A statewide initiative:
The expanding influence of Passive House in South Dakota

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- **Introduction** PHIUS and SD Initiatives
  1. **Prototype Governor’s House** and the role of SDHDA
  2. **CPHC** sponsored training to AIA South Dakota
  3. **Copper Pass** pilot multifamily affordable housing, Sioux Falls SD
  4. **PH01:BRK** SDSU student designed single family house, Brookings SD
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1. Prototype Governor’s House / income-qualified & pre-fab
2. CPHC sponsored training / professional community
3. Copper Pass / multifamily affordable housing
4. PH01:BRK / educating architecture students

While it isn’t an excuse, it is important to remember that design and construction in the region is entrenched in the known. There is little financial or cultural incentive for change or innovation.
Prototype Governor’s House and the role of the South Dakota Housing Development Authority (SDHDA)
Prototype Governor’s House
Design & fabrication 2013
PHPP pre-certification (attempted)
Installed, Britton, SD 2016
PHIUS+ certification 2017
BEDROOM 14'-1" x 9'-10"

BATH 8'-11" x 7'-11"

KITCHEN 17'-0" x 10'-3"

LAUNDRY 2'-7"

LIVING 12'-0" x 12'-4"

CLOSET 2'-0" x 4'-11"

DECK 25'-6" x 3'-9"

BEDROOM 11'-9" x 10'-8"

GROCERY 2'-0" x 4'-11"

BATH 8'-11" x 7'-11"

43'-7"

Governor's House Program
Passive House Britton
3/13/2015
Logix Block ICF foundation wall
2 1/2" EPS, 6" concrete, 2 1/2" EPS

Architectural Shingles
Synthetic Felt

Prefinished Metal Fascia
Prefinished Aluminum Soffit

8" Poly Isocynurate
Staggered and taped

15/32 OSB Sheathing
Baffle
R-84 Cellulose
1/4" OSB Blocking

2x4 furred down ceiling with R13 F.G Batts
7/16" OSB Air Barrier
Taped & Sealed

R-21 High Perf. Fiberglass batt
1/2" Gypsum Drywall

3/4" OSB Subfloor
18" Floor Truss

2" Extruded Polystyrene

4" Extruded Polystyrene
staggered and taped

1x Furring
1/2" Drywall
2 CPHC sponsored training to AIA South Dakota

2016 SDHDA / AIA SD participants:

Patri Acevedo, AIA, CPHC, JLG | AcV2 Architects
Robert Arlt, AIA, CPHC, Instructor SDSU DoArch
Alison Dvorak, AIA, CPHC, Koch Hazard Architects
Andrew Fett, AIA, CPHC, LEED AP, Williams & Associates
Herm Harms, AIA, CPHC, Puetz Corporation
Katie Krantz, AIA, CPHC, VanDeWalle Architects
Jason Roberdeau, AIA, CPHC, Williams & Associates

Other SD CPHC

Mike Harsma, CPHC, Director SDHDA Governors House Program
Aspen Greene, CPHC, Graduate Student SDSU DoArch
Emily Nelsen, CPHC, 2016 Graduate SDSU DoArch
from follow-up interviews:

Descriptions of projects that, for example, call for “a greater air-tightness or thermal envelope than usual, and then are changed ‘back to normal’ in the field” without knowledge of the architect are alarmingly common.

Other examples of municipal reviewers “waiving a nominal energy requirement for the financial benefit of developers and builders” seems standard.

A discussion of various contractor’s own interests and abilities ranged from excellent to unintelligible: one “questioned the entire topic of building science and the usefulness of knowing where the dew point falls in a wall assembly.”
Copper Pass pilot multifamily affordable housing, Sioux Falls SD
Copper Pass Affordable Housing
Design & construction 2016-18
PHIUS+ pre-certification, 2017 (in-progress)

- SDHDA pilot Passive House affordable housing project
- Architect: VanDeWalle Architects LLC
- Developer: Costello Co.
- General Contractor: BlackWing Elite Builders
- Project Goals:
  - Achieve Passive House certification
  - Build sister project to ENERGY STAR certification
  - Compare and analyze construction costs, operating costs, and performance data of both projects
- Originally 24 units; added 6 more when costs came in under budget
Copper Pass Affordable Housing

Footing and Foundation Design

- Wanted to keep it conventional as possible
- Typical spread footing with 4’ foundation wall
- 3” of high density XPS under footing
- Entire foundation wall wrapped with 3” of EPS
- 4” of EPS under entire slab
Copper Pass Affordable Housing

Wall Assembly

- Typical 2x6 stud cavity
- R-Max panels for continuous insulation
- Thin Brick & James Hardie siding
Copper Pass Affordable Housing

**Roof & Parapets**
- Roof = R-75
- 24” roof trusses, blown full
- SIPs above corridor
- R-49 above roof sheathing
- Boxed parapets outside air barrier
- No ductwork in roof truss cavity

**Mechanical System**
- Energy Recovery Ventilator – zoned by floor.
- Fresh Air Ducted to each bedroom.
- Filtered Exhaust from kitchens.
- Duct-free Mini-split System – one per apartment.
- Condensing Dryers.
- Low-flow plumbing Fixtures.
Copper Pass Affordable Housing

Footing & Foundation Wall
Copper Pass Affordable Housing

Slab Insulation & Vapor Barrier
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4 PH01:BRK SDSU student designed single family house, Brookings SD
PH01:BRK
Student design, fall 2016
PHIUS+ pre-certification, 2017
Construction, Brookings, SD 2017-18
PROPOSED SITE PLAN
PH01:BRK / PASSIVE HOUSE BROOKINGS

PROPOSED TWO-STORY PASSIVE HOUSE SINGLE FAMILY RESIDENCE

PROPOSED DETACHED GARAGE

PRIVATE DRIVEWAY

FIRST LUTHERAN CHURCH

LAT: 44˚18'57"N LON: 96˚48'00"W
ELEVATION: 1642'
DECLINATION: 3˚7'E

LEGAL DESCRIPTION:
LOTS 5A, 6A, AND 7A OF PARKDALE HOME ADDITION, BEING A REPLAT OF LOTS 5, 6, AND 7 AND THE NORTH 8 FEET OF LOT 8 OF PARKDALE HOME ADDITION, CITY OF BROOKINGS, BROOKINGS COUNTY, SD.

ZONING:
R-2 / Residence R-2 Two-Family District

Note: The lots were replatted following a sub-division in Nov. 2016. The two "narrow" lots (6A and 7A) as approved do not meet the established R-2 zoning for minimum lot width.

PARKING AREA

SIDEWALK

LOT 7A (street address to be assigned)
3rd Avenue
Brookings, SD 57006

LAT: 44˚18'57"N LON: 96˚48'00"W
ELEVATION: 1642'
DECLINATION: 3˚7'E

LEGAL DESCRIPTION:
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1.13 Vertical cross section

1. roof assembly:
   thermal bridge free to .006 btu/hrft210
   24 ga. standing seam metal roofing
   reverse board battens [1x3 over 2x4]
   5/8" zip sheathing taped and sealed
   waterproofing
   24" open web joists infill with knauf mineral wool
   1/2" osb taped and sealed
   2x2 wood blocking 16" o.c. for electrical chase
   1/2" maple/birch veneer plywood
2. south wall:
   frame out on south wall
   hardieplank
   1/2" celotex sheathing
   24" wood i-joint filled with knauf mineral wool
   built in gutter slope 1/4" per ft
3. 12" type ix eps foam insulation density=1.80 pcf,
   R-value = 5.00 per 1'
4. 4" pea rock
5. taped and sealed around block at top of wall
6. wall assembly:
   thermal bridge free to .006 btu/hrft210
   9.25" hardie board horiz. siding
   2 1/2" insulat
   6" eps foam insulation
   7/16" zip sheathing taped and sealed
   2x6 w/ infill knauf mineral wool insulation
   1/2" gwb finish
7. slab assembly:
   thermal bridge free to .006 btu/hrft210
   engineered backfill
   12" eps foam insulation seams taped and sealed
   10" compacted fill
   taped polyethylene water and vapor barrier
   6" reinforced concrete
   maple floor over 3/4" ply
8. 14" wood open web joist see struct.
9. w flange beam
10. gwb continues past flange
11. 2x3 railing 5" o.c.
12. clerestory polycarbonate, note: same detail turns
    corner and terminates at ceiling line
13. ridge vent
14. ridge beam, note: tape and seal osb air barrier to
    glulam beam
15. 3 2" thick eps frost skirt
16. osb sheathing continues on top of plate to inside
    to tape and seal to ceiling osb to maintain
    continuous air barrier.
1.18 Vertical section South wall

1. 9.25" hardieplank installed over insofast
2. floor/roof assembly (R-75):
   - cedar Soffit- 1x4 T&G
   - inSoFast Insulation- 2 1/2' (R-10.5)
   - 6" EPS Insulation- (R-4.17/in. = R-33.36)
   - zip roof sheathing system- 5/8" (vapor/air permeable)
3. 18" Wood Web Joist Truss- 16" O.C.
4. 11" Blown-In Insulation- Glass Mineral Wool
   (R-2.8/in. = R-31)
5. 1/2" OSB Sheathing- Taped & Sealed (Vapor/Air Barrier)
6. Floor Finish per Room Finish Schedule
7. 3 ply 18' LVL
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- **challenges moving forward**

1. **Capitalize on the initial burst of activity and keep the momentum.**
• challenges moving forward

2 Continued financial and political support from the state is necessary...the expectation that the construction industry will move towards higher standards without incentive or regulation is naïve.
challenges moving forward

The lack of serious building or energy code implementation is a barrier...the ‘regulatory’ smell of codes is a cultural and political obstacle that hinders the advancement of building science.

It is the architect’s responsibility to raise expectations, from both the state and the construction industry.
challenges moving forward

4 The continued support of subsidized housing must be maintained if not increased.
The investment by the state over the past four years into Passive House is a remarkable legacy, but one that still needs critical, positive investment.

It is our hope that the exponential growth of Passive House nationally will encourage South Dakota to stay the course.

Thank you!