CALIFORNIA ENERGY CODES & STANDARDS

A STATEWIDE UTILITY PROGRAM

2019 Title 24 Codes & Standards Enhancement (CASE) Proposal

Residential HVAC Measures

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Proposed Code Change Overview

- Types of building impacted
  - Single family residential
  - Low rise multi-family residential
- Building system impacted
  - Heating and air conditioning
- Anticipated types of changes
  - Added compliance option, change to mandatory verification procedures, change to HERS test protocol
- Description of changes
  - Compliance option for fault detection and diagnosis (FDD) devices for new and replacement air conditioners
  - Modify fan efficacy requirements to ensure consistency with 2019 DOE standards for furnace fans
  - Add duct leakage to outside test as an alternative to duct leakage verification
  - Allow the Delta-Q method to be used as an alternative to the RA3.1.4.3.4 method for measuring duct leakage to outside

Current Code Requirements: Fault Detection & Diagnosis Devices

- No existing code requirements
- Title 24 provision for fault indicator display (FID); none are produced that meet JA6 specification
- Inexpensive FDD devices are available that detect excessive runtime, high or low compressor current, refrigerant pressure, and related faults

Current (2016 Title 24) Code Requirements: Duct Leakage to Outside

- New Single Family with ducts in conditioned space
  - 150.0(c)9.B - 25 cfm maximum leakage to outside if ducts are in conditioned space
- New Single Family with ducts in vented attic
  - 150.0(m)11.A: 5% total leakage
- New Multifamily
  - 150.0(m)11.C.ii - 6% maximum leakage to outside
- Alterations:
  - 150.2(b)1.D.ii.b.2 - 10% maximum leakage to outside for altered duct systems
- Test methods prescribed
  - Ducts in conditioned space - RA3.1.4.3.8
  - Multifamily & altered single family – RA3.1.4.3.4

Proposed Code Change History

- Why are we proposing these measures?
  - FDD compliance option
    - Potentially low cost, long-term means to identify defects
    - Speeds diagnosis and minimizes the need for highly skilled field technicians (address industry workforce issue)
  - Changes to mandatory fan efficacy (0.58 W/cfm)
    - Synchronizes CA and DOE 2019 fan efficacy requirements
    - Responds to 2013 Title 24 requirements for return duct and filter grille sizing and improved fan motor efficiency
  - Duct leakage to outside becomes more important with high performance attics and ducts in conditioned space
  - The Delta-Q method is proposed as an alternate protocol to demonstrate compliance with duct leakage verification

Current and Pending Codes & Standards

- Fan Efficacy
  - Manufacturers are required to comply with the U.S. DOE energy conservation standards for residential furnace fans starting July 3, 2019 (79 FR 37937)
  - Alignment of DOE and Title 24 (0.58 W/cfm) proposed but not resolved; likely to include air handler fans
- Duct Leakage
  - Maximum Rates
    - ACCA Standard 5, 5.1.1(a) ≤ 10% total leakage
  - Standard Test Methods for Leakage to Outside
    - Reference Appendix RA 3.1.4.3
    - RESNET 803.7
    - ASHRAE 152-2013 Annex B
    - ASTM E1554-07 Method A: “DeltaQ”
    - ASTM E1554 Method B

2019 DOE Furnace Fan Standards

Watts/cfm based on 400 cfm/ton

Product Class	Equipment Tons					
	2	2.5	3	3.5	4	5
Indoor Non-Condensing	0.22	0.23	0.23	0.24	0.25	0.27
Indoor, Condensing	0.23	0.24	0.25	0.26	0.27	0.28
Outdoor Non-Condensing	0.23	0.24	0.25	0.26	0.27	0.29

http://www.energy.gov/sites/prod/files/2014/06/f17/furnace_fans_final_rule.pdf

Typical Practices

- Current practices and market
  - FDDs barely entering the market
  - Duct leakage verification per Title 24
  - Refrigerant charge verified on ~25% of single family and ~15% of multi-family units
- Trends
  - FIDs too expensive or manufacturers unsure of market, and available FDDs need incentives – Title 24 and/or CAHP
  - 2016 standards will increase ducts in conditioned space
- *Do you agree with this description?*

Market Overview and Analysis

- Market impacts
  - FDD: High market potential for low-cost, especially factory-installed or integrated systems
  - Fan efficacy: No market impact since Title 24 would not preempt DOE standards
  - Duct leakage to outside: Delta-Q test could simplify leakage-to-outside verification if APT equipment used
- Market barriers
  - FDD: No incentives or identified value
  - Duct leakage to outside - Reference Appendix 3.4.1.3 or Delta-Q methods could increase verification costs
- *Other market information sources we should know about?*

Incremental Cost Estimation

- How we plan to collect costs of base case technology and proposed technology
  - FDD: Interviews with manufacturers provided rough cost estimate for factory installed units
  - Fan efficacy: n/a
  - Duct leakage to outside using RA 3.1.4.3 method: Survey of HERS raters
  - Duct leakage to outside using DeltaQ method: Survey of HERS raters & LBNL
- *What components of costs did we leave out?*
- We found the costs to be …..
    - Approximately $100 for one factory installed FDD; more for field installed FDD
    - Duct leakage to outside: TBD
- *Do you find these costs to be reasonable?*

Methodology for Savings Analysis

- Methodology for energy and demand Impacts
  - FDD: Would require large field test over a number of years; rely on estimates from various sources
  - Duct leakage to outside vs. total leakage: CBECC modeling & field data

Assumptions for Energy Impacts and Incremental Cost Savings Analysis

- Key assumptions would include:
  - Average EER improvement (FDD)
  - Average reduction in duct leakage to outside
  - Use standard CEC prototype buildings
  - Fraction of buildings and building types utilizing measures
- Data sources
  - The impact of defects must come from field studies that measure existing and improved capacity and EER for a statistically valid sample
  - Statewide energy savings estimates made using modeling

Incremental Cost Savings

- Approach
  - Incremental cost savings are calculated based on TDV cost savings associated with energy savings over the entire period of analysis.
  - Net Present Value of savings based on 2019 TDV cost multiplier of $0.1732/TDV kBTU saved

Compliance and Enforcement- Market Actors

- Who would be involved in implementing this measure?
  - T24 Consultant / CEA
  - Manufacturers (HVAC & FDD)
  - Builder
  - Mechanical Contractor
  - Plans Examiner / Building Inspector
  - Building Owners
  - Others?

Compliance and Enforcement—Tasks

Market Actor	Task(s)	Success Criteria
Title 24 Consultant	- Completes compliance documents - Ensure builder is aware of requirements	- Builder and construction team are aware of requirements
Builder	- Coordinates with mechanical contractor to ensure that HVAC equipment listed in CF-1R is the same as what will be installed (as typical) - Coordinates with mechanical contractor to ensure that FDD is provided if listed in CF-1R	- Correct equipment is installed - If FDD device installed, agreement with mechanical obtained as to how it will be monitored - HERS costs reduced
Mechanical Contractor	- Installs HVAC equipment in accordance with specs (with or without FDD) - Applies best practice methods for duct sealing inside and outside conditioned space	- Correct equipment installed, commissioned, and operates efficiently - Long-term reduction in serious equipment failure and service costs
Manufacturer/ Distributor	- Provides equipment meeting standards and specifications, installation information, and technical support	- On-time delivery of specified equipment

Compliance and Enforcement—Tasks

Market Actor	Task(s)	Success Criteria
Plans Examiner	- Verifies that CF-1R is consistent with building plans and meets compliance criteria	- Minimize paperwork - Quick review and processing
Building Inspector	- Verifies that required HERS inspections listed on CF-1R have CF-2R and CF-3R paperwork - Verifies that CF forms are signed off and certified - Sign certificate of occupancy	- Minimize paperwork - Quick review and processing
HERS Rater	- Reviews CF-2Rs - Completes refrigerant charge verification or temperature split verification - Promptly communicates results to Builder - Completes registry entries	- Reduced time in the field - Greater reduction of faults vs. current practice

What are we not capturing?

Compliance and Enforcement—Resources

Market Actor	Resource(s)
T-24 Consultant	- CBECC-Res / EnergyPro compliance software - EnergyCodeAce tools - T-24 Compliance manuals
Builder / General Contractor	- Building officials at jurisdiction - T-24 Consultant - HERS Rater - Mechanical contractor
Mechanical Contractor and Other Subs	- EnergyCodeAce tools - Utility-sponsored training classes? - HERS Rater
HERS Rater	- EnergyCodeAce tools - CalCERTS / CHEERS Trainings - Utility-sponsored training classes?
Plans Examiner / Building Inspector	- EnergyCodeAce tools - CalCERTS / CHEERS Trainings - Utility-sponsored training classes?

What resources or tools are typically used for compliance

Strawman Code Change Language

- Title 24 Standards
  - Section 150.0(m)13.B: Modify W/cfm as to be determined
  - Section 150.0(m): Add leakage to outside compliance target for single family dwelling to 150.0(m)11
- Joint Appendices
  - Glossary: Add FID definition
  - JA6.1.6: Add section specifying FDD functional requirements
  - Table RA2-1: Add measure for FDD devices
  - RA3.1.4: Describe Delta-Q method
- Alternative Compliance Method (ACM) Reference Manual
  - Add provision for FDD compliance option credit
  - Update fan efficacy assumptions

Feedback Request from Stakeholders

- *We would like your input …*
  - Potential energy savings
  - Potential costs
- To respond:
  - Call or email CASE author
  - Email info@title24Stakeholders.com

Thank you.

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