



2018 Building and Fire Code Adoption and Amendments

City Council
Work Session
May 14, 2019

Amy Palmer – Building Official
Victoria St. Clair – Building Plans Examiner
Jerry Bills – Deputy Fire Chief



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How often does the City of Flagstaff adopt building model codes?

The International Code Council (ICC), a developer and publisher of model codes, is on a 3-year code update cycle, however, the City of Flagstaff has opted to adopt the model codes every other cycle, or every 6 years.

The last code adoption occurred in 2013 when the City of Flagstaff adopted the 2012 International Codes.



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What code editions will be adopted?

Flagstaff City Code - Title 4: Building Regulations

- 2018 International Building Code (IBC)
- 2018 International Residential Code (IRC)
- 2018 International Existing Building Code (IEBC)
- 2018 International Mechanical Code (IMC)
- 2018 International Plumbing Code (IPC)
- 2018 International Fuel-Gas Code (IFGC)
- 2018 International Energy Conservation Code (IECC)
- 2018 International Solar Energy Provisions (ISEP)*
- 2018 International Swimming Pool and Spa Code (ISPSC)*
- 2017 NFPA 70 - National Electrical Code (NEC)
- A117.1-2017 Standard for Accessible and Useable Buildings and Facilities

Flagstaff City Code - Title 5: Fire Code

- 2018 International Fire Code (IFC)

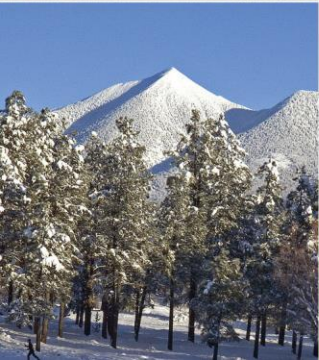
* = New to City of Flagstaff; others are currently adopted under an older code cycle



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Why adopt the most recent codes?

- Improve health, reduce emissions, create jobs
- Protect public health, safety, and welfare
- Energy and cost savings can be significant
- Provide consistent minimum standards in construction
- Protect consumers and support grid reliability
- Contribute to the well-being of the community
- Help control or lower cost of insurance premiums

****Codes are effective only if they are enacted into law and enforced by state and local governments****



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Code Updates vs. Local Amendments

Update

- Generated by the code publisher through code hearing process
- Addresses new technology, clarifications or modifications to existing code sections

Local Amendment

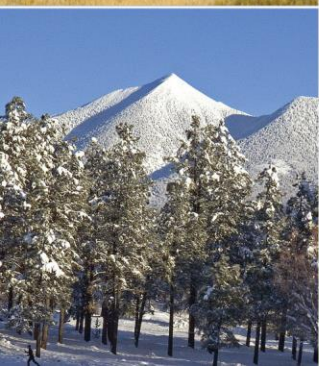
- Generated by the adopting jurisdiction
- Reflect local practices and laws
- Unique site conditions affecting foundation design or applied snow loads



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Public Outreach

Target audience: Design community (architects, engineers, home designers), contractors, any interested community members

Advertising

- Posters & flyers
 - Flagstaff City Hall / Building Safety website
 - Coconino County / Building Safety website
 - Local businesses: home improvement center, coffee shop bulletin boards
 - Social media
 - Inspection staff handout to subcontractors
 - Northern Arizona Builders Association (NABA)
- Radio interview at KAFF January 25, 2019



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Public Outreach: Training Sessions

07/25/2018: IRC - **33** attendees

08/09/2018: IRC - **53** attendees

08/22/2018: IBC + IEBC – **34** attendees

09/13/2018: IECC + ISEP – **18** attendees

10/03/2018: IPC + IFGC – **24** attendees

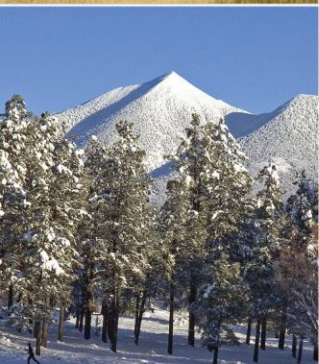
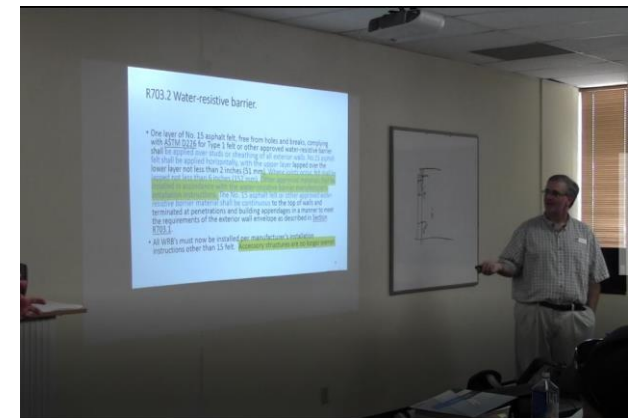
10/18/2018: NFPA 70/NEC – **16** attendees

11/04/2018: IMC + ISPSC – **15** attendees

12/13/2018: IFC – **35** attendees

01/30/2019: IRC – **17** attendees

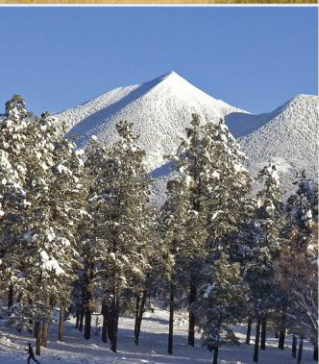
03/07/2019: IECC **12** attendees



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Public Outreach: Open House

Open discussion and questions

02/05/2019: Murdoch Center – **10** attendees

02/07/2019: Aquaplex – **8** attendees


PUBLIC OPEN HOUSES

FOR UPDATES TO CITY OF FLAGSTAFF
BUILDING AND FIRE CODES

What

The City of Flagstaff is in the process to replace the 2012 International Code Council (ICC) model building and fire codes with the 2018 editions. The goal is to have City Council adopt the new codes with local amendments in May of 2019. Both Open Houses will be the same format. Come and go as your schedule allows. Building Safety and Fire Department staff will be organized around the room by topic, ready to answer questions, clarify code language, and take your comments.

Copies of the current code editions (2012), proposed code editions (2018), and current and proposed amendments will be available for reference. The current and proposed amendments are also available to view and make comments online: <https://www.flagstaff.az.gov/494/Building-Safety>.



When and Where

Tuesday, February 5, 2019; 11 a.m. to 1 p.m.
@ Murdoch Community Center (203 E Brannen Ave)


and

Thursday, February 7, 2019; 4 p.m. to 6 p.m.
@The Flagstaff Aquaplex (1702 N Fourth St)

Why


There are several benefits to updating the building & fire codes:

- 2018 is the most current code available
- Improve life safety and welfare of the public
- Improved technology in building materials and energy efficiency
- Reduction of code modifications
- Flagstaff's codes will be more consistent with other cities and counties throughout the state of Arizona.



Who

You! These Open Houses are open to, and for, the general public, and are your best chance to participate, learn more, and comment on the proposed updates!





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Boards & Commission Meetings

- **November 8, 2018:** [Building and Fire Code Board of Appeals #1](#)
- **December 4, 2018:** [Building and Fire Code Board of Appeals #2](#)
- **January 22, 2019:** [Commission on Inclusion and Adaptive Living](#)
- **February 13, 2019:** [Planning & Zoning Commission](#)
- **February 28, 2019:** [Sustainability Commission](#)
- **April 2, 2019:** [Building and Fire Code Board of Appeals #3](#)



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Boards & Commission Meetings

All boards and commissions recommended the items to move forward with the exception of:

- Building and Fire Code Board of Appeals
 - Blower door testing
 - EV vehicle charging



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International Building Code (IBC)

AMENDMENT

Section 429 Electric Vehicle (EV) Charging

- Requires EV-ready parking spaces for all **new commercial, multi-family, and industrial structures** providing 20 or more parking spaces

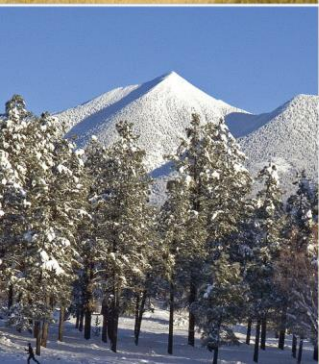
Parking Spaces Provided	EV-ready Parking Spaces Required
1-19	0
20-50	1
51-100	2
100+	3



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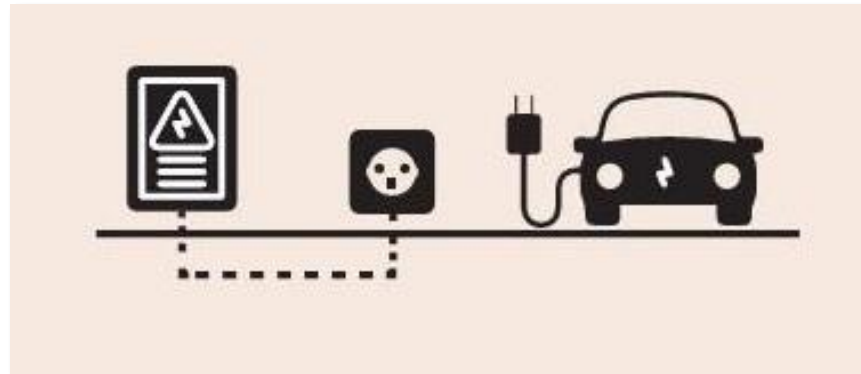


IBC

SECTION 429 Electric Vehicle (EV) Charging

What is “EV-ready”?

- Panel capacity – 208/240V, 50 capacity with overcurrent device (circuit breaker)
- Conduit with conductor/wiring
- Receptacle (similar to domestic electric clothes dryer)



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IBC

1110.4.13 Play areas.

- Play areas containing play components designed and constructed for children shall be located on an *accessible route*.



Children's playground

[iStock.com/natureexplorer2](https://www.iStock.com/natureexplorer2)



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IBC

1507.18 Building-integrated photovoltaic roof panels. (Also, IRC R905.17)

- Building-integrated photovoltaic panel systems have specific requirements as a roof-covering material.
 - Deck requirements
 - Deck slope
 - Underlayment
 - High wind attachment
 - Ice barrier
 - Material standards



BIPV panels

iStock.com/Kwangmoozaa



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IBC

2902.3 Public Toilet Facilities

- 2015 IBC Change
- Limited-size quick service tenant spaces are no longer required to provide toilet facilities for public customers.

Exception: Public toilet facilities shall not be required for:

1. Parking garages where operated without parking attendants.

2. Structures and tenant spaces intended for quick transactions, including takeout, pickup and drop-off, having a public access area less than or equal to 300 square feet.



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International Existing Building Code (IEBC)

405.2.1.1 Snow Damage

- Structural components whose damage was caused by or related to snow load effects shall be repaired, replaced or altered to satisfy the requirements of Section 1608 of the *International Building Code*.
- Structural components damaged by snow events must be repaired assuming snow loads for new buildings using the IBC.



Damage to roof due to large snow loads

[nikolpetr/Shutterstock.com](https://www.shutterstock.com)



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IEBC

505.4, 701.4

Emergency Escape Opening Operation

- **CHANGE SUMMARY:** Emergency escape and rescue openings are required to be operational. Related provisions for being operational have been added to the Prescriptive Compliance Method and Alterations Level 1.



Emergency escape and rescue opening operation in existing b

© International Code Council



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International Residential Code (IRC)

Significant Changes Regarding Seismic Provisions

- The National Association of Home Builders (NAHB) report on the 2018 Significant Changes and Cost Impacts:
- Change in Wall Bracing and Foundation Costs for Reference House 4:
 - Seismic Design Category D2 to a Seismic Design Category C
 - 2-story 2,607SF with attached 2-car garage.
 - \$11,950 – in approx. savings!



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IRC

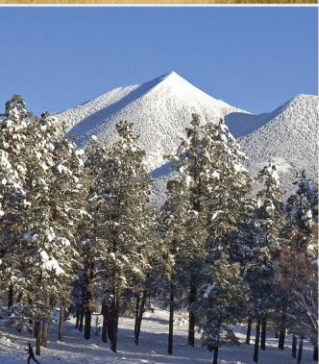
- **Wall bracing based on wind loads vs. seismic loads**
- City of Flagstaff falls within Seismic Design Category C, which means that the wind provisions prevail and not the seismic provisions.



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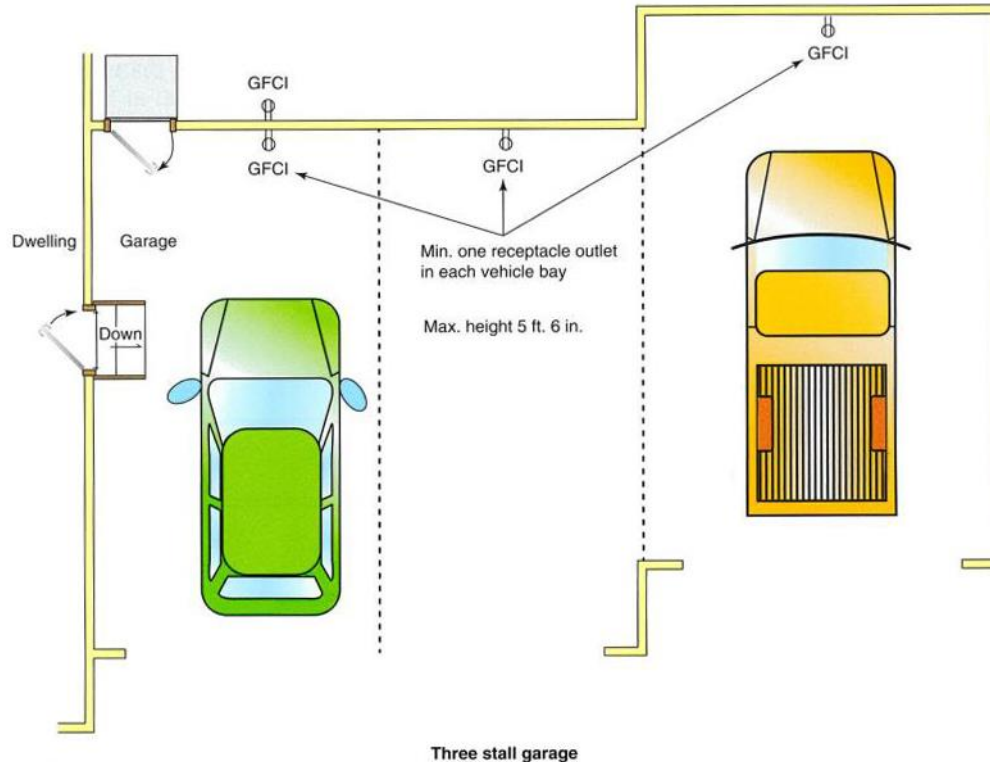




IRC

E3901.9 Garage receptacle outlet location

A receptacle outlet must be located in each vehicle bay in a garage.



© International Code Council



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IRC

AMENDMENT: E3901.9 EV Charging

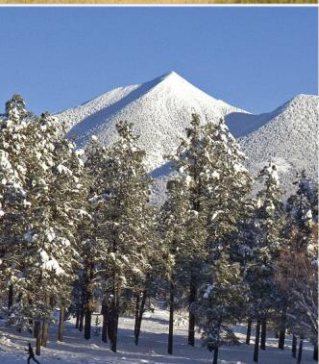
- At least one required garage receptacle shall be a 208/240-volt individual branch circuit for purposes of electric vehicle (EV) charging. The service panel or subpanel circuit directory shall provide a 50-ampere minimum dedicated branch circuit and a branch circuit overcurrent device. Electric vehicle supply equipment shall be installed in accordance with 2017 NFPA 70/NEC.
- Exception: Additions and alterations to existing one- or two-family dwellings and townhouses constructed per the IRC are exempt from the EV charging requirement.



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IRC

Appendices (Not enforceable unless specifically adopted.)

- Appendix Q Tiny Houses
- Appendix R Light Straw-Clay Construction
- Appendix S Strawbale Construction
- Appendix T Solar-ready Provisions

Element	General requirement
Egress roof access window	A skylight or roof window for emergency escape from a loft
Loft	Open on one side with a ceiling height of less than 6 feet 8 inches
Tiny house	Maximum area 400 square feet excluding lofts
Ceiling heights	Generally 6 feet 8 inches or less
Minimum loft area	35 square feet with 5-foot minimum dimension
Stairway	Width: 17 to 25 inches Headroom: 6 feet 2 inches Risers: 7 to 12 inches Treads: Calculated based on riser height
Ladders	Width: 12 inches Rung spacing: 10 to 14 inches Incline 70 to 80 degrees
Loft guard height	One-half of the clear height to ceiling Not required to be over 36 inches



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International Mechanical Code (IMC)

Chapter 14 Solar Thermal Systems

- Substantially rewritten for consistency with current technology
- Applies only to solar thermal systems as opposed to solar photovoltaic systems
- References two solar product standards
 - ICC 900/SRCC 300 Solar Thermal System Standard
 - ICC 901/SRCC 100 Solar Thermal Collector Standard



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International Plumbing Code (IPC)

Section 403.2 Separate facilities

- “Where plumbing fixtures are required, separate facilities shall be provided for each sex.”
- Exception #4 added:
 - Separate facilities shall not be required in business occupancies in which the maximum occupancy load is 25 or fewer.



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IPC

Section 202 Definitions

Section 410 Drinking Fountains

- Definitions and language included for water dispensers and water coolers



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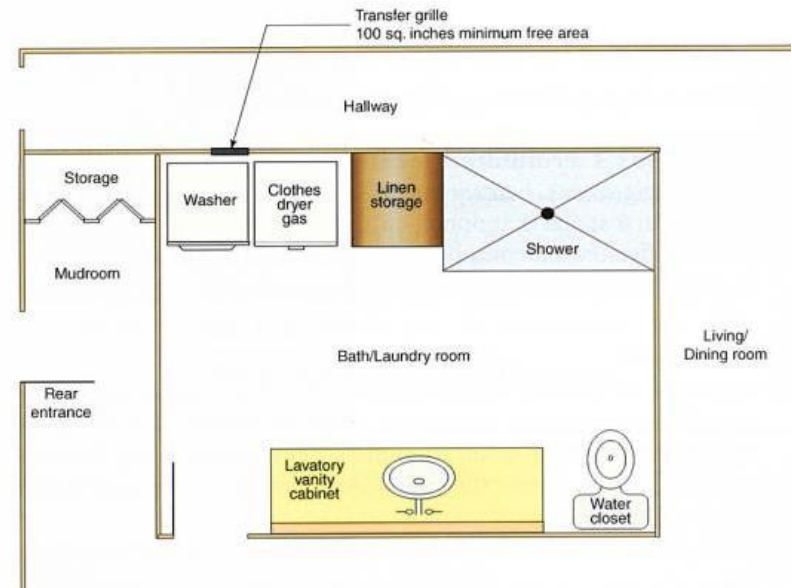




International Fuel Gas Code (IFGC)

Section 303 Appliance Location 303.3 Prohibited Locations

New Exception #6:
Clothes dryers are permitted in residential bathrooms where a permanent opening at least 100 sq. inches, communicating with a space outside of a sleeping room, bathroom, toilet room, or storage closet is provided



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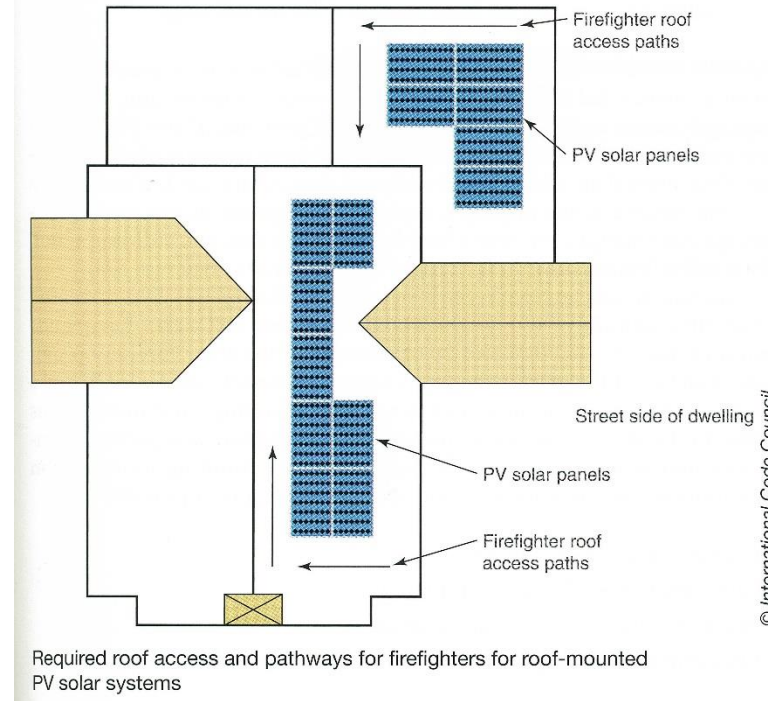




International Solar Energy Provisions (ISEP)

RS402.4 Roof Access and Pathways

- First appeared in 2012 International Fire Code (IFC); subsequently modified in 2015, 2018 IFC
- Emergency access to the roof
- Pathways to specific areas
- Smoke-ventilation opportunity areas
- Emergency egress from the roof



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International Swimming Pool & Spa Code (ISPSC)

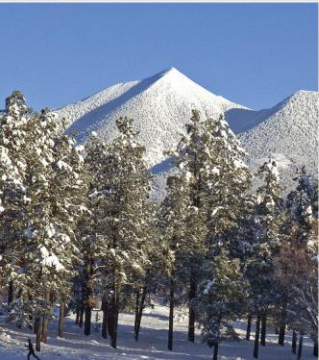
- Swimming pool, spa, and hot tub provisions removed from the IBC and IRC. These codes now reference ISPSC.
- City of Flagstaff amendments primarily to align with Arizona State Statutes.



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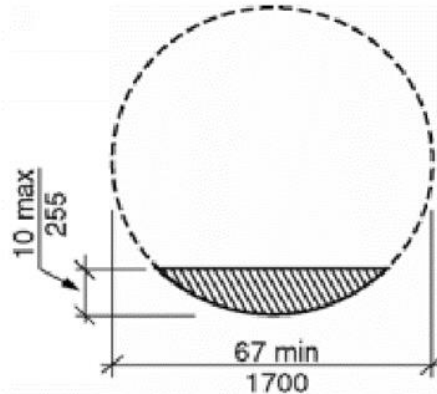


ICC A117.1-2017

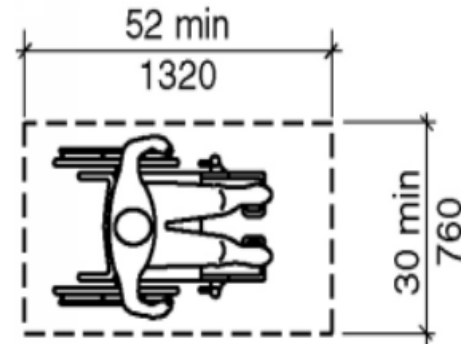
Standard for Accessible and Usable Buildings and Facilities

Chapter 3 Building Blocks

- Section 304 Turning Space – Circular Space
- Section 305 Clear Floor Space



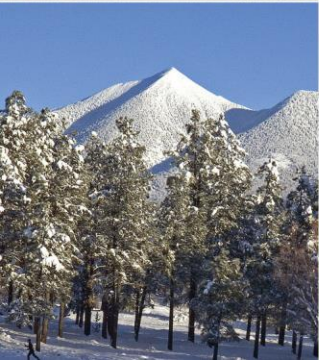
Overlap of knee and toe clearance



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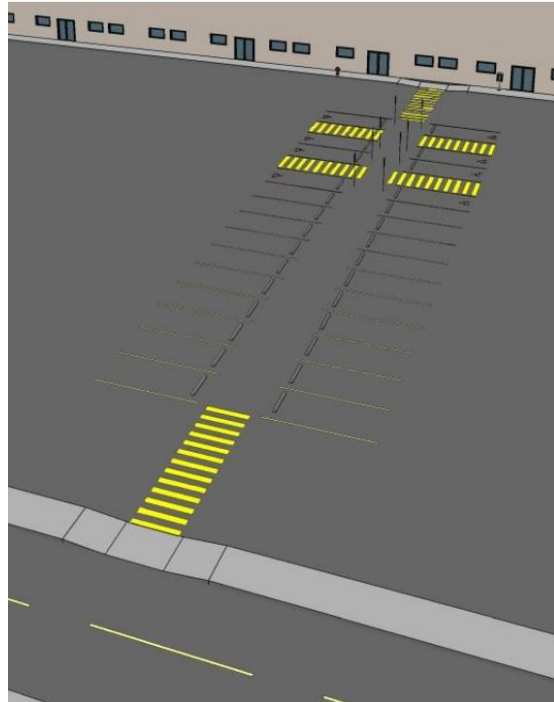




ICC A117.1-2017

Chapter 5 General Site and Building Elements

- Section 507 Accessible Routes through Parking
“Where accessible routes pass through parking facilities they shall be physically separated from vehicular traffic.”



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2017 NFPA 70/National Electrical Code (NEC)

Article 210.12(C) AFCI Protection in Guest Rooms and Suites

AFCI = Arc-Fault Circuit Interrupter

Prior to 2017 NEC no AFCI requirements existed for guest rooms/suites of hotels lacking “permanent provisions for cooking”



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International Energy Efficiency Code (IECC)

Residential Provisions

Compliance Paths (R401.2)

- Prescriptive
 - Comply with all sections in R401 - R404
- Simulated Performance
 - Comply with sections R401 - R404 marked "mandatory"
 - Comply with all sections in R405
 - Standard Reference Design and Proposed Design
- **Energy Rating Index (ERI)**
 - Comply with all sections in R406
 - Demonstrate compliance by providing documentation from an approved third party



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IECC – Residential Provisions

R406 Energy Rating Index Compliance Alternative

- First appeared in 2015 IECC
- Table R406.4 Maximum Energy Rating Index (ERI)
 - Lower score = less energy consumption
 - Climate Zone 5
 - 2009: **82***
 - 2012: **80***
 - 2015: **55**
 - 2018: **61**

* Home constructed to minimum prescriptive requirements of respective IECC edition



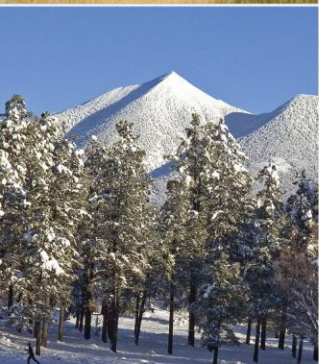
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IECC – Residential Provisions

R406 ERI Compliance Alternative



IECC 2018 Energy Rating Index Report

Property ██████████ Organization ██████████ ERI Preconstruction
 Flagstaff, AZ 86001

Annual Energy Consumption		
	Rated Home Calculated Energy Use (MBTU)	Rated Home Cost (\$/yr)
Heating	29.7	146
Cooling	0.8	32
Water Heating	13.5	58
Lights & Appliances	16.0	615
Photovoltaics	-0.0	-0
Total	60.0	1125

Projected Rating: Based on Plans - Field Confirmation Required.

Annual Estimates		
Electric(kWh):	5111	C02 Emissions(Tons): 5
Natural gas(Therms):	426	Energy Savings (\$)**: 463

*Based on standard operating conditions
 **Based on the 2018 IECC Energy Rating Index Reference Design Home

TARGET ERI: 61 **2018 ERI: 58** **PASS**

This home MEETS the 2018 Energy Rating Index requirements of Sections 406.3 and 406.4 of the 2018 IECC for climate zone 5B. This 2018 ERI is calculated per ANSI/RESNET/ICC Standard 301-2014, as published January 2016 with Addenda A & B.

Name ██████████ Signature _____
 Organization ██████████ Date 19 February 2019

Mandatory Requirements			
2018 ERI Target	PASS	Duct Insulation (Ducts outside R-6, inside is R-0)	PASS
2009 IECC UA	PASS	Maximum Fenestration U-factor/SHGC (R402.5)	PASS
Duct Testing (2015)	PASS	Air Leakage (5 ACH50 for CZ1-2, 3 ACH50 for CZ3-8)	PASS
Mechanical Ventilation	PASS	High efficacy lights installed (90%)	PASS
Hot water pipe insulated to R-3	PASS	Mandatory Requirements Checkbox (2018 IECC)	PASS
Mechanical Ventilation Efficacy	PASS		

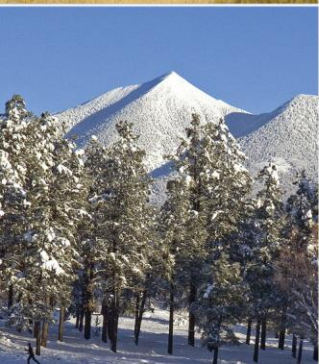
Emissions Data	Provider Data and Seal
Pollution Prevented	TITLE
Carbon Dioxide (CO2) - tons/year	3.2 Company
Sulfur Dioxide (SO2) - lbs/year	1.7 Address
Nitrogen Oxides (NOx) - lbs/year	7.5 City, State, Zip
	Phone #

REM/Rate - Residential Energy Analysis and Rating Software v15.7.1
 This information does not constitute any warranty of energy costs or savings.
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IECC – Residential Provisions

Table R402.1.1 (Prescriptive)

TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
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2009

5 and Marine 4	0.35	0.60	NR	38	20 or 13+5*	13/17	30	10/13	10, 2ft	10/13
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2009 AMENDED

5 and Marine 4	0.45				19/15**					
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2018

5 and Marine 4	0.30	0.55		49	20 or 13+5*			15/19		15/19
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*First value = cavity insulation + second value = continuous insulation

**R-19 cavity insulation for 2x6, R-15 high density cavity insulation for 2x4; no cavity + continuous option offered



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IECC – Residential Provisions

R402.4 Air Leakage (Mandatory)

R402.4.1.2 Testing

- Blower door testing to confirm number of air changes per hour
 - Air change: A measure of the air volume added to or removed from a space divided by the volume of the space
 - Climate Zone 5 – Maximum 3 air changes/hour
- 2009 IECC: One of two options
- 2012 IECC: Became mandatory testing method



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IECC – Residential Provisions

R402.4 Air Leakage (Mandatory)

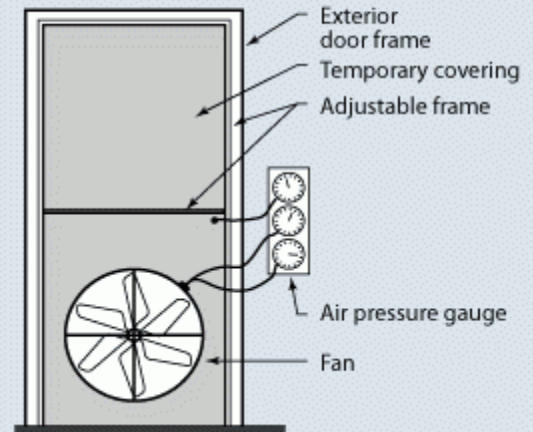
R402.4.1.2 Testing



Credit: Holtkamp Heating & A/C, Inc.

Diagnostic Tools

Testing the airtightness of a home using a special fan called a blower door can help to ensure that air sealing work is effective. Often, energy efficiency incentive programs, such as the DOE/ EPA ENERGY STAR Program, require a blower door test (usually performed in less than an hour) to confirm the tightness of the house.



Credit: United States Department of Energy



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IECC – Residential Provisions

R403.3 Ducts

R403.3.3 Duct Testing (Mandatory)

- Rough-in test or Postconstruction test to confirm duct tightness/leakage
- Appears in 2009 IECC
- Was not amended out in 2013 adoption: “not enforced”



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IECC – Residential Provisions

R403.5 Service hot water systems

R403.5.1.1 Circulation systems

- Requires circulation pump

R404.1 Lighting Equipment (Mandatory)

- 2009: 50% high efficiency
- 2012 & 2015: 75% high efficiency
- 2018: 90% high efficiency



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