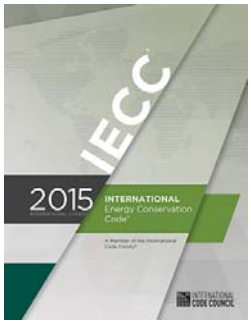
Who is Responsible for Meeting Utah's Energy Code?



Salt Lake Community College
ENERGY INSTITUTE
INVESTING IN THE ENERGY WORKFORCE

Brent Ursenbach, CBO, LEED AP
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WC3
West Coast Code Consultants, Inc.
BrentU@WC-3.com
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O: (385) 237-3722
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1

Funding for Energy Code Training

UTAH OFFICE OF ENERGY DEVELOPMENT
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2

2

The Issue – Too Many New Homes Fail to Meet the Minimum Requirements of the Energy Code

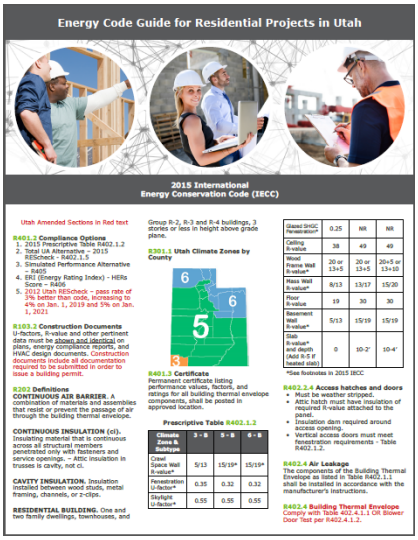
3

4

A Quick Review of the IECC Residential Code

What's Being Ignored?

- Compliance Options – 5 choices
- Complete Construction Documents
- Air Barrier/Insulation Inspection OR Blower Door Testing
- Open Combustion Appliance & Combustion Air Duct Enclosure
- Duct outside Thermal Envelope Leakage Testing
- Load Calculations & Duct
- VENTILATION



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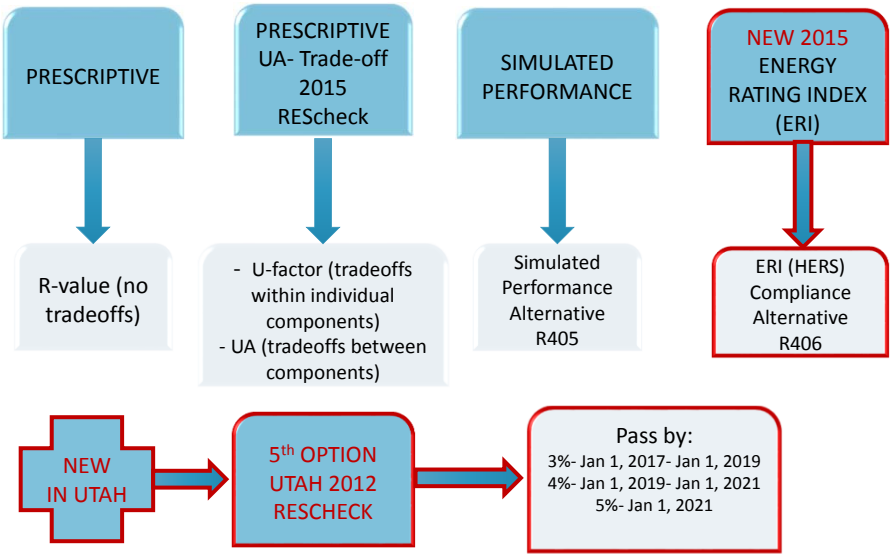
THE CODE ALLOWS ANY OF THESE COMPLIANCE OPTIONS

IECC Compliance - Four Options + One = 5 in Utah



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Section R103 Scope/Construction Documents

- ✓ Documentation shall be prepared by a registered design professional (where required)
- ✓ Electronic media can be used
- ✓ Information required:
  - ~~✓ Insulation materials and R-values~~
  - ~~✓ Fenestration U-factors, SHGC~~
  - ~~✓ Area-weighted U-factor and SHGC calculations~~
  - ~~✓ Mechanical, SWH, equipment types, sizes, and efficiencies~~
  - ~~✓ Equipment and system controls~~
  - ~~✓ Duct sealing, duct and pipe insulation and location~~
  - ~~✓ Air sealing details~~

- ✓ **Amended to: *Construction documents include all documentation required to be submitted in order to issue a building permit*.**

The Selected Compliance Option must be represented on the Submitted Documents

7

7

NEW

Insulation and Fenestration - Requirements by Climate Zone

2015 Prescriptive Table - no amendments- enclosed values are all improvements

PRESCRIPTIVE

R-value (no tradeoffs)

TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE[i]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5[h]	8/13	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

For SI: 1 foot = 304.8 mm.

a. R-values are minimums. *U*-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall not be less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in climate zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.

c. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.

d. R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Climate Zones 1 through 3 for heated slabs.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Or insulation sufficient to fill the framing cavity, R-19 minimum.

h. The first value is cavity insulation, the second value is continuous insulation, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

i. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

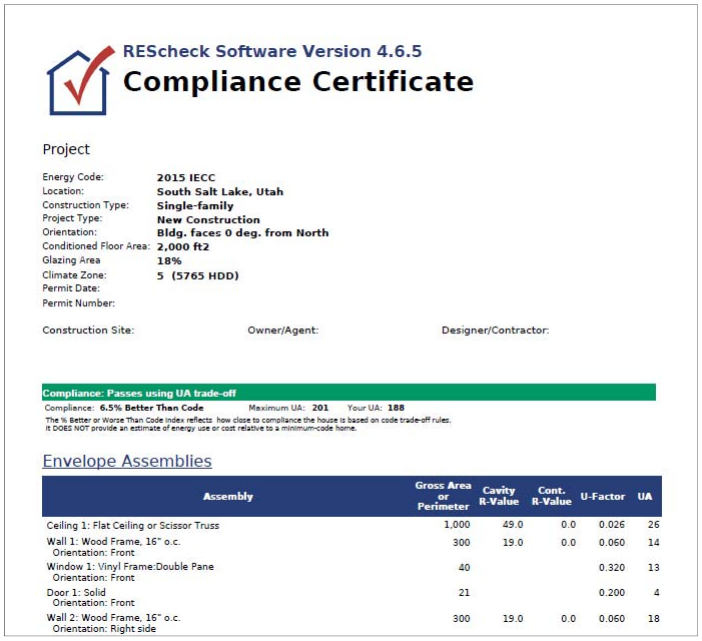
j. Log walls complying with ICC400 and with a minimum average wall thickness of 5" or greater shall be permitted in Zones 5-6 when overall window glazing is 0.31 U-factor or lower, minimum heating equipment efficiency is 90 AFUE (gas) or 84 AFUE (oil), and all other requirements met.

8

8

PRESCRIPTIVE UA- Trade-off 2015 REScheck

- U-factor (tradeoffs within individual components)
- UA (tradeoffs between components)



REScheck Software Version 4.6.5

Compliance Certificate

Project

Energy Code:	**2015 IECC**
Location:	**South Salt Lake, Utah**
Construction Type:	**Single-family**
Project Type:	**New Construction**
Orientation:	**Bldg. faces 0 deg. from North**
Conditioned Floor Area:	**2,000 ft2**
Glazing Area	**18%**
Climate Zone:	**5 (5765 HDD)**
Permit Date:	
Permit Number:	

Construction Site: Owner/Agent: Designer/Contractor:

Compliance: Passes using UA trade-off

Compliance: **6.5% Better Than Code** Maximum UA: **201** Your UA: **188**

The % Better or Worse Than Code index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

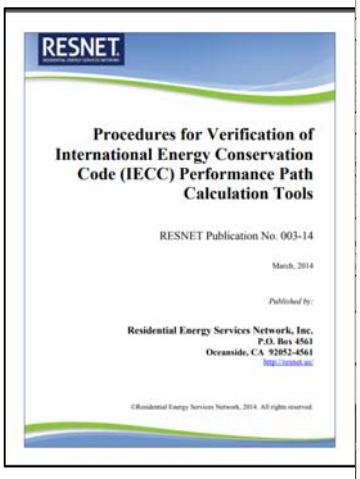
Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	1,000	49.0	0.0	0.026	26
Wall 1: Wood Frame, 16" o.c. Orientation: Front	300	19.0	0.0	0.060	14
Window 1: Vinyl Frame:Double Pane Orientation: Front	40			0.320	13
Door 1: Solid Orientation: Front	21			0.200	4
Wall 2: Wood Frame, 16" o.c. Orientation: Right side	300	19.0	0.0	0.060	18

9

SIMULATED PERFORMANCE

Simulated Performance Alternative R405



RESNET

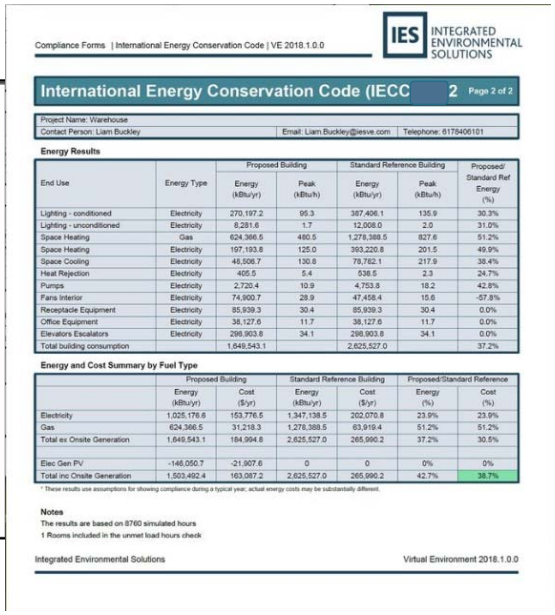
Procedures for Verification of International Energy Conservation Code (IECC) Performance Path Calculation Tools

RESNET Publication No. 003-14

March, 2014

Published by:

Residential Energy Services Network, Inc.
P.O. Box 4561
Oceanside, CA 92052-4561



Compliance Forms | International Energy Conservation Code | VE 2018.1.0.0

IES INTEGRATED ENVIRONMENTAL SOLUTIONS

International Energy Conservation Code (IECC 2 Page 2 of 2

Project Name: Warehouse
Contact Person: Liam Buckley | Email: Liam.Buckley@iesve.com | Telephone: 6178406101

Energy Results

End Use	Energy Type	Proposed Building Energy (kBtu/yr)	Proposed Building Peak (kBtu/h)	Standard Reference Building Energy (kBtu/yr)	Standard Reference Building Peak (kBtu/h)	Proposed/ Standard Ref Energy (%)
Lighting - conditioned	Electricity	270,197.2	95.3	387,406.1	135.9	30.3%
Lighting - unconditioned	Electricity	8,281.6	1.7	12,008.0	2.0	31.0%
Space Heating	Gas	624,366.5	480.5	1,276,388.5	827.6	51.2%
Space Heating	Electricity	197,193.8	125.0	393,220.8	201.5	49.9%
Space Cooling	Electricity	48,506.7	130.8	78,782.1	217.9	38.4%
Heat Rejection	Electricity	405.5	5.4	538.5	2.3	24.7%
Pumps	Electricity	2,720.4	10.9	4,753.8	18.2	42.8%
Fans Interior	Electricity	74,900.7	28.9	47,458.4	15.6	-57.8%
Receptacle Equipment	Electricity	85,939.3	30.4	85,939.3	30.4	0.0%
Office Equipment	Electricity	36,127.6	11.7	36,127.6	11.7	0.0%
Elevators Escalators	Electricity	296,903.8	34.1	296,903.8	34.1	0.0%
Total building consumption		1,649,543.1		2,625,527.0		37.2%

Energy and Cost Summary by Fuel Type

	Proposed Building Energy (kBtu/yr)	Proposed Building Cost ($/yr)	Standard Reference Building Energy (kBtu/yr)	Standard Reference Building Cost ($/yr)	Proposed/Standard Reference Energy (%)	Proposed/Standard Reference Cost (%)
Electricity	1,025,176.6	153,776.5	1,347,138.5	202,070.8	23.9%	23.9%
Gas	624,366.5	31,218.3	1,278,388.5	63,919.4	51.2%	51.2%
Total ex Onsite Generation	1,649,543.1	184,994.8	2,625,527.0	265,990.2	37.2%	30.5%
Elec Gen PV	-148,050.7	-21,907.6	0	0	0%	0%
Total inc Onsite Generation	1,503,492.4	163,087.2	2,625,527.0	265,990.2	42.7%	38.7%

* These results use assumptions for showing compliance during a typical year, actual energy costs may be substantially different.

Notes
The results are based on 8760 simulated hours
1 Rooms included in the unmet load hours check

Integrated Environmental Solutions Virtual Environment 2018.1.0.0

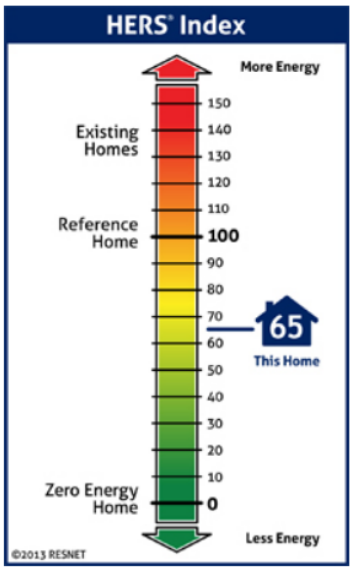
10

NEW 2015 ENERGY RATING INDEX (ERI)

ERI (HERS) Compliance Alternative R406

TABLE R406.4
MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX
1	52
2	52
3	65
4	54
5	69
6	68
7	53
8	53



11

5th OPTION UTAH 2012 RESCHECK

Pass by:
3%- Jan 1, 2017- Jan 1, 2019
4%- Jan 1, 2019- Jan 1, 2021
5%- Jan 1, 2021

REScheck Software Version 4.6.5

Compliance Certificate

Project

Energy Code: Utah Energy Conservation Code
Location: South Salt Lake, Utah
Construction Type: Single-family
Project Type: New Construction
Orientation: Bldg. faces 0 deg. from North
Conditioned Floor Area: 2,000 ft2
Glazing Area 18%
Climate Zone: 5 (5765 HDD)
Permit Date:
Permit Number:

Construction Site: Owner/Agent: Designer/Contractor:

Compliance: Passes using UA trade-off

Compliance: 14.9% Better Than Code Maximum UA: 221 Your UA: 188

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules.
It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	1,000	49.0	0.0	0.026	26
Wall 1: Wood Frame, 16" o.c. Orientation: Front	300	19.0	0.0	0.060	14
Window 1: Vinyl Frame:Double Pane Orientation: Front	40			0.320	13
Door 1: Solid Orientation: Front	21			0.200	4
Wall 2: Wood Frame, 16" o.c. Orientation: Right side	300	19.0	0.0	0.060	18
Wall 3: Wood Frame, 16" o.c. Orientation: Left side	300	19.0	0.0	0.060	17
Window 4: Vinyl Frame:Double Pane Orientation: Left side	20			0.320	6
Wall 4: Wood Frame, 16" o.c. Orientation: Back	208	19.0	0.0	0.060	8

12

Comply with the mandatory sections of the Energy Code, required with each of the Compliance Options

(with some exception or triggers)

13

Building Thermal Envelope - *Section R402.4.1 – Air Leakage*

Two options to demonstrate compliance (State Amendment)

- ✓ Whole-house pressure test
  - By State Amendment, all climate zones test to 5 ACH @ 50 pa
    - January 1, 2019- 3.5 ACH @ 50 pa ***SFD***
    - January 1, 2019- **5** ACH @ 50 pa ***Townhouse and Multi-family ≤ 3 stories***
    - January 1, 2021- To be reviewed
  - Testing may be by any certified testing- including contractors and sub contractors
  - Testing may occur any time after creation of all building envelope penetrations

OR

- ✓ Field verification of items listed in Table R402.4.1.1

- ✓ ***Homes testing 3 ACH @ 50 pa require mechanical ventilation- IRC 303.4***

14

14

NEW

Rooms Containing Fuel-burning Appliances - OPEN COMBUSTION AIR

Both Residential and Commercial Buildings- IECC Requirement

Appliances and combustion air openings to be located outside the building thermal envelope or enclosed in a room isolated from inside the thermal envelope in Climate Zones 3-8- ALL of Utah

- Where open combustion air ducts provide combustion air to open combustion *fuel-burning appliances*
  - *Furnaces, boilers, water heaters*
- Rooms to be sealed and insulated per envelope requirements
- Doors into the rooms fully gasketed
- Water lines and ducts insulated
- Combustion air ducts that pass through conditioned space, insulated to ≥ R-8
- Does not apply if combustion air is drawn from inside the home

Exceptions:
- Direct Vent
- Fireplaces
- Stoves

15

15

NEW

Section R402.4.5 - Recessed Lighting Fixtures

✓Type IC rated and labeled as meeting ASTM E 283 when tested at 1.57 psf (75 Pa) pressure differential with no more than 2.0 cfm of air movement

✓*Sealed with a gasket or caulk between the housing and interior wall or ceiling covering* (Amended out in 2012- required in 2015 Code)

16

16

NEW

Section R403.3.3- Mandatory - Duct Testing

- Ducts shall be pressure tested to determine air leakage by either of the following:
  - Rough-in test
    - Total leakage measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system including manufacturer's air handler enclosure
      - All registers taped or otherwise sealed
  - Postconstruction test
    - Total leakage measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system including manufacturer's air handler enclosure
      - All registers taped or otherwise sealed
  - Exception
    - Duct air leakage test not required where ducts and air handlers are partially within the building thermal envelope
    - ~~50% inside- July 1, 2016 to Dec 31, 2017~~ we've passed this date
    - ~~65% inside- Beginning January 1, 2017~~ also passed this date
    - 75% inside- Beginning January 1, 2019
    - 80% inside- Beginning January 1, 2021
- A written report of results of test signed by the party conducting test and provided to code official

17

17

NEW

Section R403.6 - Mechanical Ventilation

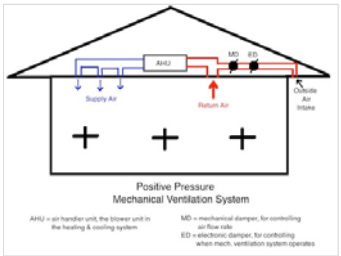
Required (IRC) if tested tighter than 3 ACH@50pa (State amended from 5 ACH@50pa)

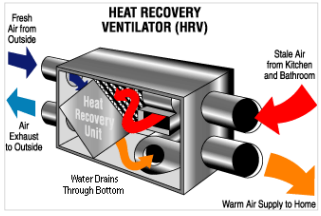
✓Ventilation

- Building to have ventilation meeting IRC or IMC or with other approved means (previously deleted by the 2012 amendments)
- Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating

✓Whole-house mechanical ventilation system fans to meet efficacy in Table R403.6.1

- ✓ **Exception**
  - ✓ When fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor





18

18

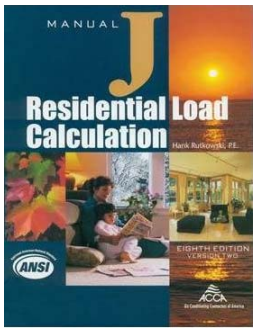
Section R403.7 - Equipment Sizing and Efficiency Rating

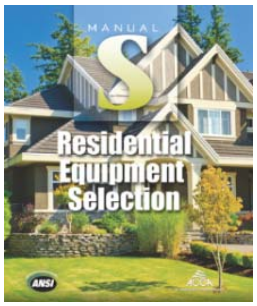
✓Equipment Sizing

- Load calculations determine the proper capacity (size) of equipment
  - Goal is big enough to ensure comfort but no bigger
- Sizing shall be performed in accordance with ACCA Manual S based on loads calculated in accordance with ACCA Manual J (other approved methods)

✓Efficiency Rating

- New or replacement heating/cooling equipment shall have an efficacy rating equal to or greater than minimum required by federal law for geographic location of installation





MANDATORY

19

19

NEW

Lighting Equipment
Section R404.1 - Mandatory

MANDATORY

A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or 75% of permanently installed lighting fixtures shall contain only high efficacy lamps

Exception:

✓ Low-voltage lighting

20

20

Who's Responsible…..for Compliance with these MINIMUM requirements?

- **Architect, Design Professional?**
- **Jurisdiction - Plans Examiner/Inspector?**
- **General Contractor, Sub Contractor?**
- **Suppliers?**
- **DOPL (Division of Professional Licensing)?**
- **Home Owner?**

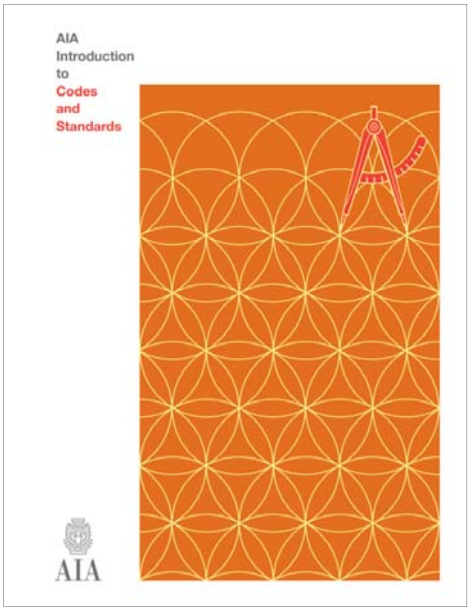
21

DEAN L. WEBB & ASSOCIATES
Consulting Structural Engineers

Dean L. Webb & Associates specializes in Structural and Forensic Engineering, which uses engineering technologies for the design of new structures and investigations of structural problems.

The firm's experience also includes the investigation, evaluation, and presentation of reports for all types of problems that have legal implications which require an expert witness.

22



Preface
AIA Introduction to Codes and Standards

Architects are typically the responsible design professionals, with a corresponding duty to protect the health, safety, and welfare of both building occupants and the public at large. As a group, architects may be the most significantly affected by, and the most significant users of, the codes. The American Institute of Architects (AIA) represents the profession on these important issues by supporting member architects' participation in code development and adoption processes.

23

Authority Having Jurisdiction - AHJ

Utah Code: Chapter 56 – Building Inspector and Factory Built Licensing Act

58-56-9 Qualifications of inspectors

(1) An inspector employed by a local regulator, state regulator, or compliance agency to enforce the codes shall:

…..(c) be subject to revocation or suspension of the inspector's license or being placed on probation if found guilty of unlawful or unprofessional conduct.

58-56-9.3 Unprofessional conduct

Unprofessional conduct is as defined in Subsection 58-1-501(2) and includes:

….. (3) gross negligence in the performance of official duties as a building inspector.

24

Contractors

Utah Code: Chapter 55 Utah Construction Trades Licensing Act

58-55-501 Unlawful conduct.

….. (16) if licensed under this chapter, willfully or deliberately disregarding or violating:

(a) the building or construction laws of this state or any political subdivision;

58-55-502 Unprofessional conduct.

….. (2) disregarding or violating through gross negligence or a pattern of negligence:

(a) the building or construction laws of this state or any political subdivision;

25

Division of Professional Licensing - DOPL

Utah Code: Chapter 55 Utah Construction Trades Licensing Act

58-55-402 Investigation of regulated activity.

(1) The division shall be responsible for the investigation of persons and activities in violation of the provisions of this chapter.

(2) (a) Investigation by the division shall include investigations of:

(i) licensees engaged in unlawful or unprofessional conduct.

26

Suppliers

Is the Big Box store responsible if it sells non-compliant windows to an unsuspecting public?

Do they provide contractors services?

Do they require building permits; therefore code compliances?

27

Home Owner

Should the Buyer of a New Home expect an energy efficient home, compliant with the adopted codes?

Is it reasonable for the new owner to expect:

- new home will include proper applications of insulation?
- An air barrier and water management system, preventing water intrusion and air sealing to prevent air leakage?
- Ventilation systems as required by code or necessary to prevent condensation formation within the building envelope?

28

QUESTIONS OR COMMENTS?

Thank you for your participation!

Brent Ursenbach, CBO, LEED® AP
West Coast Code Consultants, Inc.
Mechanical & Energy Specialist
801.381.1449
brentu@wc-3.com
bursenbach@gmail.com

29

29