

1 **ORDINANCE NO. _____**

2
3 **AN ORDINANCE REPEALING AND REPLACING ARTICLE 12 OF**
4 **CITY CODE CHAPTER 25-12 TO ADOPT THE 2012 INTERNATIONAL**
5 **ENERGY CONSERVATION CODE AND LOCAL AMENDMENTS.**
6

7 **BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:**

8
9 **PART 1.** City Code Chapter 25-12 (*Technical Codes*) is amended to repeal
10 Article 12 (*Energy Code*) and replace it with a new Article 12 to read as
11 follows:

12
13 **ARTICLE 12. ENERGY CODE**

14
15 **§ 25-12-261 ENERGY CODE.**

16
17 (A) The International Energy Conservation Code, 2012 Edition, published
18 by the International Code Council, Inc. (2012 International Energy
19 Conservation Code), is adopted and incorporated by reference into this
20 section with the deletions and amendments in Subsections (B) and (C)
21 and Section 25-12-263 (Local Amendments to the Energy Code).
22

23 (B) The following provisions of the 2012 International Energy Conservation
24 Code are deleted:

25		
26	Section C201.3	Section C402.2.1.1
27	Section C403.2.9	Section C408
28	Table R402.1.1	Table R402.1.3
29	Section R402.5	Section R403.2.1
30	Section R403.4.1	Section R403.8
31	Section R405.2	Table R405.5.2(1)
32		Section C402.3.3
		Section R201.3
		Section R402.4.1.2
		Section R403.2.2
		Section R404.1

33 **§25-12-262 CITATIONS TO THE ENERGY CODE.**

34
35 In the City Code, “Energy Code” means the 2012 International Energy
36 Conservation Code adopted by section 25-12-261.
37

§25-12-263 LOCAL AMENDMENTS TO THE ENERGY CODE.

The following provisions are local amendments to the 2012 International Energy Conservation Code. Each provision in this section is a substitute for an identically numbered provision deleted by Section 25-12-261(B) or an addition to the Energy Code.

C201.3 Terms defined in other codes. Terms that are not defined in this Code but are defined in the Building Code, Fire Code, Mechanical Code, Plumbing Code, Residential Code, shall have the meaning ascribed to them in those codes.

C401.3 Compliance documentation. Where required, energy code compliance documentation submitted during the plan review or construction phase of a project must be sealed by a licensed architect or engineer.

C402.2.1.1 Roof solar reflectance and thermal emittance. Low-sloped roofs, with a slope less than or equal to 2 units vertical in 12 horizontal, directly above cooled *conditioned spaces* in Climate Zones 1, 2, and 3 shall comply with one or more of the options in Table C402.2.1.1. Roof surfaces with an incline greater than 2 units vertical in 12 horizontal shall incorporate a roof material having a minimum reflectance of 0.35 or a minimum SRI of 29.

Exceptions: The following roofs and portions of roofs are exempt from the requirements in Table C402.2.1.1:

1. Portions of roofs that include or are covered by:
 - 1.1. Photovoltaic systems or components.
 - 1.2. Solar air or water heating systems or components
 - 1.3. Roof gardens or landscaped roofs.
 - 1.4. Above roof decks or walkways.
 - 1.5. Skylights.
 - 1.6. HVAC systems, components, and other opaque objects mounted above the roof.
2. Portions of roofs shaded by the peak sun angle on the summer solstice by permanent features of the building, or by permanent features of adjacent buildings.
3. Portions of roofs that are ballasted by a minimum stone ballast of 17 pounds per square foot ("psf") (74 kg/m²) or 23 psf (117 kg/m²) pavers.
4. Roofs where a minimum of 75 percent of the roof area meets a minimum of one of the exceptions above.
5. Repairs to roof surfaces when the repair does not exceed the lesser of 50%

of the roof surface or 20 squares (2000 sq ft).

C402.3.3 Maximum U-factor and SHGC. For vertical fenestration, the maximum U-factor and solar heat gain coefficient (SHGC) shall be as specified in Table C402.3, based on the window projection factor. For skylights, the maximum U-factor and solar heat gain coefficient (SHGC) shall be as specified in Table C402.3.

The window projection factor shall be as determined in accordance with Equation 4-2.

$$PF = A/B \quad (\text{Equation 4-2})$$

Where:

PF = Projection factor (decimal).

A = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.

B = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.

Where different windows or glass doors have different PF values, they shall each be evaluated separately.

Exception: Where windows are required to comply with the visible transmittance (VT) requirement outlined in section 3.2.2.E, Glazing on Building Facades, of the City of Austin's Subchapter E, Design Standards and Mixed Use ordinance, the solar heat gain coefficient (SHGC) requirement shall not apply. Instead, the window shall have a projection factor (PF) ≥ 0.5 .

C402.5 Air barrier requirement. Insulation (including but not limited to loose fill, spray applied cellular fiber insulation as well as other blanket and batts insulation) installed in assemblies more than 60 degrees from the horizontal must be in substantial contact with an air barrier on all sides.

Exception: Air impermeable insulation. Air impermeable insulation is defined as:

A material having an air permeance equal to or less than 0.02 L/s-m² at 75 Pa pressure differential tested according to ASTM E2178 or E283.

1 **C403.2.4.6 Overhead door HVAC shut-off devices.** Overhead doors,
2 cargo doors, sliding doors, folding and accordion style wall systems, and other
3 loading dock style doors that comprise part of the building thermal envelope
4 shall be equipped with a means for automatically shutting off the heating,
5 cooling and humidity control equipment that serves the area or zone that
6 includes the door. The shut off shall activate prior to the door being 25% open.
7 A shut off override, designed to be used when vehicles are parked in the
8 doorway, may be included on doors equipped with weatherseals per section
9 C402.4.6. The override must automatically deactivate when the vehicle is
10 removed.
11

12 **Exceptions:**

- 13 1. Where HVAC equipment must remain on for safety, sanitation or
14 other health related reasons.
- 15 2. Radiant heating systems.
- 16 3. The shut off override shall activate within 5 minutes in groups U, S1, and B
17 Motor vehicle showroom occupancies.
18

19 **C403.2.9 Mechanical systems commissioning and completion requirements.**
20 Mechanical systems shall be commissioned and completed in accordance with
21 section C408-2.
22

23 **C403.2.12 Ventilation filtration and filtration of return air.** Ventilation
24 systems shall incorporate filtration having a minimum efficiency reporting value
25 (MERV) rating of 6 or greater. All return air as well as all air that is heated,
26 cooled, or humidity controlled must be drawn through the air filtration system.
27

28 **C404.8 Electric water heater timers.** For Group R buildings electric resistance
29 water heaters must be installed in conjunction with a preprogrammed water
30 heater timer. The timer shall be preprogrammed to turn the water heater off
31 between the hours of 3:00 p.m. and 7:00p.m. from June 1 to September 30 and
32 from 12:00 a.m. to 4:00a.m. throughout the year. The timer shall have a
33 readily accessible override, as defined by the building official administrative
34 rule, capable of restoring power to the water heater for one hour when
35 activated.
36

37 **C405.2.4 Exterior lighting controls.** Lighting not designated for dusk to dawn
38 operation shall be controlled by either a combination of a photosensor and a
39 time switch, or an astronomical time switch. Lighting designated for dusk to
40 dawn operation shall be controlled by an astronomical time switch or a
41 photosensor. All time switches shall be capable of retaining programming and

1 the time setting during loss of power for a period of at least 10 hours.

2
3 **Exception:** Lighting for covered vehicle entrances or exits from buildings or
4 parking structures when required for safety, security, or eye adaptation.

5 6 **SECTION C408 SYSTEM COMMISSIONING.**

7
8 **C408.1 Mechanical systems commissioning and completion.** The
9 requirements in C408.2 are applicable to new buildings of less than 10,000 gross
10 square feet. The requirements in C408.3 are applicable to new buildings of
11 10,000 gross square feet of conditioned space or greater.

12
13 **C408.2 Mechanical systems completion for new buildings of less than 10,000**
14 **gross square feet.** Prior to passing the final mechanical inspection, the
15 design professional shall provide evidence of system completion in
16 accordance with Sections C408.2.1 through C408.2.3.

17
18 **C408.2.1 Air system balancing.** Each supply air outlet and zone terminal
19 device shall be equipped with means for air balancing in accordance with the
20 requirements of the mechanical code. Discharge dampers are prohibited on
21 constant volume fans and variable volume fans with motors 10 hp (18.6 kW)
22 and larger.

23
24 **C408.2.2 Hydronic system balancing.** Individual hydronic heating and cooling
25 coils shall be equipped with means for balancing and pressure test connections.

26
27 **C408.2.3 Manuals.** The construction documents shall require that an operating
28 and maintenance manual be provided to the building owner by the mechanical
29 contractor and to the building official upon request. The manual shall include, at
30 least, the following:

- 31 1. Equipment capacity (input and output) and required maintenance actions.
 - 32 2. Equipment operation and maintenance manuals.
 - 33 3. HVAC system control maintenance and calibration information, including
34 wiring diagrams, schematics, and control sequence descriptions. Desired
35 or field determined setpoints shall be permanently recorded on control
36 drawings, at control devices or, for digital control systems, in
37 programming comments.
 - 38 4. A complete written narrative of how each system is intended to operate.
- 39
40

1 **C408.3 Mechanical systems and energy code commissioning and completion**
2 **requirements for new buildings of 10,000 gross square feet of conditioned**
3 **space or greater.** Mechanical System Commissioning is a process that verifies
4 and documents that the selected building systems have been designed, installed,
5 and function according to the owner's project requirements and construction
6 documents. For the purposes of this ordinance, it also means that the
7 requirements of the currently adopted energy code and amendments, as
8 applicable to the mechanical systems, have been met. The commissioning
9 authority shall be responsible for the preparation and/or compilation of all
10 documentation related to this section. Drawing notes shall require
11 commissioning and completion requirements in accordance with this section.
12 Drawing notes may refer to specifications for further requirements. Copies of all
13 documentation shall be given to the owner and be made available to the
14 building official upon request in accordance with Sections C408.3.1 through
15 C408.3.6.

16
17 **C408.3.1 Qualifications.** The project commissioning authority shall be a
18 certified Commissioning Authority bearing one of the following certifications:

- 19 1. Association of Energy Engineers - Certified Building Commissioning
20 Professional (CBCP);
21 2. AABC Commissioning Group - Certified Commissioning Technician(CxT);
22 3. American Society of Heating, Refrigeration and Air-Conditioning Engineers -
23 Commissioning Process Management Professional (CPMP);
24 4. Building Commissioning Association - Certified Commissioning Professional
25 (CCP); or
26 5. Licensure as a Registered Professional Engineer in the State of Texas.

27
28 **C408.3.2 Commissioning form.** A completed commissioning form shall be
29 submitted to the plan review department during permitting in a format approved
30 by the building official. The Commissioning form will summarize the Owner's
31 HVAC Project Requirements, provide a listing of the equipment and the
32 quantity of equipment to be tested, and describe the equipment sequences of
33 operations to be tested (or a reference to the sequence of operations included
34 with the construction drawings or specifications). A minimum of 20% of the
35 installed equipment shall be tested in a manner consistent with standard
36 engineering practices.

37
38 **C408.3.3 Systems adjusting and balancing.** All HVAC systems shall be
39 balanced in accordance with generally accepted engineering standards. Air and
40 water flow rates shall be measured and adjusted to deliver final flow rates

1 within the tolerances provided in the product specifications. Test and balance
2 activities shall include as a minimum the following items:

- 3
- 4 1. Air systems balancing: Each supply air outlet and zone terminal device
5 shall be equipped with means for air balancing in accordance with the
6 requirements of the Mechanical Code. Discharge dampers are prohibited
7 on constant volume fans and variable volume fans with motors 10 hp
8 (18.6 kW) and larger. Air systems shall be balanced in a manner to
9 first minimize throttling losses then, for fans with system power of
10 greater than 1 hp, fan speed shall be adjusted to meet design flow
11 conditions.

12

13 **Exception:** Fan with fan motors of 1 hp or less.

- 14
- 15 2. Hydronic systems balancing: Individual hydronic heating and cooling
16 coils shall be equipped with means for balancing and measuring flow.
17 Hydronic systems shall be proportionately balanced in a manner to first
18 minimize throttling losses, then the pump impeller shall be trimmed or
19 pump speed shall be adjusted to meet design flow conditions. Each
20 hydronic system shall have either the ability to measure pressure across
21 the pump, or test ports at each side of each pump.

22

23 **Exceptions:**

- 24 1. Pumps with pump motors of 5 hp or less.
25 2. When throttling results in no greater than 5% of the nameplate
26 horsepower draw above that required if the impeller were trimmed.

27

28 **C408.3.4 Functional performance testing.**

29

30 **C408.3.4.1 Equipment functional performance testing.** Equipment functional
31 performance testing shall demonstrate the correct installation and operation of
32 components, systems, and system-to-system interfacing relationships in
33 accordance with approved plans and specifications. This demonstration is to
34 prove the operation, function, and maintenance serviceability for each of the
35 Commissioned systems. Testing shall include all modes of operation, including:

- 36
- 37 1. All modes as described in the Sequence of Operation;
38 2. Redundant or automatic back-up mode;
39 3. Performance of alarms; and
40 4. Mode of operation upon a loss of power and restored power.

1
2 **Exception:** Unitary or packaged HVAC equipment listed in Tables
3 C403.2.3(1) through (3) that do not require supply air economizers.
4

5 **C408.3.4.2 Controls functional performance testing.** HVAC control systems
6 shall be tested to document that control devices, components, equipment, and
7 systems are calibrated, adjusted and operate in accordance with approved plans
8 and specifications. Sequences of operation shall be functionally tested to
9 document they operate in accordance with approved plans and specifications.
10

11 **C408.3.5 Preliminary commissioning report.** A preliminary report of
12 commissioning test procedures and results shall be completed and provided to
13 the Owner. The report shall be identified as "Preliminary Commissioning
14 Report" and shall identify:

- 15 1. Itemization of deficiencies found during testing required by this
16 section which have not been corrected at the time of report preparation.
- 17 2. Deferred tests which cannot be performed at the time of report
18 preparation due to climatic or occupancy conditions.
- 19 3. Climatic conditions required for performance of the deferred tests.
20

21 **C408.3.6 Acceptance.** Mechanical Systems, or portions thereof, required by
22 the Energy Code to comply with this section shall not pass the mechanical
23 rough inspection until such time that the building official has received a letter,
24 in a format approved by the building official, from the Engineer of Record that
25 states that the commissioning process is either complete or ongoing and current
26 as of the date of inspection. At the request of the building official, a copy of
27 the Preliminary Commissioning Report, as identified in section C408.3.5, shall
28 be made available for review.
29

30 **C408.3.7 Completion requirements.** The construction documents shall require
31 that within one year after the date of final certificate of occupancy, the
32 documents described in this section be provided to the building owner.
33

34 **C408.3.7.1 Drawings.** Construction documents shall include as a minimum the
35 location and performance data on each piece of equipment.
36

37 **C408.3.7.2 Manuals.** An operating manual and a maintenance manual shall be in
38 accordance with industry accepted standards and shall include, at a minimum, the
39 following:
40

1. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
3. Names and addresses of at least one *service agency*.
4. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments.
5. A complete narrative of how each system is intended to operate, including suggested setpoints.

C408.3.7.3 System balancing report. A written report describing the activities and measurements completed in accordance with Section C408.3.3.

C408.3.7.4 Final Commissioning Report. A copy of the Final Commissioning Report shall be provided to the Austin Energy Green Building Program within one year of passing the final mechanical inspection. A complete report of test procedures and results identified as "Final Commissioning Report" shall include:

1. Results of all Functional Performance Tests.
2. Disposition of all deficiencies found during testing, including details of corrective measures used or proposed.
3. All Functional Performance Test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.

Exception: Deferred tests which cannot be performed at the time of report preparation due to climatic or occupancy conditions.

Section R201.3 Terms defined in other codes. Terms that are not defined in this Code but are defined in the Building Code, Fire Code, Mechanical Code, Plumbing Code, Residential Code, Electrical Code, or the Solar Energy Code shall have the meaning ascribed to them in those codes.

Section R202.1 Additional Definitions. Residential Building. Notwithstanding the definition found in Section R202, for this code, Residential Building includes

detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3 and R-4 buildings four stories or less in height above grade plane.

**TABLE R302.1
EXTERIOR DESIGN CONDITIONS**

CONDITION	VALUE
Winter ^a , Design Dry-bulb (°F)	30
Summer ^a , Design Dry-bulb (°F)	100
Summer ^a , Design Wet-bulb (°F)	74
Climate Zone	2A
For SI: deg C=[(deg F)-32]/1.8.	

^a Adjustments shall be permitted to reflect local climates, which differ from the tabulated temperatures, or local weather experience determined by the building official.

R302.2 Exterior Design Conditions. The design parameters in Table R302.1 shall be used for calculations under this code.

**TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY
COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT U-FACTOR ^b	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE	BASEMENT WALL R-VALUE	SLAB R-VALUE & DEPTH ^c	CRAWL SPACE WALL R-VALUE
2	.40	.60	0.25	38 ^d	15 or 13+2 ^{e,f}	4/6	13	0	0	0

^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 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 – 3 for heated slabs.

^d Air-impermeable insulation of R-25 or greater may be used if mechanical equipment and air distribution system are located entirely within the building thermal envelope. "Air-impermeable" shall be defined as having an air permeance not exceeding 0.02 L/s-m² at 75 Pa pressure differential tested according to ASTM E 2178 or ASTM E 283.

^e First value is cavity insulation, second is continuous insulation or insulated siding, so "13+2" means R-13 cavity insulation plus R-2 continuous insulation or insulated siding. Where R-13+R-2 is used, non-insulated structural sheathing shall cover no more than 25% of the exterior.

^f Total-fill cavity insulation will be deemed as meeting the R15 requirement.

TABLE R402.1.3

EQUIVALENT U-FACTORS

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	WOOD FRAME WALL U-FACTOR	MASS WALL U-FACTOR	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
2	.40	0.6	0.030	0.075	0.165	0.064	0.36	0.477

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved independent third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. The report shall include address of the residence, building permit number, name and employer of the technician performing the test, and date of the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures;
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
3. Interior doors, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

Exceptions: Existing construction where the volume of the conditioned area is unchanged and additions that cannot be physically separated from the existing construction.

R402.5 Maximum fenestration U-factor and SHGC (Mandatory). The area-weighted average maximum fenestration U-factor permitted using trade-offs from Section R402.1.4 or R405 shall be 0.51. The area-weighted average maximum SHGC permitted using tradeoffs from Section 405 for fenestration facing East, South and West shall be 0.30. The SHGC of fenestration facing within 45 degrees

of East and West shall be no greater than .025, unless the projection factor multiplier in Table R402.5.1 is applied. Glazed fenestration facing within 45 degrees of North shall not be included in the area-weighted SHGC calculation.

TABLE R402.5.1
SHGC MULTIPLIER FOR CERTAIN FENESTRATION

Projection Factor	SHGC Multiplier (Glazed fenestration from 45 to 135 degrees and 225 to 315 degrees)	SHGC Multiplier (Glazed fenestration from 135 to 225 degrees)
0 - .25	.85	.75
.26 - .50	.75	.60
.51 - .75	.60	.40
.76 - 1.00	.40	.20
> 1.00	.20	.10

R402.7 Radiant Barrier. A roof radiant barrier with an emittance of 0.05 or less as tested in accordance with ASTM C-1371 or ASTM E-408 is required. The radiant barrier shall be installed according to the manufacturer's instructions.

A roof radiant barrier is not required for:

1. Roofs covered with clay or concrete tile having a solar reflectance of .40 or greater.
2. Roofs covered with other materials having a solar reflectance of .50 or greater.
3. Residential buildings with sealed attics.
4. Residential buildings with mechanical equipment and all duct work located wholly within the conditioned space.
5. Existing construction where there is no modification to the roof framing structure.

R402.8 Attic Ventilation. Attic ventilation shall be installed in accordance with the City of Austin Mechanical Code. Ventilation shall not be provided where it introduces unconditioned air into the thermal envelope of the building.

R403.2.1 Insulation (Prescriptive). Supply and return ducts located in attics or outside the thermal envelope shall be insulated to a minimum of R-8.

Exceptions:

1. Ducts or portions thereof located within the building thermal envelope.

2. Supply and return boots and plenums may be insulated to a minimum of R-6 if the rated efficiency of the installed cooling equipment is 14 SEER or higher.

R403.2.2 Sealing (Mandatory). Ducts, plenums, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the *Mechanical Code* or *Residential Code*, as applicable.

Exceptions:

1. Air-impermeable spray foam products shall be permitted to be applied without additional joint seals.
2. Where a duct connection is made that is partially inaccessible, three screws or rivets shall be equally placed on the exposed portion of the joint so as to prevent a hinge effect.
3. Continuously welded and locking-type longitudinal joints and seams in ducts operating at static pressures less than 2 inches of water column (500 Pa) pressure classification will not require additional closure systems.

Duct tightness shall be verified by either of the following:

1. Postconstruction test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.
2. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area.

Exceptions: The total leakage test is not required for:

1. Ductless equipment.
2. Existing construction with no modification of or addition to the existing ductwork or replacement of mechanical equipment.
3. The return side of air distribution systems located within the building thermal envelope.

R403.2.4 Balancing of Air Distribution System. Volumetric airflow in cubic feet per minute (CFM) shall meet the design/application requirements. Airflow testing shall be performed by an independent third party technician approved by the building official, with all interior doors closed and all blowers operating at cooling speed.

The airflow at each supply register shall be measured. Supply registers with a design airflow exceeding 35 CFM shall have a measured airflow of within +/- 20% of design airflow. Supply registers with design airflow below 35 CFM but having a measured airflow 60 CFM or higher shall be balanced to bring measured airflow to within +/-20% of design airflow. Documentation shall verify that actual total system airflow is within +/-10 percent of total system design airflow. All documentation shall be submitted with the final mechanical Code compliance package on the job site.

Measurement of supply airflow shall be performed using a balometer (flow hood) per the manufacturer's instructions.

Documentation shall include the following:

- a. Address of building
- b. Name and company of technician performing the testing
- c. Date of final test

Exceptions:

1. Ductless systems.
2. Existing construction with no modification of or addition to the existing ductwork.
3. An addition of 200 square feet or less of conditioned space to existing construction.
4. Systems with a Manual J recommended sizing of 4.5 tons or other size not typically available from manufacturers must be balanced to within +/-20% of design air flow as indicated on the Manual J for that building. It is the responsibility for the HVAC contractor to communicate the lack of availability of a properly sized system to the 3rd party testing contractor.

R403.2.5 Pressure Differential. The pressure difference between each bedroom and adjacent interior area (i.e. hallway) shall not exceed 5 Pascals. The pressure difference between the interior area in the vicinity of the return side of the air handling equipment and the outside of the building does not exceed -5 Pascals. Testing shall be performed by an independent third party technician approved by

the building official, with all interior doors closed and all blowers operating at cooling speed.

Exception: Ductless systems where the supply and return airflow are handled by a single unit within the room.

R403.2.6 System static pressure. Total system static pressure with filters installed shall not exceed .8" water column on gas furnaces and .6" water column on electric air handlers. Static pressure testing using a digital manometer or magnehelic shall be performed by an independent third party technician approved by the building official. Documentation verifying static pressure testing results within the allowed ranges shall be submitted with the final mechanical code compliance package on the jobsite. Documentation shall include the following:

- a. Address of building
- b. Name and company of technician performing the testing
- c. Date of final test
- d. Procedure used for the test
- e. Results of the test listing static pressure for applications tested.

Exceptions:

1. Existing construction with no modification of or addition to the existing ductwork, or replacement of mechanical equipment.
2. Ductless systems.
3. Systems where the air handler equipment is housed within the return plenum.
4. Air handlers for systems having a rated capacity of 60,000 Btu per hour.

R403.2.7.1 Batch Testing. For buildings having three or more dwelling units, a minimum of 15% of the dwelling units in each building must be tested as required by Sections R402.4.2, R403.2.2, R403.2.3, R403.2.4, R403.2.5, and R403.2.6. If each tested dwelling unit within the batch meets code requirements, then all dwelling units in the batch are considered to meet code.

The 3rd party testing contractor shall perform all required tests on at least three consecutive dwelling units. Test results must meet code requirements before batch testing is allowed. Initial testing is required for each new multifamily project. Dwelling units must be within the same building to qualify for inclusion in a batch.

R403.2.7.2 Batch Identification and Sampling. The builder shall identify a "batch" which is a building where the dwelling units are completed and ready for

1 testing. The third-party testing contractor randomly selects at least 15% of
2 dwelling units from a batch for testing. All units within the batch must be ready
3 for testing (drywall complete, interior door jams installed, HVAC system installed,
4 and final air sealing completed) before the testing contractor can select the units to
5 be tested.
6

7 **R403.2.7.3 Failure to Meet Code Requirement(s).**

- 8
9 1. If any dwelling units within the identified batch fail to meet a code
10 requirement as a result of testing, the builder will be directed to fix the
11 cause(s) of failure, and 30% of the remaining dwelling units in the batch will
12 be randomly selected for testing regarding the specific cause(s) of failure.
13
- 14 2. If any failures occur in the additional dwelling units, all remaining dwelling
15 units in the batch must be individually tested for code compliance.
16
- 17 3. A multifamily project with 3 failures within a 6-month period is no longer
18 eligible to use the sampling protocol in that community or project until
19 successfully repeating "Initial Testing." Sampling can be reinstated after at
20 least 3 consecutive dwelling units are individually verified to meet code all
21 requirements.
22
- 23 4. No dwelling unit in a batch may be issued a Certificate of Occupancy until
24 testing has been performed and passed on the dwelling unit(s) selected for
25 testing.
26

27 **R403.2.8 Filtration for Air Distribution Systems.** Filters installed in air
28 distribution systems shall have a minimum efficiency reporting value (MERV)
29 rating of 6 or greater. Filters shall be located to prevent unfiltered air from
30 passing through the mechanical equipment.
31

32 **R403.4.1 Circulating Hot Water Systems (Mandatory).** All circulating hot
33 water piping shall be insulated to a minimum of R-4. Circulating hot water
34 systems shall include a manual "On" switch and a control that automatically turns
35 the system off when water exceeding 105°F reaches a point beyond the last hot
36 water runout on the system.
37

38 **R403.4.3 Water Heating.** Residential Buildings, as defined by Chapter 2 of the
39 2006 International Energy Conservation Code, having existing or planned natural

gas service or equivalent district gas service located within the adjacent right-of-way, shall not use electric resistance as the primary means for heating water.

Residential Buildings, as defined by Chapter 2 of the 2012 International Energy Conservation Code and not having natural gas service or equivalent district gas service located within the adjacent right-of-way, may install electric resistance water heaters having a minimum efficiency of 93% in conjunction with a preprogrammed water heater timer in lieu of gas fired water heating. The timer shall be preprogrammed to turn the water heater off between the hours of 3:00PM and 7:00PM from June 1 to September 30 and from 12:00AM to 4:00AM throughout the year. The timer shall have a readily accessible override, as defined by the building official, capable of restoring power to the water heater for one hour when activated.

Exceptions:

- a. Electric resistance water heater that is secondary to a primary system where the primary system is documented to provide at least 75% of the hot water from June 1 to September 30 and at least 50% of the hot water from October 1 to May 31. The secondary electric resistance water heater in such a system shall be controlled by a pre-programmed timer.
- b. Heat pump water heater where electric resistance is the secondary means of heating.
- c. Existing residential buildings where the furnace and water heater are housed in a common interior mechanical room. Electric resistance water heaters installed in these buildings shall be controlled by a pre-programmed timer.
- d. Electric resistance water heater with a rated requirement of 3000 watts or less.

R403.6.1 Documentation of Heating and Cooling Equipment Sizing.

Documentation verifying the methodology and accuracy of heating and cooling equipment sizing shall be submitted with final mechanical code compliance package. Documentation shall include the following information:

- a. Address of residence
- b. Name of individual performing load calculations.
- c. Name and version of load calculation software.
- d. Design temperatures (outdoor and indoor) according to the Air Conditioning Contractors of America's (ACCA) Manual J, ACCA Manual N, American Society of Heating, Refrigeration and Air-Conditioning Engineers, U.S

Department of Energy standards, or other methodology approved by the City of Austin.

- e. Area of walls, windows, skylights and doors within +/- 10% of architectural plans or actual building.
- f. Orientation of windows and glass doors, infiltration rate, duct loads, internal gains, insulation values, and Solar Heat Gain Coefficient of windows.
- g. Heating and cooling load calculations.
- h. Design supply airflows for each room.

R403.6.2 Space Heating. The use of electric resistance as a primary source of space heating is prohibited in all dwelling units having a conditioned floor area in excess of 500 square feet.

Exception: Buildings where dwelling units are cooled using chilled water.

R404.1 Lighting equipment (Mandatory). A minimum of 90 percent of the lamps in permanently installed-lighting fixtures shall be high efficacy lamps or a minimum of 90 percent of the permanently installed lighting fixtures shall contain only high efficacy lamps. Outdoor luminaires that are permanently attached to a structure must be high efficacy or controlled by an integral photocell or an astronomical time clock.

Exception: Low-voltage lighting shall not be required to utilize high-efficacy lamps.

TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass wall if proposed wall is mass; otherwise wood frame Gross area: same as proposed U-factor: from Table R402.1.3 Solar absorptance = 0.75 Emittance = 0.90	As proposed As proposed As proposed As proposed As proposed
Basement and crawl space walls	Type: same as proposed Gross area: same as proposed U-factor: from Table R402.1.3, with insulation layer on interior side of walls.	As proposed As proposed As proposed
Above-grade floors	Type: wood frame Gross area: same as proposed	As proposed As proposed

	U-factor: from Table R402.1.3	As proposed
Ceilings	Type: wood frame Gross area: same as proposed U-factor: from Table R402.1.3	As proposed As proposed As proposed
Roofs	Type: composition shingle on wood sheathing Gross area: same as proposed Solar absorptance = 0.75 Emittance = 0.90 Radiant barrier per 402.7	As proposed As proposed As proposed As proposed As proposed
Attics	Type: vented with aperture = 1 ft ² per 300ft ² ceiling area	As proposed
Foundations	Type: same as proposed foundation wall area above and below grade and soil characteristics; same as proposed	As proposed As proposed
Doors	Area: 40ft ² Orientation: North U-factor: same as fenestration from Table 402.1.3	As proposed As proposed As proposed
Glazing	Total area = The proposed glazing area; where proposed glazing area is less than 12% of the conditioned floor area 12% of the conditioned floor area; where the proposed glazing area is 12% or more of the conditioned floor area Orientation: equally distributed to four cardinal compass orientations (N, E, S & W) U-factor: area-weighted average of 0.40 SHGC: 0.25 Interior shade fraction: 0.92 External shading: none	As proposed As proposed As proposed As proposed As proposed As proposed
Skylights	None	As proposed
Thermally isolated sunrooms	None	As proposed
Air exchange rate	5 ACH @ 50 Pascals	Same as standard reference
Mechanical ventilation	None, except where mechanical ventilation is specified by the proposed design, in which case: $\text{kWh/yr} = 0.3942 \times CFA + 29.565 \times (N_{br} + 1)$ where: CFA = conditioned floor area N _{br} = number of bedrooms	As proposed
Internal gains	IGain = 17,900+23.8xCFA+4104xNbr (Btu/day per dwelling unit)	Same as standard reference
Internal Mass	An internal mass for furniture and contents of 8 pounds per square foot of floor area	Same as standard reference, plus any additional mass designed as a thermal storage element but not integral to the

		building envelope or structure
Structural mass	For masonry floor slabs, 80% of floor are covered by R2 carpet and pad, and 20% of floor directly exposed to room air. For other walls, for ceilings, floors, and interior walls, wood frame construction	As proposed As proposed
Heating systems	Gas: 78 AFUE Heat Pump: 7.7 HSPF Capacity in accordance with Section R403.6	As proposed As proposed As proposed
Cooling systems	13 SEER Capacity in accordance with Section R403.6	As proposed
Service water heating	Gas: 0.70 EF Electric: 0.93 EF Use: same as proposed design	As proposed Gal/day = 30 + (10 x N_{br})
Thermal distribution systems		Thermal distribution system efficiency shall be as tested or as specified in Table R405.5.2(2) if not tested. Duct insulation shall be as proposed.
Thermostat	Type: Programmable, cooling temperature setpoint = 75°F Heating temperature setpoint = 72°F	Same as standard reference

PASSED AND APPROVED

_____, 2013 §
 §
 § Lee Leffingwell
 Mayor

APPROVED: _____ **ATTEST:** _____
 Karen M. Kennard Jannette S. Goodall
 City Attorney City Clerk