

ORDINANCE NO. 9627

AN ORDINANCE OF THE CITY OF LAWRENCE, KANSAS, REPEALING EXISTING CHAPTER 5, ARTICLE 3 OF THE CODE OF THE CITY OF LAWRENCE, 2018 EDITION, AND AMENDMENTS THERETO, AND ENACTING, IN ITS PLACE, CHAPTER 5, ARTICLE 3 OF THE CODE OF THE CITY OF LAWRENCE, KANSAS, 2018 EDITION, AND AMENDMENTS THERETO, WHICH ADOPTS AND INCORPORATES BY REFERENCE THE 2018 INTERNATIONAL RESIDENTIAL CODE, REGULATING BUILDING AND CONSTRUCTION WITHIN THE CITY OF LAWRENCE, KANSAS.

BE IT ORDAINED BY THE GOVERNING BODY OF THE CITY OF LAWRENCE, KANSAS:

SECTION 1. Existing Chapter 5, Article 3, of the Code of the City of Lawrence, Kansas, 2018 Edition, and amendments thereto, is hereby repealed in its entirety, it being the intent of the Governing Body that Section 2 of this Ordinance supersede it.

SECTION 2. The Code of the City of Lawrence, Kansas, 2018 Edition, and amendments thereto, is hereby amended by enacting Chapter 5, Article 3, which reads as follows:

ARTICLE 3. RESIDENTIAL CODE

5-301 RESIDENTIAL CODE ADOPTED AND INCORPORATED.

The *2018 International Residential Code*, published by the International Code Council, Inc., other than those portions hereinafter specifically deleted, modified, or amended, is hereby adopted as the City's Residential Code and is incorporated herein by reference as if set forth in full.

5-302 OFFICIAL COPY.

Not less than one (1) copy of the *2018 International Residential Code* shall be marked or stamped "OFFICIAL COPY AS INCORPORATED BY ORDINANCE No. 9627," with all sections or portions deleted, modified, or amended clearly marked as such, and to which one (1) copy of this ordinance shall be affixed, shall be filed with the City Clerk, shall be open to inspection, and shall be available to the public during reasonable business hours. Additional official copies shall, at the cost of the City, be supplied to those officials and agencies charged with enforcement of the City's Residential Code.

5-303 AMENDMENTS TO THE 2018 INTERNATIONAL RESIDENTIAL CODE .

The *2018 International Residential Code* is amended as set forth in the succeeding sections of this Article. These amendments shall not serve to delete, modify, or amend any discretely numbered section or subsection of the *2018 Residential Code*, unless the section or subsection is specifically identified as being deleted, modified, or amended.

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APPENDICES.

Unless specifically adopted herein, all appendices to the *2018 International Residential Code* are hereby deleted.

- (a) Appendix E, "MANUFACTURED HOUSING USED AS DWELLINGS," to the *2018 International Residential Code*, is hereby specifically adopted.
- (b) Appendix F, "RADON CONTROL METHODS," to the *2018 International Residential Code*, is hereby specifically adopted.
- (c) Appendix J, "EXISTING BUILDINGS AND STRUCTURES," to the *2018 International Residential Code*, is hereby specifically adopted.
- (d) Appendix M, "Home DAY CARE - R-3 OCCUPANCY," to the *2018 International Residential Code*, is hereby specifically adopted.
- (e) Appendix Q, "TINY HOUSES," to the *2018 International Residential Code*, is hereby specifically adopted.
- (f) Appendix R, "LIGHT STRAW-CLAY CONSTRUCTION," to the *2018 International Residential Code*, is hereby specifically adopted.
- (g) Appendix S, "STRAWBALE CONSTRUCTION," to the *2018 International Residential Code*, is hereby specifically adopted.

5-305

The ***2018 International Residential Code*** is hereby amended by deleting CHAPTER 1, "SCOPE AND ADMINISTRATION."

5-306

Section R301.2 of the *2018 International Residential Code* is hereby amended to read as follows:

R301.2 Climatic and geographic design criteria. Buildings shall be constructed in accordance with the provisions of this code as limited by the provisions of this section. Additional criteria shall be established by the local jurisdiction and set forth in Table R301.2(1). the *2018 International Residential Code*, as adopted and modified by the provisions of this Article. Additional criteria are hereby established and are set forth in Table R301.2(1).

Table R301.2(1), "Climatic and Geographic Design Criteria," of the 2018 International Residential Code is hereby amended to read as follows:

**TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA**

GROUND SNOW LOAD ^a	WIND DESIGN				SEISMIC DESIGN CATEGORY ^f	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMP ^g	ICE BARRIER UNDERLAYMENT REQUIRED ^h	FLOOD HAZARD ^g	AIR FREEZING INDEX ⁱ	MEAN ANNUAL TEMP ^j
	Speed ^k	Topographic effects ^l	Special wind region ^m	Wind-borne debris zone ⁿ		Weathering ^a	Frost line depth ^b	Termite ^c					
20 lbs	115	No	No	No	A	Severe	30"	Moderate to Heavy	4	No	COL Code Chapter 20 Article 12	778	56.0
MANUAL J DESIGN CRITERIAⁿ													
Elevation	Latitude	Winter heating	Summer cooling	Altitude correction factor	Indoor design temperature	Design temperature cooling	Heating temperature difference						
833	39° N	10	95	.975	70°F	75°F	60						
Cooling Temperature difference	Wind velocity heating	Wind velocity cooling	Coincident wet bulb	Daily range	Winter humidity	Summer humidity							
20	—	—	76	M	—	—	—						

For SI: 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.

- a. Where weathering requires a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code, the frost line depth strength required for weathering shall govern. The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(4). The grade of masonry units shall be determined from ASTM C34, C55, C62, C73, C90, C129, C145, C216 or C652.
- b. Where the frost line depth requires deeper footings than indicated in Figure R403.1(1), the frost line depth strength required weathering shall govern. The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade.
- c. The jurisdiction shall fill in this part of the table to indicate the need for protection depending on whether there has been a history of local subterranean termite damage.
- d. The jurisdiction shall fill in this part of the table with the wind speed from the basic wind speed map [Figure R301.2(5)A]. Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.
- e. The outdoor design dry-bulb temperature shall be selected from the columns of 97 1/2-percent values for winter from Appendix D of the International Plumbing Code. Deviations from the Appendix D temperatures shall be permitted to reflect local climates or local weather experience as determined by the building official. [Also see Figure R301.2(1).]
- f. The jurisdiction shall fill in this part of the table with the seismic design category determined from Section R301.2.2.1.
- g. The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of the currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.
- h. In accordance with Sections R905.1.2, R905.4.3.1, R905.5.3.1, R905.6.3.1, R905.7.3.1 and R905.8.3.1, where there has been a history of local damage from the effects of ice damming, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall fill in this part of the table with "NO."
- i. The jurisdiction shall fill in this part of the table with the 100-year return period air freezing index (BF-days) from Figure R403.3(2) or from the 100-year (99 percent) value on the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°F)."
- j. The jurisdiction shall fill in this part of the table with the mean annual temperature from the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°F)."
- k. In accordance with Section R301.2.1.5, where there is local historical data documenting structural damage to buildings due to topographic wind speed-up effects, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- l. In accordance with Figure R301.2(5)A, where there is local historical data documenting unusual wind conditions, the jurisdiction shall fill in this part of the table with "YES" and identify any specific requirements. Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- m. In accordance with Section R301.2.1.2, the jurisdiction shall indicate the wind-borne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
- n. The jurisdiction shall fill in these sections of the table to establish the design criteria using Table 1a of 1b from ACCA Manual J or established criteria determined by the jurisdiction.
- o. The jurisdiction shall fill in this section of the table using the Ground Snow Loads in Figure R 301.2 (6).

The 2018 International Residential Code is hereby amended by adding **Section R310.1.2**, which reads as follows:

R310.1.2 Existing dwelling units. Basements of existing dwelling units or basements of dwelling units that were under construction prior to the adoption date of the *2006 International Residential Code* on January 1, 2008, shall have at least one operable emergency escape and rescue opening in accordance with Section R310.1, when the finished area of the basement equals fifty percent or more of the total square footage of the basement area, or when sleeping room(s) are located in the basement.

5-309 **Section R313.2 of the 2018 International Residential Code** is hereby amended to read as follows:

R313.2 One- and two-family dwellings automatic fire systems. An automatic residential fire sprinkler system shall may be installed in one- and two-family dwellings.

Exception: An automatic residential fire sprinkler system shall not be required for additions or alterations to existing buildings that are not already provided with an automatic residential sprinkler system.

5-310 **Section R404.4 of the 2018 International Residential Code** is hereby amended to read as follows:

R404.4 Retaining walls. Retaining walls that are not laterally supported at the top and that retain in excess of 48 72 inches (~~1219 mm~~) of unbalanced fill, or retaining walls exceeding 24 inches (~~610 mm~~) in height that resist lateral loads in addition to soil, shall be designed in accordance with accepted engineering practice to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Retaining walls shall be designated for a safety factor of 1.5 against lateral sliding and overturning. This section shall not apply to foundation walls supporting buildings.

5-311 **Section N1101.14 (R401.3) of the 2018 International Residential Code** is hereby amended to read as follows:

N1101.14 (R401.3) Certificate (Mandatory). A permanent certificate shall be completed by the builder or registered design professional and posted on ~~a wall in the space where the furnace is located, a utility room or an approved location inside the building the electrical panel.~~ Where located on an electrical panel, ~~t~~The certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall list the predominant R-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawl space wall and/or floor) and ducts outside conditioned spaces; *U-factors* for fenestration and the solar heat gain coefficient (SHGC) of fenestration, and the results from any required duct system and building envelope air leakage testing done on the building. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed in the residence, the certificate shall list “gas-fired unvented room heater,” “electric furnace,” or “baseboard electric heater,” as

appropriate. An efficiency shall not be listed for gas-fired unvented room heaters, electric furnaces or electric baseboard heaters.

5-312 **Table 1102.1.1 (R402.1.1), "Insulation and Fenestration Requirements by Component," of the 2018 International Residential Code** is hereby amended to read as follows:

**TABLE N1102.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAMED WALL	MASS WALL R-VALUES ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE AND DEPTH ^{h,i}	CRAWL ^c SPACE 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	20-19- or 13+5-2 ^h	8/13	19	10/13	10, 2 ft ⁱ	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 ⁱ	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	38	20+5 or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

For SI: 1 foot = 304.8 mm.

- R-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that 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.
- The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided the SHGC for such skylights does not exceed 0.30.
- "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. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation on the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.
- R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-values for slabs as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- There are no SHGC requirements in the Marine Zone.
- Basement wall insulation is not required in warm-humid locations as defined by Figure N1101.10 and Table N1101.10.
- Alternatively, insulation sufficient to fill the framing cavity providing not less than an R-value of R-19.
- The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- Mass walls shall be in accordance with Section N1102.2.5. The second R-value applies where more than half of the insulation is on the interior of the mass wall.

5-313 **Section N1102.2.9 (R402.2.9) of the 2018 International Residential Code** is hereby amended to read as follows:

N1102.2.9 (R402.2.9) Basement walls. Walls associated with conditioned basements shall be insulated from the top of the basement wall down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Section N1102.1.2 and N1102.2.8.

Exception: Basement walls that are otherwise exposed shall be insulated from the top of the basement wall down to 3 feet (914 mm) below grade or the basement floor, whichever is less.

5-314

Section N1102.4.1.2 (R402.4.1.2) of the 2018 International Residential Code is hereby amended to read as follows:

N1102.4.1.2 (R402.4.1.2) Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *building official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *building official*. 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, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exception:

When all reasonable efforts by an *approved* third party have failed to reach three air changes per hour in *Climate Zone 4* a written report of the efforts and results shall be signed by the party conducting the work and provided to the *building official*. The *building official* may administratively approve up to three-and-one-half maximum air changes per hour.

5-315

Sections N1103.3.2 (R403.3.2), N1103.3.3 (R403.3.3), and N1103.3.5 (R403.3.5) of the 2018 International Residential Code are hereby amended to read as follows:

N1103.3.2 (R403.3.2) Sealing (Mandatory). Ducts, air handlers, and filter boxes shall be sealed. Joints and seams shall comply with either the International Mechanical Code, as adopted by the City, or Section M1601.4.1- of this code, as adopted by the City, as applicable.

Exception: Air-impermeable spray foam products shall be permitted to be applied without additional joint seals.

N1103.3.2.1 (R403.3.2.1) Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of not greater than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.

N1103.3.3 (R403.3.3) Duct Testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.
1. A duct air-leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with duct serving heating or cooling systems.
3. A duct air leakage test shall not be required where a whole house air leakage test is performed.

A written report of the results shall be signed by the party conducting the test and provided to the *building official*.

5-316

Section N1103.5.1.1 (R403.5.1.1) of the 2018 International Residential Code is hereby amended to read as follows:

N1103.5.1.1 (R403.5.1.1) Circulation systems. Heated water circulation systems shall may be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. ~~Gravity and thermo-syphon circulation systems shall be prohibited.~~ Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water

within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

5-317 **Section N1103.5.3 (R403.5.3) of the 2018 International Residential Code** is hereby amended to read as follows:

N1103.5.3 (R403.5.3) Hot water pipe insulation (Prescriptive). Insulation for hot water pipe with a minimum thermal resistance (R-value) of R-3 shall be applied to the following:

1. Piping ~~3/4-inch (19 mm) and larger in nominal diameter.~~
2. Piping ~~serving more than one dwelling unit.~~
- ~~3.1.~~ Piping located outside the conditioned space.
- ~~4.2.~~ Piping from the water heater to a distribution manifold.
5. Piping ~~located under a floor slab.~~
- ~~6.3.~~ Buried in piping.
- ~~7.4.~~ Supply and return piping in recirculation systems other than demand recirculation systems.

5-318 **Section N1106.4 (R406.4) of the 2018 International Residential Code** is hereby amended to read as follows:

N1106.4 (R406.4) ERI-based compliance. Compliance based on an ERI analysis requires that the rated design be shown to have an ERI less than or equal to the appropriate value listed in Table N1106.4 when compared to the ERI reference design.

**TABLE N1106.4 (R406.4)
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX
1	52
2	52
3	51
4	62 70
5	55
6	54
7	53
8	53

5-319

Section M1401.3 of the 2018 International Residential Code is hereby amended to read as follows:

M1401.3 Equipment and appliance sizing. Heating and cooling equipment and appliances shall be sized in accordance with ACCA Manual S or other approved sizing methodologies based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies. Prior to permit issuance, those calculations shall be provided to the Building Safety Division of the Department of Planning and Development Services and shall include the following:

1. The capacity of each piece of heating and cooling equipment;
2. The calculation shall include, but is not limited to window efficiency and sizes, insulation R-values for floor, wall, and ceiling, orientation of the house, house color, and roof color; and
3. The calculations shall be submitted with every new one- and two-family dwelling or any addition that will change the heating and cooling load of such a dwelling.

Exception: ~~Building additions less than 100 square feet in area. Heating and cooling equipment and appliance sizing shall not be limited to the capacities determined in accordance with Manual S where either of the following conditions applies:~~

1. ~~The specified equipment or appliance utilizes multistage technology or variable refrigerant flow technology and the loads calculated in accordance with the approved heating and cooling calculation methodology are within the range of the manufacturer's published capacities for that equipment or appliance.~~
2. ~~The specified equipment or appliance manufacturer's published capacities cannot satisfy both the total and sensible heat gains calculated in accordance with the approved heating and cooling calculation methodology and the next larger standard size unit is specified.~~

5-320

Sections M1601.1, M1601.1, and M1601.1.2 of the 2018 International Residential Code are hereby amended to read as follows:

M1601.1 Duct design. Duct systems serving heating, cooling and ventilation equipment shall be installed in accordance with the provisions of this section and ACCA Manual D, the appliance manufacturer's installation instructions, or other approved methods. A drawing of each duct system, including the size and length of each duct trunk, branch, and CFM of each duct branch run, shall be on site prior to the rough-in mechanical inspection.

M1601.1.1 Above-ground duct systems. Above-ground duct systems shall conform to the following:

1. Equipment connected to duct systems shall be designed to limit discharge air temperature to not greater than 250°F (121°C).
2. Factory-made ducts shall be listed and labeled in accordance with UL 181 and installed in accordance with the manufacturer's instructions.
3. Fibrous glass duct construction shall conform to the SMACNA Fibrous Glass Duct Construction Standards or NAIMA Fibrous Glass Duct Construction Standards.
4. Field-fabricated and shop-fabricated metal and flexible duct constructions shall conform to the SMACNA HVAC Duct Construction Standards—Metal and Flexible except as allowed by Table M1601.1.1. Galvanized steel shall conform to ASTM A 653.
5. The use of gypsum products to construct return air ducts or plenums is permitted, provided that the air temperature does not exceed 125°F (52°C) and exposed surfaces are not subject to condensation.
6. Duct systems shall be constructed of materials having a flame spread index of not greater than 200.
7. Stud wall cavities and the spaces between solid floor joists to be used as air plenums shall comply with the following conditions:
 - 7.1 These cavities or spaces shall not be used as a plenum for supply air.
 - 7.2 These cavities or spaces shall not be part of a required fire-resistance-rated assembly.
 - 7.3 ~~Stud wall cavities shall not convey air from more than one floor level.~~ Multiple floors shall not utilize the same stud wall cavity to convey air.
 - 7.4 Stud wall cavities and joist-space plenums shall be isolated from adjacent concealed spaces by tight-fitting fireblocking in accordance with Section R602.8.
 - 7.5 Stud wall cavities in the outside walls of building envelope assemblies shall not be utilized as air plenums.
8. Volume dampers, equipment, and other means of supply, return, and exhaust air adjustment used in system balancing shall be provided with access.

**TABLE M1601.1.1
DUCT CONSTRUCTION MINIMUM SHEET METAL THICKNESS
FOR SINGLE DWELLING UNITS^a**

ROUND DUCT DIAMETER (inches)	STATIC PRESSURE			
	½ inch water gage		1 inch water gage	
	Thickness(inches)		Thickness(inches)	
	Galvanized	Aluminum	Galvanized	Aluminum
≤12	0.013	0.018	0.013	0.018
12 to 14	0.013	0.018	0.016	0.023
15 to 17	0.016	0.023	0.019	0.027
18	0.016	0.023	0.024	0.034
19 to 20	0.019	0.027	0.024	0.034

RECTANGULAR DUCT DIMENSION (inches)	STATIC PRESSURE			
	½ inch water gage		1 inch water gage	
	Thickness(inches)		Thickness(inches)	
	Galvanized	Aluminum	Galvanized	Aluminum
≤8	0.013	0.018	0.013	0.018
9 to 10	0.013	0.018	0.016	0.023
11 to 12	0.016	0.023	0.019	0.027
13 to 16	0.019	0.027	0.019	0.027
17 to 18	0.019	0.027	0.024	0.034
19 to 20	0.024	0.034	0.024	0.034

For SI: 1 inch = 25.4 mm, 1 inch water gage = 249 Pa.

- a. Ductwork that exceeds 20 inches by dimension or exceeds a pressure of 1 inch water gage (250 Pa) shall be constructed in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible.

M1601.1.2 Underground duct systems. Underground duct systems shall be constructed of approved concrete, clay, metal or plastic. The maximum design temperature for systems utilizing plastic ducts and fittings shall be 150°F (66°C). Metal ducts shall be protected from corrosion in an approved manner or shall be completely encased in concrete not less than 2 inches (51 mm) thick. Nonmetallic ducts shall be installed in accordance with the manufacturer's instructions. Plastic pipe and fitting materials shall conform to cell classification 12454-B of ASTM D 1248 or ASTM D 1784 and external loading properties of ASTM D 2412. Ducts shall slope to drainage point that has access. ~~Ducts shall be sealed, secured and tested prior to encasing the ducts in concrete or direct burial. Duct tightness shall be verified as required by Section N1103.3. Metallic ducts having an approved protective coating and nonmetallic ducts shall be installed in accordance with the manufacturer's instructions.~~ Where encased in concrete, ducts shall be sealed and secured prior to any concrete being poured. Metallic ducts having an approved protective coating and nonmetallic ducts shall be installed in accordance with the manufacturer's instructions.

5-321

The 2018 International Residential Code is hereby amended by adding Sections M1603.1, M1603.1.1, M1603.1.2, M1603.1.3, M1603.1.4, AND M1603.1.5, which read as follows:

M1603.1 Flexible Air Connectors. Flexible air connectors, both metallic and nonmetallic, shall be tested in accordance with UL 181. Such connectors shall be

listed and labeled as Class 0 or Class 1 flexible air connectors and shall be installed in accordance with International Mechanical Code Section 304.1.

M1603.1.1 Connector length. Flexible air connectors shall be limited in length to 14 feet (4267 mm).

M1603.1.2 Connector penetration limitations. Flexible air connectors shall not pass through any wall, floor or ceiling.

M1603.1.3 Air temperature. The design temperature of air to be conveyed in flexible air ducts and flexible air connectors shall be less than 250°F (121°C).

M1603.1.4 Flexible air duct and air connector clearance. Flexible air ducts and air connectors shall be installed with a minimum clearance to an appliance as specified in the appliance manufacturer's installation instructions.

M1603.1.5 Location. Flexible air connectors may only be used for environmental exhaust when located within conditioned space.

5-322

Section G2406.2 (303.3) of the 2018 International Residential Code is hereby amended to read as follows:

G2406.2 (303.3) Prohibited locations. Appliances shall not be located in sleeping rooms, bathrooms, toilet rooms, hot tub rooms, storage closets, or surgical rooms, or in a space that opens only into such rooms or spaces, except where the installation complies with one of the following:

1. The appliance is a direct-vent appliance installed in accordance with the conditions of the listing and the manufacturer's instructions.
2. Vented room heaters, wall furnaces, vented decorative appliances, vented gas fireplaces, vented gas fireplace heaters and decorative appliances for installation in vented solid fuel-burning fireplaces are installed in rooms that meet the required volume criteria of Section G2407.5.
3. A single wall-mounted unvented room heater is installed in a bathroom and such unvented room heater is equipped as specified in Section 621.6, ~~and~~ has an input rating not greater than 6,000 Btu/h (1.76 kW), and a carbon monoxide detector, meeting the requirements of Section R315, is installed in the same room as the appliance. The bathroom shall meet the required volume criteria of Section 304.5.
4. A single wall-mounted unvented room heater is installed in a bedroom and such unvented room heater is equipped as specified in Section 621.6, ~~and~~ has an input rating not greater than 10,000 Btu/h (2.93 kW), and a carbon monoxide detector, meeting the requirements of Section R315, is installed in the same room as the appliance. The bedroom shall meet the required volume criteria of Section 304.5.

5. The appliance is installed in a room or space that opens only into a bedroom or bathroom, and such room or space is used for no other purpose and is provided with a solid weather-stripped door equipped with an approved self-closing device. All combustion air shall be taken directly from the outdoors in accordance with Section G2407.6.

5-323 **The 2018 International Residential Code** is hereby amended by deleting **Section P2503.4.**

5-324 **Section P2053.5.1 of the 2018 International Residential Code** is hereby amended to read as follows:

P2503.1 Rough Plumbing. DWV systems shall be tested on completion of the rough piping installation by water or, ~~for piping systems other than plastic,~~ by air, without evidence of leakage. Either test shall be applied to the drainage system in its entirety or in sections after rough-in piping has been installed, as follows:

1. Water test. Each section shall be filled with water to a point not less than 5 feet (1524 mm) above the highest fitting connection in that section, or to the highest point in the completed system. Water shall be held in the section under test for a period of 15 minutes. The system shall prove leak free by visual inspection.
2. Air test. The portion under test shall be maintained at a gauge pressure of 5 pounds per square inch (psi) (34 kPa) or 10 inches of mercury column (34 kPa). This pressure shall be held without introduction of additional air for a period of 15 minutes.

5-325 **The 2018 International Residential Code** is hereby amended by adding **Section P2713.4**, which reads as follows:

P2713.4 Prohibited location. In no case shall tubs be installed head to head.

5-326 **Section P3005.2.3 of the 2018 International Residential Code** is hereby amended to read as follows:

P3005.2.3 Building drain and building sewer junction. The junction of the building drain and the building sewer shall be served by a cleanout that is located at the junction or within 10 feet (3048 mm) developed length of piping ~~upstream~~ of the junction and shall be located outside the building. For the requirements of this section, removal of a water closet shall not be required to provide cleanout access.

5-327 **Section P3005.4.2 of the 2018 International Residential Code** is hereby amended to read as follows:

P3005.4.2 Building drain and sewer size and slope. Pipe sizes and slope shall be determined from Table P3005.4.2 on the basis of drainage load in fixture units (d.f.u.) computed from Table P3004.1; however, no building sewer shall be less than four (4) inches in diameter.

5-328

The 2018 International Residential Code is hereby amended by adding Section P3113.5, which reads as follows:

P3113.5 Aggregate size of vents. The drainage piping of each building and each connection to a public sewer or a private sewage disposal system shall be vented by means of one or more vent pipes, the aggregate cross-sectional area of which shall not be less than that of the largest required building sewer, as determined from Table 710.1(1) of the *2018 International Plumbing Code*. Vent pipes from fixtures located upstream from pumps, ejectors, backwater valves, or other devices that in any way obstruct the free flow of air and other gases between the building sewer and the outside atmosphere shall not be used for meeting the cross-sectional area venting requirements of this section.

Exception: When connected to a common building sewer, the drainage piping of two (2) or more buildings, located on the same lot and under one (1) ownership, may be vented by means of piping sized in accordance with Table 710.1(1) of the *2018 International Plumbing Code*, provided the aggregate cross-sectional area of all vents is not less than that of the largest required common building sewer.

5-329

Sections P3114.2, P3114.3, and P3114.8 of the 2018 International Residential Code are hereby amended to read as follows:

P3114.2 Installation. The valves shall only be installed with prior approval from the Department of Planning and Development Services, in accordance with the requirements of this section, and in accordance with the manufacturer's installation instructions. Air admittance valves shall be installed after the DWV testing required by Section P2503.5.1 or P2503.5.2 has been performed.

P3114.3 Where permitted. The valves shall only be permitted in the alterations of existing buildings with prior approval from the Department of Planning and Development Services. Individual vents, branch vents, circuit vents and stack vents shall be permitted to terminate with a connection to an air admittance valve. Individual and branch type air admittance valves shall vent only fixtures that are on the same floor level and connect to a horizontal branch drain.

P3114.8 Prohibited installations. Air admittance valves shall not be used to vent sumps or tanks except where the vent system for the sump or tank has been designed by an engineer. Air admittance valves shall not be installed in new construction or on outdoor vent terminals for the sole purpose of reducing clearances to gravity or mechanical air intakes.

Exception: Island fixtures in new construction may be vented by air admittance valves that comply with Section P3114.

5-330

Section E3604.5.1 of the 2018 International Residential Code is hereby amended to read as follows:

E3604.5.1 Strength. Where a mast is used for support of service-drop conductors, it shall be a galvanized rigid conduit with a minimum trade size diameter of two inches. The service mast shall be of adequate strength or shall be supported by braces or guys to safely withstand the strain imposed by the service-drop or overhead service conductors. Hubs intended for use with a conduit that serves as a service mast shall be identified for use with service-entrance equipment.

5-331

Section E3605.1 of the 2018 International Residential Code is hereby amended to read as follows:

E3605.1 Insulation of service-entrance conductors. Service-entrance conductors entering or on the exterior of buildings or other structures shall be insulated in accordance with Section E3406.5. Service-entrance conductors shall not exceed six feet in length from the point of entrance of a building. [230.41 Exception].

Exceptions:

1. A copper grounded conductor shall not be required to be insulated where it is:
 - 1.1 In a raceway or part of a service cable assembly,
 - 1.2 Directly buried in soil of suitable condition, or
 - 1.2 Part of a cable assembly listed for direct burial without regard to soil conditions.
2. An aluminum or copper-clad aluminum grounded conductor shall not be required to be insulated where part of a cable or where identified for direct burial or utilization in underground raceways. [230.41 Exception].

5-332

Section E3611.2 of the 2018 International Residential Code is hereby amended to read as follows:

E3611.2 Accessibility. All mechanical elements used to terminate a grounding electrode conductor or bonding jumper to the grounding electrodes that are not buried or concrete encased shall be accessible. The location of the grounding electrode conductor connection to the grounding electrode(s) shall be permanently stated on a plaque or directory on the service disconnecting means. [250.68(A) and 250.68(A) Exception].

5-333

The 2018 International Residential Code is hereby amended by adding **Section E3703.8**, which reads as follows:

E3703.8 Sump Pumps. Sump pumps shall be served by an individual branch circuit. The circuit and its single receptacle outlet shall be in addition to any other outlets required by Section E3901.

5-334

Table E3801.4, "Allowable Applications for Wiring Methods, of the 2018 International Residential Code is hereby amended to read as follows:

TABLE E3801.4 (Chapter 3 and 300.2)
ALLOWABLE APPLICATIONS FOR WIRING METHODS^{a, b, c, d, e, f, g, h, i, j, k}

ALLOWABLE APPLICATIONS (applications allowed where marked with an "A")	AC	EMT	ENT	FMC	IMC RMC RNC	LFC ^a	MC	NM	SR	SE	UF	USE
Services	—	A ^h	A	A ⁱ	A	A ⁱ	A	—	—	A [—]	—	—
Feeders	A	A	A	A	A	A	A	A	—	A ^b	A	A ^b
Branch circuits	A	A	A	A	A	A	A	A	A	A ^c	A	—
Inside a building	A	A	A	A	A	A	A	A	A	A	A	—
Wet locations exposed to sunlight	—	A	A ^h	A ^d	A	A	A	—	—	A	A ^e	A ^e
Damp locations	—	A	A	A ^d	A	A	A	—	—	A	A	A
Embedded in non-cinder concrete in dry Location	—	A	A	—	A	—	—	—	—	—	—	—
In non-cinder concrete in contact with grade	—	A ^f	A	—	A ^f	—	—	—	—	—	—	—
Embedded in plaster not exposed to Dampness	A	A	A	A	A	A	A	—	—	A	A	A
Embedded in masonry	—	A	A	—	A ^f	A	A	—	—	—	—	—
In masonry voids and cell exposed to dampness or below grade line	—	A ^f	A	A ^d	A ^f	A	A	—	—	A	A	—
Fished in masonry voids	A	—	—	—	—	—	—	—	—	—	—	—
In masonry voids and cells not exposed to dampness	A	A	A	A	A	A	A	A	A	A	A	A
Run exposed	A	A	A	A	A	A	A	A	A	A	A	A
Run exposed and subject to physical damage	—	—	—	—	A ^g	—	—	—	—	—	—	—
For direct burial	—	A ^f	—	—	A ^f	A	A	—	—	—	—	A

For SI: 1 foot = 304.8 mm.

- a. Liquid-tight flexible nonmetallic conduit without integral reinforcement within the conduit wall shall not exceed 6 feet in length.
- b. Type USE cable shall not be used inside buildings.
- c. The grounded conductor shall be insulated except where used to supply other buildings on the same premises.
- d. Conductors shall be a type approved for wet locations and the installation shall prevent water from entering other raceways.
- e. Shall be listed as "Sunlight Resistant."
- f. Metal raceways shall be protected from corrosion and approved for the application. Aluminum RMC requires approved supplementary corrosion protection.
- g. RNC shall be Schedule 80.
- h. Shall be listed as "Sunlight Resistant" where exposed to the direct rays of the sun.
- i. Conduit shall not exceed 6 feet in length.
- J Liquid-tight flexible nonmetallic conduit is permitted to be encased in concrete where listed for direct burial and only straight connectors listed for use with LFNC are used.
- k. In wet locations under any of the following conditions:
 - (i) The metallic covering is impervious to moisture.
 - (ii) A lead sheath or moisture-impervious jacket is provided under the metal covering.
 - (iii) The insulated conductors under the metallic covering are listed for use in wet locations and a corrosion-resistant jacket is provided over the metallic sheath.

5-335 **Section E3901.4.4 of the 2018 International Residential Code** is hereby amended to read as follows:

E3901.4.4 Separate spaces. Countertop spaces separated by range tops, refrigerators, or sinks shall be considered as separate countertop spaces in applying the requirements of Sections E3901.4.1, E3901.4.2 and E3901.4.3. Where a range, counter-mounted cooking unit, or sink is installed in an island or peninsular countertop and ~~the depth of the countertop behind the range, counter-mounted cooking unit, or sink is less than 12 inches (305 mm),~~ the range, counter-mounted cooking unit, or sink has divided the countertop space into two separate countertop spaces as defined in Section E3901.4.4. Each separate countertop space shall comply with the applicable requirements of this section. [210.52(C)(4)]

5-336 **The 2018 International Residential Code is hereby amended by adding Section E3901.9.1,** which reads as follows:

E3901.9.1 Garage Door Opener Receptacle Outlets. A single receptacle outlet shall be installed in the garage ceiling for each vehicle entry door. The single receptacle outlet shall be located near the center of the finished edges of the opening. The single receptacle outlet shall be located from the opening by the sum total of the height of the door plus a minimum of two feet.

5-337 **The 2018 International Residential Code is hereby amended by adding Section E3902,** which reads as follows:

E3902 General. Ground-fault circuit-interrupter protection for personnel shall be provided as required in Sections E3901.2 through E3902.13. Arc-fault circuit-Interrupter protection shall be provided as required by Sections E3902.14 through E3902.16.

Exceptions:

1. A single receptacle outlet for refrigerators, freezers, garage door openers and sump pumps located within dedicated space for each appliance that, in normal use, are not easily moved from one place to another and that are cord-and-plug connected shall be permitted to be installed in accordance with Section E3909.
2. Arc-Fault Circuit-Interrupter protection shall be permitted to be omitted from 120 volt single station smoke detectors.

5-338 **Section E902.7 of the 2018 International Residential Code** is hereby amended to read as follows:

E3902.7 Sink receptacles and washing machines. 125-volt, single-phase, 15- and 20-ampere receptacles that are located within 6 feet (1829 mm) of the top inside edge of the bowl of the sink shall have ground-fault circuit-interrupter protection for personnel. [210.8(A)(7)]

Exception: 125-volt, single-phase, 15- and 20-ampere single receptacles located within dedicated space serving washers, microwave ovens, ice makers, warming ovens and dishwashers.

5-339 **The 2018 International Residential Code is hereby amended by deleting Sections E3902.9 and E3902.10.**

5-340 **Section E3902.16 of the 2018 International Residential Code** is hereby amended to read as follows:

E3902.16 Arc-fault circuit-interrupter protection. Branch circuits that supply 120-volt, single-phase, 15- and 20-ampere outlets installed in ~~kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreations rooms, closets, hallways, laundry areas and similar rooms or areas~~ shall be protected by any of the following: [210.12(A)]

1. A listed combination-type arc-fault circuit interrupter, installed to provide protection of the entire branch circuit. [210.12(A)(1)]
2. A listed branch/feeder-type AFCI installed at the origin of the branch-circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit. [210.12(A)(2)]
3. A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - 3.1 The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
 - 3.2 The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 50 feet (15.2 m) for 14 AWG conductors and 70 feet (21.3 m) for 12 AWG conductors.
 - 3.3 The first outlet box on the branch circuit shall be marked to indicate that it is the first outlet on the circuit. [210.12(A)(3)]
4. A listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - 4.1 The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.

- 4.2 The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 50 feet (15.2 m) for 14 AWG conductors and 70 feet (21.3 m) for 12 AWG conductors.
 - 4.3 The first outlet box on the branch circuit shall be marked to indicate that it is the first outlet on the circuit.
 - 4.4 The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and shall be listed as such. [210.12(A)(4)]
5. Where metal outlet boxes and junction boxes and RMC, IMC, EMT, Type MC or steel-armored Type AC cables meeting the requirements of Section E3908.8, metal wireways or metal auxiliary gutters are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, a listed outlet branch-circuit type AFCI installed at the first outlet shall be considered as providing protection for the remaining portion of the branch circuit. [210.12(A)(5)]
6. Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 2 inches (50.8 mm) of concrete for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, a listed outlet branch-circuit type AFCI installed at the first outlet shall be considered as providing protection for the remaining portion of the branch circuit. [210.12(A)(6)]

~~**Exception:** AFCI protection is not required for an individual branch circuit supplying only a fire alarm system where the branch circuit is wired with metal outlet and junction boxes and RMC, IMC, EMT or steel sheathed armored cable Type AC or Type MC meeting the requirements of Section E3908.8.~~

SECTION 3. If any section, sentence, clause, or phrase of this ordinance is found to be unconstitutional or is otherwise held invalid by any court of competent jurisdiction, it shall not affect the validity of any remaining parts of this ordinance.

SECTION 4. After passage and publication as provided by law, this ordinance shall be in full force and effect commencing July 1, 2019.

PASSED by the Governing Body of the City of Lawrence, Kansas, this ____ day of _____, 2019.

APPROVED:

Lisa Larsen
Mayor

ATTEST:

Sherri Riedemann
City Clerk

APPROVED AS TO FORM:

Toni R. Wheeler
City Attorney