	OITC _c 45	OITC _c 50

Conclusions/Recommendations

- Energy: We must continue to optimize building enclosures and how they interact with other building energy consuming/conserving systems
- In order to improve the performance of our buildings. It will be inevitable to look at active façade
- Conflicts with CBR protection no doubt will have to be evaluated.

Conclusions/Recommendations

- Water Penetration: Commissioning the building enclosure will likely benefit the outcome of water penetration control and water vapor management, as well as the air-tightness.
- Service Life: is an Owner's choice and has related costs connected to the choices.
- Acoustical: By using the matrix of different Demands and Benchmarks, the acoustical performance of the façade may be determined for a facility that is being planned.

Discussion

