IRC 2012 Key Changes

Overview of changes between the 2009 and 2012 IRC

A Webinar Provided by The Pennsylvania Housing Research Center

November 4, 2011

Presented by Mike Turns; Associate Director, PHRC

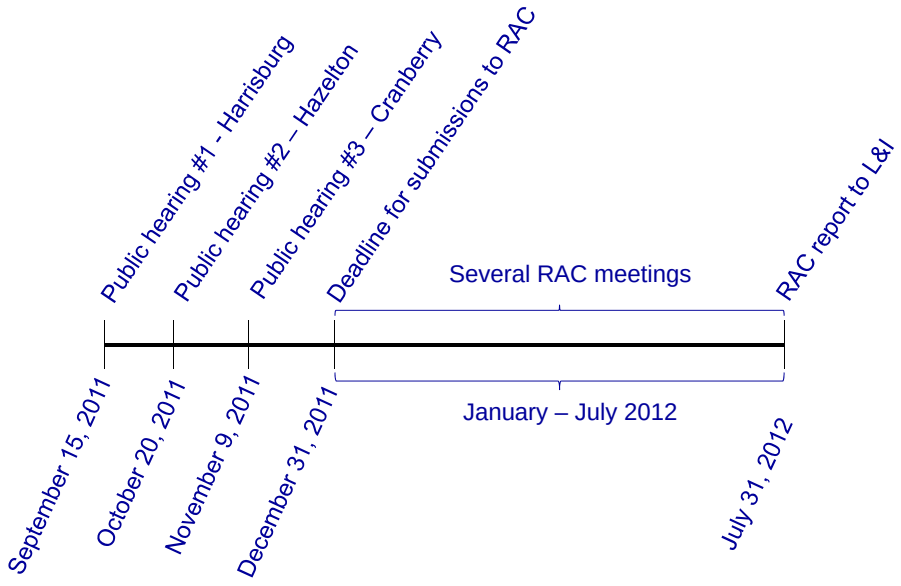
Objective

- Provide a brief review of some of the changes in the 2012 International Residential Code that will likely have an impact compared to the 2009 IRC (if adopted by the UCC Review and Advisory Council):
  - Constructability issues
  - Redesign likely or required
  - Cost of materials / labor (affordability)
  - Sufficient labor force of specialty contractors, sub-contractors and technicians

UCC Review & Advisory Council

- 19 member council
- Decide which new code provisions will be adopted
  - 2/3 vote required for adoption
- Public hearings
- RAC meetings
- Submissions to recommend AGAINST adoption due: **December 31, 2011**
- Report due to L&I: July 31, 2012

Tentative Process Timeline



Residential sprinkler systems

IRC: P2904.1

Partial systems

- New Shall be permitted to be installed only in buildings not required to be equipped with a residential sprinkler system.
  - In Pennsylvania, as a result of Act 1 of 2011
    - Sprinkler systems are not required in one and two family dwellings
    - Partial systems would be allowed

Residential sprinkler systems

IRC: P2904.1

- Sprinkler systems ARE required in:
  - All townhouses
  - All one and two family dwellings if a lawful UCC municipal amendment is in place requiring them
  - Partial systems would NOT be allowed in these applications

Residential sprinkler systems

IRC: P2904.1

Partial systems

- May be installed in locations by the applicant
- Could be basement-only systems to comply with Act 1 requirements for I-joist or open web truss floor systems
- The design and installation of the system must be in compliance with Section P2904 or NFPA 13D

Fire protection – exterior walls

IRC: R302.1

New

Minimum clearances from lot lines reduced from 5 feet to 3 feet for unrated walls when:

- Dwelling has a sprinkler system installed

Clearance to lot line for unrated walls reduced to 0 feet when

- Setback of adjoining dwelling is at least 6 feet **AND**
- All dwellings in subdivision have sprinkler systems installed

Fire resistant construction

IRC: R302.1

REVIEW

TABLE R302.1(1) EXTERIOR WALLS [no sprinklers]

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E 119 or UL 263 with exposure from both sides	< 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Fire-resistance rated	1 hour on the underside	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥5 feet
Openings in walls	Not allowed	N/A	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 5 feet
		None required	5 feet

Fire resistant construction

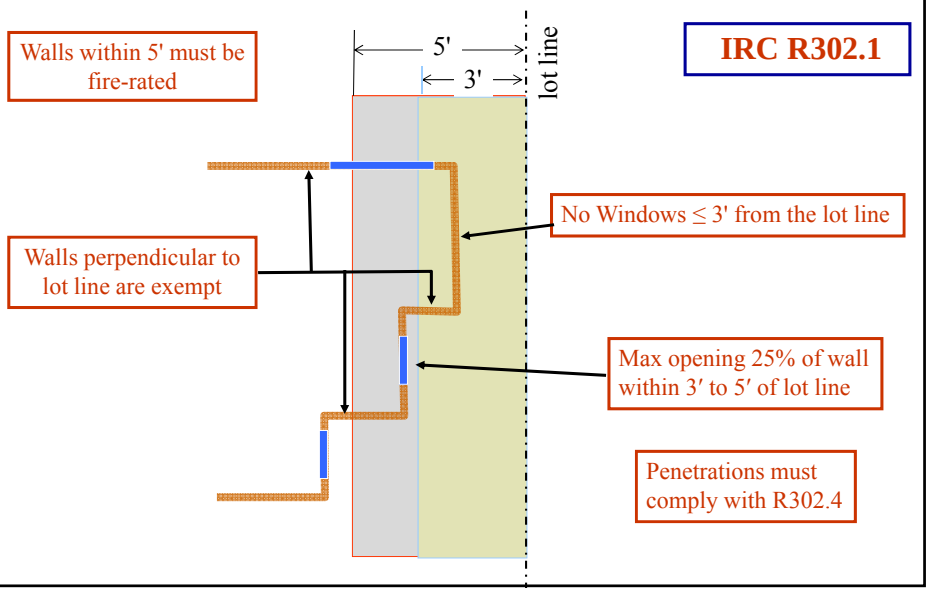
IRC: R302.1

New

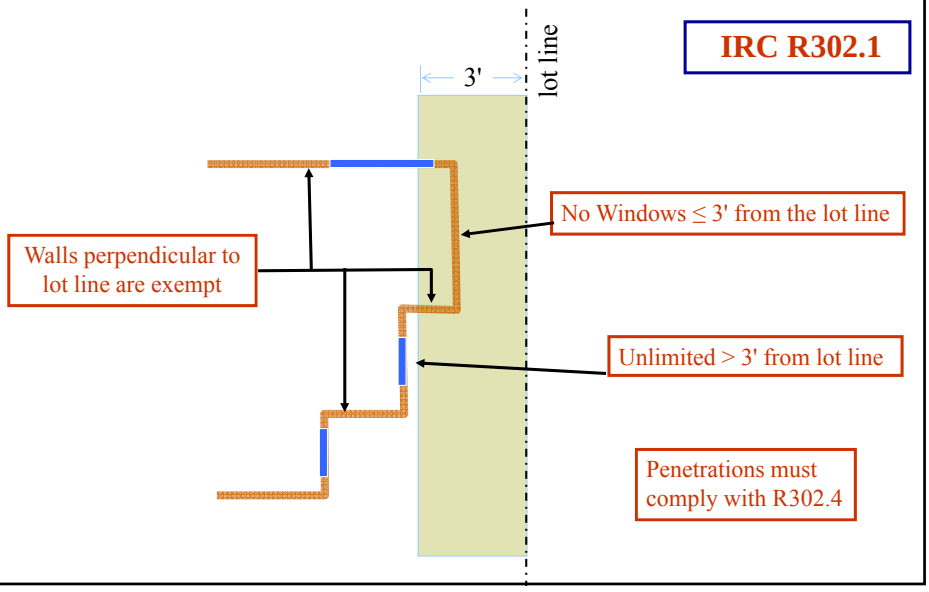
TABLE R302.1(2) EXTERIOR WALLS — DWELLINGS WITH FIRE SPRINKLERS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E 119 or UL 263 with exposure from the outside	0 feet
	Not fire-resistance rated	0 hours	3 feet[a]
Projections	Fire-resistance rated	1 hour on the underside	2 feet[a]
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not allowed	N/A	< 3 feet
	Unlimited	0 hours	3 feet[a]
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet[a]

Exterior walls – fire separation (no sprinklers)



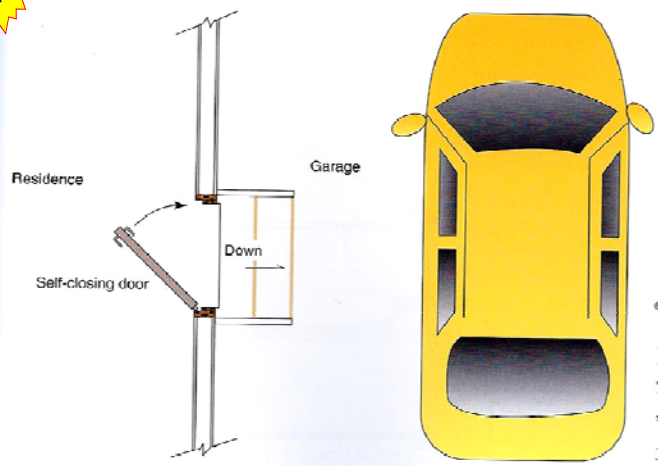
Exterior walls – fire separation (sprinklers)



Self-closing doors

IRC: R302.5.1

New



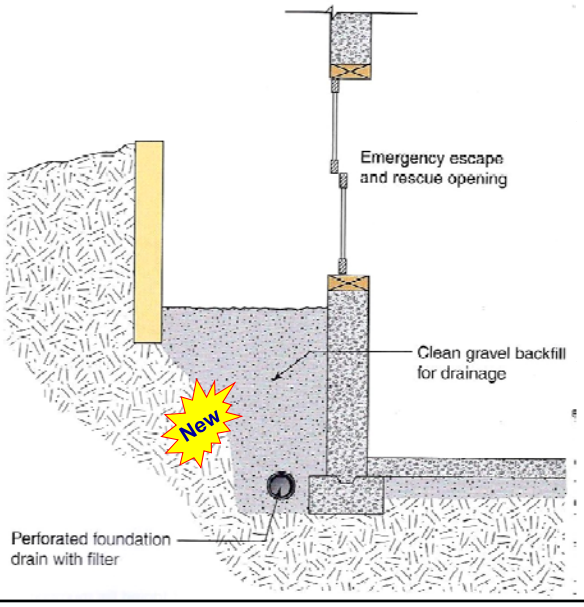
The door between a house and a garage is required to be self-closing.

Applies to all allowable doors between garage and house

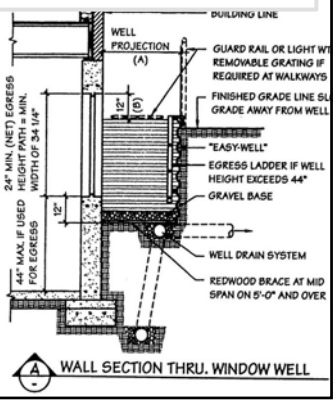
Not just 20-minute fire rated doors

Window well drainage

IRC: R310.2.2



Drainage system for window well must connect to footer drain system or an approved alternative method



ENERGY ISSUES

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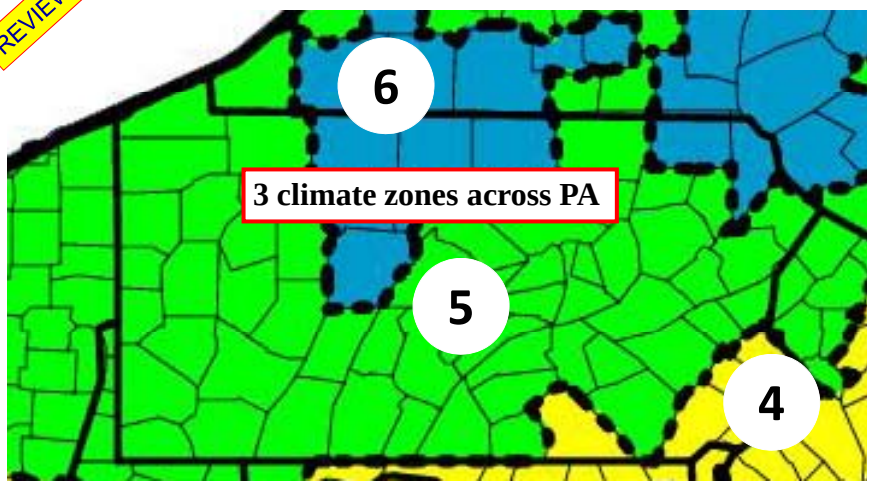
PA Climate Zones

H

REVIEW



No change

Envelope Changes - 2012

South – Zone 4[a]	2012	2009
	Zone 4	Zone 4
Wall (R-value)	20, 13+5[h]	R-13
Windows (U-factor)	0.35	0.35
Windows (SHGC)	0.40	NR
Skylights (U-factor)	0.55	0.60
Doors (U-factor)	0.35	0.35
Roof – open attic (R-value)	49	38/30
Roof – cathedral (R-value)	30	30
Floor (R-value)	19	19
Slab (R-value)	10@2ft	10@2ft
Basement wall (R-value)	10/13	10/13
Crawlspace wall (R-value)	10/13	10/13

Big change

Change

Envelope Changes - 2012

Central– Zone 5[a]	2012	2009
	Zone 5	Zone 5
Wall (R-value)	20, 13+5[h]	20, 13+5
Windows (U-factor)	0.32	0.35
Skylights (U-factor)	0.55	0.60
Doors (U-factor)	0.32	0.35
Roof – open attic (R-value)	49	38/30
Roof – cathedral (R-value)	30	30
Floor (R-value)	30	30
Slab (R-value)	10@2ft	10@2ft
Basement wall (R-value)	15/19 13+5	10/13
Crawlspace wall (R-value)	15/19 13+5	10/13

Big change

Change

Envelope Changes - 2012

North – Zone 6[a]	Zone 6 2012	Zone 6 2009
Wall (R-value)	20+ 5[h], 13+10[h]	20, 13+5
Windows (U-factor)	0.32	0.35[5]
Skylights (U-factor)	0.55	0.60
Doors (U-factor)	0.32	0.35
Roof – open attic (R-value)	49	49/38
Roof – cathedral (R-value)	30	30
Floor (R-value)	30	30
Slab (R-value)	10@4ft	10@4ft
Basement wall (R-value)	15/19 13+5	15/19 13+5
Crawlspace wall (R-value)	15/19 13+5	10/13

Big change

Change

Thermal Envelope Table Footnote Changes

a. When insulation is installed in a cavity which is less than the label or design thickness of the insulation,

the installed R-value shall not be less than the R-value requirement specified in the thermal envelope table

Meaning – the installed R-value of compressed insulation cannot be less than the minimum R-value required in the table

R-values: Exterior Walls

Material	R-Value /Inch	2x4 (3.5″)	2x6 (5.5″)
Fiberglass Batts	~3.2	13	17
Fiberglass HD Batts	~3.8	15	21
Cellulose wet spray	~3.8	15	20
Spray Foam – low density	3.5-3.8	13	20
Spray Foam – high density	6.0-7.0	21	33

Thermal Envelope Table Footnote Changes

h. If structural sheathing covers 40 percent or less of the exterior, continuous insulation R-value shall be permitted to be reduced by no more than R-3 in the locations where structural sheathing is used.

Practical application – A house is sheathed with a combination of foam sheathing (not over WSP sheathing) and WSP sheathing (for wall bracing purposes).

- The R-value of foam installed over structural sheathing may be reduced to R-2 where R-5 is required, and R-7 where R-10 is required.
- If WSP sheathing is used on >40% of the exterior, the full R-5 or R-10 must be used.

Building envelope air tightness

E402.4.1

Building envelope air tightness and insulation installation shall be demonstrated by ***both:***

- Blower door test
- Visual inspection

In 2009, either option was acceptable

Building official may require third party agency to conduct either blower door test, visual inspection or both

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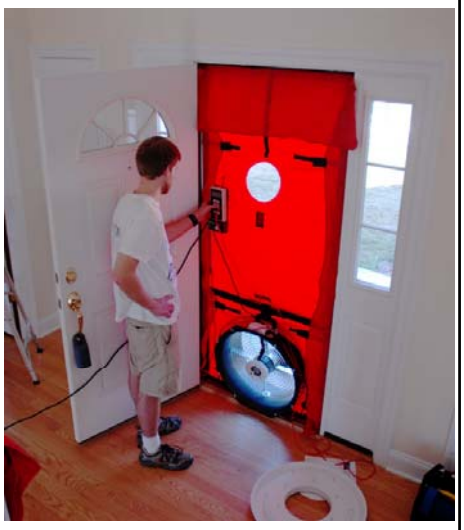
Blower door testing

Blower door test:

1. Pressurize house to 50 Pascals (0.2" w.g.)
2. Measure air flow (CFM) through fan with sensor on blower and digital manometer
3. Using volume of conditioned space, convert CFM to air changes per hour (ACH)



Blower door testing

Air tightness requirement:

Tested leakage must be **≤ 3 ACH** at 50 Pascals of pressure (ACH_{50}) (in climate zones 3-8)

None of these would have passed!

ACH_{50} of 12 PA Homes

Source: Energy Code Enforcement and Compliance in Pennsylvania, PHRC Research Report No. 106, July 2008

Blower door testing

E402.4.1.2

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

Testing may be performed at any point after creation of all penetrations in building thermal envelope.

Insulation & air barrier - changes

E402.4.1.1

COMPONENT	CRITERIA[a]
Air barrier and thermal barrier	**A continuous air barrier shall be installed in the building envelope.** **Exterior thermal envelope contains a continuous air barrier.** Breaks or joints in the air barrier shall be sealed. Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. **Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed.**
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. **The junction of the top plate and top of exterior walls shall be sealed.** **Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.** **Knee walls shall be sealed.**

Insulation & air barrier - changes

E402.4.1.1

Windows, skylights and doors	The space between window/door jambs and framing and **skylights and framing** shall be sealed.
Rim joists	Rim joists shall be insulated and include the air barrier.
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.

Insulation & air barrier - changes

E402.4.1.1

Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.
Narrow cavities	Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air tight, IC rated, and sealed to the drywall.
Plumbing and wiring	Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, **or insulation that on installation readily conforms to available space shall extend behind piping and wiring.**

Insulation & air barrier - changes

E402.4.1.1

Shower/tub on exterior wall	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating them from the showers and tubs.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air sealed boxes shall be installed.
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.
Fireplace	An air barrier shall be installed on fireplace walls. **Fireplaces shall have gasketed doors.**

a. In addition, inspection of log walls shall be in accordance with the provisions of ICC-400.

Duct sealing & testing

E403.2.2

Post-construction duct test:

Total leakage ≤ **4cfm** per 100 ft² of conditioned floor area (**12 cfm** in 2009)

Rough-in duct test:

Total leakage ≤ **4cfm** per 100 ft² of conditioned floor area (**6 cfm** in 2009)

≤ **3cfm** if air handler is not installed

Note: Leakage to outdoors option eliminated. Results in increased stringency for homes with small percentages of ducts located outside the thermal envelope.

Duct leakage testing

E403.2.2

1. Seal off supply registers and return grilles
2. Pressurize (or depressurize) ducts with variable-speed fan
3. Measure pressure and airflow
4. Airflow at test pressure provides leakage estimate

Building cavities used as ducts

E403.2.3

- Building framing cavities shall not be used as ducts or plenums
- In other words, hard-ducted returns are required.

Hot water pipe insulation

E403.4.2

Insulation for hot water pipe with a minimum thermal resistance (*R*-value) of R-3 shall be applied to the following:

1. Piping larger than $^{3}/_{4}$ inch nominal diameter.
2. Piping serving more than one dwelling unit.
3. Piping from the water heater to kitchen outlets.
4. Piping located outside the conditioned space.
5. Piping from the water heater to a distribution manifold.
6. Piping located under a floor slab.
7. Buried piping.

Hot water pipe insulation

E403.4.2

Insulation for hot water pipe with a minimum thermal resistance (R-value) of R-3 shall be applied to the following: (continued)

8. Supply and return piping in recirculation systems other than demand recirculation systems.
9. Piping with run lengths greater than the maximum run lengths for the nominal pipe diameter given in Table R403.4.2.

All remaining piping shall be insulated to at least R-3 or meet the run length requirements of Table R403.4.2.

Hot water pipe insulation

E403.4.2

TABLE R403.4.2 MAXIMUM RUN LENGTH (feet)[a]

Nominal Pipe Diameter of Largest Diameter Pipe in the Run (inch)	3/8	1/2	3/4	> 3/4
Maximum Run Length	30	20	10	5

High efficacy lighting

E404.1

A minimum of **75%** of the **lamps** (i.e. bulbs) in permanently installed fixtures shall be **high efficacy (50% in 2009)**

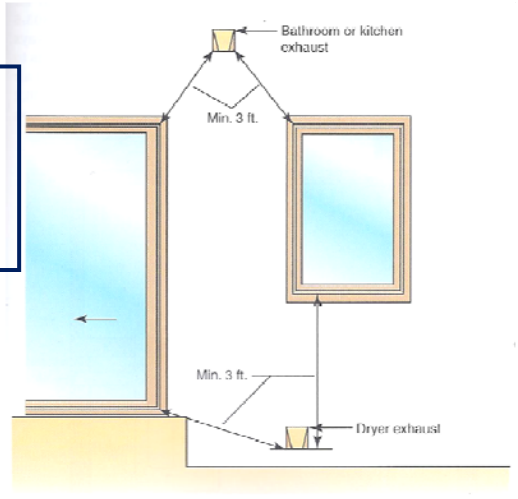
- 60 lumens per watt for lamps over 40 watts,
- 50 lumens per watt for lamps over 15 watts to 40 watts,
- 40 lumens per watt for lamps 15 watts or less.

Note: Includes exterior façade lighting, sheds, garages, etc.

Exhaust openings

IRC: M1506.2

3ft clearance from **non-operable** openings is the big change



Minimum clearance from exhaust openings

Dryer exhaust ducts

IRC: M1502.4.4.1

Maximum equivalent length now 35' for both gas and electric dryers– reductions for 45° and 90° elbows

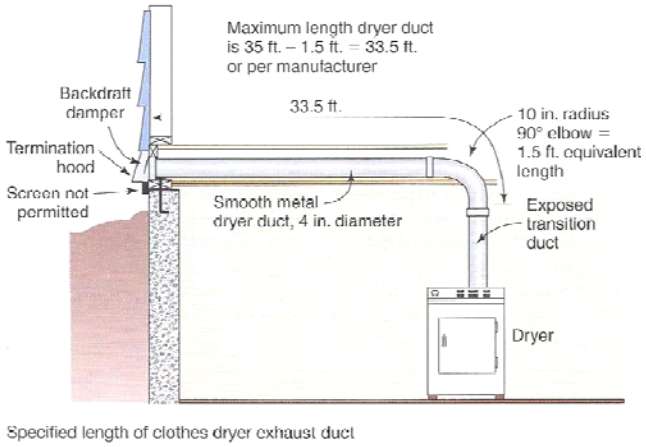
Maximum length does not include transition duct

See Table M1502.4.4.1 – on next slide

- Unless manufacturer installation instructions allow a longer length and make / model of dryer are known at time of inspection of exhaust system – MII must be provided to code official prior to concealment

Dryer exhaust ducts

IRC: M1502.4.4.1



Specified length of clothes dryer exhaust duct

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Whole house ventilation systems

- Whole house ventilation systems are required when:
  - Openable windows and doors do not provide the minimum amount of square footage required to provide sufficient natural ventilation, or

IRC: R303.1

  - A blower door test has been performed and the air infiltration rate is less than 5 ACH50
    - All homes in PA are required to have an ACH50 of less than 3

IRC: R303.4

Whole house ventilation systems

IRC: M1507.1

- A whole house ventilation system shall consist of one or more supply or exhaust fans and their associated ducts and controls.
- Local supply or exhaust fans are permitted to serve as such a system (meeting the requirements for the system).
- Outdoor air ducts connected to the return side of an air handler shall be considered to provide supply ventilation.
- The system shall be provided with manual override controls.

Whole house ventilation systems

IRC: M1507.1

- New definitions:

- **LOCAL EXHAUST** - An exhaust system that uses one or more fans to exhaust air from a specific room or rooms within a dwelling (kitchen, bathroom, etc.)

- **WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM** - An exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air for outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole-house ventilation rate.

Whole house ventilation systems

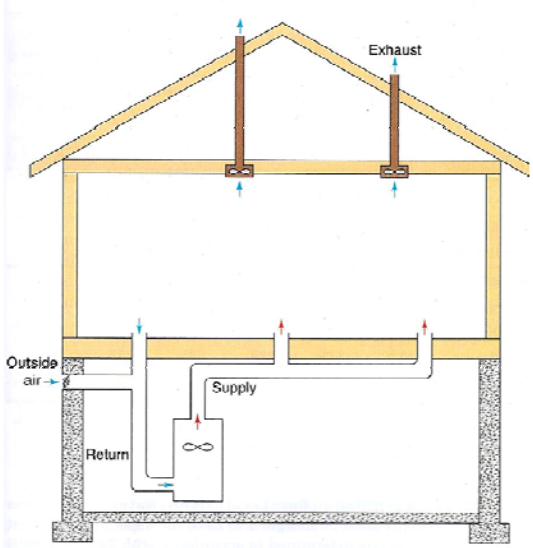
IRC: M1507.1

- Continuous supply of outdoor air shall be provided per Table M1507.3.3 (1) based on square footage and number of bedrooms, or

- Intermittent supply of outdoor air based on Table M1507.3.3 (2)

Whole house ventilation systems

IRC: M1507.1



Whole-house ventilation

Photovoltaic solar energy systems

IRC: M2301-2

Photovoltaic solar energy system

Photovoltaic solar energy systems

IRC: M2301-2

New

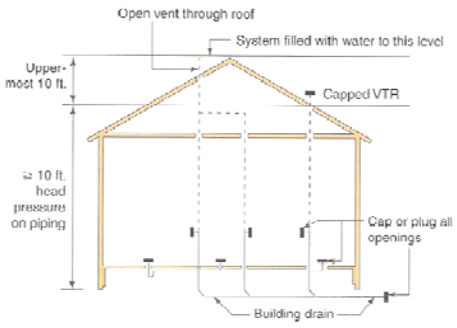
- Installation must comply with manufacturer's installation instructions, this chapter and NFPA 70 (NEC Article 690 – *Solar Photovoltaic Power Systems*)
- Roof-mounted
  - Roof must be designed to accommodate the load
  - Components must be non-combustible
  - Roof and wall penetrations must be flashed and sealed

Air test – plastic DWV systems

IRC: P2503.5.1

New

- No air tests allowed for plastic drain-waste-vent (DWV) systems
  - In some cases, poses risk for installers



Water test on plastic pipe DWV system.

Decks-Balconies-Porches Required Receptacles

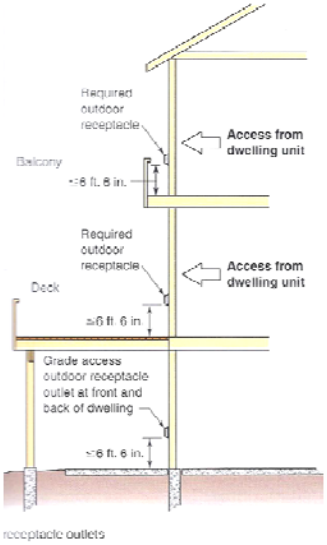
One outdoor receptacle required in perimeter of decks, balconies, porches [of any size]. Receptacle shall be located not > 6 ½' above walking surface.

- Attached to a dwelling and accessible from inside the dwelling
- ~~Exception: < 20 ft² of usable area~~

IRC: E3901.7

Decks-Balconies-Porches Required Receptacles

IRC: E3901.7



receptacle outlets

SUMMARY