



**RTU FDD**  
**in Title-24:**  
**Past, Present**  
**and Future**

FDD for RTUs Workshop  
Purdue University

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Standards Development Office  
Energy Efficiency Division

# Presentation Outline

- ✚ Quick background of CA Building Energy Code
- ✚ History of RTU FDD in CA Building Energy Code
- ✚ Future(s) for RTU FDD in CA

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# CA Building Energy Efficiency Standards

- ✚ “Title-24” == CA Building Code

<http://www.bsc.ca.gov/codes.aspx>

- ✚ “Title-24, Part 6” == CA Building Energy Efficiency Standards (BEES)

<http://www.energy.ca.gov/title24/>

- ✚ CA has been updating BEES for 37 years (since 1977)
- ✚ BEES + CA Appliance Stds has saved CA consumers ~ \$74B
- ✚ The 2013 BEES will save the equivalent energy of 6 new power plants



# RTU FDD in CA Code – Step 1

## 2008 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

CALIFORNIA  
ENERGY  
COMMISSION

REGULATIONS / STANDARDS



Effective January 1, 2010

December 2008  
CEC-400-2008-001-CMF

Arnold Schwarzenegger  
Governor



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# RTU FDD in CA Code – 2008 BEES

## 5% Cooling Performance Credit for FDD

- 10% performance degradation assumed w/o FDD
- 5% performance degradation assumed w/ FDD

## FDD Construction Inspection

- Factory-installed integrated economizer w/  $\leq 2$  deg. deadband
- Direct-drive actuators on dampers
- Compressor low temp lockout
- Damper max. leakage
- Adjustable expansion control device
- High/low refrigerant pressure ports
- Sensors
  - Refrigerant suction & liquid line - pressure & temp
  - SA, RA, OA temp & humidity



# RTU FDD in CA Code – 2008 BEES

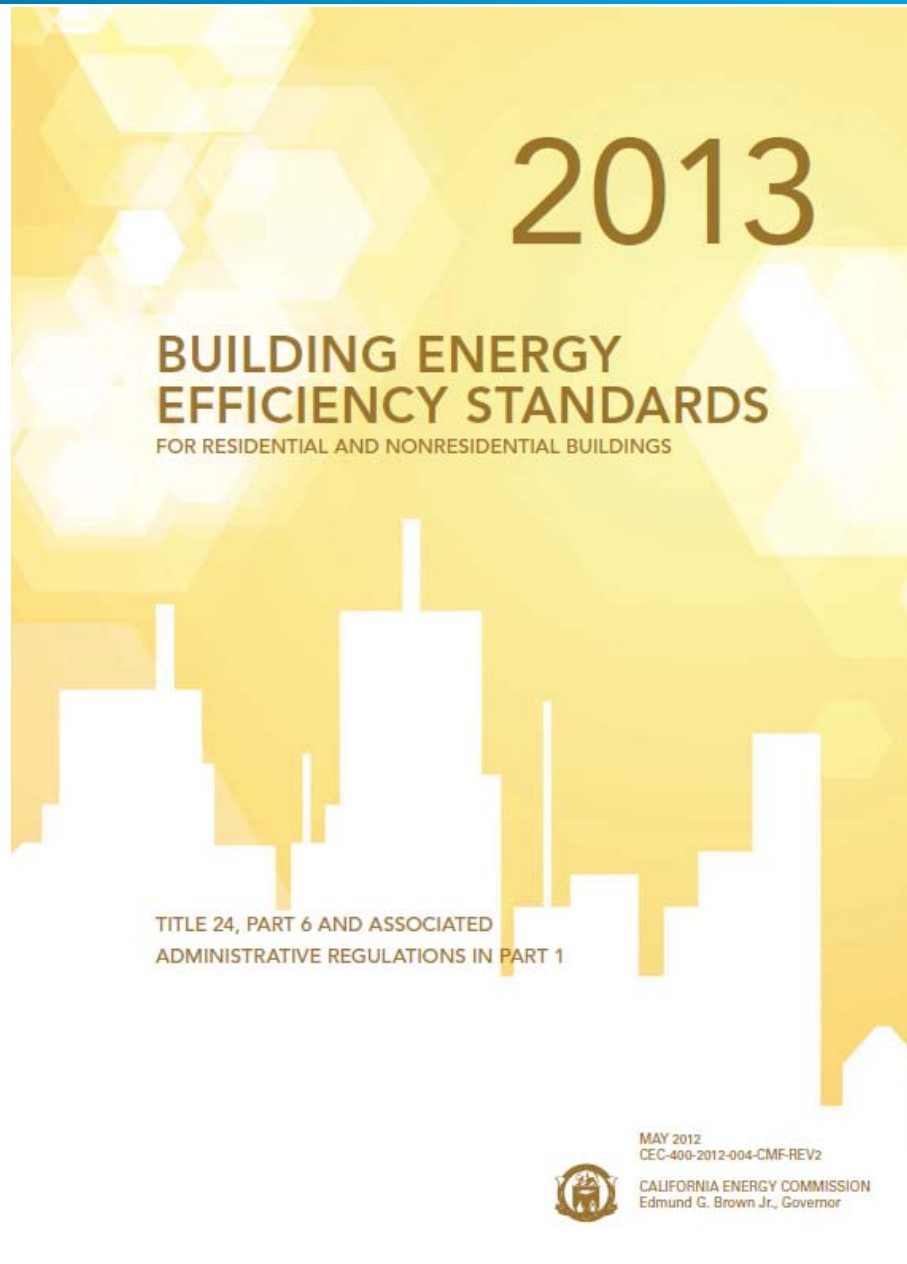
## FDD Functional Testing

- Sensor drift
- Sensor failure
- Damper/actuator fault
- Valve/actuator fault
- Simultaneous heating, cooling and/or economizing

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# RTU FDD in CA Code – Step 2



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# RTU FDD in CA Code – 2013 BEES

## + FDD for air-side economizer operations is **MANDATORY**

- For units with cooling capacity  $\geq$  54,000 Btuh (4.5 tons)
- Applies to all air-cooled unitary direct expansion equipment
  - ✓ packaged & split AC systems
  - ✓ heat pumps
  - ✓ VRF systems

## + FDD Controls

- Can be stand-alone or integrated into RTU controller
- Must be capable of displaying values of each sensor





# RTU FDD in CA Code – 2013 BEES

## FDD Controls, cont.

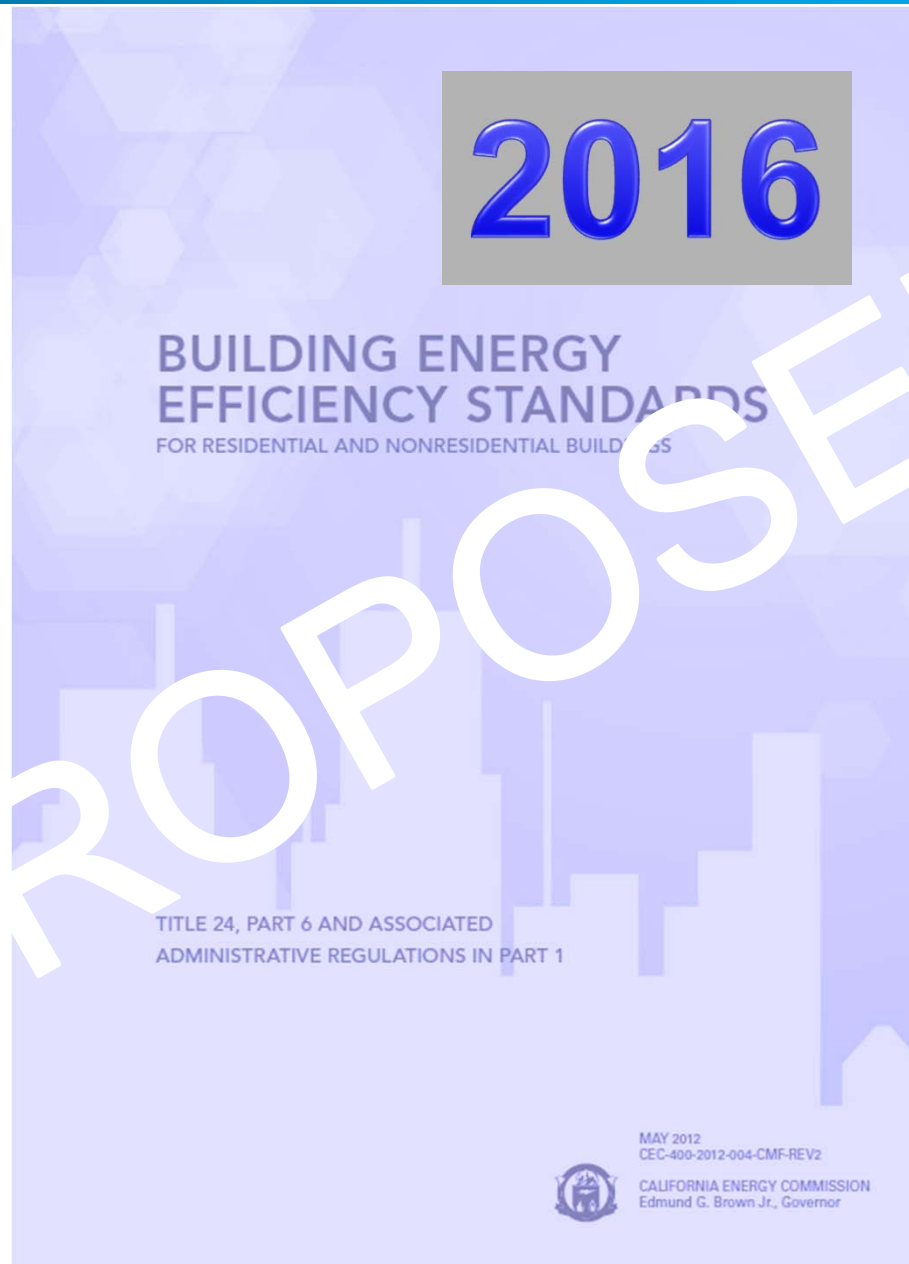
- Must report a minimum of these system conditions:
  - ✓ Free cooling available
  - ✓ Economizer enabled
  - ✓ Compressor enabled
  - ✓ Heating enabled
  - ✓ Mixed air low limit cycle active
- Must be able to manually initiate each operating mode to independently test component operations

## FDD Construction Inspection

## FDD Functional Testing



# RTU FDD in CA Code – Step 3



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# RTU FDD in CA Code – 2016 BEES

## + FDD for air-side economizer operations is **STILL MANDATORY**

- For units with cooling capacity  $\geq 54,000$  Btuh (4.5 tons)
- Applies to all air-cooled unitary direct expansion equipment
  - ✓ packaged & split AC systems
  - ✓ heat pumps
  - ✓ VRF systems

## + FDD Controls

- Can be stand-alone or integrated into RTU controller
- Must be capable of displaying values of each sensor

Same requirements (mostly), with clarifications



# RTU FDD in CA Code – 2016 BEES

- ✦ No requirement for refrigerant pressure sensors
- ✦ Clarifications for how faults will be reported

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# RTU FDD in CA Code – What's Next?

## APPLIANCE EFFICIENCY REGULATIONS

Future date goes here



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# RTU FDD in CA Code – What's Next?

## ✚ RTU FDD in CA Appliance Regulations?

- Every RTU with a factory-installed economizer sold in CA would have FDD requirements
  - not just the ones installed under Title-24 building code requirements
- Best way to impact existing building RTU replacement market
- Several years of Title-24 requirements may facilitate this

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