Proposed Codes and Standards Changes for 2019 Residential Standards

Residential HVAC

WHPA FDD Committee

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Summary of Proposed Changes

- HVAC Measures
  - Add compliance option for FDD devices, including FIDs
  - Improve FID specs to invite participation
  - Reduce maximum fan efficacy from 0.58 W/cfm to ~0.40 W/cfm
  - Add temperature split to A/C verification options
- Also of interest – proposed IAQ Measures
  - Adopt 62.2-2016 (includes high-rise multifamily)
  - Increase filter MERV requirement to 13 (?)
  - Address compartmentalization and PM 2.5 issues in high-rise

FDD & FID Code Change Objectives

- FDD
  - Provides low-cost means of ensuring long-term, sustained performance
  - Facilitates fault identification and diagnosis
  - Notifies service tech of significant fault
- FID
  - Provides a more sophisticated, communicating device capable of notifying the homeowner and/or the technician
  - Notification of fault and/or loss of performance
  - Ensures sustained performance <u>and</u> serves as an alternative to refrigerant charge verification

Four Proposed Compliance Options that can be Modeled in CBECC-RES

Case	EER Multiplier	Notes
No refrigerant charge	90%	Prescriptive CZ 1, 3-7, 16
FDD	94%	CZ 1, 3-7, 16 only
Refrigerant charge OR Temperature split OR Weigh-in method	96%	Prescriptive CZ 2, 8-15
FID OR FDD & refrigerant charge or FDD & temperature split	98%	All CZ’s

Problems with Current FID Specification (JA6)

- Very specific as to the method used
- Lots of measurements:
  - (a) Suction line temperature (Tsuction,).
  - (b) Liquid line temperature (Tliquid).
  - (c) Evaporator saturation temperature or low side refrigerant pressure (Tevaporator, sat).
  - (d) Condenser saturation temperature or high side refrigerant pressure (Tcondensor, sat).
  - (e) Return air wet bulb temperature or humidity (Treturn, wb).
  - (f) Return air dry bulb temperature (Treturn, db).
  - (g) Condenser air entering dry bulb temperature (Tcondenser, db).
  - (h) Supply air dry bulb temperature (Tsupply, db).
- Intended only as an alternative to manual charge verification
- Not designed to report on performance (capacity, EER)
- Uses temperature split to verify airflow, and employs a table for only one outdoor temperature

Temperature Split

- Performance-based verification method using only 9 steps instead of the 25 required for sub-cooling
- Refrigerant charge verifies refrigerant charge, temperature split captures all faults
- Measurements:
  - Airflow (as typical) – used to normalize measured temp split
  - Outdoor temperature – for selecting the right table (50º to 115º)
  - Entering and leaving dry bulb
  - Entering wet bulb
- Fewer measurements = less measurement uncertainty
- Problem: How to accurately measure supply air temperature

Validations to Date

- Field tests
  - Two systems, both with verified refrigerant charge
  - Both within 2°F of target
- Evaluation using data from SCE & PG&E lab tests with multiple faults
  - Faults: Undercharge, overcharge, low evaporator and condenser airflow, refrigerant line restrictions, non-condensables
  - Outdoor temperatures ranging from 75 to 115°F and indoor from 70/59 to 80/67
  - Using a 2.5°F margin, able to detect all faults that reduced the measured EER by 10% or more with no false positives
- Evaluation using expanded tables for 5 manufacturers
  - 21 variations of temperature conditions and coil combinations
  - Temperature split differences ranged from -2.6 to +2.1°F

Field Test Example

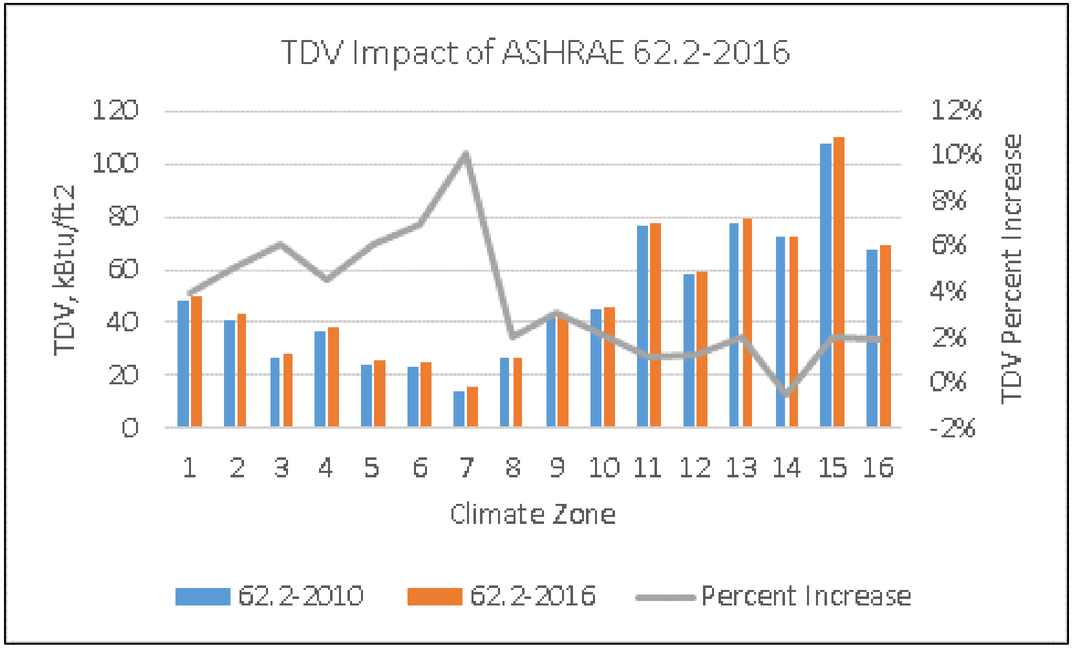
- Nominal tons: 2 (18 SEER)
- Airflow: 1028 cfm = 514 cfm/ton
- Outdoor temperature: 90^o (used 90^{o}F chart)
- T_{sup} = 59.8*, T_{ret} = 76.8, TS_{meas} = 17.0
- TS_{cor} = 17.0 x (0.00264 x 514 – 0.054) = 22.2
- T_{wb} = 60.0
- TS_{target} = 23.5
- 23.5 – 22.2 = 1.3 <u>PASS</u>

*Measured at largest supply

RA WB	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
46	21.7	22	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4										
47	21.7	22	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.8	25.1								
48	21.7	22	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.8	25.1	25.4	25.7						
49	21.7	22	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.8	25.1	25.4	25.7	26	26.3				
50	21.7	22	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.8	25.1	25.4	25.7	26	26.3	26.6	26.9		
51	21.4	22	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.8	25.1	25.4	25.7	26	26.3	26.6	26.9	27.2	27.5
52	20.6	21.3	22.1	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.8	25.1	25.4	25.7	26	26.3	26.6	26.9	27.2	27.5
53	19.8	20.5	21.3	22.1	22.9	23.2	23.5	23.8	24.1	24.4	24.8	25.1	25.4	25.7	26	26.3	26.6	26.9	27.2	27.5
54	19	19.7	20.5	21.3	22.1	22.9	23.5	23.8	24.1	24.4	24.8	25.1	25.4	25.7	26	26.3	26.6	26.9	27.2	27.5
55	18.2	18.9	19.7	20.5	21.3	22.1	22.8	23.6	24.1	24.4	24.8	25.1	25.4	25.7	26	26.3	26.6	26.9	27.2	27.5
56	17.4	18.1	18.9	19.7	20.5	21.3	22	22.8	23.6	24.4	24.8	25.1	25.4	25.7	26	26.3	26.6	26.9	27.2	27.5
57	16.6	17.3	18.1	18.9	19.7	20.5	21.2	22	22.8	23.6	24.4	25.1	25.4	25.7	26	26.3	26.6	26.9	27.2	27.5
58	15.8	16.5	17.3	18.1	18.9	19.7	20.4	21.2	22	22.8	23.6	24.3	25.1	25.7	26	26.3	26.6	26.9	27.2	27.5
59	15	15.7	16.5	17.3	18.1	18.9	19.6	20.4	21.2	22	22.8	23.5	24.3	25.1	25.9	26.3	26.6	26.9	27.2	27.5
60	14.2	14.9	15.7	16.5	17.3	18.1	18.8	19.6	20.4	21.2	22	22.7	23.5	24.3	25.1	25.9	26.6	26.9	27.2	27.5
61	13.4	14.1	14.9	15.7	16.5	17.3	18	18.8	19.6	20.4	21.2	21.9	22.7	23.5	24.3	25.1	25.8	26.6	27.2	27.5
62	12.6	13.3	14.1	14.9	15.7	16.5	17.2	18	18.8	19.6	20.4	21.1	21.9	22.7	23.5	24.3	25	25.8	26.6	27.4
63	11.8	12.5	13.3	14.1	14.9	15.7	16.4	17.2	18	18.8	19.6	20.3	21.1	21.9	22.7	23.5	24.2	25	25.8	26.6
64	11	11.7	12.5	13.3	14.1	14.9	15.6	16.4	17.2	18	18.8	19.5	20.3	21.1	21.9	22.7	23.4	24.2	25	25.8
65		10.9	11.7	12.5	13.3	14.1	14.8	15.6	16.4	17.2	18	18.7	19.5	20.3	21.1	21.9	22.6	23.4	24.2	25
66			10.9	11.7	12.5	13.3	14	14.8	15.6	16.4	17.2	17.9	18.7	19.5	20.3	21.1	21.8	22.6	23.4	24.2
67				10.9	11.7	12.5	13.2	14	14.8	15.6	16.4	17.1	17.9	18.7	19.5	20.3	21	21.8	22.6	23.4
68					10.9	11.7	12.4	13.2	14	14.8	15.6	16.3	17.1	17.9	18.7	19.5	20.2	21	21.8	22.6
69						10.9	11.6	12.4	13.2	14	14.8	15.5	16.3	17.1	17.9	18.7	19.4	20.2	21	21.8
70							10.8	11.6	12.4	13.2	14	14.7	15.5	16.3	17.1	17.9	18.6	19.4	20.2	21
71								10.8	11.6	12.4	13.2	13.9	14.7	15.5	16.3	17.1	17.8	18.6	19.4	20.2
72									10.8	11.6	12.4	13.1	13.9	14.7	15.5	16.3	17	17.8	18.6	19.4
73										10.8	11.6	12.3	13.1	13.9	14.7	15.5	16.2	17	17.8	18.6
74											10.8	11.5	12.3	13.1	13.9	14.7	15.4	16.2	17	17.8
75												10.7	11.5	12.3	13.1	13.9	14.6	15.4	16.2	17
76													10.7	11.5	12.3	13.1	13.8	14.6	15.4	16.2

Energy Impact of ASHRAE 62.2-2016 Ventilation Rate Change

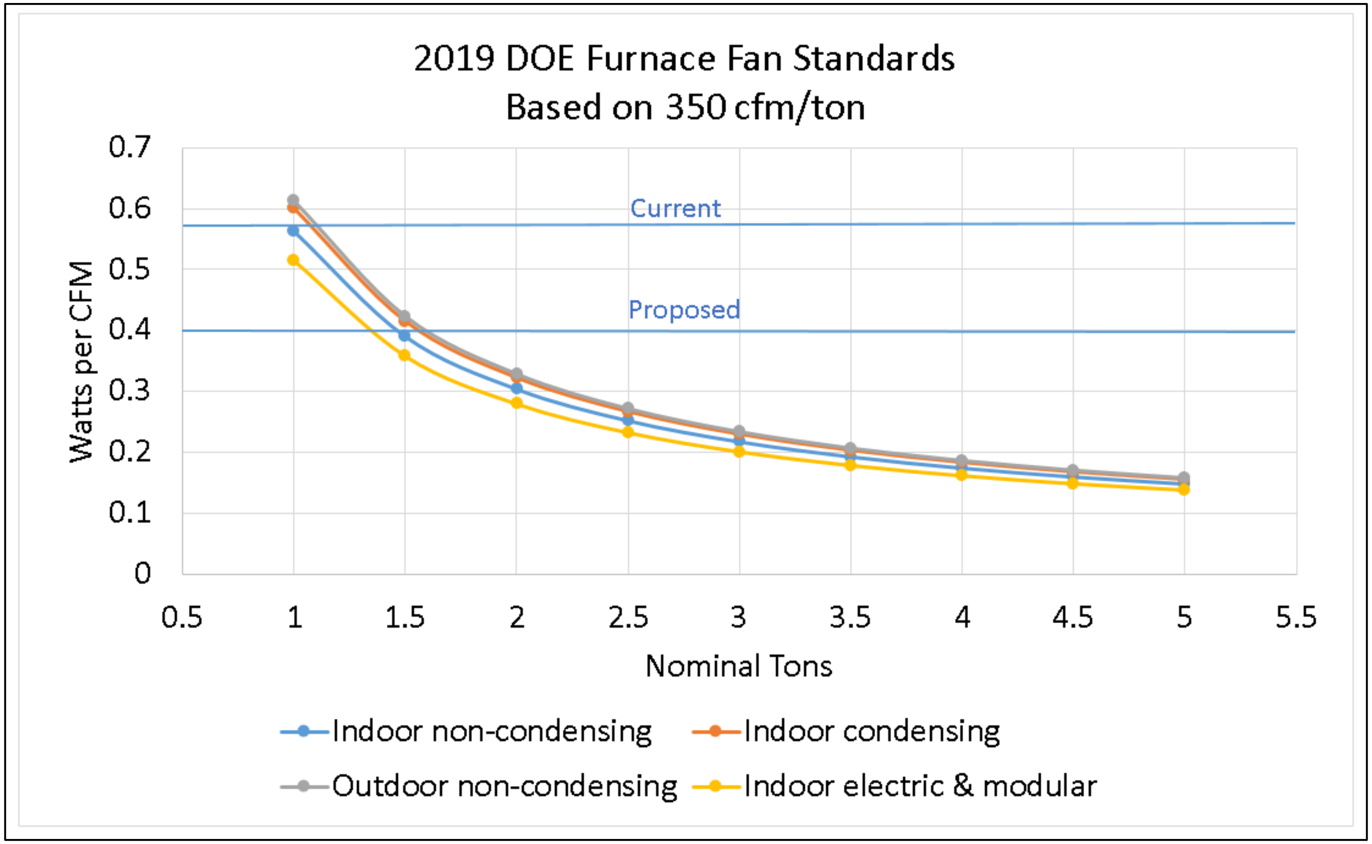
Energy Use Based on Title 24 Residential Prototype Homes



- Single family energy use will increase due to higher ventilation rates
- Multifamily low-rise energy use will not change
- Multifamily high-rise ventilation rates and energy use will decrease

DOE Standards for Furnace Fan Efficacy

- Effective July 3, 2019
- Fan efficiency rating (FER) varies by equipment type
- Function of maximum airflow-control setting



CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

To Stay Engaged….

- HVAC Stakeholder Meeting: 9 AM, March 28th
- For more information: Title24Stakeholders.com
  EnergyCodeAce.com