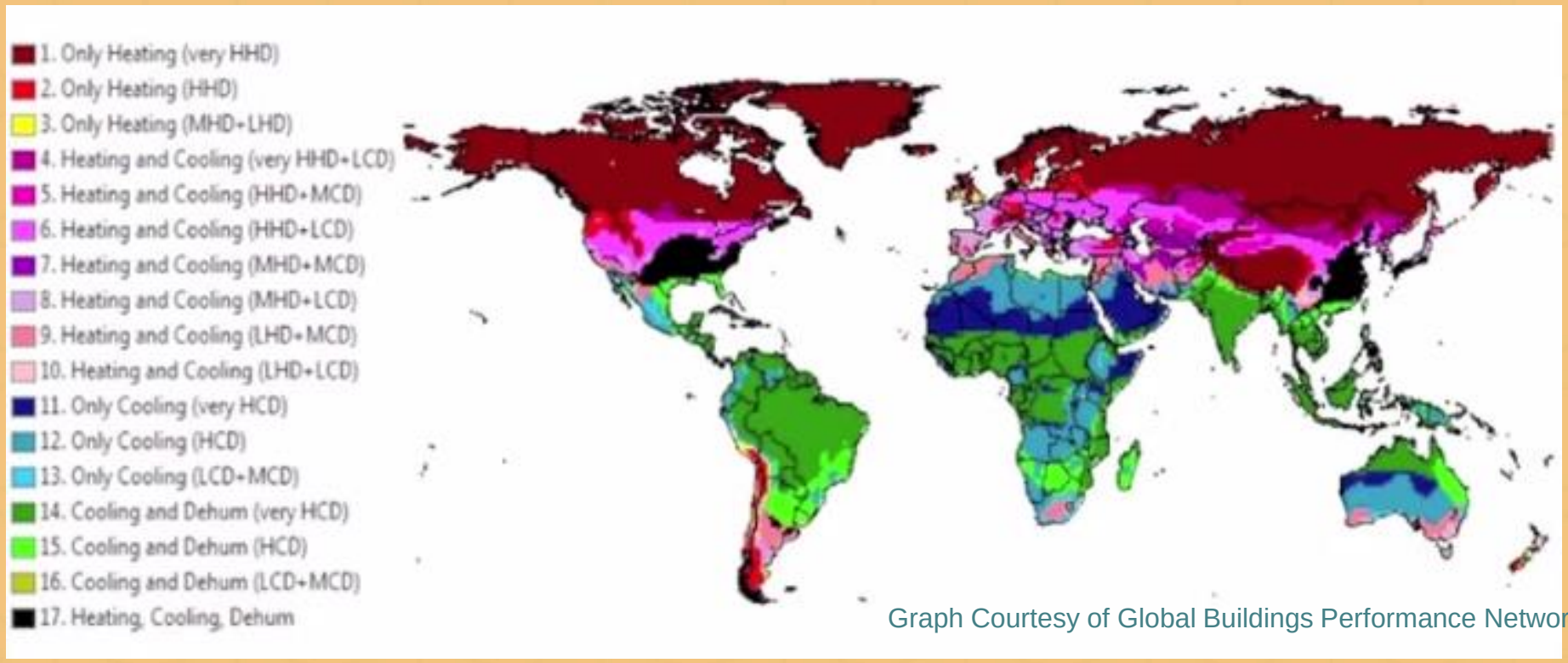

# PASSIVE BUILDING TRENDS

# PHIUS+2015:
# CLIMATE SPECIFIC DESIGN



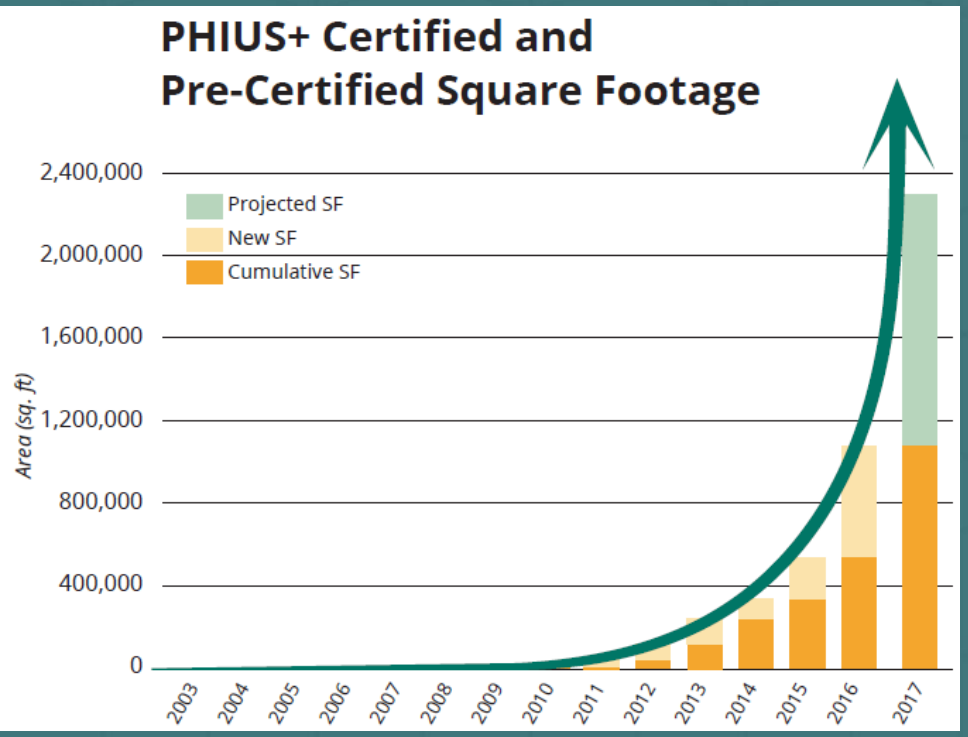

Graph Courtesy of Global Buildings Performance Network

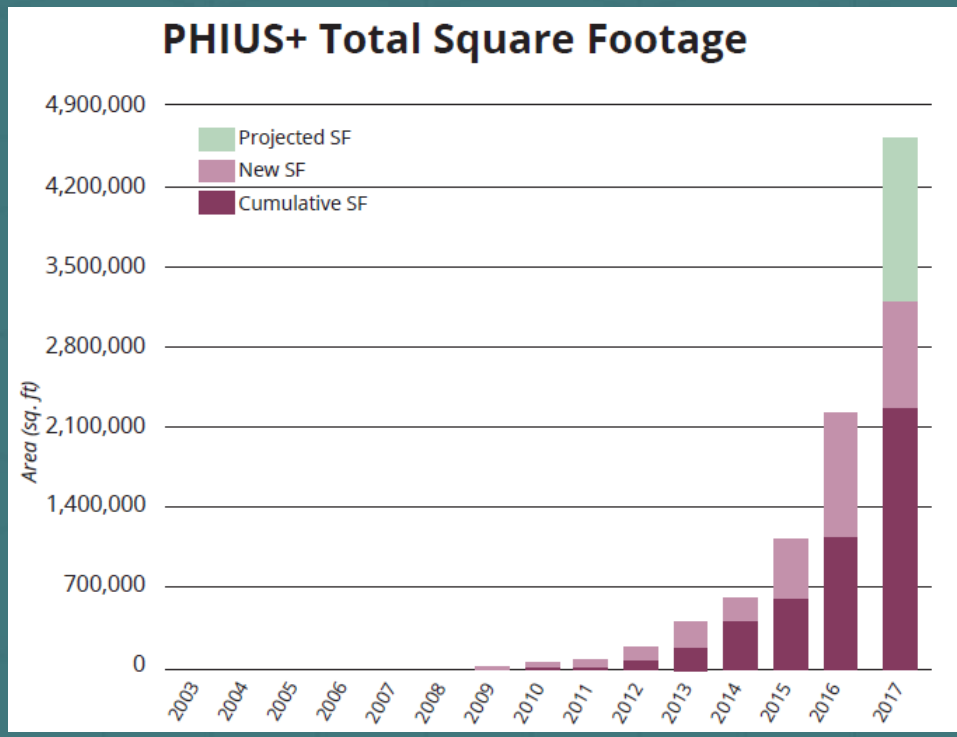
# DOE PERFORMANCE STAIRCASE

| IECC 2009 | IECC 2012 | ENERGY STAR v3 | ENERGY STAR v3.1 | ZERH | PHIUS+ | PHIUS+ SourceZero |
|---|---|---|---|---|---|---|
| | | | | | | Source Zero Renew-able Energy System |
| | | | | | Balanced Ventilation HRV/ERV | Balanced Ventilation HRV/ERV |
| | | | | SOLAR READY Depends on climate | SOLAR READY ALWAYS | SOLAR READY ALWAYS |
| | | | | Eff. Comps. & H2O Distrib | Eff. Comps. & $H_2O$ Distrib | Eff. Comps. & $H_2O$ Distrib |
| | | | | EPA Indoor Air Pacakge | EPA Indoor Air Pacakge | EPA Indoor Air Pacakge |
| | | | | Ducts in Condit. Space | Ducts in Condit. Space | Ducts in Condit. Space |
| | | HVAC QI w/WHV | HVAC QI w/WHV | HVAC QI w/WHV | Micro-load HVAC QI | Micro-load HVAC QI |
| | | Water Management | Water Management | Water Management | Water Management | Water Management |
| | | Independent Verification | Independent Verification | Independent Verification | Independent Verification | Independent Verification |
| IECC 2009 Enclosure | IECC 2012 Enclosure | IECC 2009 Enclosure | IECC 2012 Enclosure | IECC 2012/15 Encl./ES Win. | Ultra-Efficient Enclosure | Ultra-Efficient Enclosure |
| HERS 85-90 | HERS 70-80 | HERS 65-75 | HERS 55-65 | HERS 48-55 | HERS 35-45 | HERS < 0 |

# PHIUS+ TRENDS FOR 2017

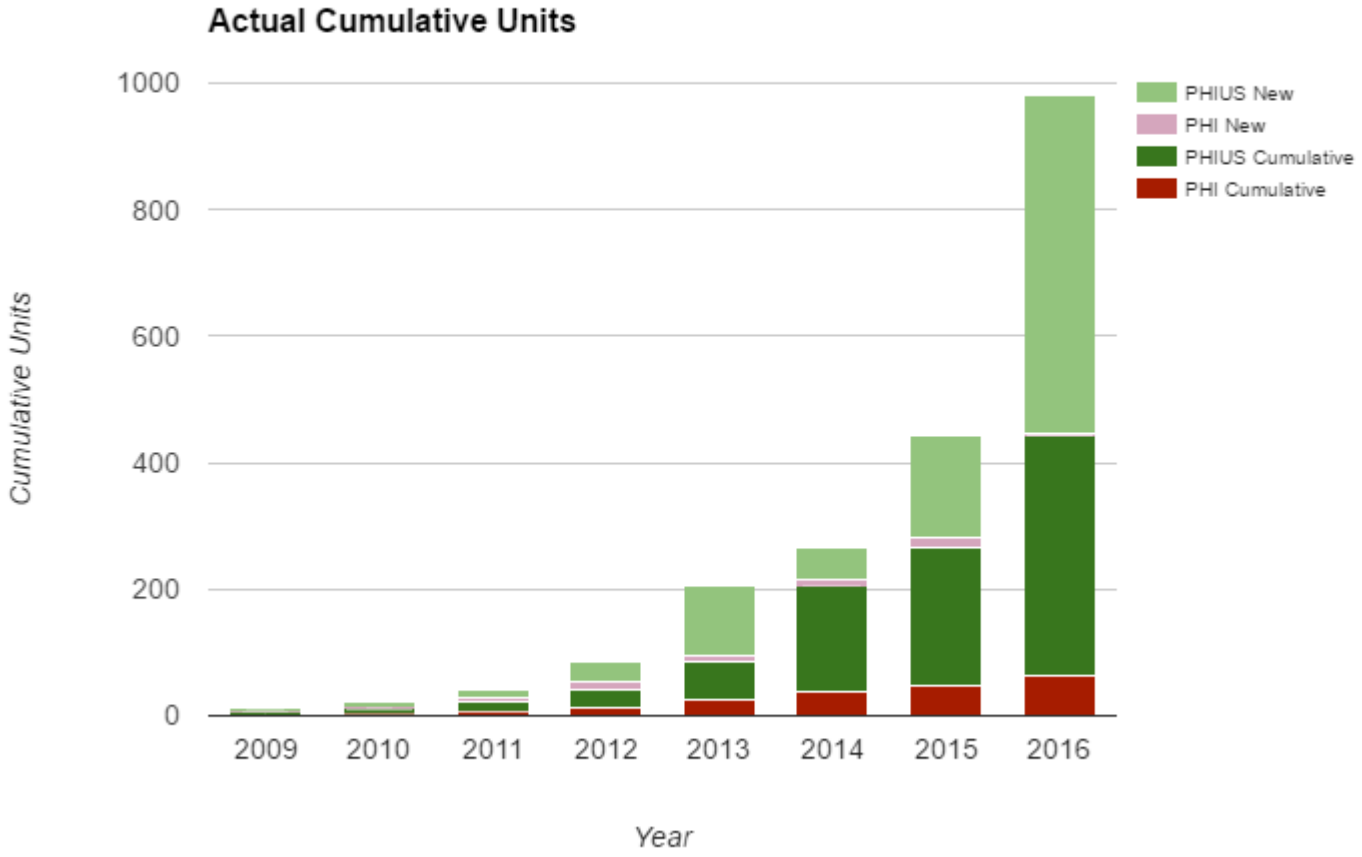
Source: www.phius.org



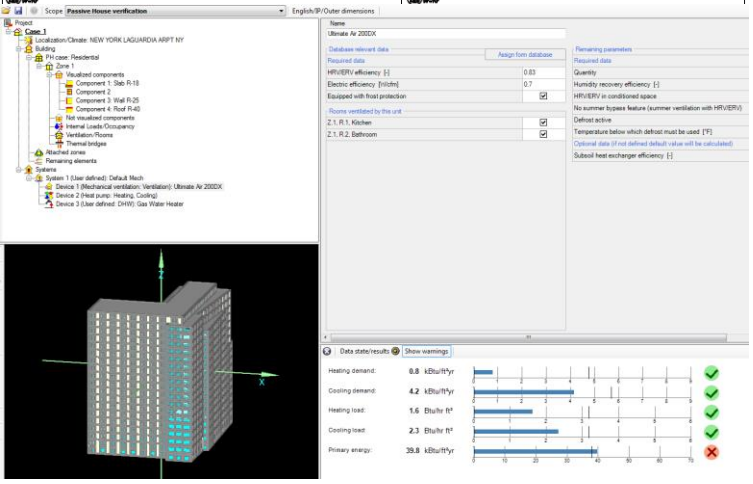

95% of total certified and pre-certified passive building construction (SQFT) in NA

# PHIUS+ AND PHI TRENDS IN NA:
## CERTIFICATIONS BY END OF 2016




Source: Pembina Institute

# MULTIFAMILY/COMMERCIAL HAS BETTER **SURFACE TO VOLUME** RATIO THAN SMALLER STRUCTURES

## SF Home Specs 5A:

- R-50 WALLS
- R-90 ROOF
- R-50 SLAB
- R-8 WINDOWS

## Large MF Specs 5A:

- R-32 WALLS
- R-50 ROOF
- R-20 SLAB
- R-5 WINDOWS

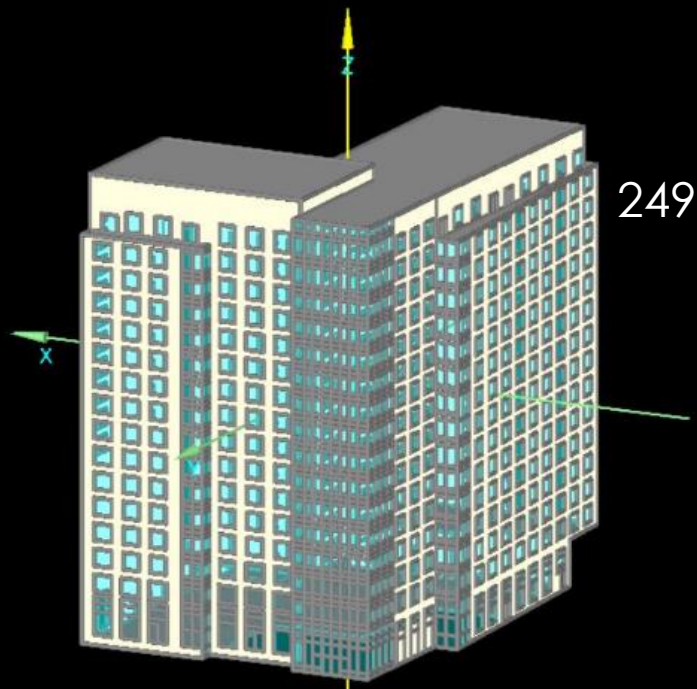
# 350+ PHIUS PROJECTS NATIONWIDE

## 70+ MULTIFAMILY SUBMITTED, PRE-CERTIFIED, CERTIFIED


## SITE EUIs OF 10-25 kBTU/ft².yr

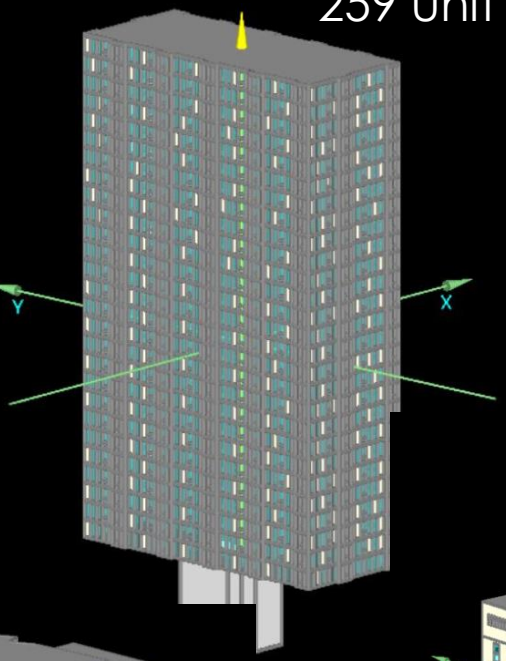
~20-50% better than DOE's Zero Energy Home Program

# FEASIBILITY STUDIES

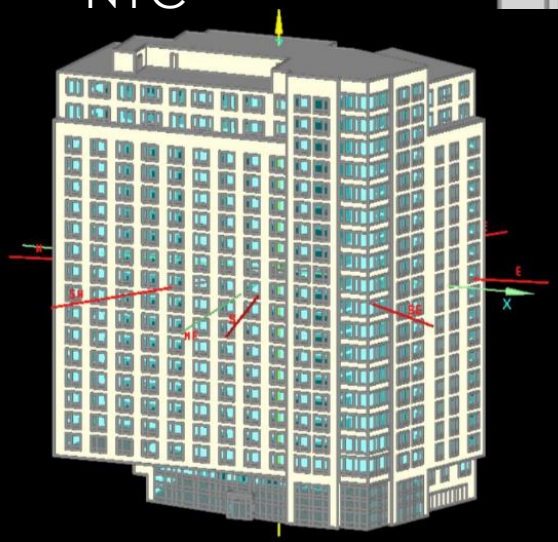


249 unit - NYC

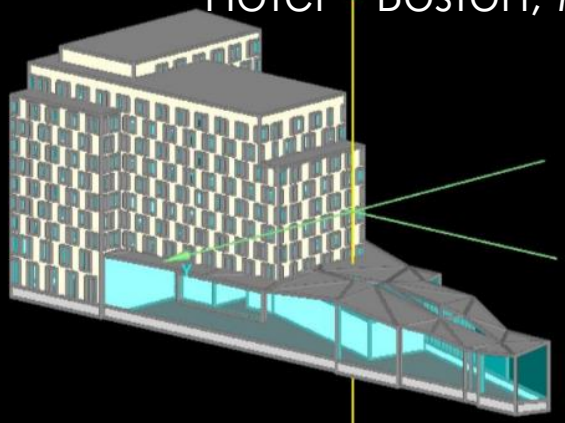
259 unit – Chicago, IL

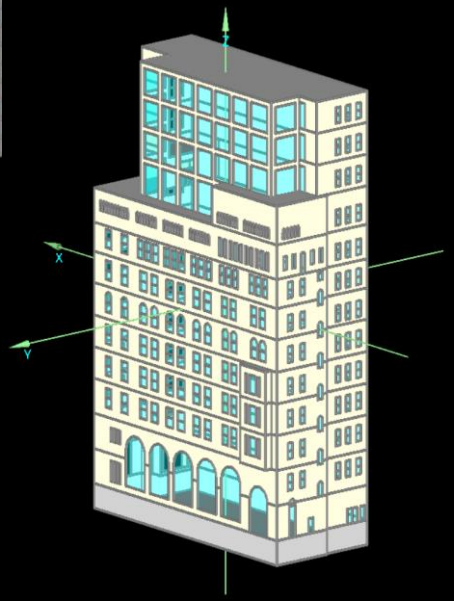


209 unit - NYC



Hotel – Boston, MA

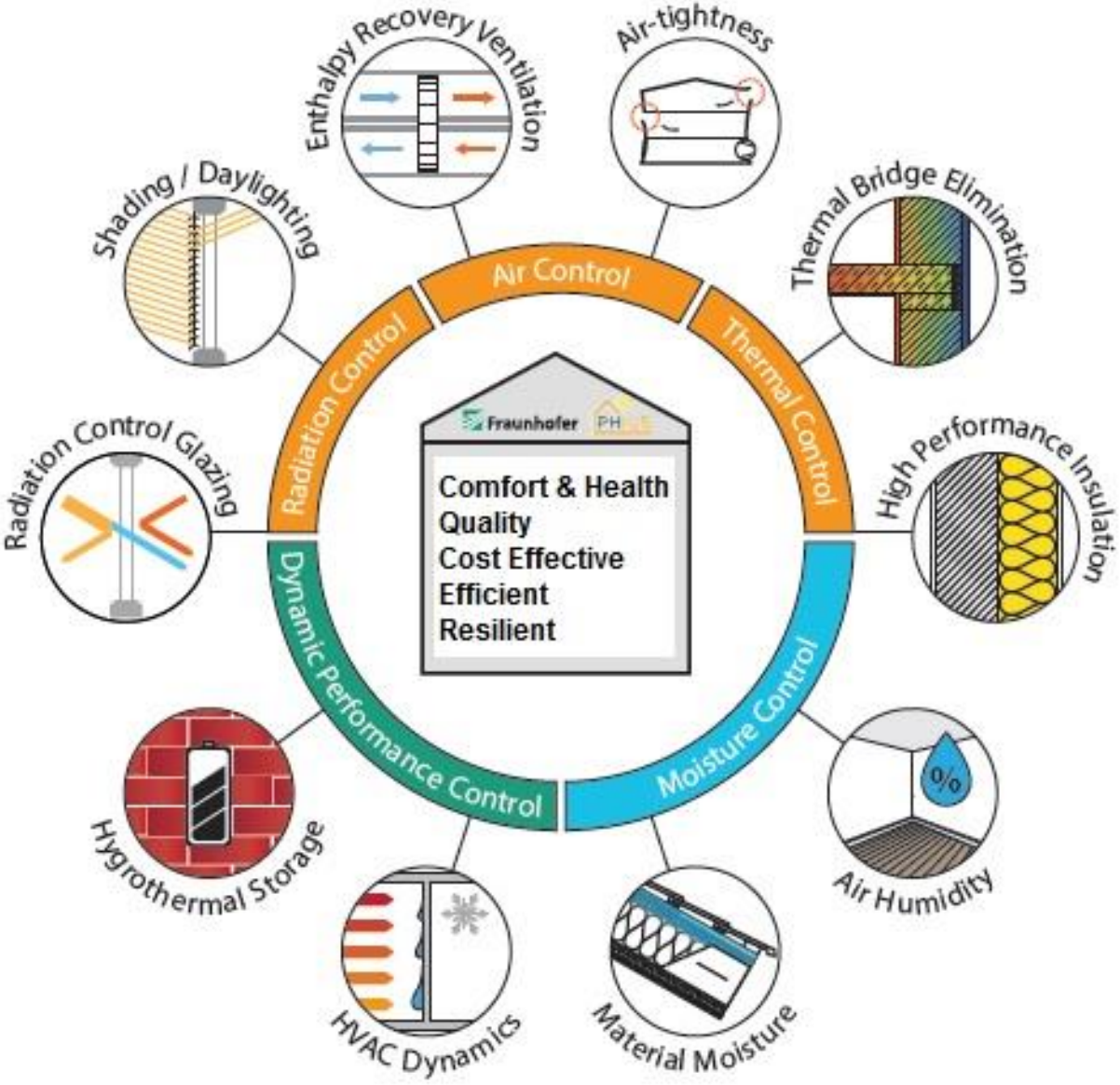




Hotel – Pittsburgh, PA

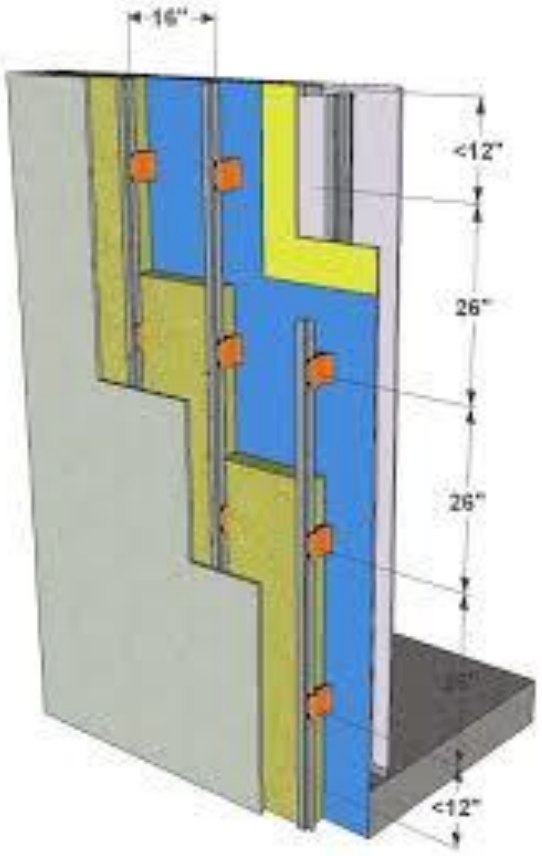
# PASSIVE BUILDING PRINCIPLES

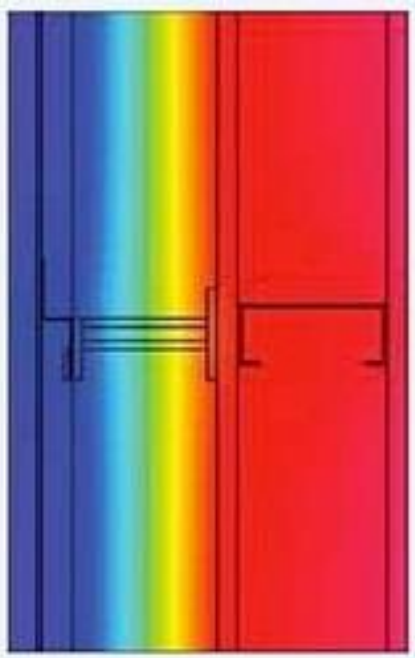


# CONTINUOUS INSULATION

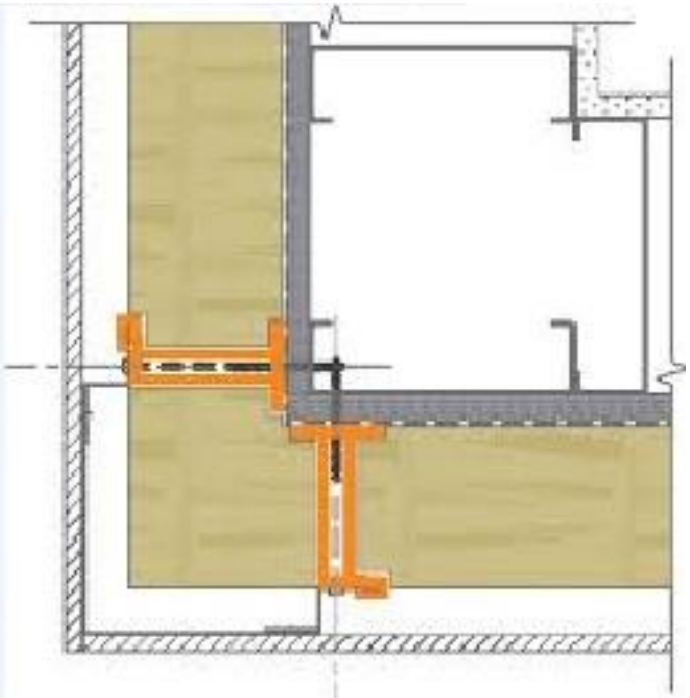
## INSULATED CONCRETE FORMS

# THERMAL BREAKS



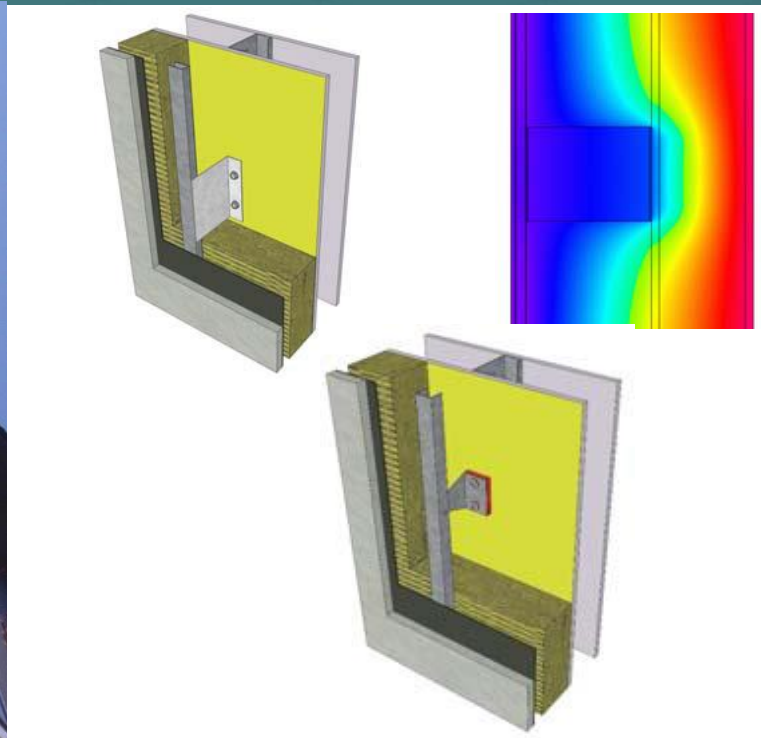



Cascadia Clip® system



# MINIMIZE POINT TB LOSS

Photo courtesy Jesse Thompson



Illustrations by RDH, Shawn Colin, NAPHC 2014

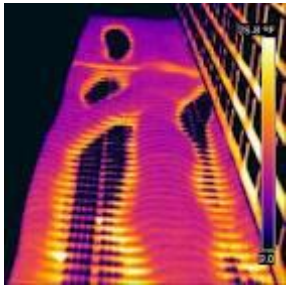
STRUCTURAL THERMAL BRIDGING CAUSED BY CLADDING SYSTEMS ATTACHMENT – RED SPACER BEHIND STAND-OFF=THERMAL BREAK

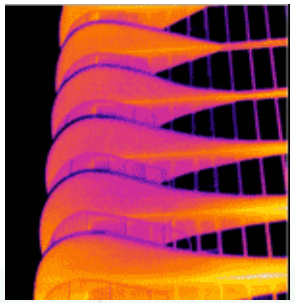
# **UPTOWN LOFTS** STRUCTURAL THERMAL BRIDGE ISSUE: SEPARATION TO UNCONDITIONED PARKING DECK

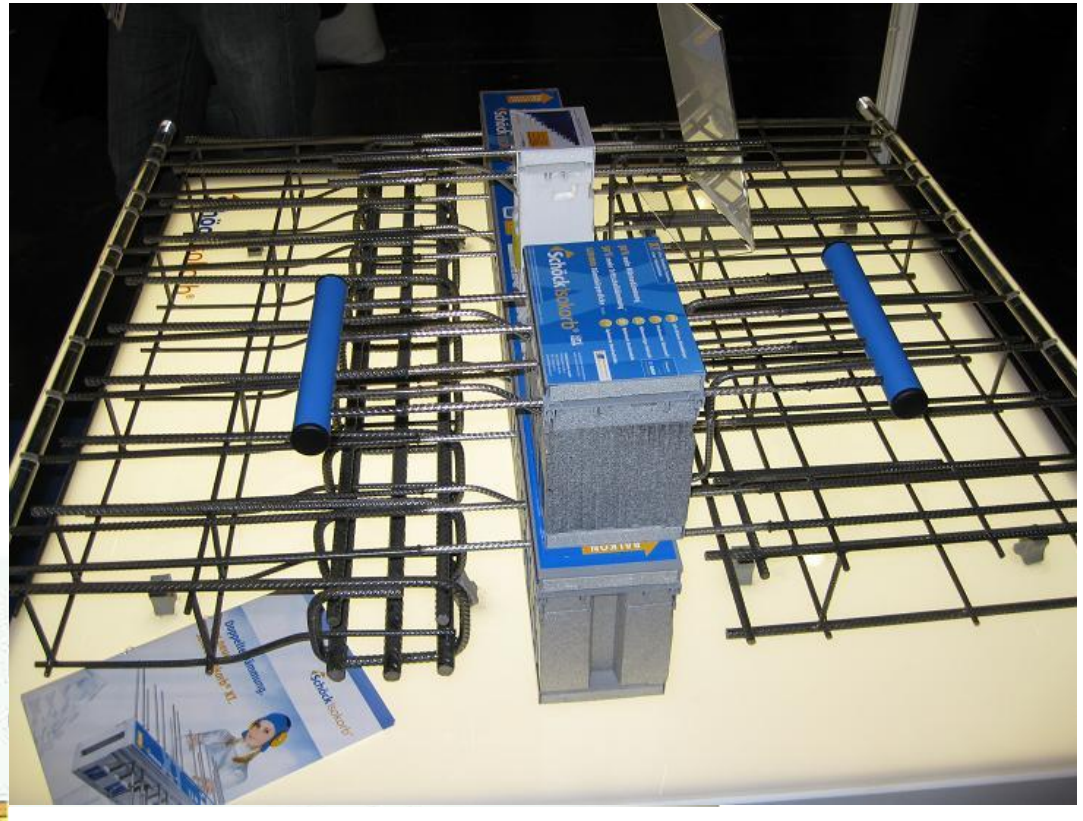
| | | | |
|---|---|---|---|
| **Mechanical Properties** | | | |
| Tensile Strength | PSI | ASTM D638 | 9,400 |
| Flexural Strength | PSI | ASTM D790 | 22,300 |
| Compressive Strength | PSI | ASTM D695 | 38,900 |
| Compressive Modulus | PSI | ASTM D695 | 1,450,377 |
| Shear Strength | PSI | ASTM D732 | 13,400 |
| Thickness | in | - | 1/4", 1/2", 1" |
| **Flame Resistance** | | | |
| Oxygen Index | $\%O_2$ | ASTM D2863 | 21.8 |
| **Thermal Properties** | | | |
| Coefficient of Thermal Expansion | in/in/°Cx10$^{-5}$ | ASTM D696 | 2.2 |
| Thermal Conductivity | BTU/Hr/ft²/in/°F | ASTM C177 | 1.8** |
| | W/m*K | | 0.259 |
| **Reference: Thermal Conductivity of Steel | BTU/Hr/ft²/in/°F | | 374.5 |
| | W/m*K | | 54.0 |

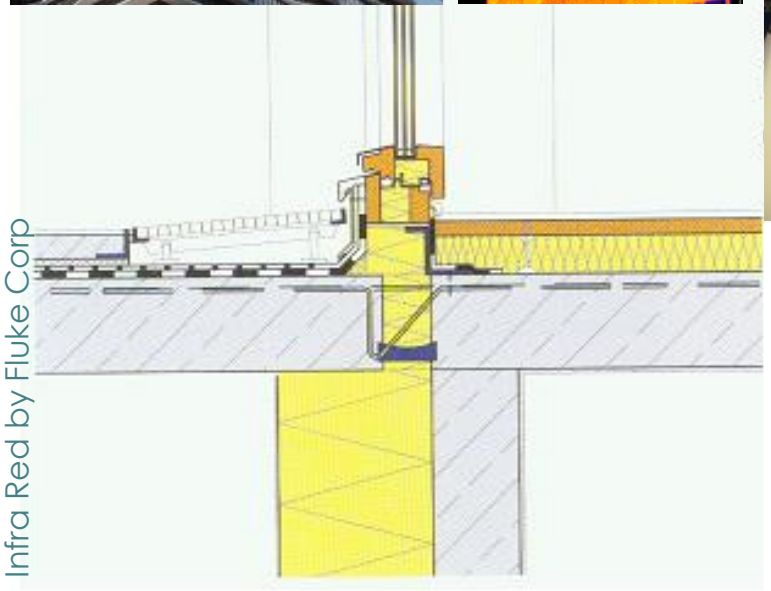
**Additional Products for Building & Construction**

# STRUCTURAL THERMAL BREAKS



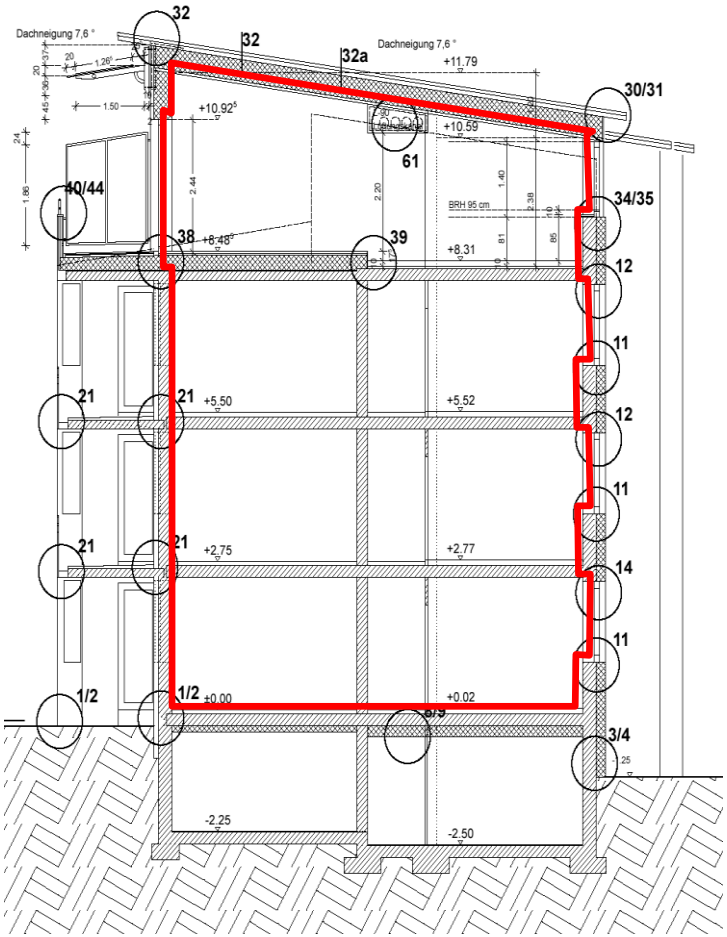






Source: Building Science Corporation Newsletter #49: Aqua Tower and Infra Red by Fluke Corp

# AIR-TIGHTNESS **BENEFITS**




Energy benefits:

- Minimizes energy losses in conjunction with ventilation
- Minimizes latent loads in conjunction with ventilation

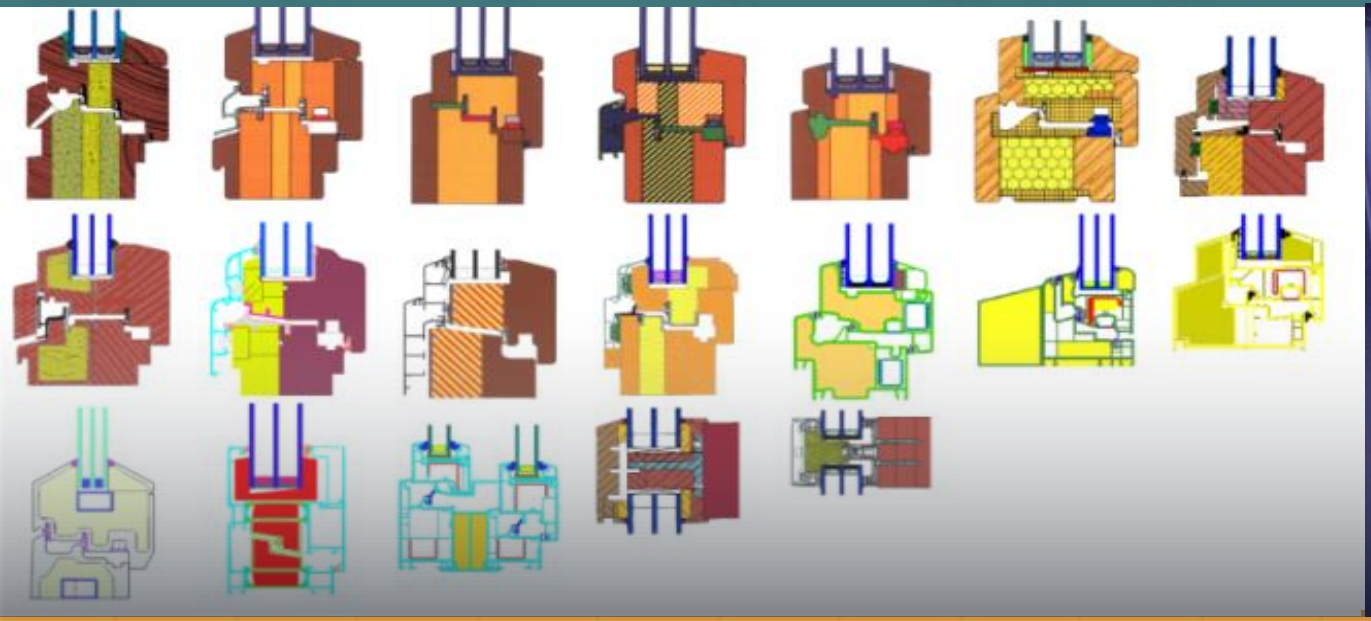
Hygrothermal benefits:

- Minimizes moisture traveling into the wall through infiltration or exfiltration
- Minimizes condensation risk in components
- Increases durability of assemblies


# EXTERIOR AIR BARRIERS

## EASE OF CONTINUOUS APPLICATION: SPRAY-APPLIED FOR MF PROJECTS

# HIGH PERFORMANCE WINDOWS
## FOR BETTER COMFORT



IMPROVING WINDOW PERFORMANCE
MINIMIZES HEAT LOSS/GAIN, ASSURES THERMAL COMFORT,
ELIMINATES CONDENSATION

# DIALING IN WINDOW PERFORMANCE BY CLIMATE

WUFI® Passive

Product name: **Alpen Casement 073**

PHIUS Passive House Institute US

| ASHRAE/IECC /DOE North American Climate Zone | South-facing | North, East, West - facing | Whole-window installed U-value W/m2K | BTU/hr.ft2.F | Center-of-glass properties Alpen _073 SHGC | Ucog-Value W/m2K | BTU/hr.ft2.F |
|---|---|---|---|---|---|---|---|
| **Climate specific recommendations:** | | | | | | | |
| 8 | | | 0.82 | 0.14 | 0.469 | 0.478 | 0.084 |
| 7 | | | 0.82 | 0.15 | 0.469 | 0.482 | 0.085 |
| 6 | | | 0.83 | 0.15 | 0.469 | 0.489 | 0.086 |
| 5 | | | 0.83 | 0.15 | | | |
| 4 | | | 0.83 | 0.15 | | | |
| Marine North | | | 0.84 | 0.15 | | | |
| Marine South | ☑ | | 0.84 | 0.15 | | | |
| 3 | ☑ | | 0.84 | 0.15 | | | |
| 2 West | | | 0.83 | 0.15 | | | |
| 2 East | | | 0.83 | 0.15 | | | |

| **Alpen Casement 073** | FRAME | | |
|---|---|---|---|
| | Frame height | | U-fra |
| | mm | in | W/m2K |
| Head | 72 | 2.82 | 1.12 |
| Sill | 72 | 2.82 | 1.12 |
| Left | 72 | 2.82 | 1.12 |
| Right | 72 | 2.82 | 1.12 |

Valid through February 2016

## Find & Compare Windows

PHIUS Certified Data for Windows : PHIUS Certified Window Data for Designers & Builders

**Available manufacturers:**

Alpen
Cold Chain
HH
Intus
Kolbe
Marvin
Thermotech
Veka
Wasco
Zola

**Frame Material (FM)**

FG - Fiberglass
VL - Vinyl
WD - Wood
PC - Unplasticized Polyvinyl Chloride (uPVC)
Al - Aluminum
AW - Aluminum Clad Wood

**Psi-Opaque Grade (PO)**

Frame-spacer grade is based on combining the frame heat transmission and the edge-of glass effect into a single linear heat loss coefficient. This provides a basis for comparison of frames of different widths and different frame-spacer combinations.

| PO [Btu/h.ft.F] | Frame-Spacer Grade |
|---|---|
| <=0.065 | A+ |
| <=0.110 | A+ |
| <=0.155 | B |
| <=0.200 | C |
| >0.200 | D |

**Downloadable datasheets (.pdf) and therm files (.zip) for each listing**

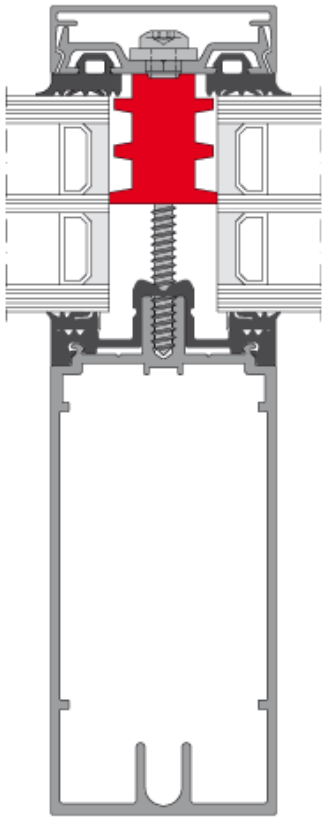
Recommendations by climate zone

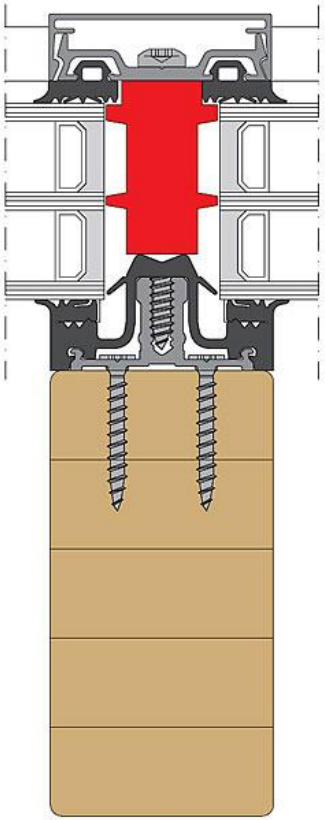
Climate zone map

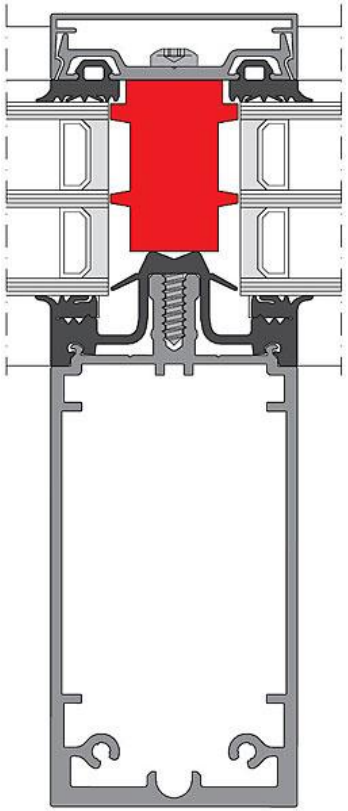
| | Model | Glazing | FM | PO | South - Facing 8 | 7 | 6 | 5 | 4 | 4C | 3C | 3 | 2B | 2A | North, East, West - Facing 8 | 7 | 6 | 5 | 4 | 4C | 3C | 3 | 2B | 2A | Datasheet | thm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alpen | 525-SH Casement | 108 | FG | B | | | | | | | | | | | | | | | | | | | | | datasheet | .zip |
| Alpen | 525-S 5L Casement | 200 | FG | B | | | | | | | ☑ | ☑ | | | | | | | | | | | | | datasheet | .zip |
| Alpen | 525-S Casement 5S-L2 | 17 | FG | B | | | | | | | ☑ | ☑ | ☑ | ☑ | | | | | | | ☑ | ☑ | ☑ | ☑ | datasheet | .zip |
| Alpen | 525-S Fixed HP 5S-H | 108 | FG | B | | | | | | | | | | | | | | | | | | | | | datasheet | .zip |
| Alpen | 525-S Fixed HP 5S-I | 109 | FG | B | | | | | | | ☑ | ☑ | | | | | | | | ☑ | | | | | datasheet | .zip |

# CURTAIN WALLS &
## HIGH PERFORMANCE PANELIZATION

Source: Schüco







| | system width | $U_f$-value |
|---|---|---|
| **THERM+ A-V** | 50 / 56 mm | **up to 0.85 W/(m²K)** |
| **THERM+ S-I** | 50 / 56 mm | **up to 0.88 W/(m²K)** |
| **THERM+ H-V** | 50 / 56 / 76 mm | **up to 0.87 W/(m²K)** |
| **THERM+ H-I** | 50 / 56 / 76 mm | **up to 0.88 W/(m²K)** |

# PASSIVE BUILDING

## IS PART OF THE SOLUTION

Katrin Klingenberg, Executive Director
www.PHIUS.org/www.PHAUS.org