Montana Department of
LABOR & INDUSTRY

2018 Building Code Adoption
Listening Sessions Summary

Produced by the Department of Labor and Industry
Business Standards Division
Building Codes Program

November 30, 2018

Steve Bullock, Governor **BUSINESS STANDARDS DIVISION** - Building Codes Bureau Galen Hollenbaugh, Commissioner

301 South Park P.O. Box 200517 Helena, MT 59620-0517 (406) 841-2056 FAX (406) 841-2050 buildingcodes@mt.gov BUILDINGCODES.MT.GOV

Montana Department of
LABOR & INDUSTRY

Date: November 30, 2018

To: Interested Parties of the State of Montana

From: Tim Lloyd, Bureau Chief
Building Codes Program
Department of Labor and Industry

Re: Summary of the 2018 I-Code "Listening Sessions"

Introduction:

Since 2010, the Department of Labor and Industry has re-dedicated itself to the process of inviting and including stakeholders and other interested parties to participate in the department's processes of crafting policy and procedures on a wide variety of issues, code development, and adoption practices. This emphasis in transparency and citizen engagement began back with the 2009 code cycle when the department launched a series of stakeholder meetings to evaluate and seek input on the 2009 International Residential Code.

In 2018 the department continued the process by holding additional "Listening Sessions" on topics vital to both industry stakeholders and the department. In February and Mach of 2018, the department held six introductory listening sessions on the topic of the adoption of the 2018 versions of the I-Codes, and potentially the adoption of the International Plumbing Code (IPC).

The department's responsibilities with regard to this process is to balance the regulations found in the state building code and rules with the needs of the construction industry and the public interest in efficiency, cost-effectiveness, and safety in order to arrive at a level of regulation for building codes that meets this balance. The department is ultimately attempting to determine if additional code adoption or administrative rule amendments is necessary to protect public safety and welfare. The adoption process has a variety of steps and many opportunities for the public and stakeholders to weigh in with both written submittals and in-person testimony at one or all of the numerous public hearing opportunities. See Appendix "A" for a graphic representation of the code adoption process the department follows.

This document is primarily a summary of the completed "Listening Session" meetings to date. It contains the public comments received by the department during and following the

"Listening Session" meetings. The summary should assist the department and the public in understanding the dynamic perspectives functioning in, and around, the built environment on this topic.

Purpose:

The purpose of the "Listening Session" meetings is to cultivate from the most stakeholders possible using a geographical cross-section of the State of Montana. The department wants to provide as much opportunity for stakeholders to make it to a meeting and express their opinions regarding the topic and to promote a free exchange of ideas and concerns. Transparency was a key element of this process and the department continues to seek methods and opportunities to be inclusive and open with this engagement process.

It is important to provide a local, familiar environment for stakeholders to meet and discuss their concerns with the State of Montana, Department of Labor and Industry, Building Codes Program, so a regional format was decided on. Obviously, it is not possible or practical to hold meetings in every city, county, or town so the department reviewed those areas with generally the most building activity and chose locations close to those centers of building activity.

Scope:

The Initial "Listening Session" meetings were held in the following locations on the dates indicated:

- **Helena – Monday, February 26, 2018 – MACO Building – 2715 Skyway, Helena – 8:30 am – 10:30 am**

- **Great Falls - Monday, February 26, 2018 – Great Falls MSU, B101 – 2100 16th Ave S, Great Falls – 2:00 pm – 4:00 pm**

- **Missoula – Tuesday, February 27, 2018 – Missoula Court House, Annex 115 – 200 West Broadway, Missoula – 10:00 am – 12:00 pm**

- **Kalispell – Wednesday, February 28, 2018 – Flathead Valley Community College, Room A & B – 777 Grandview Dr., Kalispell – 8:30 am – 10:30 am**

- **Bozeman – March 1, 2018 – Emerson Center, Weaver Room – 111 S Grand Ave, Bozeman – 10:00 am – 12:00 pm**

- **Billings – Friday, March 2, 2018 – Billings Library – 510 N 28th St, Billings – 8:30 am – 10:30 am**

All six sessions were moderated by Tim Lloyd, Bureau Chief Building Codes Program. A formatted script was followed so each location was exposed to the same general information.

Each meeting location had a variety of handout information, sign in sheets, agendas, and contact information for submitting written information to the department. This handout information was the same for each location. See Appendix "B" for this information.

At each location, notes were taken on each and every public comment received. Notes were not literal dictations but a synopsis of the points being made from the speaker. Some participants delivered written comments to the moderator. See Appendix "C" for written correspondence.

Summary (Location by Location)

Helena – 02/26/2018 – MACO Building – Start time 8:30 am

Number of Counted Participants: 16

Number of Public Comments Received: 30

Synopsis of Public Comments:

1. Why is the energy code not being included during these sessions?
2. Federal emergency management organization looking at mitigation for natural disasters. FEMA is declaring that agencies are not liable for emergency monies if they are not on the most current code. They have publicized these requirements.
3. Participant asked for clarification on the part of the book that referenced the sprinkler standards
4. Bozeman conference session is being looked forward to
5. Fire watch during non-working hours to protect neighboring structures – fire marshal can require this during construction for structures that are over 40 feet – question as to who would be responsible for that – general consensus that it would be the building owner's responsibility.
6. We would like to see the adoption of this appendix. Current our commission is interested. It would not be applicable at the state level, only at the local jurisdiction.
7. There is a lot of Radon in this area. It is okay for us to regulate that and I would not be opposed to that.

8. We would be opposed to adoption of this appendix.

9. DEQ has the authority currently to regulate radon. So we would have to figure out how to do this.

10. We encourage our members to do it anyway, but they are not making it mandatory.

11. We provides our members with info from DEQ. DEQ info is very similar to the appendix chapter.

12. We want residential sprinklers to stay out, and for 24.301.154 to remain as is.

13. Exception in the past for interconnected smoke alarms has been deleted – now they will all have to be interconnected. A lot of the newer smoke alarms are wireless anyway so there really is no need for this to be a exception any more.

14. Total adoption of the IRC would be in line with Chapter 50 title 60 – modern construction, uniform standards, reasonableness, not increasing construction costs, meet the needs of affordable housing, etc. 2018 codes vs the 2015 codes would allow for a decrease in house construction cost by $1200. 66% of the nation has adopted the entire IRC. IRC would be consistent with "commercial codes". 2015 codes had changes to alternative materials and design – if you meet with that code says, it shall be permitted. Section 104.11 requires that the AHJ provided something in writing that tells the builder how they missed the mark. 2018 has this as well – better due process and communication between the parties.

15. Accessibility – ready access to and access to is better defined. Chapter 3 of the IRC, code now requires local jurisdiction to provide the climatic issues that HVAC systems need to be designed to based on climate. Clarification on seismic requirements. Common wall exceptions and clarifications. This will allow for less construction costs. Emergency escape and rescue windows is clarified. Vertical rise from floor to floor has been increased and so an intermediate landing is no longer required. Deck guard rail changes that clarify when and where a guardrail is required. Clarification on habitable attic, so that is does not get labeled a story. Deck construction requirements in the 2018 have been reorganized for easier understanding. Girders on exterior walls has been readdressed to allow for a different type of wood. Air barriers for FBB chimneys has been addressed. High efficiency lighting has been addressed. Plumbers would strongly be opposed to adoption of the IRC in the entirely because it is a lesser way to build something.

16. We are very happy with the 2018 codes. Small committee has taken a look at the new codes and likes them. Vigorous debate on IPC vs UPC and we have decided to take no side.

17. We do not want to adopt parts of the IRC that relate to IPC or NEC. Everyone is licensed to, trained on, and used to the UPC. We are not sure that the savings will be passed on to the consumer - same as stated by the plumbers. We are against the IPC at this time.

18. We are here for a specific reason - what is best for Montana. There are disconnects when you have two developers of codes. Refrigeration is one example of lack of correlation. ICC codes require an explanation if the builder is told about a particular design. An argument was made as to why the IPC will "get you down the road" the same way as the UPC. IPC just gives you some alternatives to get there. Main Street Montana project which speaks to education and development of the workforce. Using the IPC is consistent with the Main Street Montana Project. Half our state amendments could be eliminated by going to the IPC. The fixture table could be eliminated. IPC is coordinated with the IBC and the IRC. Accessibility requirements are better defined with regard as to a toilet assembly. Some of the code requirements in the UPC have not be reevaluated or changed since the 1970's. ICC codes are available online for easy use. The same technics used under the UPC pass the IPC. The state can allow a phased adoption of the IPC which would allow the contractor to pick which one they want to use for a time. IPC is more of a cost-effective way to build a home, ICC does not dictate how the cost is passed on to the consumer. IPC would allow for more flexibility in the code.

19. We are the guys that are training the future work force. We feel that the IPC is lesser code. The training side of it would be a nightmare. There is no way they are going to understand two codes - that is crazy to me. We do not have the resources to try and back up and teach them a new code. Adoption of the IPC is going to be way to hard. All of the inspectors will need to be retrained.

20. We are strongly opposed to the IPC. Education requirements and process is very hard - it is tough. The inspectors do not know or understand the IPC and don't know how to handle systems built to the IPC. Cost savings is not going to be there. UPC is more technical and stringent, in my opinion. Venting is huge! It is important that that is there.

21. I am against adopting the IPC. The UPC is listed in statute and ARM. Expense for the change is a big problem. Professional level, I am totally against the change. We know our business like no one else - we want to ensure public health and safety. I want to stay with the UPC because it works.

22. Our forte is public health and safety. To suggest that we have been stuck in the muck of the past is an unfair assessment. We have been involved in many cutting-edge research and development. UPC allows for alternative methods and design as

well. There is no other same discipline that operates under two codes. We continue to grow with the times. We have continued to incorporate technological and innovative sections of the code.

23. It is okay to find an easy method as long as it does not compromise safety. The UPC has more detail than the IPC. To me is a Mercedes vs a Honda. It is a better built product. There is a vast difference. I am totally with the more restrictive code. The people who are out there now the code well, and administratively and logistically it would be a real mess to convert to the IPC. I do not see anything wrong with the current way we are doing things. There is way more info in the UPC on how to get to the safer product. I do not think we can be generic and stuff it all into one book. We want to pretty much stay the way we are.

24. Plumbing board is currently soliciting test vendors to test to the UPC. In that proposal we are looking for subject matter experts - switching mid gear would be another additional cost.

25. I strongly support the adoption of the 2017 NEC. It recognizes a lot of the new technology and additional safety measures. Provisions for more efficient and economical methods.

26. We agree with the adoption. An adoption in whole would be good for us.

27. I would concur that the 2017 should be considered for adoption in particular in a large part for the additional technology coverage. Having a code that can address the new technology means that is has been developed well enough to address these issues. The residential provisions of the NEC are in the IRC

28. I also concur as long as they are adopted at the same time.

29. We need an amendment for either the IPC or UPC with how we calculate fixtures on open decks. Dictates how many people can be in the pool vs. how many restrooms we need.

30. Our only concern is how to determine who is in the WUI and who is not. We would oppose the ability for the local jurisdictions to set the WUI.

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Great Falls – 02/26/2018 – Great Falls MSU, B101 – Start time 2:00 pm

Number of Counted Participants: 16

Number of Public Comments Received: 13

Synopsis of Public Comments:

1. Section 903.3.5 – we need an amendment of the water provisions as this has been an issue in Great Falls. We have observed a number of projects where they take advantage of the proximity of the city limits but do not annex. This section has been abused by developers and the department itself. Leaving structures with less than adequate protection. We would like to see this looked at – ARM speaks to reduced water supply. Buildings that are right across the street from the city limits are being permitting and approved by the department with inadequate water supply and protection.

2. NFPA 3000 will help address some of these issues. Right now, we are staying with the letter of the code. As long as the locks meet the code, we are fine with that. Improvised locking devises that have to have special tools are not allowed. Concerned about life safety and egress issues. Want to stay with the one motion unlocking of the doors. After market locking devices cannot be unlocked from outside. Code complaint locks allows for someone to be able to get in from the outside.

3. Who wants to adopt the IRC in its entirety? Most of the 10 western states adopt the codes like we do. Most of the other states adopt the entire IRC.

4. We would like to have Appendix Q in the IRC optional for adoption by the certified cities. As the times have changed, there has been a need to take another look at these issues. I would support have an option to adopt as these things make more sense inside of the cities.

5. As an architect it is hard for me to design inside of the city limits vs outside since the state does not look at Radon outside of the city limits. I would be in favor of addressing the issue.

6. Would the deletion of the residential fire sprinkler code section prevent a certified city from suggesting sprinklers if the street is narrow or other mitigating factors?

7. The ARM that contains modifications to the UPC fixture table needs to be worked on so that there is more clarification as to what is required.

8. I would be in favor of a method to more easily find what is the best code to use – UPC vs. IPC.
9. Is there ever going to be another push to not allow home owners to do their own plumbing without an inspection?
10. Why is the med case code not the most recent version?
11. I am in favor of the UPC. I believe it is and always has been superior.
12. As a licensed plumber, I would be opposed to any new code besides the UPC. It would take too much personal time to learn the new codes on our own. For that reason, I would be opposed to the adoption of the IPC.
13. A couple of plumbing contractors in my area are in favor of having at least the option to use the IPC.

Missoula – 02/27/2018 – Missoula County Court House, Annex 151 – Start time 10:00 am

Number of Counted Participants: 35

Number of Public Comments Received: 54

Synopsis of Public Comments:

1. It may be cheaper to put in a smaller sprinkler system with a reduced water supply rather than a larger system.
2. I want only one hand rail required in a stairwell on less than 44 inches. No egress windows in bedrooms in sprinklered structures above or below 4th floor. Space is too narrow with two handrails.
3. Additional required inspection for impervious moisture barriers on external balconies and walkways.
4. Fire watch during construction – Are you intending to delete the chapter with regard to building safety?
5. Participant provided an overview of the statue that requires us to be reasonable and less regulatory, and the main street Montana project. The code has a new section that you have to classify occupancy of outdoor spaces. New codes have made an attempt to better define green houses. New codes address owner occupied lodging house with 5 or fewer guest rooms can be built to the IRC. Lots of changes in

communication equipment and technology buildings – classified as U buildings. Assisted living structures have had a lot of growth lately. Code addresses multi use areas with regard to fire protection. Mezzanines and equipment platforms now have an increased area limit. New fire barrier/separation info to allow for compartmentalizing within a structure. New concept that came to light in the I-Codes – could not be done in the UBC. Clarification on fire partition continuity. Wall and ceiling finishes now names NFPA 286 as the primary test you test finishes to – trying to prevent rapid spread of fire.

6. Special inspection mentioned above is a special inspection and not part of the normal building inspections – it would be nice if it was part of the regular building inspections.

7. Increased paperwork necessary on a job list with regard to special inspections is a concern.

8. Who are the people interested in the IPC? Domestic hot water requirements amendments – will these stay the same? Amend section 609.11 – 609.11.2 suggestion. Possible adoption of the IPC – reciprocity issues – harder for plumbers to work in other states – state of Montana would have to change education and testing procedures. Trying to adapt current plumbing to the IPC would be a nightmare. Lots of issues with frost opening. Info was wrong on cost analysis of the IPC vs the UPC.

9. Isn't the purpose of all of the codes to protect the public? My comment is that people are taking a lot of this to the extreme and over complicating things. TMPN water heater over insulation seems to be a bit extreme and does not have the best interest of the contractors or homeowners in mind. People who design the codes are making it too complicated.

10. Wrapping stuff around some of the pipes to insulate them causes the product to fail.

11. Codes have recently drifted into public policy rather than life safety. It is coming from outside of people working in the industry.

12. The way that the IPC code is looked at is they are going to rely on a certain kind of vent that will fail. The hardest part it to accept the venting differences in the two codes. We all know how to vent a house and methods have been trained on and adhered to for a very long time. Concern is that the mechanical venting mechanism will fail.

13. I'm trying to do a good job for a customer, and when I read the plumbing codes and study pluming, I felt that I was actually protecting the health of the general public. I try to understand the purpose of the code and how it protects people. I am constantly questioning the code as to why I have to do something. Some of the codes now area just reflecting expense and costing people money without a good

reason. It just seems to me that some of the codes are being produced for political reasons. I would like someone to look into this.

14. The IPC does not keep up with the details of new products. Trap are lengths are to long and there are issues with that.

15. The current UPC has worked really well and the cost is good. I feel reluctant to change because it has proven to work really well and we are all reluctant to move to a new code. The code we currently have works really well.

16. It would be great if the state could have a listening session with all of the inspectors across the state.

17. As plumbers we have to be repairers for people. If we have someone remodeling a house that is old, that presents a bunch of problems and you cannot always meet the codes in an older building. There should be some provisions to cover that.

18. As plumbers we have to be trained, licensed, and we have to get permits. Ton of copper was dropped off and drain lines are being ran and they drill a hole in the stack. They are not inspected, and they do not need permits.

19. ICC Codes are correlated and work together. There is overlap and that makes things better. Research for the base of where all plumbing codes come from is based on an older model code.

20. Is this a new base code that can be modified to fit our area?

21. Some of our anxiety comes from the fact that we are so far behind in code adoptions.

22. You can't say that the IPC is better when we have not even adopted the 2018 codes.

23. What is the point in either code if you are just going to amend it anyway?

24. I think we all want to work together, but we need education and we need the state to help us out.

25. We used to adopt codes at a much faster pace and we should take advantage of new technologies.

26. Does not feel that the IPC code is very scientifically proven. When we have to fix something that does now work, ICC is not going to come and pay for the repair.

27. We are now looking at adopting two code books in one year. It is an awful lot of expense as a business owner to adopt codes every three years. It cost us a lot of money when the state gets behind.

28. Huge skip from 12 to 18 – it is just a huge jump and hard is hard for everyone.

29. If you are going to try to bring in a new code, I do not know if the state even has enough money to cover the cost of changing the test and education criteria. Without reciprocity, people are going to be losing their jobs.

30. Are we going to the IPC or not – are you just doing this to hear our "feelings" and then shove it down our throats?

31. Asbestos surveys for water heaters – only found in the back of some manufactures and the universities. Is that something that the state can change and get something from the manufactures?

32. So, you are telling me that if I have to replace a water heater in an 18 year old building, that I have to go and talk to someone else and not you?

33. More and more everyday, we have people getting away with illegal stuff. You are right, we do need another plumbing inspector. Everyone of you have the right to check to see if the person is licensed and if not, get their name and file a complaint with the board of plumbing. They can be taken to court and fined. Back and forth for a while about unlicensed practice.

34. Plumbing board does not want the code change. We feel it is the better code and it is what everyone is used to. It is just not going to work to change the codes right now.

35. We are educated in the UPC and we do not need a whole room full of people trying to learn new codes.

36. The UPC is up to date with technology.

37. Air gaps on kitchen sinks – I brought this up the last listening session. I would like the state to amend this. Residential dishwashers – get rid of them – amend them out. A lot of inspectors around the state are not enforcing these.

38. Solar chapter is a much-needed code in Montana. Going to a big change for the people in the solar industry.

39. Anchor bolt amendment – over specification and is no longer the case. Due to the 2018 code, that amendment is no longer needed.

40. Planning chapter of the IRC has taken drastic oversimplification and is not a good fit for Montana with regard to seismic. Soil classification has changed in the 2018 and that may not be a good idea for Montana. Use the NEHRP tables instead would be my recommendation.

41. We would like to voice our support of the adoption of the radon appendix. I believe that the DEQ is also on board for the adoption of this appendix chapter. The federal guidelines have now changes that regulation is now on the state or local jurisdictions. Missoula community has formed a coalition for radon and there is a lot of stakeholder support. We have looked at namely educational approaches and also at regulatory approaches. It is a little bit frustrating that none of the Missoula building officials are here to talk about this, but they are on the coalition.

42. Tiny homes appendix – what are the specifics? For a place like Missoula, it would be good idea.

43. I would like it if there is a monitored security/smoke detector system in a house you are allowed to use that in place of the IRC required smoke detector in that same location.

44. The 2018 IRC does not have the 2017 NEC in it?

45. I see confusion if we are still on the UPC and there is the IPC in the IRC.

46. The benefit is if a homeowner is building their own house, they are allowed to do everything. If they had one code they could by, at least they would have one code that they could follow. It would make more sense for a homeowner.

47. Adoption of the 2018 IEBC – adopt it again as an alternate – no reason anymore. It is not really an alternate to the IBC. Language reads that you must use the IEBC, so it is not really an alternate – amendment in ARM needs to be looked at.

48. Loading changes? Will that be applicable to existing buildings? Some of these buildings will never pass.

49. Electricians are overwhelming in favor of the adoption of the 2017 NEC.

50. The 2018 IFGC allows a schedule 10 pipe to be used for gas lines – cannot be threaded. No different from CSCT. Schedule 10 has more than enough integrity. And has now become an attractive option due to pro press fittings rather than threading them or welding them – I do not think it will be a problem.

51. If you look at installation manuals they have been changes from 12 inches to 10 inches.

52. Fall restraint kit on the roof vs guard rails? Code says you have to have a guardrail or an anchorage device – that would be nice. It came in in the 2015 code. What has been modified is what the prescriptive spacing is. They have taken out language to make it simpler.

53. Adoption of the Pool Code – Still deleting requirements for dwellings?

54. Adoption of the WUI – That would be a good one. With the fire season we had last year, we need to tell people that if you are going to build in the woods, this is what you need to do. I think we need to adopt something that tells people how to do fire mitigation.

Kalispell – 02/28/2018 – Flathead Valley Community College, Room A & B – Start time 8:30 am

Number of Counted Participants: 11

Number of Public Comments Received: 25

Synopsis of Public Comments:

1. Adoption of the 2018 IBC – I take issue with the 5 ft tall wood trusses requiring a special inspection. There are houses going up all day long with this. It has been previously suggested that this part get amended out.

2. Chapter 34 has been removed – a designer would do better using the IEBC.

3. Keep the school door locking mechanisms simple is my suggestion.

4. I will need to look at the elevator communication piece more closely. Sometimes there are limited phone lines in a building. What does the visual part look like on the back end?

5. Chapter 107 requirements for licensed architect – how do we adopt that through MCA or ARM? Definition of a public building has been an issue. The intent of the MCA is difficult to track. It is not difficult to justify and engineer in the code, but it is an architect.

6. Allow the certified cities to adopt the whole IRC.

7. One major obstacle for adoption of the entire code is the IPC is in there.

8. Electrical is almost exactly the same.

9. I noticed that the home builders association had a lot of comments about amending the IRC. Do not think they had good suggestions.

10. Appendix Q – Tiny Homes – well if they are putting them on wheels they are trailers not buildings. Put something in the appendix that they have to be on a permeant

foundation. Plumbing and electrical will probably have something to say about clearances and such.

11. Radon appendix – Radon is voluntary right now with the DEQ. Based on geographical area. You would just have to do it? There would be no exceptions? Department is looking at making the adoption of it optional for the certified cities. DEQ says you can't do it via MCA, even making it optional is something we do anyway. Should it be a building regulation?

12. Group R sprinkler systems – ARM will carry forward without substantial comments. Isn't there a licensing issue there – can the plumber install the suppression system?

13. Interconnected smoke alarms – exception has been deleted. Wireless alarms can be bought at home depot.

14. Habitable attic space definition has changed.

15. Cost of changing the code at this time is a big undertaking. We have the test set up for the UPC. Rules would have to be re written.

16. There is a lot of concern as to why would you want to dumb down a code. The I code is actually a lesser code that what we are in now. Why would we want to do that?

17. What is an example of a part that is dumbed down? Venting is the big one. It has worked on the east coast for a long time. I do not feel that a mechanical device for venting is wrong and is a bad idea. IAPMO list air admittance valve as a certain thing but does not really fully list them. They fail because they are a mechanical device – whereas open pipe does not fail. They do not limit their trap arm – they should be limited for hydraulic purposes. Non-limited trap arm and air admittance valves can cause very unsanitary situations. Jed – in my personal opinion the UPC is better for public safety and health. It would be chaos to adopt both codes at the same time.

18. Newer inspectors are being certified in the IPC and then going to get their UPC.

19. Participant is not aware of any special or different test for individuals with IPC certifications.

20. Issues with the insulation of domestic hot water lines voids the manufacture warranties if a certain tape is used. One needs to know up front what insulations and adhesives can be applied to the pipe. Spray foam is causing problems because the petroleum agent in the foam eats the pipes.

21. Urinal clean outs now required above the urinal – before it was just somewhere in the system.

22. Question as to the necessity of a clean out every 50 ft. Can we take another look at this ARM – code says it depends on the size of the pipe – suggest doing away with the ARM and just follow what the code says.

23. Adoption of the 2018 ISPSC - I think it is good to finally have some definitions on this item. I am getting slapped by the state health department. I think this is a good one. CTA said having the code is appreciated on their side.

24. Adoption of the WUI – What about residential?

25. Whitefish adopted the WUI. We have started with a lot education and maintenance with the fire departments and fire marshals, but it is difficult to get the homeowners to maintain their defensible space.

Bozeman – 03/01/2018 – Emerson Center, Weaver Room – Start time 10:00 am

Number of Counted Participants: 13

Number of Public Comments Received: 20

Synopsis of Public Comments:

1. We have had a number of multi residential buildings that have been going up – they are condominiums. Code requires handicap assessible units based on overall units in the building. This can be inconvenient for the contractors. The handicap people want units on the top floor or other units that were not accessible. We want to propose that R-2 occupancies be adaptable so that the handicapped person could pick and choose what they want.

2. As a plans examiner we go over 3 plexes all the way up to 32 plexes. Are the sprinkler requirements ARMs going to stay the same – yes, the current rule will remain. TO make it a clean and to the code, all R's get sprinklered. I would like the IRC to be not sprinkled and all units built to the IBC get sprinklered.

3. Building and pluming code – if we are going to go with what he said, I would like to see plumbers being able to install residential sprinklers.

4. As a fire suppression installer, I would not be in favor of a plumber installing the sprinkler system as there are special things to consider.

5. Chapter 34 has been deleted – have to use the IEBC or the IBC. I would think that as long that someone chose one or the other, there would not be an issue.

6. Required inspection for impervious moister barrier on external balconies and walkways and a special inspection for roof truss bracing. Impervious is a building department inspection.

7. Referenced standards for sprinklers will all be updated to the 2016 editions.

8. We would be in support of the full adoption of the IRC – the plumbing code would be an issue. We are all used to the UPC and it has worked well for all of us in the past. I have looked at both and do not see all that big of a difference.

9. I would be against adopting the whole IRC because of the plumbing code issue.

10. Appendix Q – tiny homes. We would be in support of the adoption of this appendix. There is not a lot of yes or now in the IRC regarding Tiny Homes. Having some guidance would help. I would take out alternating treads if you adopt it – those are killers. Something has got to hold it up and hold it down.

11. Radon Appendix – it could be helpful as a lot of people install them and right now no one looks at them. No one checks them for compliance. We have had complaints about systems being installed incorrectly. DEQ pointed us towards the EPA suggestions/requirements. We would be in support of it being optional. Another person was in support of it being optional.

12. What are the fundamental reasons for going to the IPC?

13. Plumber protect the health of the nation. We keep drinking water safe. No one protects the health better that a UPC p-trap. It is not worth making the change. I do not see a ton of difference for the IPC and the UPC on a day to day basis. One of the advantages I do see with the IPC is reciprocity with other states. I have a hard time finding staff to hire. Currently Montana has reciprocity with 5 touching states. Reciprocity would be another big deal with the Board of Plumbers with regard to current reciprocity. I just have a hard time with the public safety with regard to the IPC. I do not think that there will be much of a cost savings with the IPC. I have learned both the IPC and the UPC and there are not really any differences. I have worked in two different states that have made the change. I know people do not like change, but they have done it and it is working just fine. I think the UPC has just done a good job here in Montana. People can die of sewer gas. I would never want the state to change the Licensing laws with regard to plumbers.

14. I would say that if you take the IPC it is not as high of a level as the UPC. If we settle for the IPC, what is next? I do not think we should accept the IPC. I want to trust something that we know.

15. I do not like the change. I do not want to see it. Licensure is separate from the codes. If is hard for someone to get a license here, it is because they do not know

what they are doing. Supply houses should not be raising their prices, and we do not need to change the codes for that reason.

16. I am struggling with brining in apprentices, the younger generation does not want to do it. We are not getting enough licensed plumbers because there is just no interest in it.

17. The unions are managing to get some great qualified candidates.

18. I would be opposed to removing the 50ft cleanout amendment.

19. ARM language needs to be cleaned up with regard to ware washing sinks and the corresponding floor drain.

20. I feel that the IPC is an inferior code to the UPC and I do not want it.

21. I respectfully disagree with the ICC map of what states have adopted the IPC. I feel that the map is an incorrect representation. Participant presented an IAPMO map that was much different from the ICC map. I feel that the code adoption is closer to 50/50. Reaffirmed reciprocity would be jeopardized with our touching states. Adopting both codes would be chaos. UPC embraces new and innovative techniques. Air admittance valves are not allowed in the UPC because they fail. They fail all the time. Some AHJs can allow them. The IPC does not limit trap length and allows for larger pipe sizes - this creates an opportunity to blow the contents of one bowl into another adjoining one.

22. Chapter 5 of the UPC deals with venting of water heaters. Is there anyway an amendment can state that water heater venting in the IMC be directed to the UPC. Just looking for clarification here.

Billings – 03/02/2018 – Billings Library – Start time 8:30 am

Number of Counted Participants: 17

Number of Public Comments Received: 16

Synopsis of Public Comments:

1. What is your stand point in the sprinkler codes in the R's? That is an existing rule.
2. Deck construction - the 2012 had one method, 2015 changed a bit, and now we have the 2018. We have gone from light decks to medium decks to heavy decks. The provisions of the 2018 code would be applicable.

3. Architect would prefer to go to the entire IRC.

4. Radon Appendix F – DEQ is the agency that has statutory authority over radon. There are conflicting maps that list Yellowstone county at different levels. It is kind of a difficult thing to cover the entire county. There are spots where there is none and there is spots where it is heavy. I think it would be nice if the local jurisdictions could adopt the appendixes without the department having to adopt first.

5. Would the inspectors be required to retest to the IPC if the code changed?

6. I would like to state that the we would be totally against going to the IPC.

7. I am totally against going to the IPC as well, I do not think we should fix something that is not broken.

8. What is the transition time frame if we were to go to the IPC? There should be a little bit of a drag time to allow everyone to get back on board with the different code. That would be a pretty tall order I would imagine. If it would to go forward I would hope that it would incorporate some transition time.

9. It is a bloody nightmare to make the change to the IPC. There is too much in ARM and MCA to make the change.

10. Aside from the added cost to a training program, I do not see a benefit to switching to the IPC.

11. Chapter 5 of the UPC be used in place of the IMC with regard to replacing water heaters. I believe it is easier to understand.

12. Adoption of the 2018 IFGC – Schedule 10 steel pipe can now be used for gas lines. Cannot be threaded. As a plumber I am opposed to that idea.

13. Adoption of the 2018 Pool code – I think we should incorporate the residential portion. We have more residential pools here and it seems ridiculous to have a code that we cannot enforce on the most prevalent section.

14. We are in favor of the adoption of the 2017 NEC.

15. One section of the NEC that talks about the size of the equipment in the room determines the exit hardware. One part of the NEC addresses and architectural issue rather than an electrical issue – can we link these two somehow?

16. Added 691 – large solar systems provisions. I would like to see that section stay in there. I would agree with that. We are seeing a lot of unlicensed work going on.

Findings:

It is the findings of the department, based on both the preliminary comments received and the level of participation at all of the session locations, that additional collaboration should be undertaken on this topic. Additional collaboration sessions should also focus on specific sections of the 2018 versions of the I-Codes in order to provide an appropriate standard within the jurisdiction authority of the department and local certified governments.

Lastly, the department has received a request to proceed with the adoption process for the 2017 National Electrical Code (NEC) ahead of the rest of the other codes. The vast majority of stakeholders are in support of the adoption of the 2017 NEC and there does not appear to be any contentious issues. The department has decided to fulfill this request.

Montana Department of
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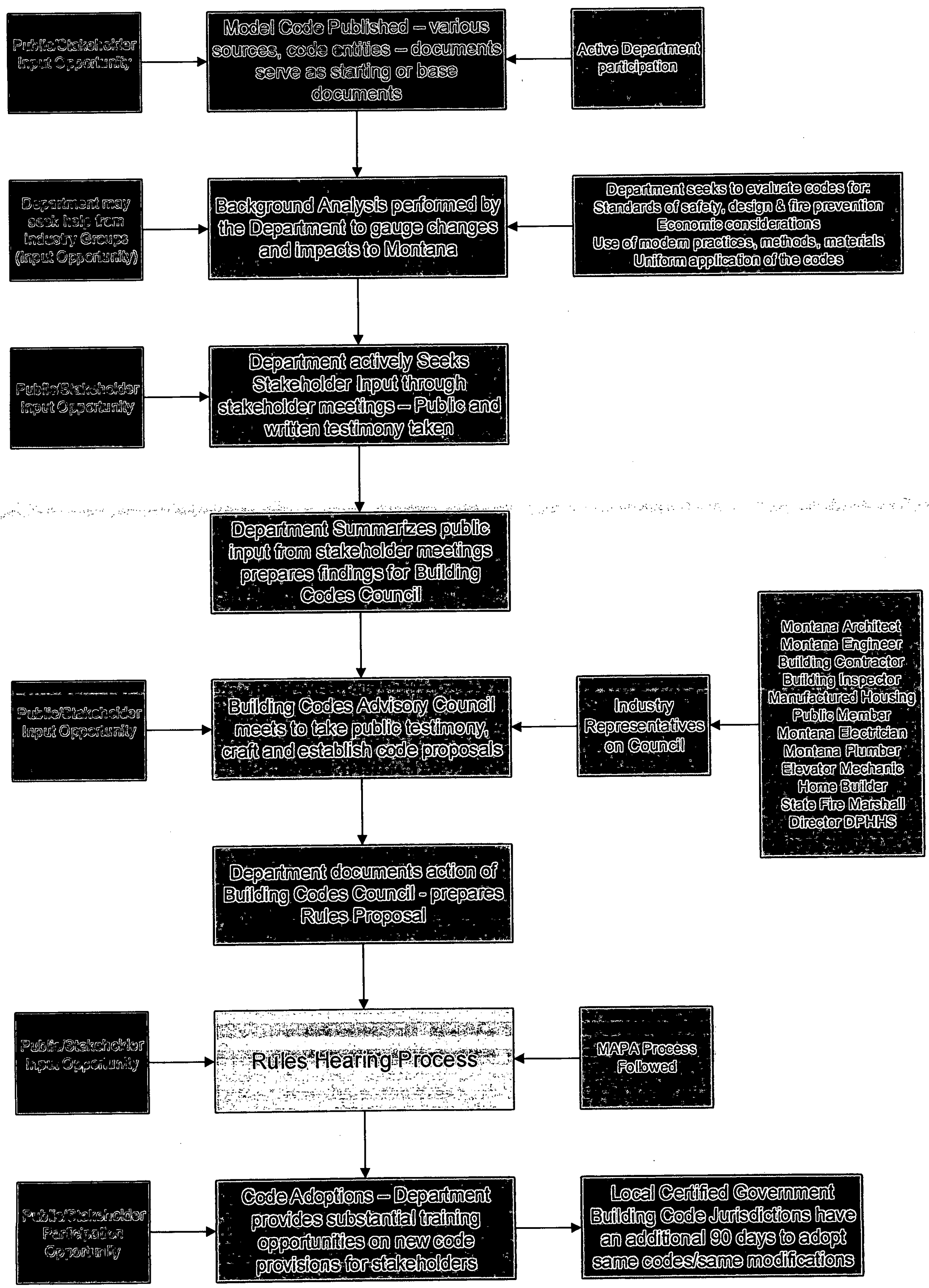
Appendix

"A"

CODE ADOPTION PROCESS IN MONTANA – AT A GLANCE



Montana Department of
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Appendix

"B"

2018 Montana Building Codes Listening Sessions

Monday, February 26th

Helena – 8:30a.m.
Montana Association of Counties – Basement Conference Room
2715 Skyway Drive
Helena, MT

Great Falls – 2:00p.m.
Great Falls College, Montana State University – Room B101
2100 16th Ave S
Great Falls, MT

Tuesday, February 27th

Missoula – 10:00a.m.
Missoula Court House Annex - Room 151
200 West Broadway
Missoula, MT

Wednesday, February 28th

Kalispell – 8:30a.m.
Flathead Valley Community College
Arts and Technology Building AT144 - Room A & B
777 Grandview Drive
Kalispell, MT

Thursday, March 1st

Bozeman – 10:00a.m.
Emerson Center - Weaver Room
111 S Grand Ave
Bozeman, MT

Friday, March 2nd

Billings – 8:30a.m.
Billings Library - Community Room
510 N Broadway
Billings, MT

Montana Department of
LABOR & INDUSTRY

2018 Code Adoption Listening Sessions

AGENDA

Welcome – Introductions

Review Sign-up Sheets, Materials, and Email Addresses

Review Purpose of Session

Review of Adoption Process

- Modifications to the Codes
- Stakeholder Input Opportunities
- Building Codes Council Process
- Administrative Rules Process

Overview of and Receive Public Input on the Codes or Alternatives

- International Building Code, 2018 Edition
- International Residential Code, 2018 Edition
- International Existing Building Code, 2018 Edition
- Uniform Plumbing Code, 2018 Edition
- International Mechanical Code, 2018 Edition
- International Fuel Gas Code, 2018 Edition
- National Electrical Code, 2017 Edition
- International Swimming Pool and Spa Code, 2018 Edition
- International Wildland Urban Interface Code, 2018 Edition

Other Public Comment

Adjourn

INTERNATIONAL BUILDING CODE

24.301.109 DEFINITIONS (1) As used in this chapter:
(a) "Department" means the Department of Labor and Industry.
(b) "IBC" means the International Building Code, ~~2012~~ 2018 edition.
(c) "IMC" means the International Mechanical Code, ~~2012~~ 2018 edition.
(d) "IFGC" means the International Fuel Gas Code, ~~2012~~ 2018 edition.
(History: 50-60-203, MCA; IMP, 50-60-203, MCA; NEW, 2010 MAR p. 1733, Eff. 7/30/10; AMD, 2014 MAR p. 2776, Eff. 11/7/14.)

24.301.131 INCORPORATION BY REFERENCE OF INTERNATIONAL BUILDING CODE (1) The department adopts and incorporates by reference the International Building Code, ~~2012~~ 2018 edition, unless another edition is specifically stated, together with Appendix Chapter C (Group U - Agricultural Buildings).

24.301.146 MODIFICATIONS TO THE INTERNATIONAL BUILDING CODE APPLICABLE TO BOTH THE DEPARTMENT'S AND LOCAL GOVERNMENT CODE ENFORCEMENT PROGRAMS (1) through (9) remain the same.

(10) Subsection 903.3.5, Inadequate Water Supply, is amended by addition of the following: "This subsection shall apply to buildings which are required by the International Building Code to be provided with an automatic fire extinguishing system and do not have access to an existing multiple user water supply system, such as a municipal water supply system or a private community water supply system, capable of providing the water supply requirements of National Fire Protection Association Standard for the Installation of Sprinkler Systems, ~~2010~~ 2016 edition (NFPA 13). Under such circumstances, water storage requirements may be modified by the building official. The modified design shall include sufficient storage onsite to operate the hydraulically remote area for the response time of the local fire department. Response time is the time from alarm to the time the fire department can apply water to the fire. Response time shall be established by the use of the formula T = 6.5 minutes (mobilization time) + 1.7 minutes/mile D (travel time), where T is response time, in minutes, and D is distance, in miles, from the fire station to the building. The modified water supply shall be sufficient to operate the system for the response time calculated above but not be less than 20 minutes. Water supply requirements shall be established by using the area/density method as defined in NFPA 13. A reduction in water storage of up to 50 percent, but not less than that required for a 20 minute supply is allowed. All automatic fire sprinkler system designs and components shall be in compliance with NFPA 13. When a modified water storage is allowed, the automatic fire sprinkler system must be equipped with a flow alarm, digital alarm communicator transmitter, and a fire department connection. The automatic fire sprinkler system shall be monitored by an approved central station in accordance with NFPA 72, National Fire Alarm Code, ~~2010~~ 2016 edition."

(11) The standards for fire-extinguishing systems and standpipe systems referenced in Chapter 9 of the International Building Code shall be the following unamended National Fire Protection Association (NFPA) Standards:

(a) Fire-extinguishing system.

(i) Installation of Sprinkler Systems: NFPA 13 Standard for the Installation of Sprinkler Systems, ~~2010~~ 2016 edition.

(ii) Installation of Sprinkler Systems in Group R Occupancies Four Stories or Less: NFPA 13R Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, ~~2010~~ 2016 edition. (b) Standpipe Systems: NFPA 14 Standard for the Installation of Standpipe and Hose Systems, ~~2010~~ 2016 edition.

(c) Notwithstanding any other provisions or references to the contrary within the NFPA standards, the authority having jurisdiction over any fire protection system required by the International Building Code shall be the building official.

(12) remains the same.

(13) Subsection ~~1018.1~~ 1020.1 is amended by addition of the following: "Upgrading of corridors in existing E occupancies serving an occupant load of 30 or more, may have walls and ceilings of not less than one-hour fire-resistive construction as required by this code. Existing walls surfaced with wood lathe and plaster in good condition or 1/2-inch gypsum wallboard or openings with fixed wired glass set in steel frames are permitted for corridor walls and ceilings and occupancy separations when approved. Doors opening into such corridors shall be protected by 20-minute fire assemblies or solid wood doors not less than 1 3/4 inches (45 mm) thick. Where the existing frame will not accommodate the 1 3/4-inch-thick door, a 1 3/8-inch-thick solid bonded wood-core door or equivalent insulated steel door shall be permitted. Doors shall be self-closing or automatic closing by smoke detection. Transoms and openings other than doors from corridors to rooms shall comply with this code or shall be covered with a minimum of 3/4-inch plywood or 1/2-inch gypsum wallboard or equivalent material on the room side. Exception: Existing corridor walls, ceilings, and opening protection not in compliance with the above may be continued when such buildings are protected with an approved automatic sprinkler system throughout. Such sprinkler system may be supplied from the domestic water system if it is of adequate volume and pressure."

(14) For "R" occupancies that are exempt from the requirements of a fire sprinkler system, pursuant to ARM 24.301.146(12), Table ~~1018.1~~ 1020.1, referenced in subsection ~~1018.1~~ 1020.1, shall be amended by the deletion of the language "Not Permitted" under the heading "Required Fire-Resistive Rating (hours) – Without sprinkler system" for "R" occupancies with an occupant load served by corridor of greater than ten. Under that same location where "Not Permitted" is to be deleted, the language "1" shall be inserted instead, which will require those corridors to have one-hour fire-resistive ratings.

(15) through (19) remain the same.

(20) Delete Section 3109 in its entirety and replace with the International Swimming Pool and Spa Code, ~~2015~~ 2018 edition as adopted in ARM 24.301.175.

(21) through (35) remain the same.

INTERNATIONAL RESIDENTIAL CODE

24.301.154 INCORPORATION BY REFERENCE OF INTERNATIONAL RESIDENTIAL CODE (1) remains the same.

(2) The Department of Labor and Industry adopts and incorporates by reference the International Residential Code, ~~2012~~ 2018 Edition, referred to as the International Residential Code or IRC.

(3) through (5) remain the same.

(6) Subsection 302.2, Townhouses, ~~delete~~ add ~~the~~ an exception ~~and replace with the following~~: "A common two-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263 is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts, or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be installed in accordance with the adopted electrical code. Penetrations of electrical outlet boxes shall be in accordance with Section R302.4."

(7) through (14) remain the same.

(15) Subsection ~~501.3~~ 302.13, Fire Protection of Floors, is deleted in its entirety.

(16) remains the same.

(17) Subsection ~~602.10.11~~ 602.10.10, Cripple Wall Bracing, ~~delete the last sentence and replace with the following~~ add the following sentence: "The distance between adjacent edges of braced wall panels shall be 20 feet."

(18) Subsection ~~703.8~~ 703.4, Flashing, delete the first paragraph in its entirety and replace with the following: "Flashing shall be provided in accordance with this section to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Flashing shall extend to the surface of the exterior wall finish or to the water resistive-barrier for drainage and shall be installed at all of the following locations:"

Further, delete Number "1", number "1.1", number "1.2", and number "1.3" in their entirety and replace with the following: "1. Exterior window and door openings." Number "2" through "7" remain unchanged in Subsection ~~R703.8~~ 703.4.

(19) Add new subsection as follows: "~~R703.8.1~~ 703.4.1, Flashing Materials. Approved flashing materials shall be corrosion-resistant. Self-adhered membranes used as flashing shall comply with AAMA 711. Pan Flashing shall comply with Section ~~R703.8.2~~ 703.4.2. Installation of flashing materials shall be in accordance with Section ~~703.8.3~~ 703.4.3.

(20) Add new subsection as follows: "~~R703.8.2~~ 703.4.2, Pan Flashing. Pan Flashing installed at the sill of exterior window and door openings shall comply with this section. Pan Flashing shall be corrosion-resistant and shall be permitted to be pre-manufactured, fabricated, formed, or applied at the job site. Self-adhered membranes complying with AAMA 711 shall be permitted to be used as Pan Flashing. Pan Flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage."

(21) Add new subsection as follows: "~~R703.8.3~~ 703.4.3, Flashing Installation. Installation of flashing materials shall be in accordance with one or more of the following methods:
1. The fenestration manufacturer's installation and flashing instructions.
2. The flashing manufacturer's installation instructions.
3. Flashing details approved by the Building Official.
4. As detailed by a Registered Design Professional."

(22) and (23) remain the same.

INTERNATIONAL EXISTING BUILDING CODE

24.301.171 INCORPORATION BY REFERENCE OF INTERNATIONAL EXISTING BUILDING CODE (1) The department adopts and incorporates by reference the International Existing Building Code (IEBC), ~~2012~~ 2018 edition, which may be used as an alternate prescriptive method(s) for the remodel, repair, alteration, change of occupancy, addition, and relocation of existing building.

(1) (a) through (4) remain the same.

UNIFORM PLUMBING CODE

24.301.301 INCORPORATION BY REFERENCE OF UNIFORM PLUMBING CODE (1) The department adopts and incorporates by reference the Uniform Plumbing Code, ~~2012~~ 2018 edition, unless another edition is specifically stated, together with the following appendix chapters and amendments:

(a) through (c) remains the same.

(d) Subsection ~~103.1.2~~ 103.3.1, is amended with the addition of the following language: The requirements for who must be licensed to perform plumbing work is regulated by Title 37, chapter 69, MCA.

(e) Subsections ~~102.3, 102.4, 102.5, 103.1, 103.2, 103.3, 103.4, 103.5, and 103.6~~ 104.1, 104.2, 104.3, 104.3.2, 104.4, 104.5, 105.0, 105.4, 106.1, 106.3, and 107.0 will be left as is for use by local governments (i.e., municipalities and counties), but will not be used by the department and the state of Montana. For the purposes of enforcement by the department, these subsections are replaced with provisions of Title 50, chapter 60, part 5, MCA.

(i) through (iv) remains the same.

(f) through (m) remains the same.

(o) Subsection ~~604.2~~ 604.3, the exception is amended to read as follows: Exception: Type M copper tubing may be used for water piping when piping is above ground in, or on, a building.

(p) Subsection ~~605.13.2~~ 605.12.2, Solvent Cement Joints, delete the third sentence and replace with the following: "Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, apply approved primer in accordance with ASTM F 656."

(q) Subsection ~~701.1~~ 701.2 is amended to read as follows: "Drainage piping shall be cast iron, galvanized steel, galvanized wrought iron, lead, copper, brass, Schedule 40 ABS DWV, Schedule 40 ABS DWV cellular core, Schedule 40 PVC DWV, Schedule 40 PVC DWV cellular core, extra strength vitrified clay pipe, or other approved materials having a smooth and uniform bore, except that:

"(1) Galvanized wrought iron or galvanized steel pipe shall not be used underground, and it shall be kept at least six inches (152 mm) above ground. "(2) ABS and PVC DWV piping installations must be installed in accordance with Chapter ~~15~~ 14,"Firestop Protection." Except for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed index of not more than 50, when tested in accordance with the Test for Surface-Burning Characteristics of the Building Materials (See the building code standards based on ASTM E-84 and ANSI/UL 723). "(3) Vitrified clay pipe and fittings shall not be used above ground or where pressurized by a pump or ejector. They shall be kept at least 12 inches (305 mm) below ground.

"(4) Copper tube for drainage and vent piping shall have a weight not less than that of copper drainage tube type DWV." (r) remains the same.

(s) Subsection ~~701.1 (4)~~ 701.2(4), is amended with the addition of the following language: Copper tube for underground drainage and vent piping shall have a weight of not less than that of copper tube type L.

(t) remains the same.

(u) Subsection ~~705.7.2~~ 705.6.2 Solvent Cement Joints, delete the third sentence and replace with the following: "Where surfaces to be joined are cleaned and free of dirt, moisture, oil, and other foreign material, apply approved primer in accordance with ASTM F 656." (v) through (y) remains the same.

(z) Subsection ~~807.4~~ 807.3 Domestic Dishwashing Machine, add exception as follows: "Exception #1: An approved type of indirect waste receptor may be used to receive discharge from domestic dishwashing machines." (aa) through (ah) remains the same.

(ai) Chapter 13, Health Care Facilities and Medical Gas and Vacuum Systems, is deleted except for subsections 1303.0, 1304.0, 1305.0, 1306.0, 1307.0, and 1308.0. In lieu of Chapter 13, except for the subsections not deleted, the Department of Labor and Industry adopts and incorporates by reference the National Fire Protection Association's Standard NFPA 99, ~~2012~~ 2015 edition, Chapters 1 through 5 for the exclusive use as a standard for medical gas and vacuum systems, unless a different edition date is specifically stated, as the standard for the installation of medical gas and vacuum systems. The requirements of this rule shall not be construed as to replace or supersede any additional requirements for testing and certification of medical gas and vacuum systems, including independent third party certification of systems, as may be applicable. NFPA 99 is a nationally recognized standard setting forth minimum standards and requirements for medical gas and vacuum systems. A copy of NFPA 99 may be obtained from the National Fire Protection Association, One Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

(2) remains the same.

INTERNATIONAL MECHANICAL CODE

24.301.172 INCORPORATION BY REFERENCE OF INTERNATIONAL MECHANICAL CODE (1) The department adopts and incorporates by reference the International Mechanical Code, ~~2012~~ 2018 edition, published by the International Code Council, unless another edition is specifically stated, together with the following amendments:

(1) (a) through (f) remain the same.

(g) Table ~~403.3~~ 403.3.1.1 is amended by the addition of a footnote "i". Footnote "i" is to be referenced in the table at, "Private Dwellings, Single and Multiple[i]". The footnote at the end of the table should be as follows: "i. Every dwelling unit shall have installed a minimum 100 CFM exhaust fan controlled by either an automatic timer or humidistat. Structures built to the provisions of the International Residential Code may provide mechanical ventilation per Section ~~M1507~~ M1505 of the International Residential Code." (2) through (6) remain the same.

INTERNATIONAL FUEL GAS CODE

24.301.173 INCORPORATION BY REFERENCE OF INTERNATIONAL FUEL GAS CODE (1) The department adopts and incorporates by reference the International Fuel Gas Code, ~~2012~~ 2018 edition, published by the International Code Council, IFGC, unless another edition is specifically stated, together with the following amendments:

(1) (a) through 6 remain the same.

NATIONAL ELECTRICAL CODE

24.301.401 INCORPORATION BY REFERENCE OF NATIONAL ELECTRICAL CODE (1) The department, by and through the Building Codes Bureau, adopts and incorporates by reference the National Fire Protection Association Standard NFPA 70, National Electrical Code, ~~2014~~ 2017 edition referred to as the National Electrical Code, unless another edition date is specifically stated. The National Electrical Code is a nationally recognized model code setting forth minimum standards and requirements for electrical installations. A copy of the National Electrical Code may be obtained from the Department of Labor and Industry, Building Codes Bureau, P.O. Box 200517, Helena, MT 59620-0517 or the National Fire Protection Association, One Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

INTERNATIONAL SWIMMING POOL AND SPA CODE

24.301.175 INCORPORATION BY REFERENCE OF INTERNATIONAL SWIMMING POOL AND SPA CODE (ISPSC) (1) The department adopts and incorporates by reference the International Swimming Pool and Spa Code, ~~2015~~ 2018 edition, published by the International Code Council, unless another edition is specifically stated, together with the following amendments:

(1) (a) through (6) remain the same.

INTERNATIONAL WILDLAND-URBAN INTERFACE CODE

24.301.181 INCORPORATION BY REFERENCE OF INTERNATIONAL WILDLAND-URBAN INTERFACE CODE (IWUIC) (1) The department adopts and incorporates by reference the International Wildland-Urban Interface Code, ~~2012~~ 2018 edition, published by the International Code Council, unless another edition is specifically stated, together with Appendix "B" (Vegetation Management Plan) and Appendix "C" (Fire Hazard Severity Form).

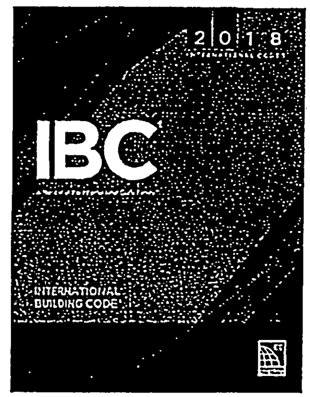
(2) through (10) remain the same.

(11) Subsection ~~109.4.4~~ 110.4.4, Citations, is deleted in its entirety.
(12) Subsection ~~109.4.5~~ 110.4.5, Unsafe Conditions, is deleted in its entirety.
(13) Subsection ~~109.4.5.1~~ 110.4.5.1, Record, is deleted in its entirety.
(14) Subsection ~~109.4.5.2~~ 110.4.5.2, Notice, is deleted in its entirety.
(15) Subsection ~~109.4.5.2.1~~ 110.4.5.2.1, Method of Service, is deleted in its entirety.
(16) Subsection ~~109.4.5.3~~ 110.4.5.3, Placarding, is deleted in its entirety.
(17) Subsection ~~109.4.5.3.1~~ 110.4.5.3.1, Placard Removal, is deleted in its entirety.
(18) Subsection ~~109.4.5.4~~ 110.4.5.4, Abatement, is deleted in its entirety.
(19) Subsection ~~109.4.5.5~~ 110.4.5.5, Summary Abatement, is deleted in its entirety.
(20) Subsection ~~109.4.5.6~~ 110.4.5.6, Evacuation, is deleted in its entirety.
(21) through (24) remain the same.

What's New in the 2018 I-Codes?

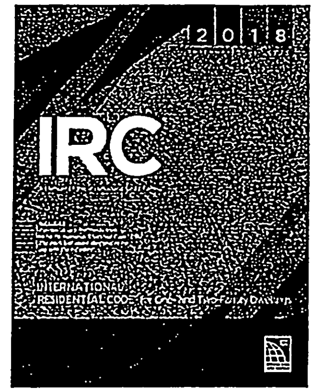
Key changes include:

2018 International Building Code® (IBC®)



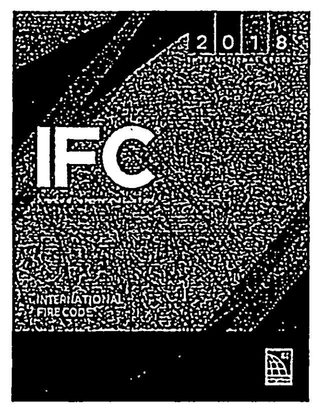
- Accessory storage spaces of any size are now permitted to be classified as part of the occupancy to which they are accessory.
- New code sections have been introduced addressing medical gas systems and higher education laboratories.
- Use of fire walls to create separate buildings is now limited to only the determination of permissible types of construction based on allowable building area and height.
- Where an elevator hoistway door opens into a fire-resistance-rated corridor, the opening must be protected in a manner to address smoke intrusion into the hoistway.
- The occupant load factor for business uses has been revised to one occupant per 150 square feet.
- Live loads on decks and balconies increase the deck live load to one and one-half times the live load of the area served.
- The minimum lateral load that fire walls are required to resist is five pounds per square foot.
- Wind speed maps updated, including maps for the state of Hawaii. Terminology describing wind speeds has changed again with ultimate design wind speeds now called basic design wind speeds.
- Site soil coefficients now correspond to the newest generation of ground motion attenuation equations (seismic values).
- Five-foot tall wood trusses requiring permanent bracing must have a periodic special inspection to verify that the required bracing has been installed.
- New alternative fastener schedule for construction of mechanically laminated decking is added giving equivalent power-driven fasteners for the 20-penny nail.
- Solid sawn lumber header and girder spans for the exterior bearing walls reduce span lengths to allow #2 Southern Pine design values.

2018 International Residential Code® for One- and Two-Family Dwellings (IRC®)



- An updated seismic map reflects the most conservative Seismic Design Category (SDC) based on any soil type and a new map reflects less conservative SDCs when Site Class A, B or D is applicable.
- The townhouse separation provisions now include options for using two separate fire-resistant-rated walls or a common wall.
- An emergency escape and rescue opening is no longer required in basement sleeping rooms where the dwelling has an automatic fire sprinkler system and the basement has a second means of egress or an emergency escape opening.
- The exemption for interconnection of smoke alarms in existing areas has been deleted.
- New girder/header tables have been revised to incorporate the use of #2 Southern Pine in lieu of #1 Southern Pine.
- New tables address alternative wood stud heights and the required number of full height studs in high wind areas.

2018 International Fire Code® (IFC®)

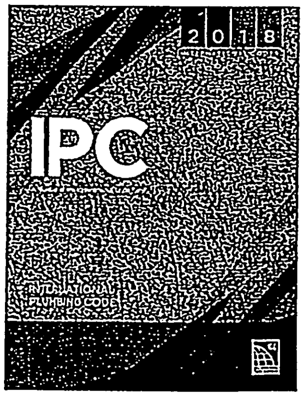


- New provisions address hazards related to outdoor pallet storage, higher education laboratories, mobile food trucks and plant processing and extraction activities.
- Mass Notification Requirements for college and university buildings have been added to the code.
- Sprinkler protection is now required in existing Group A-2 occupancies having an occupant load of 300 or more where alcoholic beverages are consumed.
- A new chapter has been added to address issues related to Energy Systems.
- Integrated testing requirements for fire protection and life safety systems have been added for high rise buildings and smoke control systems.
- The requirements for gas detection systems have been revised throughout the code to be more reflective of industry practice.
- Required sprinkler protection of Group E occupancies has been expanded through the introduction of a new thresholds related to fire areas.

- Manual fire alarm systems in Group A occupancies are now required not only when the occupant load is 300 or more but also where the occupant load exceeds 100 above or below the lowest level of exit discharge.
- A manual fire alarm system and an automatic smoke detection system are no longer required in Group R-4 occupancies.
- New provisions require illumination for the exit discharge path of travel to the public way or to a safe dispersal area for all occupancies.
- Provisions have been added to address the hazards associated with outdoor assembly events, indoor trade shows and exhibitions.
- The fire watch requirements for construction and demolition activities have been enhanced.
- The provisions for the maintenance of fire and smoke protection features in Chapter 7 have been enhanced and reorganized.
- The applicability of the decorative materials requirements in Chapter 8 have been clarified.

)18 International Plumbing Code® (IPC®)

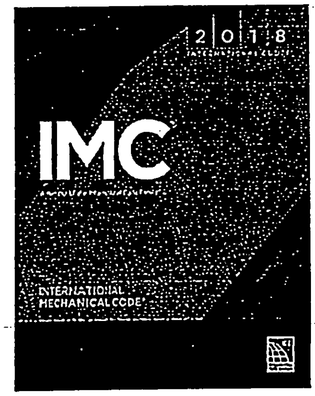
- Updated table for the Minimum Number of Required Plumbing Fixtures
- Single-user toilet facilities (a room having a single water closet and a single lavatory) are not required to be labeled for use by only a male or female (separated use designations).
- Solar thermal water heating systems need to conform to the ICC 900/SRCC 300 standard.
- Well systems are required to comply with standard NGWA-01 where local requirements do not cover subject matter or are lacking in detail on others.



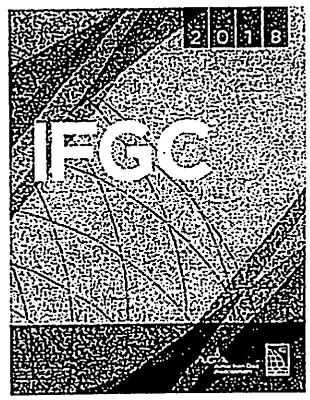
)18 International Mechanical Code® (IMC®)

- Added coverage of pollution control units.
- A new exception was added to recognize Type I kitchen hoods listed for clearances to combustibles of less than 18 inches.
- Added coverage for a newer type of non-metallic duct, phenolic duct.
- New coverage for high volume large diameter fans (HVLD), also referred to as high volume low speed (HVLS) fans.

- Relaxed requirements for sealing of duct joints and seams for Snap- and Button-lock duct joints located within the thermal envelope.

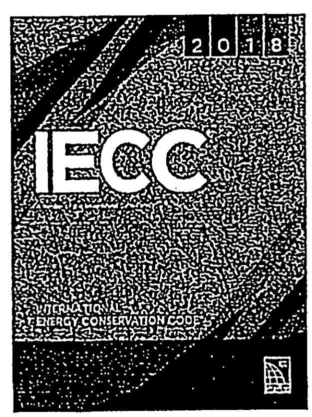


2018 International Fuel Gas Code® (IFGC®)



- A new Section was added to recognize arc-resistant CSST products.
- The code now allows Schedule 10 steel pipe to be used, whereas previously, Schedule 40 was the lightest steel pipe material allowed. Schedule 10 steel pipe joints are allowed to be welded, brazed, flanged or assembled with press-connect fittings. Schedule 10 pipe cannot be threaded.
- The code clarifies that appliance shutoff valves located behind movable appliances, such as ranges and clothes dryers, are considered to be provided with the required access.
- The code now calls for the plastic vent pipe material to be labeled as complying with the standards for the specific pipe material as called out by the manufacturer.
- The clearances between direct-vent appliance vent terminals and openings in the building exterior that could allow combustion products to enter the building have been revised.

2018 International Energy Conservation Code® (IECC®)



- Revisions to interior and exterior lighting power budgets and better clarity for lighting controls.
- Clarity that regardless of design methodology, system commissioning is required.
- New limits on heated or cooled vestibules.
- Mechanical provisions reorganized based on equipment type rather than design methodology.

- The maximum allowable fenestration *U*-factors in Table R402.1.2 (for the prescriptive compliance path) for climates zones 3 through 8 have been reduced from the values in the 2015 edition.
- The ICC/RESNET 380 standard has been included as one of standards that can be used for determining the air leakage rate of a building or dwelling unit.
- The Energy Rating Index compliance alternative index values have been increased slightly however, the method for determining an index is now required to be in accordance with standard ICC/RESNET 301.

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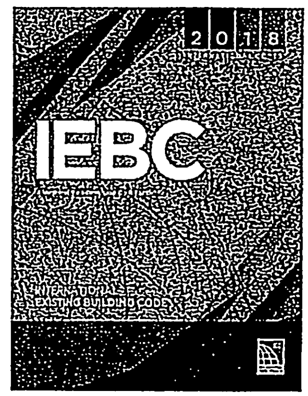
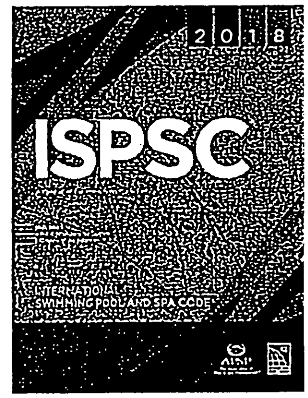
018 International Existing Building Code® (IEBC®)



- Section 410 Accessibility has been relocated to a new Section 305. Chapters 4, 5, 6, 13 and 14 have been relocated resulting in a reorganization and new chapter numbering.
- Requirements for live loads from Chapters 4 and 8 have been combined and placed in Chapter 3 to apply for all compliance methods.
- Structural components damaged by snow events must be repaired assuming snow loads for new buildings from the IBC.
- A new exception is added for loading of existing structural elements next to an addition in buildings designed using the IRC.
- When a work area includes more than half the building in an alteration, wall anchors must be installed at the roof line along reinforced concrete and masonry walls.
- Buildings undergoing a change of occupancy shall have live, snow, wind and seismic loads checked. Design loads are based on IBC-level forces.
- When a change of occupancy occurs placing a building in a higher risk category, the seismic loads on the building must be evaluated using IBC-level forces. Access to the building must be maintained when passing through or near other buildings and structures.
- Where storm shelters are required based on IBC and ICC 500 for Group E Occupancies, any addition to such existing occupancies where the occupant load of the addition is 50 or more will trigger the construction of a storm shelter.
- Carbon Monoxide provisions have been added in the Prescriptive Method Additions, Alterations Level 2 Additions, and in Additions for I-1, I-2, I-4 and R Occupancies.
- Emergency Escape and Rescue Opening provisions related to being operational have been added to Prescriptive Compliance Method and Alterations Level 1.
- Single exit buildings and spaces under Alteration Levels 2 and 3 have been modified to be more consistent with the IBC.

- The Alterations Level 2 requirement that water for automatic fire sprinkler system be available at the floor of alteration without the need for a fire pump has been moved to Chapter 9 for Alterations Level 3 and the fire pump criterion was deleted.

2018 International Swimming Pool and Spa Code® (ISPSC®)



- It was clarified that flotation tank systems for sensory deprivation therapy are not within the scope of the ISPSC.
- Hot water storage tanks are now required to be listed and labeled to a standard.
- New sections were introduced into the code to cover solar thermal water heating systems. Installation requirements refer to the IMC.

Montana Department of
LABOR & INDUSTRY

Appendix

"C"

Lloyd, Timothy

To: Tim Lloyd
Subject: FW: 2018 UPC
Attachments: UPC - code of choice....DOC

From: Jed Scheuermann <Jed.Scheuermann@iapmo.org>
Sent: Wednesday, November 29, 2017 7:38 AM
To: Lloyd, Timothy <tlloyd@mt.gov>
Subject: RE: 2018 UPC

Hi Tim,

Glad you received that jump drive and everything was there & functional! Attached above is a brief overview of why IAPMO's UPC is a superior choice of plumbing code. As soon as the dates, times & venues for all your upcoming "Listening Sessions" becomes available, would you kindly send it to me?

Pleased to help, do let me know if there's anything else...

jed

From: Lloyd, Timothy [mailto:tlloyd@mt.gov]
Sent: Monday, November 27, 2017 8:53 AM
To: Jed Scheuermann <Jed.Scheuermann@iapmo.org>
Subject: RE: 2018 UPC

Hi Jed,

I received the jump drive and was able to access the preprinted version of the UPC. Could you send me some documents supporting that the adoption of the UPC over the IPC? We are still researching how to proceed here in Montana and anything you can provide would be appreciated.

Thanks for your help.

Tim Lloyd
Bureau Chief
Building Codes/Weights and Measures
Business Standards Division
Montana Department of Labor and Industry
Phone (406) 841-2053
Email : tlloyd@mt.gov

Montana Department of
LABOR & INDUSTRY

IAPMO UNIFORM CODES – THE CODES OF CHOICE: UNIFORM PLUMBING CODE (UPC)

- **The Uniform Plumbing Code (UPC) is promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO) and has been continuously published since 1945.**
- **IAPMO is a model codes and standards organization, founded in the USA in 1926, was a founding member of the World Plumbing Council, and works with Cities, Counties, States and Nations in support of the UPC and other codes and standards.**
- **The UPC has served the industry longer than any other plumbing code in the USA.**
- **The Uniform Plumbing Code is adopted statewide or used as the basis for the plumbing code in twenty-one states. In addition, the UPC is predominately used where no state codes exist; the UPC is adopted in hundreds of jurisdictions in Texas, Kansas and Nebraska, Missouri and is utilized in twelve nations internationally.**
- **The UPC is an accredited American National Standard, the ONLY plumbing code so designated by the American National Standards Institute (ANSI).**
- **UPC is a true consensus document: as mandated by ANSI, expertise comes from all segments of industry, not just the regulators or a few segments, and everyone is assured of Due Process, Openness, Balance and a voice and vote in the UPC process**
- **UPC maintains the necessary balance between prescriptive requirements and allowable performance standards: it tells exactly how systems need to go together, it is easier to enforce as there are fewer areas for field interpretation often requiring more information than either the inspector or the contractor readily have at the time of inspection, while still allowing engineered design systems by Architects and the professional design community.**
- **The Uniform Plumbing Code is published utilizing the proven "turn-key" philosophy of IAPMO, placing as much of the necessary information on installations as possible in one codebook. The competition uses six books to perform the same functions at four times the cost.**
- **UPC maintains proven health and safety standards, while remaining current with technology, being cost effective, consistent and easy to use.**

Ph: 909.472.4100 • Fax: 909.472.4150 • www.iapmo.org

International Association of Plumbing and Mechanical Officials
5001 East Philadelphia Street • Ontario, California – USA 91761-2816

- **Support documents relating to the UPC include the following:**
  - **Uniform Plumbing Code Illustrated Training Manual:**
    Contains technical diagrams and illustrations that demonstrate the intent and use of the UPC. A great reference for everyone involved in Plumbing design and installation.
  - **Uniform Plumbing Code Study Guide:**
    The Study Guide is a complete self-study course for learning the UPC. A big help in getting ready for a certification exam! This book is the perfect complement to the UPC Illustrated Training Manual.
  - **Guide to Important Code Changes: The Important Code Changes Guide is a very useful tool in targeting the latest changes between editions of the code. It is an excellent guide for anyone proposing a UPC change.**

- **IAPMO provides code answers, analysis and interpretations free to anyone who requests them and has a toll free request line. The ICC provides them only to building official members.**
- **UPC follows a time-tested and proven mechanism for code harmonization with all codes utilized in the construction process from ICC, NFPA and others.**
- **IAPMO provides free codes and training to the State and Municipal Code Enforcement personnel who adopt the UPC for the first time, and makes similar training available to the industry.**

Lloyd, Timothy

From: Kraig Stevenson <KStevenson@iccsafe.org>
Sent: Tuesday, August 14, 2018 11:20 AM
To: Lloyd, Timothy
Cc: Baker, Carrie
Subject: MT 2018 Codes adoption testimony
Attachments: Montana 2018 Codes Adoption.ICC Testimony.pdf; Studor Cost Analysis of High-rise vent system 2012 JB Engineering consolidated report.pdf; AAV vs conventional vent cost saving study 6-8-11.pdf; Heriot_Watt_University_reportJan2007fromStudorwebsite.pdf; SFH_FHA_INFO_18-27.pdf; ufc_3_420_01 pg 1.6.7.pdf; Heat-loss-via-internal-drainage-vent-pipes-full.pdf

Mr. Lloyd:

Please include my attached letter and comments with supporting exhibits and source information into the Building Code Bureau's 2018 codes adoption records.

Thank you.

Kraig Stevenson, CBO
Senior Regional Manager Government Relations
International Code Council
12819 SE 38th # 381
Bellevue, WA 98006
kstevenson@iccsafe.org
888-422-7233 ext. 7603
562-201-9209 mobile

International Code Council
500 New Jersey Avenue, NW
Sixth Floor
Washington, DC 20001
t: 888.ICC.SAFE (422.7233)
t: 202.370.1800
f: 202.783.2348
www.iccsafe.org

August 11, 2018

Tim Lloyd, Bureau Chief
Montana Building Codes Bureau
301 South Park
PO Box 200513
Helena, MT 59620-0513

RE: Montana Code Adoption of 2018 Model Codes

Mr. Lloyd:

I am submitting the following comments/testimony to be entered into the records for the Montana 2018 Codes Adoption Process.

Respectfully,

Kraig Stevenson, CBO
Sr. Regional Manager
ICC Government Relations
12819 SE 38th St., # 381
Bellevue, WA 98006
kstevenson@iccsafe.org
562-201-9209 mobile

Adoption of the 2018 Codes and Comments Regarding Current ARM 24.301.301 and Draft Administrative Rule Package Preparation

(Cost-effective justification Exhibits)

- **Exhibit 1: IPS Corporation Cost Analysis of High-rise Vent System by JB Engineering**
- **Exhibit 2: Report on Vent Systems Cost Differences for AAV vs Conventional Venting Systems At Ford Field by Plumb-Tech Design & Consulting**
- **Exhibit 3: Building Drainage Waste and Vent System: Options for efficient pressure control by Heriot Watt University**

(Sources)

- **Source 1: The Economic Benefits of the International Plumbing Code National Focus by Alexander Quinn of Hatch Urban Solutions**
- **Source 2: Robert Payne 2003 Uniform Plumbing Code/2003 International Residential Code Plumbing Cost Comparison for Plumbing Installations (IAPMO)**
- **Source 3: (FHA INFO #18-27) Elimination of FHA Inspector Roster and Recognition of ICC Residential Combination Inspector Certification and Combination Inspector Certification**
- **Source 4: DOD UFC 3-420-01 US Dept. of Defense Unified Facilities Criteria Plumbing Systems**

Comments to the adoption of the 2018 IBC

(Comment 1) ARM 24.301.146(3): Retain section 101.4.3 of the 2018 IBC which names the "International Plumbing Code" and adopts it by reference.
Reason: The International Plumbing Code (IPC) is a companion document to the International Building Code these codes are part of the ICC Family of Codes which are specifically correlated to work as a set of model construction regulations to achieve the most cost-effective implementation of correlated requirements which will not cause code conflicts, duplication, unnecessary requirements, or conflicting requirements which can raise the cost of construction. The Montana Department of Labor and Industry can reduce the installed cost of plumbing systems saving up to 17% on materials and 54% on installation labor **(Exhibit 1)** by adopting the IPC. This is a benefit to the citizens of Montana and will improve the requirements for healthy, sanitary and safe plumbing systems allowing for more economical installations. Montana can become part of a trend and join with other states in adopting the IPC. Based on national historical rates of construction, builders would save $837 million in annual construction costs if the IPC were adopted universally across the nation in the states that currently adopt the UPC or a state developed plumbing code (**Source 1**). The saving by switching to the IPC would translate to $418 million in additional purchasing power in the national economy and add 2,600 new jobs per year (**Source 1**). Now (Refer to **Exhibit 2**), adopting the IPC aligns with the goals of the Main Street Montana Project Pillars # 1 and # 5. The IPC is the most widely adopted plumbing code across the nation and by being familiar with it will allow the Montana "Tomorrow's Workforce" to learn the most current plumbing technologies found in the IPC and as (Exhibit 3 illustrates) and have transportable trade skills useful to them anywhere they may choose to practice the plumbing trade. The IPC is adopted by the US

Department of Defense and is the federal regulations used at all US military installations (**Source 4**) including Malmstrom Air Force Base, Great Falls, MT. Adopting the IPC also aligns with Pillar # 5 by nurturing and emerging industry innovation. The IPC embraces the most current plumbing innovations and technologies, which on the average include plumbing innovations of up to 6 to 12 years before the UPC. To achieve the most technically sound, safe and up-to-date codes, the ICC code development process is the most rigorous, open and transparent development process out of all processes used to develop codes and standards. The ICC process requires code change proposals to document cost effectiveness and safety data. The IPC is the most widely adopted plumbing code across our nation. The IPC is adopted by 35 states the Department of Defense, (**Source 4**) other federal agencies and the US Territories. The IPC is the safest and most cost effective plumbing code. Lastly, adopting the IPC will reduce the amount of amendments the Department currently makes to the UPC through administrative rules.

(Comment 2) ARM 24.301.146(16): Replace by retaining IBC section 2902.1 for the minimum number of plumbing fixtures. Repeal ARM 24.301.351 and adopt IBC Table 2902.1 which is identical to IPC Table 403.1.
Reason: By adopting the IBC Table 2902.1/IPC Table 403.1 consistency between the building and plumbing codes is created and ARM 24.301.351 can be repealed because many of the amendments to ARM 24.301.351 are amendments to the UPC to bring it to the technical equal of the IBC and IPC requirements. Comments made by attendees at the February Listening Sessions held by the Department said, "why doesn't the ARM 24.301.351 have specific requirements for various occupancies for requirements for service sinks." Adopting the IPC with Table 403.1 will address this concern.

(Comment 3) ARM 24.301.146(18): Retain IBC section 2902.3 Employee and Public Toilet Facilities by repealing ARM 24.301.146(18).
Reason: Retaining IBC section 2902.3 maintains consistency between the building and plumbing code and with the requirements for accessibility to toilet facilities. Retaining this section of the IBC will help facilitate accessibility for all and will align consistently with the ANSI A117.1 standard for accessibility.

<u>Comments to the adoption of the 2018 IRC</u>

<u>(Comment 1)</u> ARM 24.301.154(3) Repeal and replace with adoption of IRC chapters 1-11, and 13 through 41 to include provisions for energy, mechanical, plumbing and electrical.
Reason: See (**Source 3**) FHA INFO #18-27. FHA approved mortgages now recognize the ICC Residential Combination Inspector Certification (RCI) and the Combination Inspector (CI) Certification as the credential meeting the new HUD criteria of credentialing required to demonstrate that residential construction both new and refurbished is constructed to the standards as set by the HUD regulations. If all parts of the IRC are adopted by the state this will help to facilitate more local inspectors to acquire the certification category and reduce the duplicity of inspections and costs associated with hiring third party RCI or CI certified inspectors necessary to meet the HUD requirements. Action to fully adopt all parts of the IRC will help to lower the costs associated with gaining an approved HUD mortgage. If a jurisdiction has ICC certified combination inspectors (CI) or residential combination inspectors (RCI) hiring a third party inspector meeting the HUD/FHA regulations will be unnecessary. Adopting the IRC essentially in its entirety will provide the most cost-effective set of requirements for building dwellings

covered by the scope of the IRC. The majority of states across our nation adopt more of the IRC than just chapters 1 through 10. Recent national statistics show the housing costs across Montana as being higher than the national average. Adopting the IRC essentially in its entirety will help deliver more affordable housing to Montanans. This is consistent with the goals of the "Main Street Montana Project" and will aid economic growth and success for Montana. The International Association of Plumbing and Mechanical Officials (IAPMO) which publishes the UPC, issued a report in 2003 (**Source 2**) that found that a single family home constructed to the IRC plumbing requirements or the IPC uses, on average 57 feet less pipe than one constructed to the UPC. Chapter 11 of the IRC is an identical extract from the IECC residential requirements so any amendment made to Montana's adopted IECC residential provisions should be made to chapter 11 of the IRC. This adds value for Montana home builders as they will not need to purchase a separate IECC code document builders will have the energy code requirements in Chapter 11 of the IRC. Chapters 13 through 41 will correlate with the IMC, IFGC, IPC and the NEC as adopted by Montana. The NFPA works with the ICC and provides the electrical code content for chapters 34 through 43 of the IRC making it technically equal to the model NEC as adopted by Montana, and will be consistent with the HUD/FHA requirements for inspection of homes by ICC Residential Combination Inspectors (RCI) or ICC Combination Inspectors (CI). The IRC will be the only code book a home builder will need to use to construct the safest and most cost-effective home in Montana.

Comments to the adoption of the 2018 UPC

(Comment 1) ARM 24.301.301(1) Repeal adoption of the Uniform Plumbing Code and replace with the adoption of the 2018 International Plumbing Code, together with the following IPC chapters and appendix chapters appendix B rates of rainfall for various cities, appendix C structural safety, and appendix E sizing of water piping systems.

ARM 24.301.301(1)(a) Replace UPC appendix A with IPC appendix E sizing of water piping system. (note: IPC Section 604.1 requires the design of water distribution systems conform to accepted engineering practice. Methods utilized to determine pipe sizes shall be approved.) The method noted in appendix A is just one accepted engineering practice.

ARM 24.301.301(1)(b) Replace UPC appendix B with IPC section 915 for combination waste and vent system. Appendix B explanatory notes not needed with the use of the IPC.

ARM 24.301.301(1)(c) Replace UPC appendix D with IPC chapter 11, section 1106 for size of conductors, leaders and storm drains.

ARM 24.301.301(1)(d) Repeal UPC subsection 103.3.1 and retain the amendment "The requirements for who must be licensed to perform plumbing work is regulated by Title 37, chapter 69, MCA.

Reason: Adopting the International Plumbing Code will reduce the amendments found in ARM 24.301.301 and ARM 24.301.351. This will create more consistency with the set of codes adopted by the Department. Adopting the IPC will reduce the number of ARM amendments.

(Comment 2) ARM 24.301.301(1)(e). Repeal the rule and repeal UPC subsections 102.3, 102.4, 102.5, 103.1, 103.2, 103.3, 103.4, 103.5, and 103.6, and replace with IPC subsections 102.3, 102.4, 102.9, 103.4, 104, 104.2, 104.3, 104.4, and 108.7.3, respectively. Adopting the IPC will eliminate the need for the rule. These are being left as to be used by local government (i.e. municipalities and counties), but will not be used by the department and the state of Montana for the purpose of enforcement.

(Comment 3) ARM 24.301.301(1)(e)(i) through 24.301.301(1)(e)(iv). Retain the current rule.

(Comment 4) ARM 24.301.301(f). Retain the current rule.

(Comment 5) ARM 24.301.301(1)(g). Retain the current rule.

(Comment 6) ARM 24.301.301(1)(h). Repeal the rule and repeal UPC Table 422.1 and adopt IPC Table 403.1 for minimum plumbing facilities and adopt IPC Table 403.1 as ARM 24.301.351. Adopting the IPC will eliminate the need for the rule.

(Comment 7) ARM 24.301(1)(i). Repeal the rule and repeal UPC section 507.13 and adopt IPC section 502.1. This will create consistency with the installation requirements for installation of water heaters and equipment and the requirements as adopted by the Department in the International Mechanical Code and the International Fuel Gas Code. The consistency created by adopting the IPC will reduce code conflicts caused by adopting codes from different code developers. Adopting the IPC will eliminate the need for the rule.

(Comment 8) ARM 24.301.301(1)(j) through ARM 24.301.301(1)(l). Repeal the rule and repeal the UPC adoption and adopt IPC section 608 and IPC Table 608.1 for the protection of potable water supply. Adopting the IPC will eliminate the need for the rule.

(Comment 9) ARM 24.301.301(1)(m). Repeal the rule and repeal UPC section 603.5.12 and adopt IPC section 608.17.1. Adopting the IPC will eliminate the need for the rule.

(Comment 10) ARM 24.301.301(1)(n). Repeal the rule and repeal the UPC section 604.0 and adopt IPC section 605.3. Adopting the IPC will eliminate the need for the rule.

(Comment 11) ARM 24.301.301(1)(p). Repeal the rule and repeal UPC section 605.13.2 and adopt IPC section 605.21.3 along with the reference standards noted in the section, this will eliminate the need for the rule.

(Comment 12) ARM 24.301.301(1)(q). Repeal the rule and repeal UPC section 701.1 and adopt IPC sections 702.1 and 702.2. The material and standards listed in this easy to read table format makes it easier on the user and the designer. Adopting the IPC will eliminate the need for the rule.

(Comment 13) ARM 24.301.301(1)(u). Repeal the rule and repeal UPC 705.7.2 and adopt IPC section 705.10.2. Adopting the IPC will eliminate the need for the rule.

(Comment 14) ARM 24.301.301(1)(x). Repeal the rule and repeal UPC section 710.1 and adopt IPC section 714. Adopting the IPC will eliminate the need for the rule.

(Comment 15) ARM 24.301.301(1)(y). Repeal the rule and repeal UPC section 718.1 and adopt IPC section 710.1 and IPC Table 710.1(1). Adopting the IPC will eliminate the need for the rule.

(Comment 16) ARM 24.301.301(1)(z). Repeal UPC section 807.4 and adopt IPC section 409 and amend if necessary.

(Comment 17) ARM 24.301.301(1)(ad). Repeal the rule and repeal UPC section 906.7 and adopt IPC section 903.2. Adopting the IPC will eliminate the need for the rule.

(Comment 18) ARM 24.301.301(1)(ae). Repeal the rule and repeal UPC section 908.1 and adopt IPC section 912. Adopting the IPC will eliminate the need for the rule.

(Comment 19) ARM 24.301.301(1)(af) and ARM 24.301.301(1)(ag). Repeal the rules and repeal UPC sections 908.1 and 908.1.1 and adopt IPC section 912. Adopting the IPC will eliminate the need for the rule.

(Comment 20) ARM 24,301.301(1)(ah). Repeal the rule, it is not needed because the IFGC is adopted by the department and IPC section 502.1 coordinates the requirements of the IFGC with the IPC.

(Comment 21) ARM 24.301.301(1)(ai). Repeal the rule, it is not needed because the IPC directs the user to use NFPA 99 for medical gas installation. Adopting the IPC will eliminate the need for the rule.

(Comment 22) ARM 24.301.301(2). Repeal the rule and revise the rule by adopting IPC sections 101.2 and 101.3 which describes the scope and intent of the code. Revise the rule to include how to obtain a copy of the International Plumbing Code. A copy of the International Plumbing Code can be obtained by writing to the international Code Council 4051 Flossmoor Road, Country Club Hills, IL 60478 or directly from the ICC website https://www.iccsafe.org The International Plumbing Code can also be viewed at the International Code Council's public collections website https://codes.iccsafe.org/public/collections/i-codes

CONSOLIDATION
– Engineering Report –
Cost Analysis of High-rise Vent System

Client:

IPS Corporation
500 Distribution Parkway
Collierville, TN 38017
USA

Prepared by:

Julius Ballanco, P.E., CPD, FASPE - President
JB Engineering and Code Consulting, P.C.
1661 Cardinal Drive
Munster, IN 46321
USA

Purpose:

JB Engineering and Code Consulting, P.C. was requested to prepare two comparative cost analyses of a vent system in a high-rise building. The high-rise building selected for analysis is a 10 story residential building with 45 units.

This summary report consolidates the results of the two comparative cost analyses:

1. ***Report number 12S0211E1, dated 11 February 2012***: Comparing a vent system not using Air Admittance Valves (AAVs) versus a vent system using AAVs.
2. ***Report number 12S0327E1, dated 27 March 2012***: Comparing a vent system not using AAVs and P.A.P.A.s (Positive Air Pressure Attenuators) versus a vent system using AAVs and P.A.P.A.s.

Abstract:

The ICC International Plumbing Code permits many venting systems for protecting the trap seal and maintaining a balance of pressure in the drainage system. The types of venting systems include: individual venting, common venting, wet venting, circuit venting, waste stack venting and engineered vent systems. The International Plumbing Code also permits the use of AAVs. P.A.P.A.s are permitted by the International Plumbing Code as part of an engineered vent system.

When air admittance vales are used, a minimum of one vent must extend to the outdoors for a plumbing drainage system. Individual and branch type AAVs are permitted to be used on individual floors as a terminus for any vent. When the drainage system is more than 4 branch intervals in height, a relief vent is required on the branch connection between the fixtures vented with an AAV and the drainage stack, or a P.A.P.A. must be installed on the stack with an AAV installed at the top of the stack. One P.A.P.A. is required t the base of a stack for a 10 story building.

For stack applications, AAVs are limited to stacks not more than 6 branch intervals in height.

Summary:

The below Tables 1a and 1b list the differences between the material costs (in USD) and the labor (in hours) required to install the three venting systems. Also listed is the percentage of savings with the use of just AAVs and with the use the AAVs and the P.A.P.A.

Table 1a*:* Difference between Stacks without AAVs and Stacks with AAVs

Item	Stacks Without AAVs	Stacks with AAVs	Savings with AAVs	Percentage Difference
Material (USD)	$18,506	$15,315	$3,191	17.2%
Labor (hours)	445.10	203.96	241.14	54.2%

(Source: Report 12S0211E1)

Table 1b*:* Difference between Stacks without AAVs and Stacks with AAVs and P.A.P.A.s

Item	Stacks Without AAVs & P.A.P.A.s	Stacks with AAVs & P.A.P.A.s	Savings with AAVs and P.A.P.A.s	Percentage Difference
Material (USD)	$18,506	$8,751	$9,755	52.7%
Labor (hours)	445.10	67.07	378.03	84.9%

(Source: Report 12S0327E1)

The labor rate established by the plumbing contractor varies. The below Tables 2a and 2b provide total costs using various labor rates that range from $65 per hour to $165 per hour. The material and labor costs from Tables 1a and 1b are used to calculate the total cost of installation for the venting systems.

Table 2a*:* Total Cost Difference between Stacks without AAVs and Stacks with AAVs

Labor Rate (USD per hour)	Stacks Without AAVs	Stacks with AAVs	Cost Difference	Percentage Difference
$65	$47,437.34	$28,572.19	$18,865.15	39.8%
$75	$51,888.34	$30,611.79	$21,276.55	41.0%
$90	$58,564.84	$33,671.19	$24,893.65	42.5%
$100	$63,015.84	$35,710.79	$27,305.05	43.3%
$125	$74,143.34	$40,809.79	$33,333.55	45.0%
$150	$85,270.84	$45,908.79	$39,362.05	46.2%
$165	$91,947.34	$48,968.19	$42,979.15	46.7%

(Source: Report 12S0211E1)

The cost savings shown in Table 2a range from 39.8 percent to 46.7 percent. Since the majority of savings is in the labor to install the system, the higher the labor rate, the greater the savings for the total installed cost of the venting system.

Table 2b: Total Cost Difference between Stacks without AAVs and Stacks with AAVs and P.A.P.A.s

Labor Rate (USD per hour)	Stacks Without AAVs	Stacks with AAVs	Cost Difference	Percentage Difference
$65	$47,437.34	$13,110.49	$34,326.85	72.4%
$75	$51,888.34	$13,781.19	$38,107.15	73.4%
$90	$58,564.84	$14,787.24	$43,777.60	74.8%
$100	$63,015.84	$15,457.94	$47,557.90	75.5%
$125	$74,143.34	$17,134.69	$57,008.65	76.9%
$150	$85,270.84	$18,811.44	$66,459.40	77.9%
$165	$91,947.34	$19,817.49	$72,129.85	78.4%

(Source: Report 12S0327E1)

The cost savings shown in Table 2b range from 72.4 percent to 78.4 percent. More than half of the savings is in material cost. A higher percentage of savings is in the labor to install the system. Where a greater percentage of savings is in the labor, the higher the labor rate, the greater the savings for the total installed cost of the venting system.

Conclusion:

The use of AAVs / AAVs and P.A.P.A.s on the venting system for the analyzed 10 story residential high-rise building resulted in savings on the cost of the installation. The total savings of installed cost of the venting system with AAVs was greater than 39 percent, whereas the total savings of the installed cost of the venting system with AAVs and P.A.P.A.s was greater than 70 percent.

One stack did not provide a savings with the use of AAVs; this was vented by a waste stack vent which is a unique single stack venting system. A minimum of one vent must connect to the outdoors; this stack provides the vent to the outdoors.

Every other stack in the building could facilitate the use of AAVs and P.A.P.A.s. Each stack using AAVs / AAVs and P.A.P.A.s resulted in material and labor savings. The material savings resulted in the use of less vent piping and fittings. The labor savings was the savings associated with the reductions in piping that needed to be installed.

The actual cost savings for any high-rise building utilizing AAVs / AAVs and P.A.P.A.s will be dependent on the labor rate, the material discounts for the plumbing contractor, and the bidding process for the project. With the exception of specialized single stack venting systems, the use of AAVs / AAVs and P.A.P.A.s will result in savings in the cost of installation for the venting system.

Certification:

These reports were prepared by Julius Ballanco, P.E., President, JB Engineering and Code Consulting, P.C., registered as Professional Engineer in the State of Indiana, license number PE60900631. JB Engineering and Code Consulting, P.C. is a registered Engineering Professional Corporation in the State of Indiana, license number PC50910000.

Report on Vent System Cost Differences for:

Air Admittance Valves

vs

Conventional Venting Systems

at

Detroit Lions Stadium (Ford Field), Detroit, MI

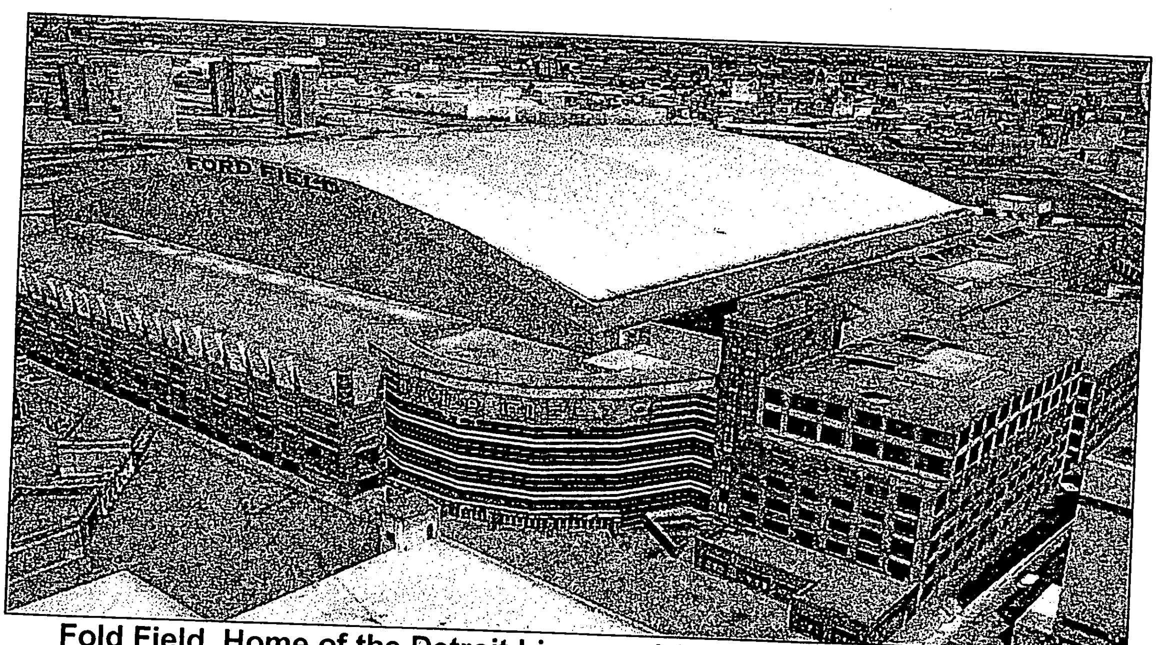
June 8, 2011

Report Prepared By:

Ronald L. George, CPD, President
Plumb-Tech Design & Consulting Services LLC,
Lead Plumbing Designer, Ford Field, Detroit, MI
www.Plumb-TechLLC.com
Phone: (734)322-0225 Cell: (734) 755-1908

and

Robert C. Hulsey Jr., PE, President
Hulsey Engineering
www.hulseyengineering.com



Fold Field, Home of the Detroit Lions and Site of the 2006 Super Bowl

Report on the Comparison of the System Cost for: *Air Admittance Valves vs Conventional Venting Systems at Ford Field*

Executive Summary

We were hired to provide a report on the cost comparison between two different venting methods for sanitary waste & vent systems in the Detroit Lions Stadium (Ford Field). Ron George was the lead plumbing system designer for the project and he made the decision to utilize air admittance valves (AAVs) for the venting system on the project. The reason for using air admittance valves was not originally for cost savings, it was to prevent sewer gas from entering the building from rooftop Air handling unit air intakes on the roof above the concourses. This cost comparison was done in June of 2011 to look at the overall cost of installing a cast iron venting systems up through the roof verses installing air admittance valves (AAVs) at the top of the each plumbing chase wall. The comparison shows a significant cost savings was realized when utilizing air admittance valves in lieu of conventions vents through the roof. The Stadium was built utilizing AAVs for venting the plumbing chases for most of the concessions and restrooms around the main seating bowl in lieu of installing conventional vent systems up to and through the upper concourse level roof. The air admittance valve option included several vents through the roof in appropriate areas to address positive pressures in the drainage system.

At the time of the system design, Air Admittance valves were available as an alternative engineered system and we never really considered the potential cost savings. The main reason that contributed to the decision to use air admittance valves for this project was to the conflict with the vent locations and the Air Handling units on the roof level above the concourses. To prevent drawing sewer gas into the air handling units on the roof, we decided to utilize AAVs. No cost estimate was done at the time to show the construction cost savings. In many areas of the stadium where we had planned to route conventional vents up through the concourse roof, there were rows of rooftop air handling units (AHUs) located on those rooftops for providing cooling and make-up air to the stadium. (See Figure 14 and Figure 16) If the vents through the roof were installed in these concourse roof areas, sewer gasses would have been drawn into the make-up AHU intake hoods and then it would have been distributed by the AHUs into the stadium. Installing conventional vents through the roof would have been extremely difficult because of the height above the concourse floor without significant additional piping away from the air intake hoods or routing the vents to the upper stadium roof which was in a location significantly higher and more difficult to reach for installation. Use of air admittance valves on the vents in these areas avoided the sewer gas from being drawn into the stadium through the air handling unit make-up air hoods. We knew it would be less expensive, but we never did an estimate to determine the actual savings. Other environmental advantages of using Air Admittance Valves were they are a product that saves material, labor which can be a Environmentally friendly, LEED or Green advantage. And they allow less methane gasses to be released or vented to the atmosphere and they cause less impact on the environment which is another LEED or Green advantage over conventional venting methods.

Cost Savings

Installing Air admittance Valve in this stadium saved over Two hundred sixty three thousand, four hundred and sixteen dollars ($263,416.00) in construction costs and the use of air admittance valve helped save the indoor air quality and using air admittance valves helps save the environment by reducing sewer gas emissions.

Stadium Statistics
Ford Field is the home to the Detroit Lions NFL football team. The stadium was designed over a two year period from 1999 to 2000 and it was constructed from 2000 to 2002. The stadium construction was completed in August 2002 in time for the Pre-season games for the 2002-2003 NFL season.
The stadium complex included renovation of an existing 9-story Hudson's warehouse building on the site and incorporating it into the plan. The complex consists of one million, eight hundred thirty thousand (1,830,000) square feet of space. The decision was made to utilize the existing warehouse as one wall of the stadium and provide the opportunity to renovate and re-use the old structure to save on structural costs. We used spaces in the warehouse for offices, a hotel lease space, restaurants, retail and other lease spaces. The concourse level went through two levels of the warehouse and there was a private club level with club level seating in the warehouse. Several levels of suites were included in the warehouse building on upper floors with views and seating areas looking into the stadium. The stadium site occupies 25 acres in downtown Detroit. The stadium bowl superstructure is a concrete and steel frame with a rigid steel roof. The rigid steel roof cost was mostly paid for with advertising dollars from naming rights to the stadium. The stadium has a seating capacity for 65,000 seats with the capability of expanding to 70,000 seats which was the minimum seating requirement for hosting the Super Bowl XL event in 2006. There are approximately 132 Suites located in the warehouse building each suite has a private bath. There were approximately 30 public restrooms on the lower concourse level and 23 public restrooms on the upper concourse level. The stadium had over 906 public water closets, 363 urinals, 625 lavatories, 47 mop sinks, 60 showers, approximately 152 stack-type air admittance valves and 140 individual air admittance valves. There was 750,000 square feet of roof to drain with a snow melt system and an ice fence. There were 25 food concessions on the lower concourse level and 21concessions on the upper concourse level. There was a 34 month construction schedule and the cost of the stadium was about five hundred million dollars ($500,000.00) in the year 2000. The Stadium was funded by the Detroit Lions Incorporated, City of Detroit, the Downtown Development Authority, Wayne County, Ford Motor Company, and Corporate Founding Investors. John Richards was the HVAC team leader and Ron George was the plumbing design team leader.

Piping Materials
The drainage, waste & vent (DWV) piping systems for Ford Field were designed with the following material requirements after meetings with code officials, the construction manager and the owner. Underground piping was allowed to be Polyvinyl Chloride (PVC) schedule 40 DWV piping. The piping above ground and inside concrete masonry unit plumbing chase walls was allowed to be PVC piping. The DWV piping beyond the plumbing chase walls and exposed to the stadium environment was to be cast iron.

Conventional Venting Option
The conventional venting system option in the stadium was designed with cast iron piping in all exposed areas. Vents were to be extended up through the roof where practical and located at least 25 feet away from any outside air inlet connections. The vent routing is illustrated in red on Figure 16.

Air Admittance Valve Option
The Air Admittance Valve (AAV) option was estimated by utilizing stack type air admittance valves on the vent pipe a few inches above each pipe chase. This allowed the elimination of the vent piping leaving each pipe chase and routing to the roof level above the upper mezzanine.
In the comparison we evaluated the cost of the specified pipe material and labor for the following items: Pipe Material, Fittings, Fire stopping for floor penetrations, Expansion joints where required, Pipe hangers, Vent flashings through the membrane roof and the cost of the air admittance valves
The cost estimate shows an overall cost savings when installing the air admittance valves in lieu of installing a conventional vent through the roof system.

Hybrid Conventional Vents through the roof and AAV Systems
This stadium design was a combination of air admittance valves and conventional venting methods. We found that in some strategic locations, conventional venting was necessary to provide for relief of positive pressures which were possible due to the high peak loads possible during halftime of sold out events. Sanitary drains are intended and normally designed to flow only half full to prevent slugs of waste or water

that can cause severe pressure fluctuations in a drainage system. Normally sanitary drain sizing charts include a probability of use that allows more connected load as drain sizes increase or as fixture units are added. In an assembly building the potential for simultaneous use of many fixture is much greater. The conventional vents were located at strategic restrooms and lower concourse manholes to minimize positive pressures and keep the drains within the pressure limitations in the code.

Fire Stopping

Cast-iron pipe is fire resistant and will not burn away or otherwise deform when exposed to fire. To seal the penetration of a cast-iron pipe through a fire rated floor, all that is needed is some mineral wool batting and fire-resistant caulking or mortar. Firestopping assemblies from various manufacturers can be found in the Underwriters Laboratories standard UL 1479 (ASTM E814). All firestopping assemblies must be listed and approved by The American Society of Testing and Materials ASTM E814 (UL 1479) and ASTM E119 standards.

Cost comparison

This report is a cost comparison of using Air Admittance Valves (AAVs) vs conventional venting on the Detroit Lions Stadium project. for purposes of this report we compared the costs of installing a conventional venting system with the cost of installing air admittance valves for each public restroom and the vent up through the stadium to the roof level.

Material and Labor Costs

Figure 16 illustrates the approximate pipe routing for the vents from the lower concourse to the concourse roof. Each pipe chase from each restroom or concession area had a vent pipe routed from each pipe chase in the toilet rooms and concession areas up to the upper concourse roof level. The red piping indicated the vent piping for one set of stacked toilet rooms. The piping is itemized below showing quantities and lengths for materials:

Unit Prices

For venting the plumbing chases from the toilet rooms and concession areas the vents were 4inches in diameter. The following unit prices would apply to the materials and labor for the cast iron pipe, fittings, couplings, hangers and firestopping.

Item Description:	Unit Prices Material Price	Labor Price	Total Price
4 in. C.I. Pipe:	$ 4:00 /ft	$ 8.50 /ft	$ 12.50
4 in. 90 C.I. Elbow	$ 13.00 ea.	$ 13.00 ea.	$ 26.00
4 in. 45 C.I. Elbow	$ 12.50 ea.	$ 13.00 ea.	$ 25.50
4 in. C.I. San Tee	$ 26.00 ea.	$ 21.00 ea.	$ 47.00
4 in. C.I. Pipe coupling	$ 8.00 ea.	$ 6.00 ea.	$ 14.00
4 in. C.I. Pipe hanger material	$ 17.00 ea.	$ 15.00 ea.	$ 32.00
6 in. Floor Penetration core	$ 25.00 ea.	$ 60.00 ea.	$ 85.00
4 in. Firestop floor penetration	$ 10.00 ea.	$ 25.00 ea.	$ 35.00
6 in. Wall sleeve	$ 10.00 ea.	$ 6.00 ea.	$ 16.00
6 in. Firestop wall penetration	$ 10.00 ea.	$ 25.00 ea.	$ 35.00
4 in. Vent thru Membrane roof/flashing	$200.00 ea.	$ 223.00 ea.	$ 423.00
Lift rental (8 hour day) for wk abv 10'	$125.00 per day	$ 520.00 per day	$ 745.00
Additional labor – lift oper. wk. abv.15 ft	$250.00 ea. lift rent	$1,040.00 per vent	$1,290.00
4 in. Stack type AAV	$ 49.10 ea.	$ 6.00 ea.	$ 55.00

Figure 16 - Material Take-off List for One Vent Stack

(As shown in Figure 16)

Description	Quantity	Unit Cost	Cost
4 inch cast iron pipe	210 LF	$ 12.50	$2,625.00
90 Elbow	9	$ 26.00.	$ 234.00
45 Elbow	2	$ 25.50	$ 51.00
San Tee	1	$ 47.00	$ 47.00
Pipe Couplings	32	$ 14.00	$ 448.00
Pipe Hangers	42	$ 32.00	$ 588.00
Floor Penetration core	2	$ 85.00	$ 170.00
Firestopping floor pen.	2	$ 35.00	$ 70.00
Wall sleeve	1	$ 16.00	$ 16.00
Firestopping wall pen.	1	$ 35.00	$ 35.00
Lift Rental – for work above 10'	2 days	$ 125.00/day	$ 250.00
Additional Labor for high work	2 days	$ 65.00/hr	$1,040.00
Vent through Roof	1	$ 423.00.	$ 423.00
Sub-Total cost per roof penetration			$6,247.00 per roof vent location
15% Overhead and Profit=			$ 938.00
Total cost per roof Penetration			$7,185.00
Less the cost of 4 Stack type AAV installations w/ OH&P			$ 253.00 per roof vent location
Total cost per roof penetration using conventional vents			**$6,932.00**

There were approximately 38 roof penetrations that were eliminated in this project. 38 x $6,932 per penetration = $263,416.00.

Summary

This report compares the cost of installing a conventional cast iron vent piping system verses installing air admittance valves at each pipe chase.

The comparison showed an overall cost savings when installing air admittance valves verses a conventional vent system. The material and labor savings for using Air Admittance valves in lieu of conventional venting was approximately Two hundred sixty three thousand, four hundred and sixteen dollars ($263,416.00) less than conventional venting methods.

The resulting design utilizing air admittance valves still required several conventional vents that were routed through the roof in appropriate locations to deal with positive pressures in the drainage system.

Certification:

This cost comparison report was prepared by Ronald L. George CPD, a Certified Plumbing Designer and President of Plumb-Tech Design & Consulting Services LLC in Monroe, Michigan and Robert C, Hulsey Jr., P.E., President, Hulsey Engineering Inc., registered as a Professional Engineer in the State of Texas.

Respectfully submitted,

Ronald L. George, CPD

and

6-7-11

Robert C. Hulsey Jr. PE

FIRM # 1255

STATE OF TEXAS
CLINT HULSEY
81081
REGISTERED
PROFESSIONAL ENGINEER
6-7-11

References:

1. Nayyar, Mohinder L., Piping Handbook, McGraw-Hill, 6th ed., 1992, pp. D.9-D.11
2. Means Plumbing Cost Data.
3. Cast Iron Soil Pipe & Fittings Handbook, Cast Iron Soil Pipe Institute (CISPI).

Photos and illustrations

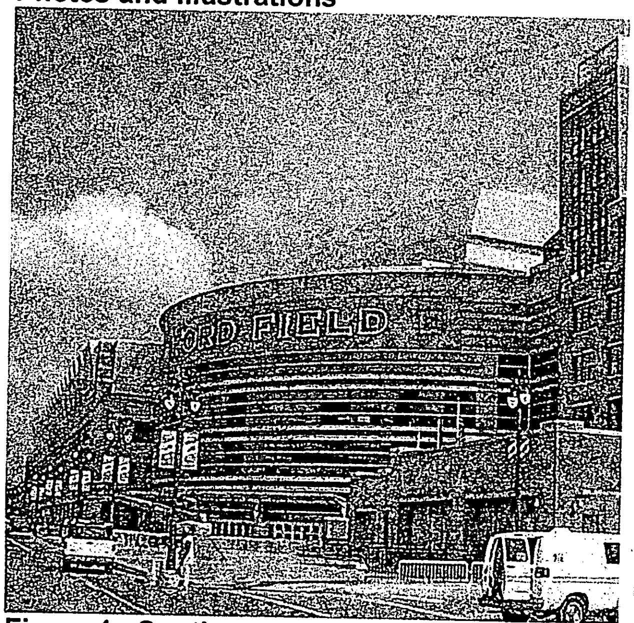


Figure 1 - Southwest Entry

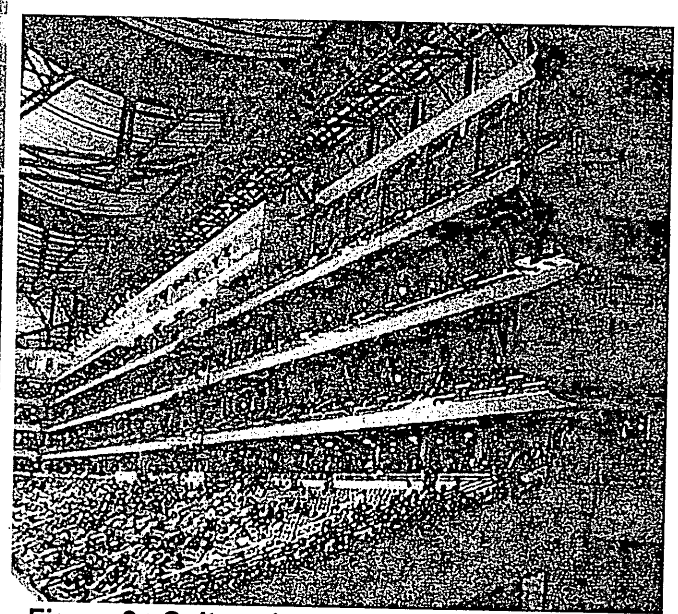


Figure 2 - Suites along South Wall

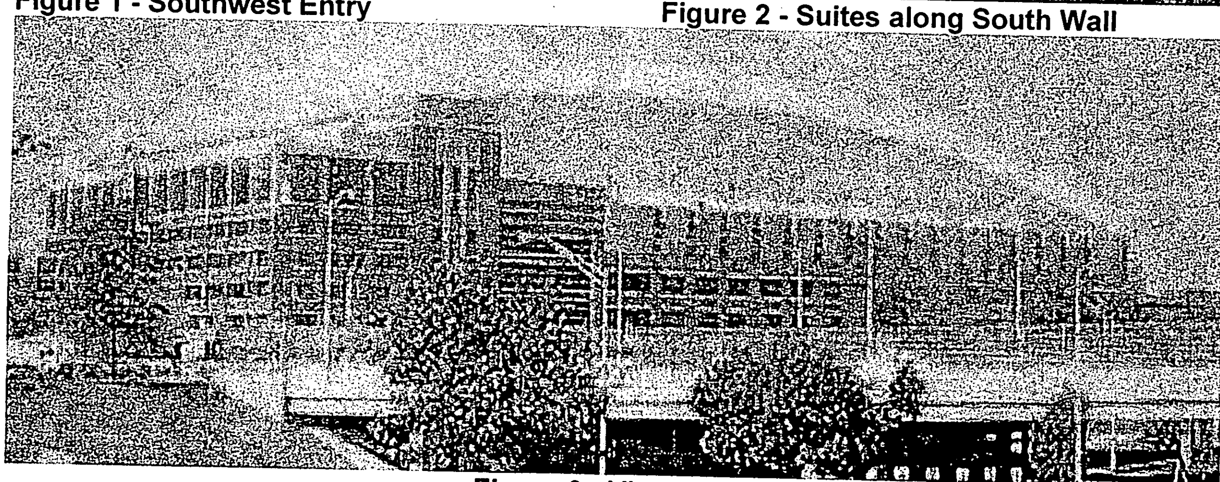


Figure 3 - View from Southeast

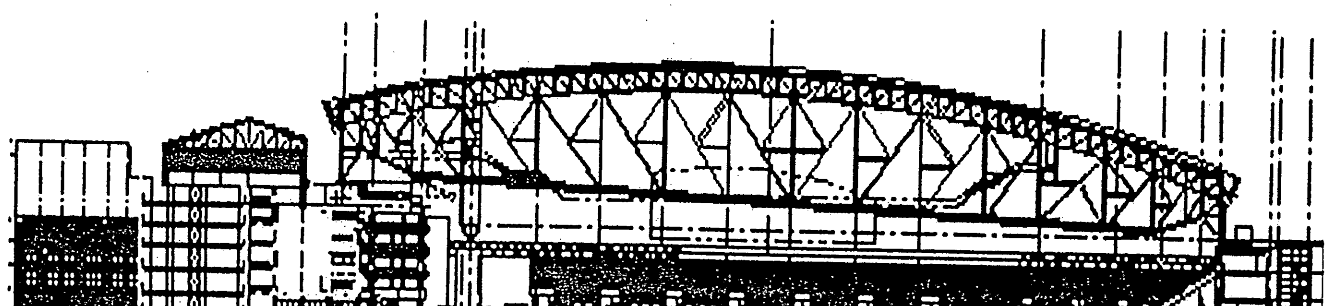


Figure 4 –Section through Stadium and adjacent 9-story warehouse building looking West

Drawings

The following are illustrations of the floor plans and sections through the building showing the number of public restrooms and concession spaces that needed to be vented.

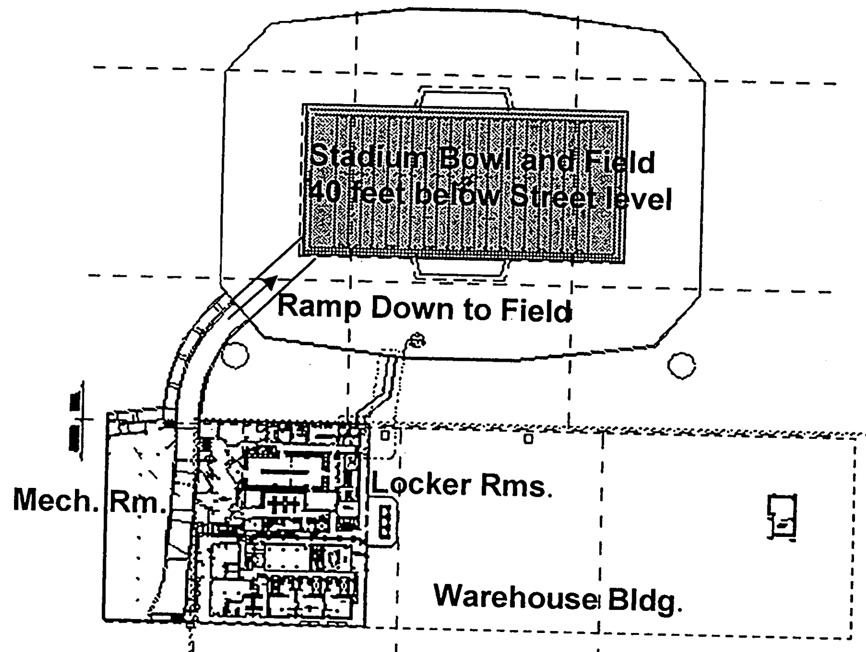


Figure 5 - Basement – Field Level – Mech. room, Players, Coaches, Officials, and Cheerleaders Locker Rooms

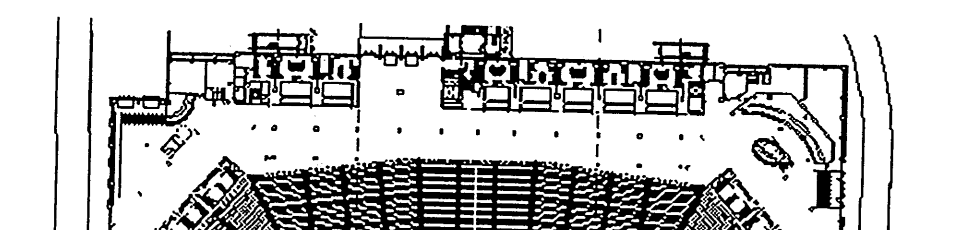


Figure 6 - First floor - Lower Level Concourse (30 Restrooms, 25 concessions)

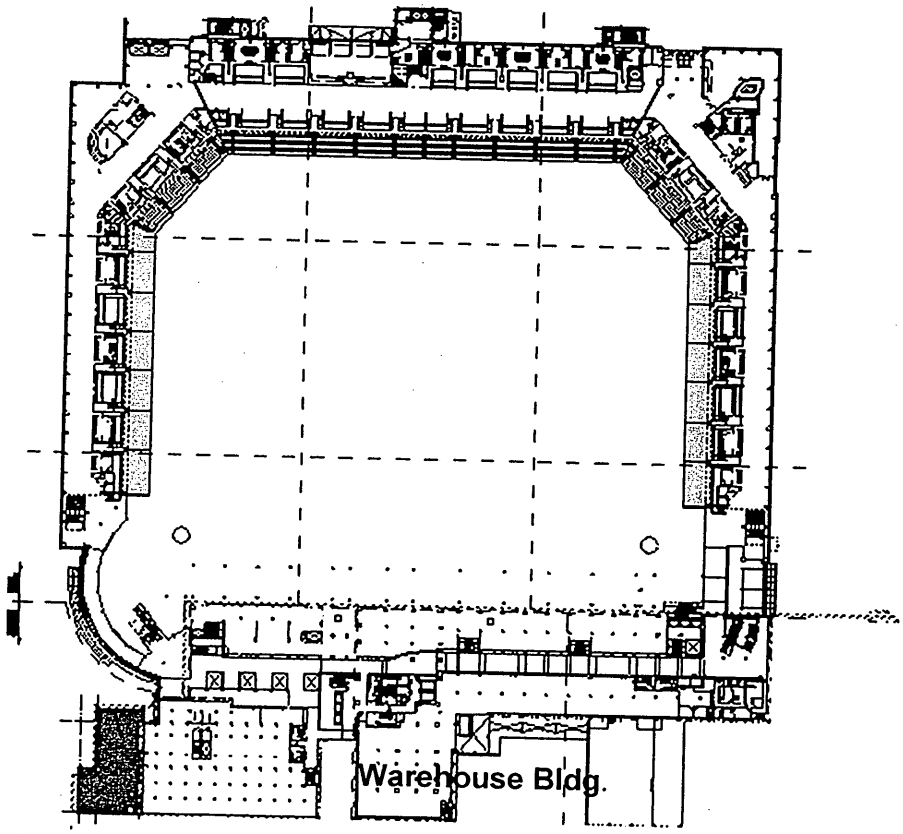


Figure 7 - Upper Level Concourse (23 Restrooms, 21 concessions)

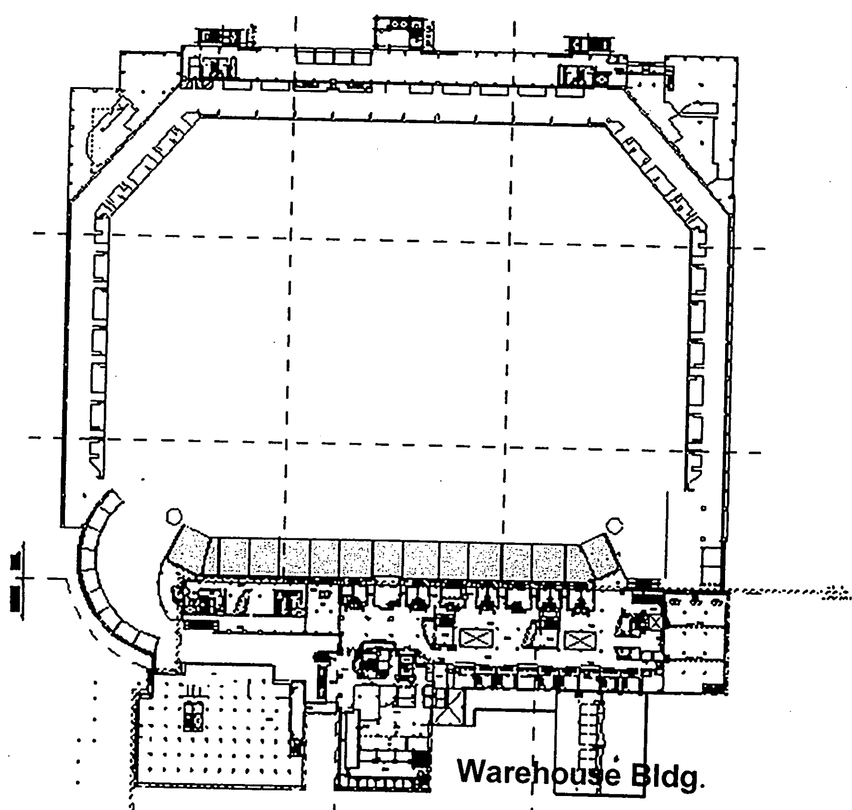


Figure 8 - Third Level – Club Level

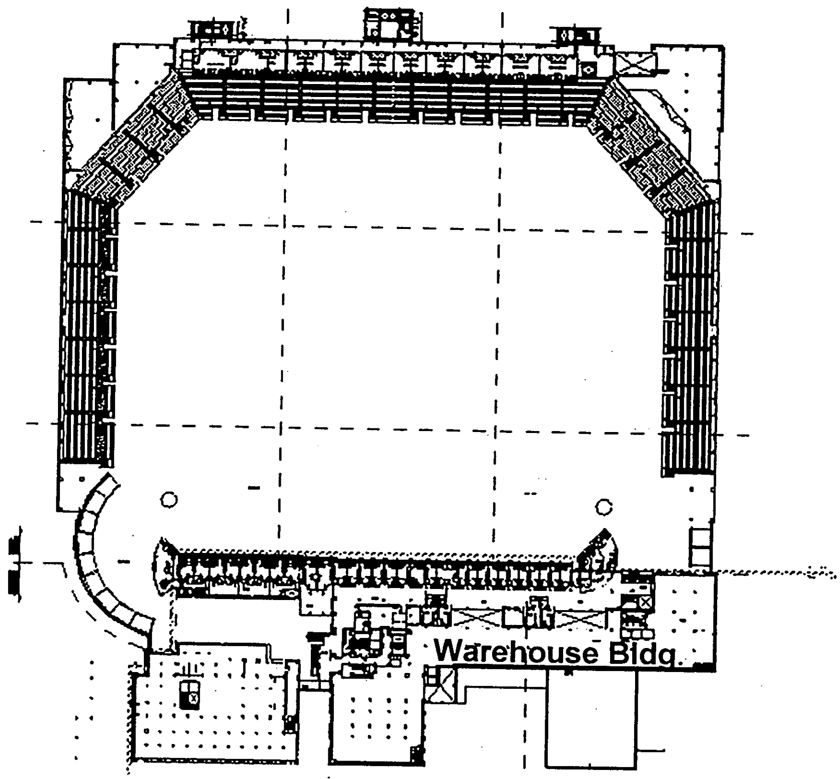


Figure 9 - Suite Levels 4 – 6 and Upper Deck Seating

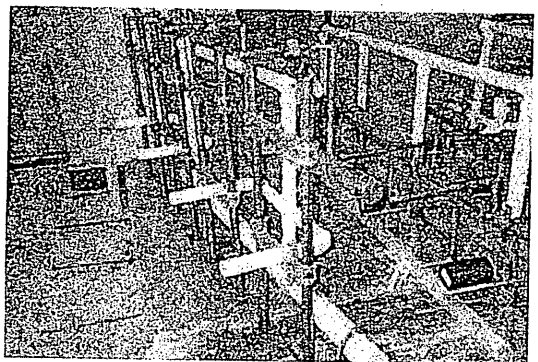


Figure 10A – Concourse toilet Pre-Fab Plbg.

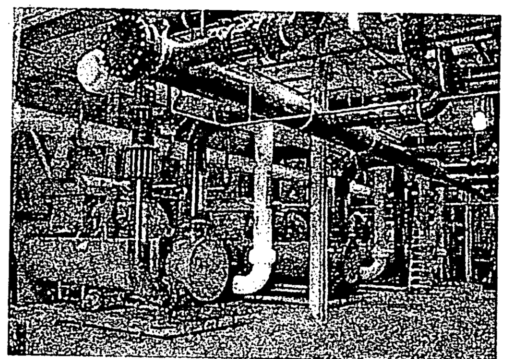


Fig 10B – Chiller Room

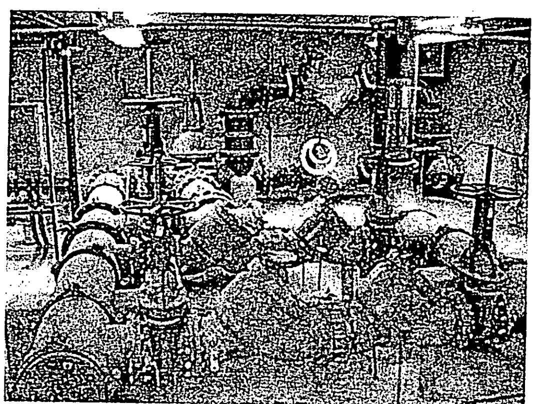


Figure 10 C – Mech Rm. Water Service

Figure 10 D – Mech Rm. Booster Pumps

24" CW Bldg Service off of a 48" street main, 16" Feed to the building, 12" feed to Fire Pumps., 12 in S/S CW loop around lower concourse, Duplex strainer, Electronic water meter, Duplex Reduced Pressure Zone Backflow Preventers, (2) quadraplex booster pumps, One a high volume medium pressure zone for the stadium bowl & the other is a medium flow high pressure zone for the 9-story Warehouse

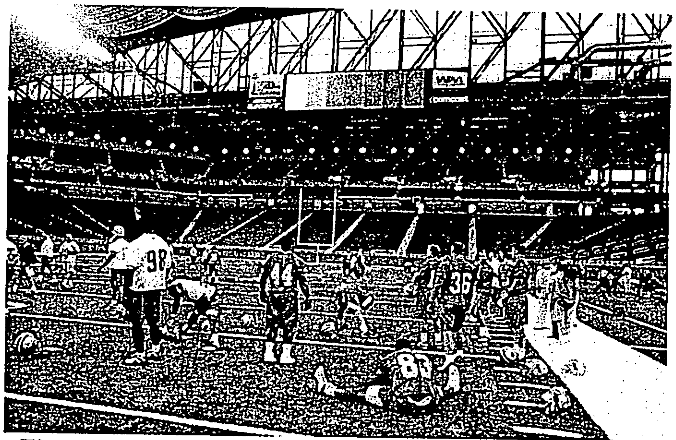


Figure 11 - Playing Field Photo

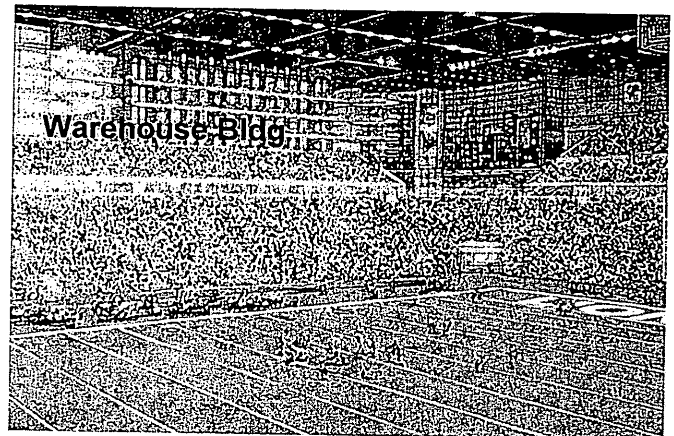


Figure 12 – Playing Field Rendering

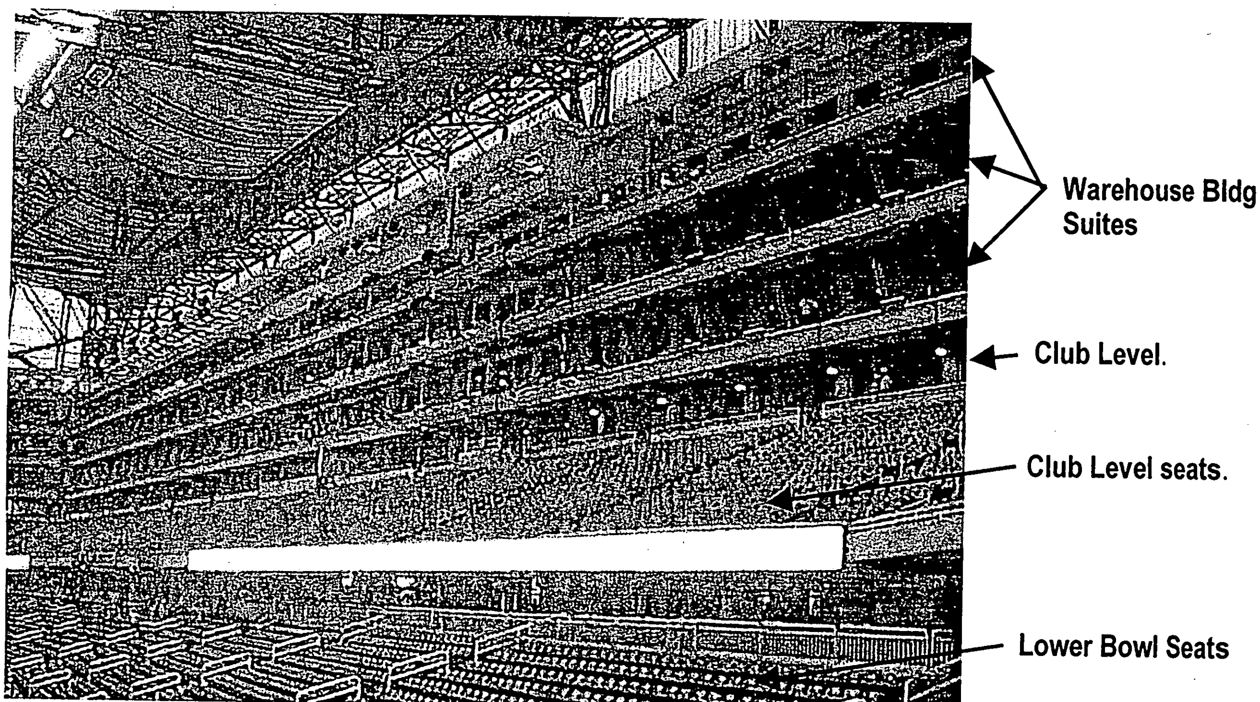


Figure 13 - Suite Levels 4 – 6 and Club Level Seating from the Old Hudson's Warehouse Building

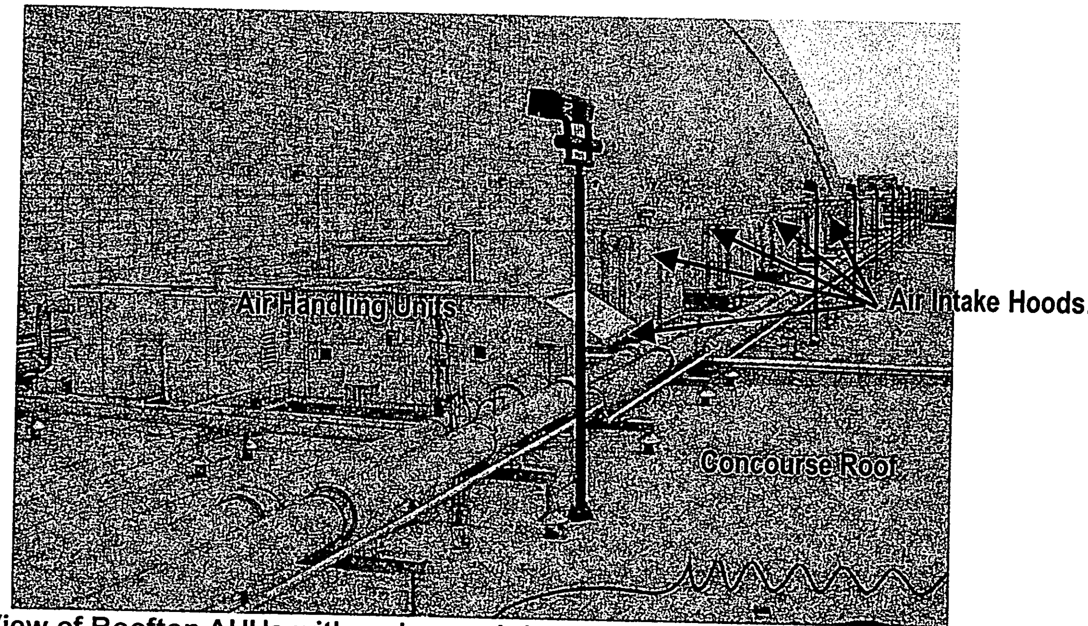


Figure 14 - View of Rooftop AHUs with make-up air hoods on roof above upper level concourses

The upper level concourses and concession areas are below this roof area. This is typical for three sides of the stadium. Plumbing vents through these roof areas would have created problems with the outside air intakes on the rooftop air handling equipment.

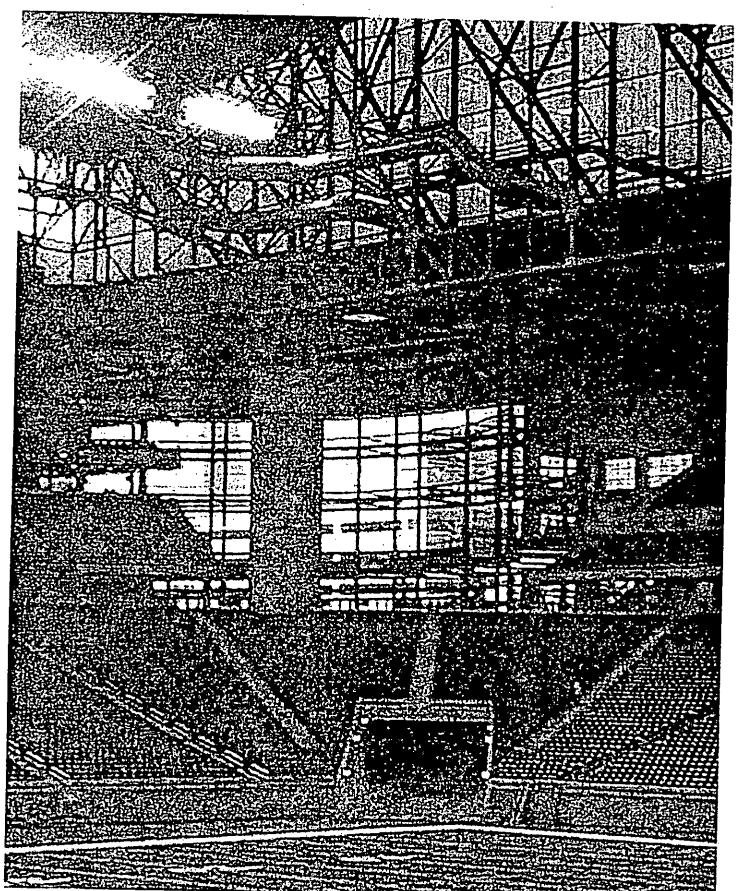


Figure 15 – View of the S. E. Corner of the Stadium

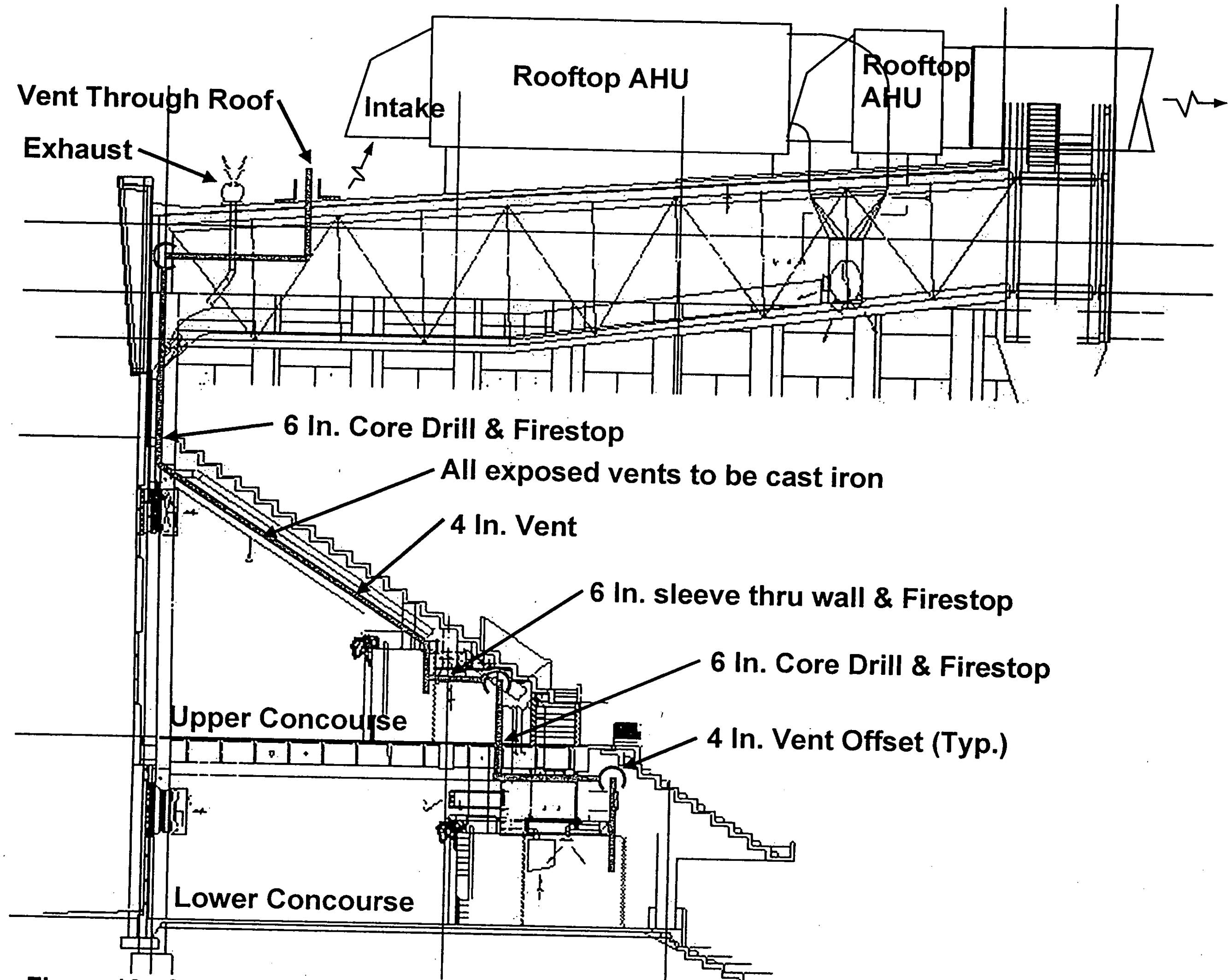


Figure 16 - Section through Stadium concourse levels at end zone Showing Conventional Venting
The red piping is the vent piping that was eliminated by using Air Admittance Valves.

Figure 16 - Material Take-off List for One Vent Stack
(As shown in Figure 16)

Description	Quantity	Unit Cost	Cost	
4 inch cast iron pipe	210 LF	$ 12.50	$2,625.00	
90 Elbow	9	$ 26.00.	$ 234.00	
45 Elbow	2	$ 25.50	$ 51.00	
San Tee	1	$ 47.00	$ 47.00	
Pipe Couplings	32	$ 14.00	$ 448.00	
Pipe Hangers	42	$ 32.00	$ 588.00	
Floor Penetration core	2	$ 85.00	$ 170.00	
Firestopping floor pen.	2	$ 35.00	$ 70.00	
Wall sleeve	1	$ 16.00	$ 16.00	
Firestopping wall pen.	1	$ 35.00	$ 35.00	
Lift Rental – for work above 10'	2 days	$ 125.00/day	$ 250.00	
Additional Labor for high work	2 days	$ 65.00/hr	$1,040.00	
Vent through Roof	1	$ 423.00.	$ 423.00	
Sub-Total cost per roof penetration			$6,247.00	per roof vent location
15% Overhead and Profit=			$ 938.00	
Total cost per roof Penetration			$7,185.00	
Less the cost of 4 Stack type AAV installations w/ OH&P			$ 253.00	per roof vent location
Total cost per roof penetration using conventional vents			**$6,932.00**	

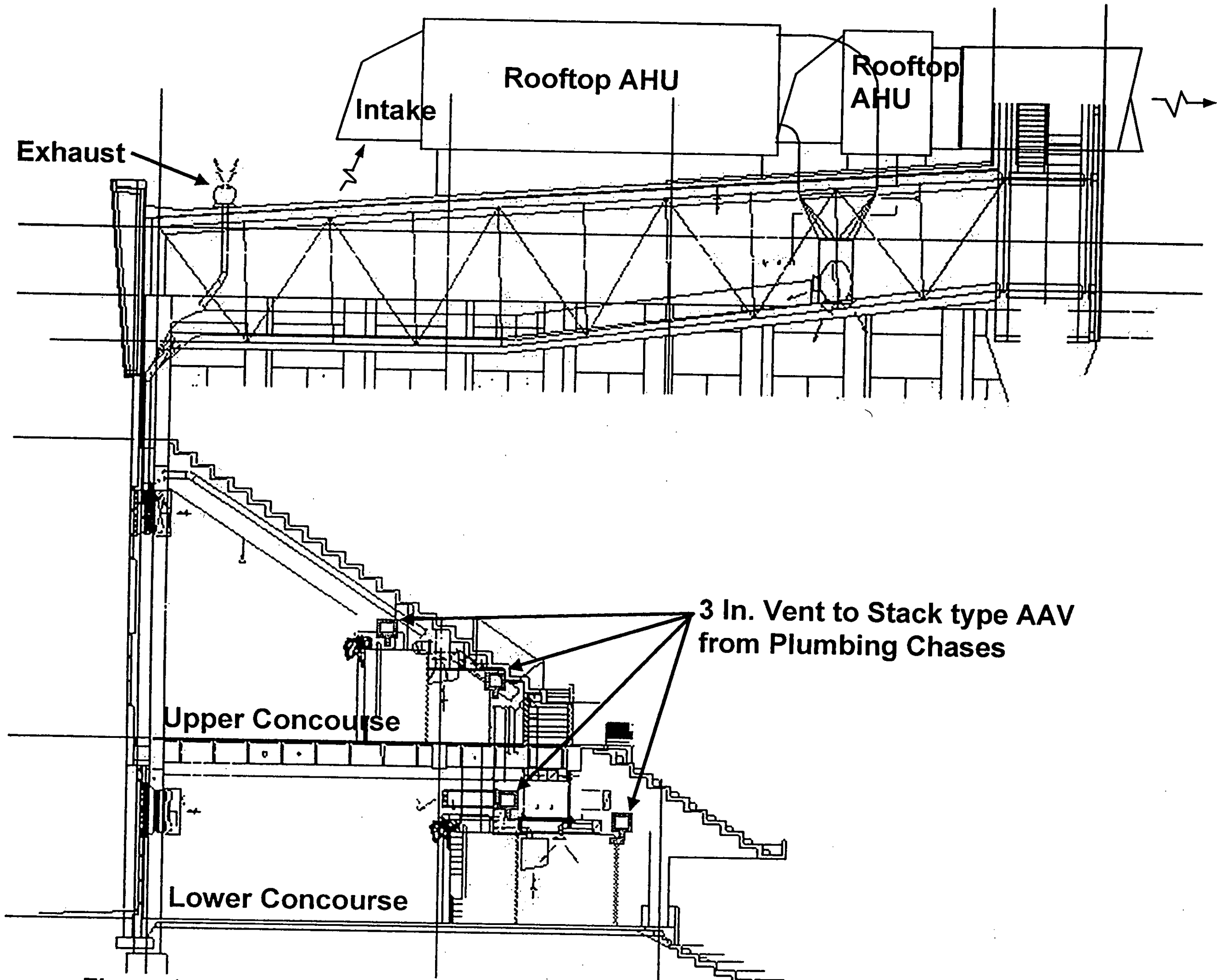


Figure 17 - Section through Stadium concourse levels at end zone showing AAV Design

Drainage Research Group

Building Drainage Waste and Vent systems: Options for efficient pressure control

By

Dr. Michael Gormley
MSc MPhil PhD CEng MCIBSE MIET

Lecturer in Architectural Engineering and tenured Research Fellow of the Drainage Research Group, The School of the Built Environment, Heriot-Watt University
Scotland.
Email: m.gormley@sbe.hw.ac.uk

Prof. John A. Swaffield
BSc MPhil PhD FRSE CEng FCIBSE MRAeS

William Watson Chair in Building Engineering, Fellow of the Royal Society of Edinburgh, Vice President of the Chartered Institution of Building Services Engineers (CISBE) and Head of the School of the Built Environment, Heriot-Watt University, Scotland.
Email: J.A.Swaffield@.hw.ac.uk

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Summary

There are few real mysteries remaining about the mechanisms at play in building drainage and vent systems. This has been well understood from the beginning of modern sanitary engineering at the end of the 19th Century. The description of Building drainage and vent system operation is best understood in the context of engineering science in general and fluid mechanics in particular.

Early researchers in the field were well aware of this and many examples of the application of sound fluid mechanics are available as evidence. Much research has been carried out since the end of the World War II, where, particularly in Europe, extensive reconstruction work prompted the quest for more efficient approaches to drainage and vent system design.

At the center of the system's integrity is the water trap seal, which stops foul air from entering a habitable space from the sewer. The water trap seal is usually 1½ or 2 inches in depth depending on the fixture it is protecting.

It comes as a surprise to many that the flow of air is as important, if not more important, than the flow of water, to the safe operation of the drainage system. This air flow is 'induced' or 'entrained' by the flow of water. The unsteady nature of the water flows causes pressure fluctuations (known as pressure transients) which can compromise water trap seals and provide a path for sewer gases into the habitable space.

Transients can be dealt with by a combination of careful design and the introduction of pressure relief devices as close to the area of concern as possible. Long vent pipes can be an inefficient way of providing relief due to friction in the pipe. Distributing air supply inlets using AAVs around a building provides an efficient means of venting and it reduces the risk of positive transient generation. AAVs do not cause positive pressure transients, they merely respond to them by closing, and hence reflect a reduced amplitude wave.

In tall buildings parallel vent pipes can only provide a small relief path for a positive pressure transient (approx 1/3 if the vent pipe is the same diameter as the main vertical stack) thus a wave will still propagate throughout the rest of the system that could compromise water trap seals. The introduction of a positive air pressure transient alleviation device provides a means to 'blow off' pressure surges as close to their source, thereby protecting water traps. Attenuation of up to 90% of the incident wave can be achieved, thus protecting the entire system. There is little that can be done for a system experiencing a total blockage, generating excessive static positive pressures in the drainage system. In such circumstances the lowest water trap seal will 'blow' providing relief for the whole system. This will occur regardless of the method of venting employed.

In validated test simulations air admittance valves (AAVs) have been shown to provide as least as good protection for water trap seals as a fully vented system, and in tall buildings in some circumstances, even better. The fully engineered designed active control system utilizing AAVs for negative pressure relief and Positive Air Pressure Transient Attenuators (PAPAs) for positive transient relief is shown to be an effective method for balancing the need for safety and efficiency while maintaining functionality invisible to the user.

1. Introduction

1.1 A historical perspective.

To most people the building drainage system lurking beneath their pristine ceramic and stainless steel appliances presents a mystery beyond their usual 'need to know'. How their sink full of soapy water gets from their newly refurbished kitchen island to the municipal treatment plant is of little or no interest, and likewise, few people ponder the similar journey from the WC, bath or bidet in the bathroom; until that is, they are suddenly faced with a foul smell from 'somewhere down there' or are met by a filling WC bowl which keeps on filling and pours onto the new floor covering. The mystery surrounding the drainage system suddenly deepens on the presentation of an unfeasibly costly repair bill.

In truth there are few mysteries about the operation of a building drainage system. The underlying principles governing the flows of all fluids (water and air) have been well described and indeed applied to the building drainage system for both design (making the system work) and forensic analysis (finding out why it didn't work) for many years. It is worth remembering that while humans have many cultural taboos surrounding the bathroom, which have contributed to the myths surrounding the drainage system, there is a strong scientific basis for the movement of waste by means of water which has a long tradition, going back thousands of years. However our concern is with modern systems and therefore developments over the last 120 - 150 years are relevant.

The age in which the innovation of safe and practical building drainage and plumbing were at the cutting edge of technology was in the late 19th Century. Many of the important factors of maintaining the system's integrity by preventing sewer gases from entering living spaces, the water trap seal and system venting, had already been introduced and much work on improving the system's response to the inevitable pressure fluctuations encountered in a fluid transport system were well under way. This work was initially carried out by Scientists and notable Engineers of the time. In the U.K. the water trap seal was invented by Cummings as early as 1775[(1)]. Cummings was an Engineer and a watchmaker and resurrected the idea of a flushing

WC originally invented by Harrington in the 17th Century. While much of the parts of the system had been around for some time it wasn't until the mid 19th Century that any impetus existed to sort out the poor sanitary conditions in large towns and cities. In 1842 Edwin Chadwick, an English civil servant, published his *'Report into the Sanitary Conditions of the Labouring Population of Great Britain'.* This report initiated a process of reform which prompted investment in sanitation as a public health priority in the slum conditions created by the rapid expansion of British cities as a result of the Industrial Revolution. Such was the importance of sanitation at the time that even the eminent Scientist/Engineer, Osborne Reynolds, whose work on turbulent flow was seminal and still considered central to any discussion of fluid dynamics today, was moved to write a paper on 'Sewer Gas and How to Keep it Out of the House' (2), which dealt with sanitation in the slums of Manchester, England in the late 19th Century.

While this work was continuing in Europe, in the United States, Architects, Scientists and Engineers were facing their own growth problems as immigration from Europe and rapid economic expansion provided the driver for a building boom. Work (reported by) a notable Engineer, George Waring in his book *'How to drain a house, practical information for householders'*,(3) highlights the depth of knowledge available at the time.

While some of Waring's approaches are outdated, his writings did show that he had a firm grasp of the link between what was going on in the drain and its relation to fluid mechanics. The following extract illustrates this well;

> "Efficiency [of the vent system] is due entirely to the admission of air fast enough to supply the demand for air to fill the vacuum caused by water flowing through some portion of the pipe beyond the trap, it is not only a question of having an opening large enough to admit air, but of having an adequate current led freely to the opening.........A one inch pipe, for example may admit air fast enough, while a longer pipe of same diameter, or a smaller pipe of the same length would not do so"
>
> Waring, 1895 pp 101-102

What Waring is suggesting here is the importance of pipe friction and the necessity to analyze the problem in a time – dependent and dynamic way. This is a crucial point and one which has driven much of the computer based systems modeling carried out in the past 30 years. Building drains carry unsteady flows which mean that they are rapidly changing and cannot be analyzed using simple calculations based on steady, unchanging flows, which are often used for the slower moving public sewer networks.

A contemporary of Waring, the Boston Architect J. Pickering Putnam went further in his 1911 book '*Plumbing and household sanitation*' (4) in which he doubts the necessity for any venting on properly designed systems with anti-siphon traps – he even suggests the use of mechanical air vents in close proximity to water traps in order to overcome siphonage problems(4,p169). Putnam's conclusions followed years of experimentation on water trap seals and venting arrangements based on sound fluid mechanics principles. The point raised by Waring above was further promoted by Putnam following a series of experiments on pipe friction carried out by the *Massachusetts Institute of Technology (MIT)*(4,p254). Putnam's 718 page book concludes with a paper delivered to the 44th annual convention of the American Institute of Architects in San Francisco, Jan 18, 1911, entitled *'Better Plumbing at half the Cost'* in which he suggests a single pipe system for multi-storey buildings based on an economic argument and the years of experimentation and experience of the author.

This work on the single pipe system was further investigated in the U.K by the Building Research Station in the 20 years or so following World War II. Again, the driver was a rapid expansion in building projects as the war torn country was rebuilt. Work published by Wise in 1957(5) concluded that the single pipe system (known as the single stack system in the U.K.) was a robust, safe and economical option and that, if properly designed, building drainage systems do not require every trap to be vented.

Against this historical background this report will explain some of the long established principles of the operation of building drainage waste and vent systems, and will illustrate options for effective venting using the modern method of computer based simulation to represent and predict the rapidly varying flows found in building drains.

1.2 Water in building drains

When a WC is flushed or a bath or lavatory is emptied, the water flows in the horizontal part of the drainage system and carries with it solids from the WC or, perhaps solids which had deposited in the pipe from a previous flush. When this water reaches a vertical stack pipe, it pours in, in a curved fashion until it strikes the back wall of the vertical pipe.(6) The water then swirls around the inner surface and falls down the pipe, under gravity, clinging to the pipe wall, this is called annular water flow (see figure 1). The water film on the inner surface of the pipe is surprisingly thin, even at high flow rates producing little more than ¼ inch film thickness. The solids fall, under gravity, in the core of the pipe.

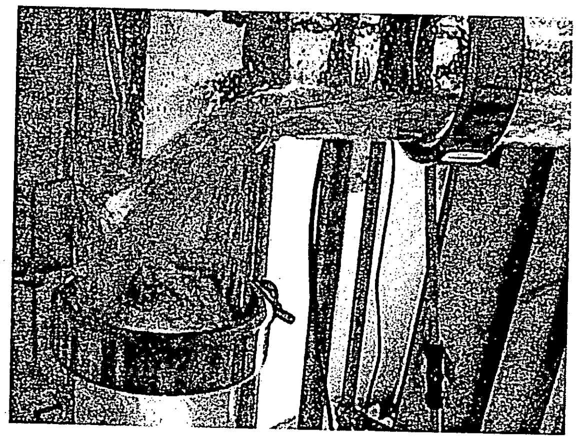

Figure 1 Water discharging from a branch
Heriot –Watt University

1.3 Air in building drains

While most people are aware of the presence of water in a building drain, because this is what the user is trying to get out of their house or office, few are aware of the important role played by air in the system. Of these two important fluids (air and water) it is the regulation and control of the air flow which poses the greatest challenge for designers, installers and code authorities alike. The whole process isn't helped by the general lack of understanding surrounding the subject. So, how does air come to play a role at all in the building drain.

When water starts to flow in a pipe, as described above, air is entrained along with it. This phenomenon is more marked when water falls down the vertical drainage pipe, where air is drawn down from the upper termination.(7) This is due to the shear between the water and the air which acts to produce an airflow. The air pressure, which is assumed to be atmospheric at the upper termination (where the air comes from) is subject to 'losses' on the way down the pipe. These losses can be due to separation (at the termination itself), friction (in the dry part of the pipe) or simple pressure drop across a branch to stack junction when water is pouring in.

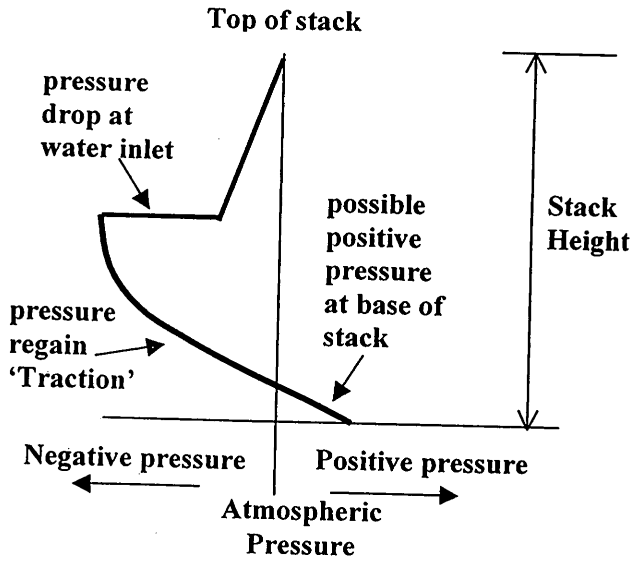

Figure 2 Pressure Profile in the Stack

These losses reduce in the pipe to sub - atmospheric and therefore place a suction force on a portion of the system.

The pressure in the pipe below the discharging branch follows a different pattern. Since the water induces an air flow the dominant force on the air is traction rather than friction[8]. This has a tendency to make the air pressure move in a positive direction (or a reduction in suction pressure) this moves the pressure back towards atmospheric at the base of the stack. This pressure at the base of the stack can go above atmospheric pressure in certain circumstances, this is known as back pressure.

The pressure profile usually associated with this process is shown in Figure 2. It must be remembered that this is only a representation of the pressure 'signature' associated with a specific event at a single point in time, it is in effect a 'temporal snapshot' of the pressure distribution in the vertical stack, and is probably best applied to taller buildings. In reality this profile will change rapidly with time sending pressure transients up and down the stack communicating these changes as described below.

It is very useful to measure pressure in drainage systems in terms of 'head' - Where pressure is referred to as an equivalent water depth, for example 'column inches of water', or simply inches of water. The advantage of using depth of water as a reference for air pressure is that a suction pressure of 2 inches of water will remove a trap 2 inches deep and is therefore a useful equivalence.

1.4 The requirements of a well designed system

Put simply, the main requirement of a well designed system is that it should operate without the user being aware of its existence. However, this is a tall order and there is therefore a need to more fully specify some requirements which can lead to the 'invisible system'. The following requirements are essential in achieving a safe, usable and reliable drainage system;

- The system should remove all waste as quickly as possible
- Long horizontal pipe runs must be self-cleansing
- There must be minimal loss of water trap seal to ensure there is a barrier for the ingress of sewer gases

Other requirements which are less critical are

- Minimal noise from the system
- Minimal Odor from the appliance side (WC design)
- Ease of maintenance

Code regulations were essentially designed in order to ensure that installations meet these requirements, and to protect inhabitants against any possible health risks from contact with contaminated fecal material. In developed industrialized countries the majority of installations meet these standards and the health risks from drainage systems are still very low. As with most fields of engineering, sanitary equipment and techniques have benefited from scientific and engineering research which has improved understanding of system operation and helped develop new innovate and cost-effective ways of achieving the goal of safe, reliable drainage systems with no increase in health risk.

2. Pressure transients in plumbing systems

2.1 What are pressure transients?

Any discussion on the challenge of draining a building would be incomplete without reference to air pressure transients, but what are they? Pressure transients are very simply the physical communication of a condition at one point in a system to another point. This means that if there is an event at point A then this information is communicated to point B some distance away by means of a pressure wave. The wave moves much faster than the air in which it travels and can move in any direction, not necessarily in the flow direction. In a pipe the speed at which an air pressure transient travels is the acoustic velocity, approx 1050 ft/sec. A negative transient communicates a need for more air and represents a suction force while a positive transient communicates the need to reduce the air flowing and represents a pushing force. A negative transient can be caused by air leaving the system (hence the need for more air) and a positive transient can be caused by the air reaching a closed end (stop the air there's no escape route)

An analogy may help to visualize how this works in practice. Imagine driving along a highway at rush hour when cars are traveling at a modest 40 MPH nose to tail. The road is long and winding with a slight incline, it is dark so the stream of taillights can easily be seen for several miles ahead. At some point in the journey, a car, now out of sight, is forced to stop. The driver is forced to apply the brakes. At this time you are still traveling at 40 MPH. Up ahead in the distance you can see the brake lights illuminating as drivers respond to the event out of sight. The 'wave' of brake lights works its way back trough the traffic until you are forced to apply your brakes and stop. The illuminating lights are analogist to a pressure transient communicating to you that there has been an event up ahead (which you can't see) and that you must stop. This "positive" type pressure wave travels much faster than the 40MPH that you were traveling at before braking (although in this case the speed of the wave is determined by the response of drivers to seeing brake lights up ahead). When the road is cleared up ahead the reverse happens as brake lights go out and drivers find themselves with a space to drive into as the car in front moves away. Again the information to move is communicated by the "negative" type pressure wave.

It is interesting to consider the consequences if the car speed is increased. If the cars were traveling at 70 MPH and the first car stopped abruptly then there is a good chance of a pile up, the driving equivalent of a Jowkowsky type pressure surge. [Jowkowsky determined that the magnitude of a pressure surge is dependent on the product of the velocity of the fluid, its density and its wave speed]

2.2 What do these pressure transients do in a building drainage system?

A negative transient will attempt to suck water out of a water trap seal. The pressure may not be sufficient to completely evacuate the water in one go, but the effect can be cumulative. Positive air pressure transients cause air to be forced through the water seal from the sewer side to the habitable space inside.

2.3 How to overcome pressure transients?

The need to communicate an increase or decrease in the air flow and the finite time that this takes is central to the requirements of providing a safely engineered drainage system. The absolute key to maintaining a state of equilibrium in a drainage system is to provide pressure relief as close to the source of an event as possible. In the case of our stream of traffic above, a diversion around the road blockage as close to the blockage itself would cause the minimum amount of disturbance. The point raised by George Waring in 1884 (see Introduction above), referring to the relief of suction pressures is still true; air must be provided as fast as possible and long pipe runs mean a time delay and subsequently a possible compromise of water trap seals.

3. Designing for best practice

3.1 Alleviating negative transients

As described above, negative transients are the system's way of communicating the need for more air. This call for air can be caused by a number of phenomenon;

- A branch pipe filling up with water (full bore flow) cause siphonic action to produce a vacuum into which the water from a trap seal is sucked.
- The pressure losses associated with water falling down a vertical stack will induce negative transients which will propagate around the system at the speed of sound. Some of these transients can be of sufficient suction pressure to evacuate water from a trap seal (induced siphonage).
- Any increase in airflow (for whatever reason) will produce negative air pressure transients in the system as the need for more air is communicated to the termination (where the air comes from).
- Air leaving the system will cause a negative transient (either into the sewer or from any other interface point e.g. the top of the stack)

The most efficient way of dealing with this call for increased airflow is to simply answer it as quickly as possible. This means providing the extra air as quickly as possible. In a drainage system this equate to having a termination as close to the point of need as possible, in effect distributed venting using AAVs allows this to happen in the most efficient way. If a trap is 30 ft away from an air inlet to the system then it will delay the arrival of air and quite possibly compromise a water trap seal.

If this is the case then why do people not experience foul odors on a regular basis in a fully vented system? Well, as mentioned earlier, work carried out by Wise in Post-War Britain, proved that if pipework was set to the correct slope and was of sufficient diameter to carry required loads over a specified distance, trap seals would not be compromised(9). This system (the single stack or one pipe system) has operated very successfully in Europe for 50 years with little increase in risk to system integrity. Distributed venting provides alternatives for modern building design where distances from appliance to the sewer may be longer than those anticipated 50 years ago.

3.2 Alleviating Positive Pressure Transients

If negative pressure transients are a call for more air then positive pressure transients are a call to stop sending air. Because pressure transient analysis follows a set of well defined rules (remember there are no real mysteries) their source can be established and are given below;

- Changes in the water/air flow rate produce positive as well as negative air pressure transients
- A sudden closure at a system termination, for example a surcharge in the sewer, resulting in a stoppage of the airflow out of the system will cause a positive pressure wave to be produced and propagate throughout the system
- A Blockage or major clog in the system

Positive pressure transients travel at the same speed as negative pressure transients, the speed of sound, and represent a deceleration force on air and water in its path. So, the consequences of a positive air pressure transient reaching a water trap seal would be that air is blown through the trap into the building (at best) or all the water in the trap is forced into the habitable space.

It is important to note here that a positive pressure wave, produced at the base of a drainage stack, will not be alleviated by an open top on the stack. This is because the pressure wave must travel the length of the stack in order to escape the building at the top. It will meet water traps on the way which, if it has sufficient pressure, will blow and so relieve the system into the habitable space.

Again the best way to provide relief against positive air pressure transients is to locate a pressure relief device such as the PAPA as close to the source as possible. So in the case of a transient produced at the base of a stack, relief is needed at the bottom, not at the top. Parallel vent pipes only divert a portion of the wave and will provide best relief if the diameter of the vent pipe is equivalent to the diameter of the stack. But this will only reduce the magnitude of the pressure by 1/3. In laboratory tests PAPAs have been shown to reduce the magnitude of a positive air pressure transient by up to

90%[10],[11]. Effectively the device allows the diversion of the airflow and its gradual deceleration – another example of the cars on the highway analogy.

Do AAVs produce positive air pressure transients? Quite simply No. AAVs respond to positive air pressure waves by closing and simply reflect a % of the incident wave. AAVs will also produce a small negative transient as the inflow is closed off.

The magnitude and ferocity of positive air pressure transients can be limited by distributing the air venting around the building. Since the magnitude of a positive air pressure wave is a function of the velocity of the airflow stopped, and hence airflow rate itself, it is better to reduce the risk of stopping a large flow by installing a number of air inlets with small airflows around the building, thereby limiting the magnitude of any potential air pressure transient produced. This is best done by installing AAVs around the building.

4. Building Case Studies

4.1 Modeling flows in drainage networks

Research and analysis of real building drainage systems is complicated by the difficulty in obtaining data from 'live' buildings. Most areas of engineering employ some form of modeling technique in research and development in their 'look and see' approach to development. In DWV research there are few models capable of dealing with the complex time dependent transient flows. The computer model AIRNET is such a model and as far as the authors are aware, the only validated model[8],[12],[13] capable of such a complex task. At the heart of the AIRNET model is the mathematical technique known as the method of characteristics. The technique allows the propagation of waves to be predicted along the length of a pipe at different time steps. This is a very powerful and unique way to 'look and see' what is actually going on inside a building drainage system, the simulations in this section were carried out using AIRNET.

4.2 Two story building

As stated above, a two story building drainage system can operate sufficiently well with minimal additional ventilation as long as it is designed and installed properly. This is borne out by reference to the installation shown in Figures 3 and 4 below. The building represents a fairly common house with a number of bathrooms and a group branch in a kitchen / laundry area. The simulation was run in two different scenarios.

1. System with open top
2. System with an AAV at the top of the stack

A discharge flow rate was simulated from the top floor consisting of a combined flow from a WC and a bath. This discharge was simulated from the upper floor and the effect on the water trap indicated by shading was recorded from the output data. It can be seen from the bar graph that little water has been lost as a result of the operation of system devices in either scenario.

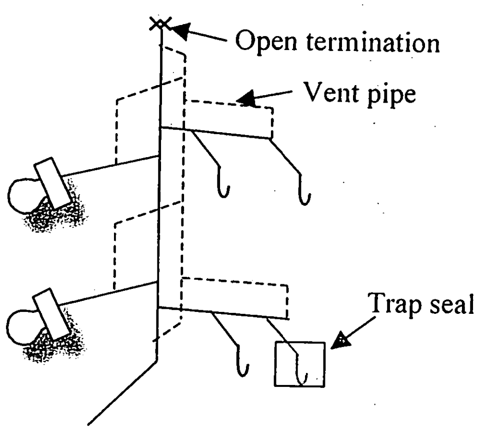

Figure 3 Fully vented system with open top and parallel vent pipe

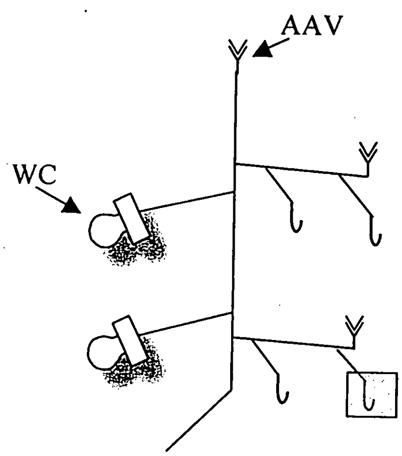

Figure 4 Two story house with AAVs on branches and an AAV termination at the top of the stack

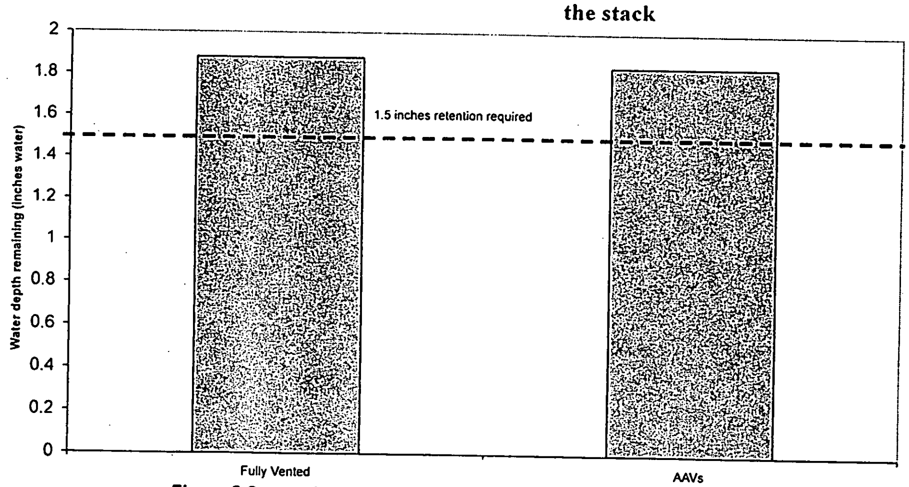

Figure 5 Comparison of water retained in the ground floor trap indicated (shaded on schematic)

4.3 10 Story Building

The 10 story building scenario is shown in Figure 6 below. There are basically three installation types being simulated here; the fully vented system Figure 6(a) and a one pipe system with distributed venting and an AAV on the top of the stack, Figure 6 (b). This system also includes a relief vent. Figure 6 (c) is the one pipe system with distributed AAVs and PAPAs subjected to a positive air pressure transient simulated to replicate the occurrence of a surcharge in the sewer. In each of the scenarios a representative water trap is shown on three floors up the building

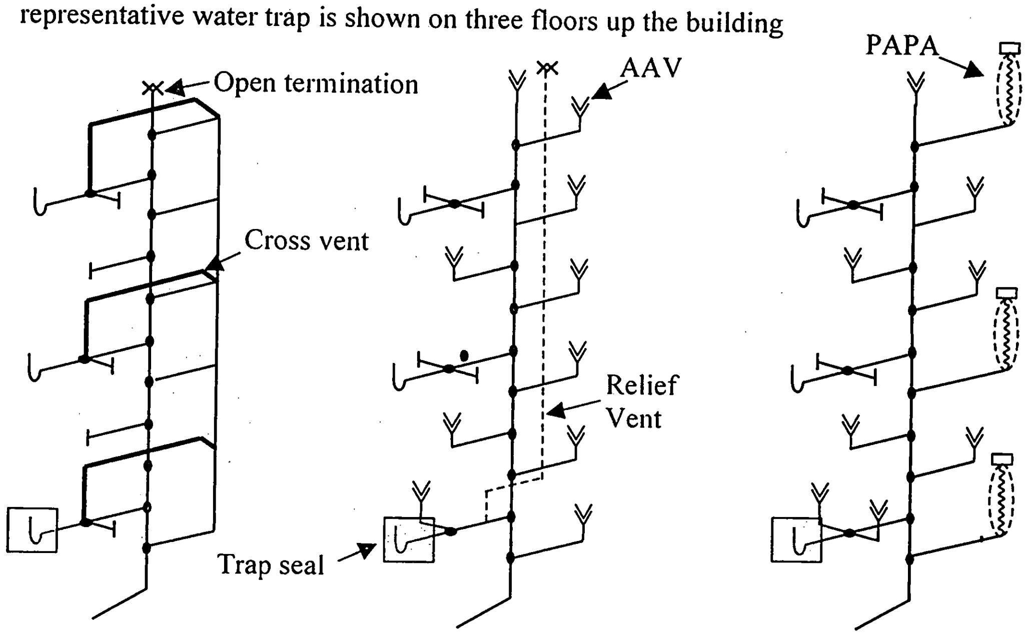

Figure 6 (a) **Figure 6 (b)** **Figure 6 (c)**

Discussion

The flow rate used in this simulation represents a maximum for the 4" vertical stack in question (80 USgpm). This flow rate is unlikely to be observed in practice as the simultaneous discharges required are a probabilistic impossibility (Hunter 1940). The flow rate is therefore indicative of a 'worst case scenario' in order to push the drainage vent system to its limits, and therefore show comparisons between the options investigated. The discharges making up the flow rate are distributed evenly along the stack to simulate a number of simultaneous discharges (approximated 16 USgpm from 5 different floors).

The bar graph shown in Figure 7 illustrates the water depth retained in the shaded water trap in Figure 6 following this event. It can be seen that under these conditions the system with AAVs installed (Figure 6b) has retained the most water. Why is this? Well, the main reason is that the flow in the vertical stack induces a negative pressure transient as it calls for more air. This negative transient propagates to all parts of the system 'looking for air'. The negative transient represents a suction force which will try to draw water out of the trap seal. If the negative transient is too great it will suck water out of the trap. To stop this happening, air must be provided from somewhere else. The methods shown in Figure 6(a) and Figure 6(b) show two different methods. In Figure 6(a) the air must travel from the top of the stack, approximately 100ft away (but only after the negative transient has propagated to the top of the stack first so the round trip is approximately 200ft). Alternatively, air can be provided locally by the provision of an AAV (Figure 6(b)). In this case the round trip to is only a matter of 10 ft. This means that the air can be provided quicker than the fully vented system.

The bar graph also shows the influence of cross vent diameter on vent performance. The smaller vent pipe is less effective than the larger vent pipe due to increased friction. This is identical to the point made by Waring in 1895 (see Introduction above).

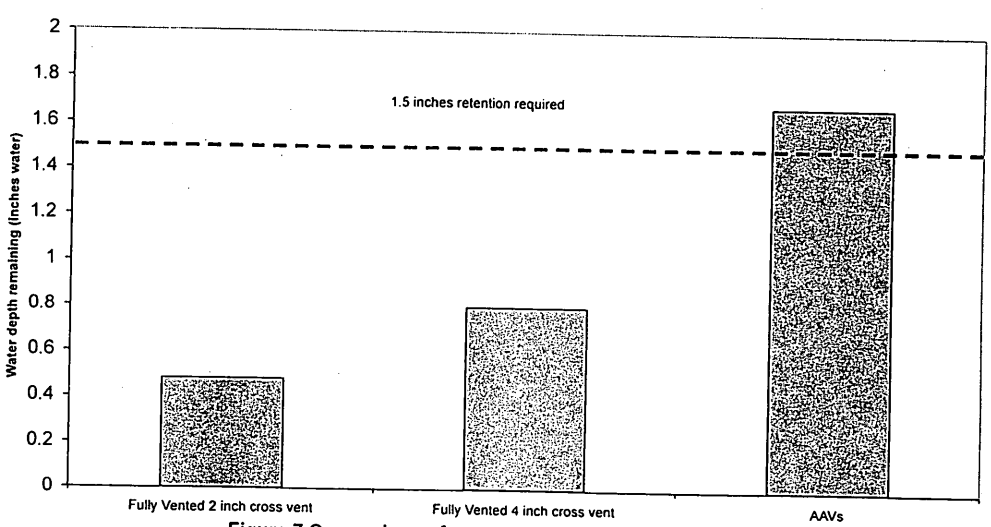

Figure 7 Comparison of water retained in the lowest water trap (shaded on schematic) conditions based on negative transient

Figure 8 shows the trap retention on the same trap as the result of a positive pressure transient in the system. The positive transient was generated by simulating a surcharge in the sewer, causing the airflow through the stack to be stopped. Again two methods of dealing with this scenario; the fully vented system shown in Figure 6(a) and the 'active control' option utilizing AAVs and PAPAs as shown in Figure 6(c). The bar graph of trap retention clearly shows that the active control system protects against this sort of event, and that the AAV system with a relief vent provides better protection than the fully vented system. The reasons for active control being better are two- fold; firstly, the distribution of the air inlets reduces the maximum positive pressure possible in the first place and secondly, the PAPA presents a volume which can consume the positive pressure wave, attenuate it and destroy it, rendering it harmless. This is borne out by the amount of water displaced by the positive pressure wave.

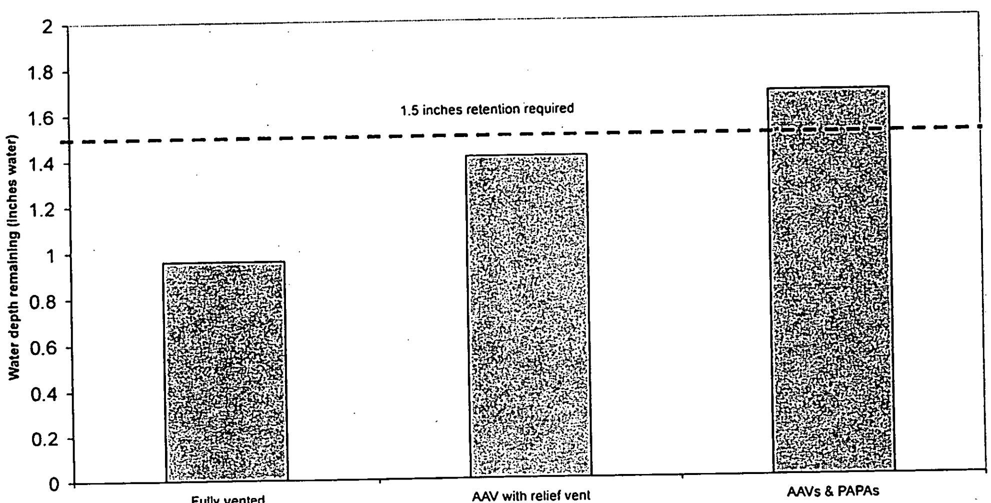

Figure 8 Comparison of water retained in the ground floor trap indicated (shaded on schematic) Conditions based on positive transient

5. Conclusions

This report has considered the implications for venting in building drainage systems. The discussion has concentrated on the fundamental fluid mechanics which so readily describe the unsteady flows resulting from plumbing fixture discharges. The description of the workings of a drainage and vent system in these terms is not new, many early innovators were well aware of this, however, many codes and regulations worldwide seem to avoid the engineering imperative of a description based on fluid mechanics in favor of a prescriptive legalistic approach based on the evolution of the industry rather than the science.

The fundamentals of system friction and pressure transient generation and propagation are central to understanding why venting is required in the first place. Possible solutions for alleviating pressure transients were discussed, including the well respected view that in certain circumstances systems operate perfectly well without venting.

The advent of fast digital computers has resulted in the ability to model and simulate unsteady air and water flows in building drainage and vent systems; providing the capability of solving the well understood governing wave equations first described in the 18th Century. The computer simulation program AIRNET has been under development for over 20 years and has been validated in many laboratory and site investigations. This report shows results from simulations of two building types; a two storey building and a ten storey building. The output from the program confirms the validity of distributed venting utilizing AAVs and the effectiveness of the positive air pressure attenuator (PAPA) at dealing with positive pressure transients.

It is hoped that this paper has gone some way in de-mystifying the workings of the building drainage and vent system 'lurking' beneath the sink and floorboards. It is also hoped that the work of those attempting to create a safe, hygienic environment for people, for the first time, such as Waring, Putnam, Reynolds and Wise should be remembered in a favorable light, not least because of their commitment (Waring died as a result of investigations into a possible link between sanitation and yellow fever), but because their observations were based on the sound engineering and scientific methods often absent from deliberations today.

6. References

1. Munro, B. (2000) '*Ceramic Water Closets*' Shire Publications, London.

2. *Reynolds, O.* (1872) '*Sewer Gas and How to Keep It Out of Houses*' *in Allen, M 'FROM CESSPOOL TO SEWER: SANITARY REFORM AND THE RHETORIC OF RESISTANCE, 1848–1880' Victorian Literature and Culture (2002), 30: 383-402 Cambridge University Press.*

3. Waring, G. E. (1895) '*How to drain a house, practical information for householders*' D. Van Nostrand company, New York.

4. Putnam, J. P. (1911) '*Plumbing and household sanitation*' Doubleday, Page & Co, Garden City, New York.

5. Wise, A.F.E (1957) '*Drainage pipework in buildings: Hydraulic design and performance*' HMSO, London

6. Swaffield J.A & Boldy A.P (1993) 1993, '*Pressure surge in pipe and duct systems*', Avebury Technical, England

7. Swaffield J. A. and Galowin L.S., (1992) '*The engineered design of building drainage systems*', Ashgate Publishing Limited, England.

8. Jack L.B., (2000). *Developments in the definition of fluid traction forces within building drainage vent systems*', Building Services Engineering Research & Technology, Vol 21, No 4, pp266-273, 2000.

9. EN 12056:2000 '*Gravity Drainage Systems inside buildings Part 2: Sanitary Pipework, layout and calculations*', British Standards Institute, London

10. Swaffield, J.A.,Campbell, D.P. , Gormley, M. (2005) 'Pressure transient control: Part I — criteria for transient analysis and control' *Building Services Engineering Research and Technology*, Volume 26, Number 2, June 2005, pp. 99- 114 (16)

11 Swaffield, J.A.,Campbell, D.P. , Gormley, M. (2005) 'Pressure transient control: Part II— simulation and design of a positive surge protection device for building drainage networks'

Building Services Engineering Research and Technology, Volume 26, Number 3, September 2005, pp. 195-212(18)

12. Swaffield J. A. and Campbell D. P., 1992[a], "Air Pressure Transient Propagation in Building Drainage Vent Systems, an Application of Unsteady Flow Analysis", *Building and Environment*, Vol 27, n°. 3, pp 357-365

13. Swaffield J. A. and Campbell D. P., 1992[b], "Numerical modelling of air pressure transient propagation in building drainage vent systems, including the influence of mechanical boundary conditions", *Building and Environment*, Vol 27, n°. 4, pp 455-467

FHA INFO #18-27
July 3, 2018

FHA Single Family Housing — NEWS

TO: All FHA-Approved Mortgagees and Servicers
All Other Stakeholders in FHA Transactions

NEWS AND UPDATES

Elimination of FHA Inspector Roster

Today, the Federal Housing Administration (FHA) published in the *Federal Register*, a final rule (Docket No. FR-5457-F-02) that streamlines the inspection requirements for FHA single family mortgage insurance by eliminating the regulations for the FHA Inspector Roster (Roster).

This final rule — which follows a February 6, 2013, proposed rule — recognizes the sufficiency and quality of inspections carried out by International Code Council (ICC) certified Combination Inspectors (CI) and Residential Combination Inspectors (RCI) and other qualified individuals. As a result, FHA acknowledges there is no longer a need to maintain and administer its own standardization process for inspectors.

This final rule becomes effective August 2, 2018.

Quick Links

- View the *Federal Register* notice — *Streamlining Inspection Requirements for Federal Housing Administration (FHA) Single Family Mortgage Insurance: Removal of the FHA Inspector Roster* — in the *Federal Register* at: https://www.federalregister.gov/documents/2018/07/03/2018-14212/streamlining-inspection-requirements-for-federal-housing-administration-fha-single-family-mortgage

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Resources

Contact the FHA Resource Center:

- Visit our online knowledge base to obtain answers to frequently asked questions 24/7 at www.hud.gov/answers.
- E-mail the FHA Resource Center at answers@hud.gov. Emails and phone messages will be responded to during normal hours of operation, 8:00 AM to 8:00 PM (Eastern), Monday through Friday on all non-Federal holidays.
- Call 1-800-CALLFHA (1-800-225-5342). Persons with hearing or speech impairments may reach this number by calling the Federal Relay Service at 1-800-877-8339.

FHA INFO Archives:	Visit the FHA INFO Archives to access FHA INFO messages issued from 2012 to the present.
Subscribe/Unsubscribe Instructions:	To subscribe to the Single Family FHA INFO mailing list you can use this link: FHA INFO or send a request by email to: answers@hud.gov Bulk subscriptions: To sign up your entire office or a large group, send the list of

email addresses (in the format below) to: answers@hud.gov
aaa@xyz.com
bbb@xyz.com
ccc@xyz.com
To Unsubscribe follow the unsubscribe instructions on that page.

Resource Links:	FHA Archived Webinars	Foreclosure Assistance
	Career Opportunities	Grant Opportunities
	Contracting Opportunities	HUD Homes - Property Listings
	Events & Training	HUD.gov
	FHA Forms	Making Home Affordable
	FHA Homeownership Centers	Presidentially-Declared Major Disaster Areas
	FHA Mortgagee Letters	Visit our Single Family Home Page

We hope that you will want to continue receiving information from HUD.
We safeguard our lists and do not rent, sell, or permit the use of our lists by others, at any time, for any reason.

Connect with HUD on Social Media and follow Secretary Carson on Twitter and Facebook.

UFC 3-420-01
25 October 2004
Including change 8, October 27, 2009

UNIFIED FACILITIES CRITERIA (UFC)

PLUMBING SYSTEMS

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

CHAPTER 1

INTRODUCTION

1-1 **PURPOSE AND SCOPE.** This UFC provides guidance in the design of plumbing systems, together with the criteria for selecting plumbing materials, fixtures, and equipment and is applicable to all elements of the Department of Defense (DoD) charged with planning military construction. This UFC provides minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation, and use of plumbing systems. It is not the intent of this manual to duplicate information contained in the standards cited herein, but to reference them as appropriate (see Appendix A.)

1-2 **APPLICABILITY.** This UFC applies to all service elements and contractors involved in the design and construction of plumbing systems for use in facilities of all branches of service. A plumbing system consists of the water supply distribution system; fixtures, and fixture traps; soil, waste, and vent piping; storm water drainage; acid and industrial waste disposal systems; and special gases (medical and oxygen) systems. The plumbing system extends from connections within a structure to a point 1.5 m (5.0 ft) outside the structure. Additions, alterations, renovations, or repairs to a plumbing system must conform to that required for a new plumbing system without requiring the existing plumbing system to comply with all the requirements of this manual. Do not execute additions, alterations, or repairs that cause an existing plumbing system to become unsafe, hazardous, or overloaded.

1-3 **GLOSSARY.** Appendix B contains a glossary of acronyms used in this document.

1-4 **REFERENCES.** Appendix C contains a list of references used in this document.

1-5 **Background.**

1-5.1 **Model Code Organizations.** Three major voluntary consensus building code organizations jointly organized the International Code Council™ (ICC), which issued the International Plumbing Code (IPC). They are the Building Officials and Code Administrators International (BOCA)®; International Conference of Building Officials (ICBO)®; and the Southern Building Code Congress International (SBCCI)®.

1-5.2 **Public Law 104-113.** Public Law 104-113, *The National Technology Transfer Act of 1995*, requires the Federal agencies and departments to adopt voluntary consensus standards whenever possible.

1-5.3 **International Plumbing Code®.** The availability of the IPC allows the DoD to comply with Public Law 104-113 by adopting the IPC. Sufficient familiarity to the Architects and Engineers, and the Construction Contractor is assured by the broad usage of the IPC and the prior plumbing codes of the three code organizations of the ICC.

1-6 **PRIMARY VOLUNTARY CONSENSUS STANDARD REFERENCE.** The DoD adopts the \1\ latest /1/ edition of the International Code Council™ International Plumbing Code® as the primary voluntary consensus standard for DoD facility plumbing systems.

1-6.1 **International Plumbing Code® Copyright.**

1-6.2 **IPC Additions, Deletions, and Revisions.** The additions, deletions, and revisions to the IPC sections listed in Appendix A "Supplemental Technical Criteria" of this document preserve the appropriate supplemental technical criteria for use in current and future designs of DoD facilities. When and if these supplemental technical criteria are adopted into the IPC, they will be removed from this document. When interpreting the International Plumbing Code®, the advisory provisions must be considered mandatory; interpret the word "should" as "shall".

The format of Appendix A, including English and metric unit references, does not follow the UFC format, but instead follows the format established in the IPC, to the extent possible.

1-7 **SECONDARY VOLUNTARY CONSENSUS STANDARD REFERENCES.** The DoD adopts the current issue of the following voluntary consensus standards, fully referenced in a later paragraph:

(1) American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) Handbook Series, including the latest editions of the following:

(a) Fundamentals
(b) HVAC Applications
(c) HVAC Systems and Equipment

Heat loss via internal drainage vent pipes

Alan Clarke, E-Mail alan@arclarke.co.uk
Nick Grant, E-Mail nick@elementalsolutions.co.uk
Elemental Solutions, www.elementalsolutions.co.uk

1 Introduction

This paper examines the theory and practice of heat loss from ventilated internal drainage pipes. Pipes for drainage of waste water (foul drainage) are often vented to outside at their top. We call the main vertical pipe a stack – various sanitary appliances drain to the stack via branch pipes.

There are two reasons for ventilating the stack: first, when the drain runs full with falling waste water there is a negative pressure behind the water and this could break the water seal at traps on sinks and baths etc, potentially allowing smelly air into the building. Allowing free flow of air into the top of the stack overcomes this problem (subject to maximum branch pipe lengths and other details). The second reason for ventilating the stack is to avoid build up of excess pressure in the drainage system as a whole.

The negative pressure issue can be dealt with using air admittance valves (AAVs) at the top of a stack. These are located inside the building envelope and allow air into the stack under negative pressure but do not allow smelly air to leak out. The requirements for installing AAVs are clearly defined according to the configuration of the drainage system. The need for the second type of ventilation is not well defined, and is usually taken to require an open vent at the head of a below-ground drainage run, so one vent is required per detached house, or one per group of attached houses.

The air flowing through a ventilated stack comes from outside so will be below room temperature and there is a heat loss from the building to the air in the stack. PHPP 7&8 recognise this and provides a procedure for calculating an approximation to the thermal bridge and hence the heat loss. This is based on 50% of the Ψ-value for a water-filled pipe and external air temperature. For an uninsulated stack 6m tall the heat loss calculated this way is 7 W/K, an increase in annual heat demand typically 2-4kWh/(m^2.a) depending on house size for the UK climate.

There are two ways to reduce this heat loss where a vented stack is required. One is to install a separate vented stack outside the thermal envelope with the internal stack topped with an AAV. The other is to insulate the stack – however the stack is at least as long as the house is high so this is not very effective. Some Passivhaus dwellings were designed before this detail was included in PHPP and so have uninsulated stacks. We wanted to see if the heat loss was as severe as predicted, and what retrofit measures would be worthwhile.

2 Model

A spreadsheet model was used to make a more accurate estimate of the heat loss via the stack. Overall we can see the heat loss in two ways – one is the conduction through the pipe wall, the other is the increase in heat in the air travelling through the stack. The consistent driving force for air movement is the buoyancy effect or stack effect, though wind will also have an effect. The buoyancy driven flow is dependent on the difference between air temperature in the stack and outside, as well as the resistance to airflow in the system. The air temperature at the base of the stack is determined by the ground temperature under the house, with possibly some additional heating from waste water and some possible cooling from air leaking into the drains through covers. The temperature at the top of the stack is determined by how much heat is transferred across the pipe from the house. However both the stack pressure and the heat transfer rate are in turn dependent on this temperature so there isn't a straightforward solution of the equations.

Our approach was to use an iterative model of a simple stack. The assumed starting conditions generate an initial estimate of pipe wall heat transfer, stack pressure, and in turn an air flowrate, which then produces a revised temperature at the top of the stack by equating the pipe wall heat transfer with the heat transfer of the air movement.

The duct heat transfer coefficients were calculated using the PHPP formulae for ventilation duct heat transfer. This is on the basis that the vent pipe is normally dry (and when water flows down the lower half it is generally at or above room temperature). This gives heat transfer rates less than half of those for water carrying pipes. Pressure loss for the below ground section of the drainage was estimated, and understood to be an unknown variable which will vary between houses.

Initial results of the modelling indicated that airflow velocities of 0.5-1.0 m/s were likely, the air temperature would rise by a few degrees as it rose up the stack, and the temperature difference between the air in the stack and the room was less than we had expected. The impact of the unknown external pressure loss in the drainage system did have an impact, but not a major one.

3 Measurements

Detailed measurements of soil vent pipe (SVP) temperature and airflow were made at a Passivhaus in Ledbury, UK. The stack is vented above the roof and was installed uninsulated within removable plywood boxing and so can be accessed along the whole length of the pipe.

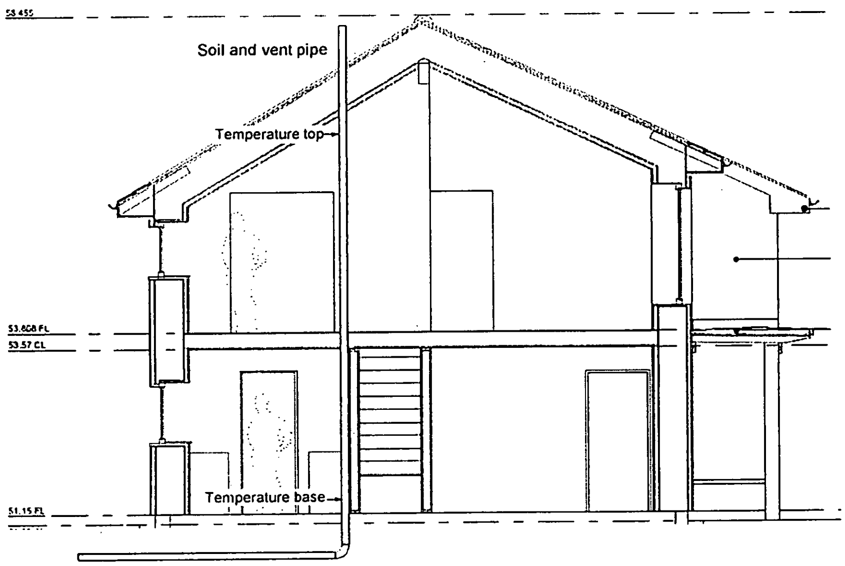

Figure 1: section drawing of the house showing soil vent pipe location

We installed thermocouples and data loggers at the base and top of the stack, and took spot measurement of air velocity at the top, checking with smoke that the airflow was upwards. We also measured external temperature and looked at the drain temperature in an access chamber outside. This was not conclusive but did indicate that temperatures in the drain could be higher than ground or external air temperatures:

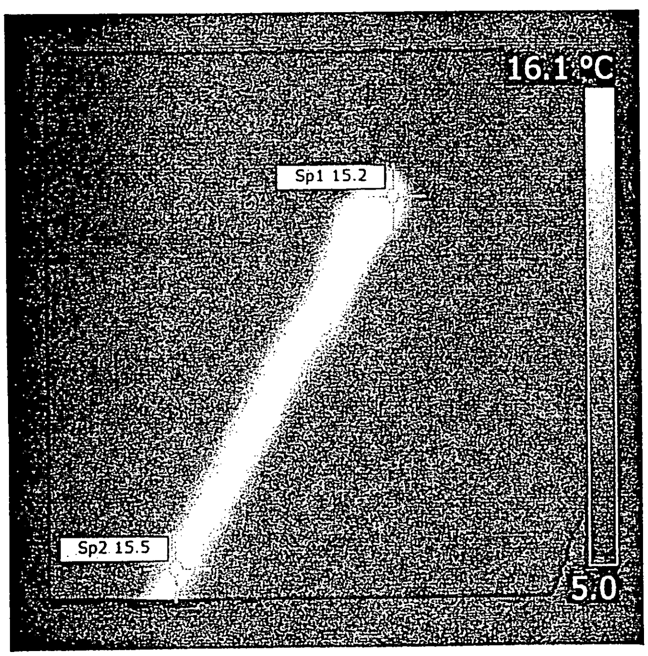

Figure 2: thermographic image of drain in access chamber

Measurement	Value	Units
Outside air temperature	7	°C
Wind speed at roof top (estimated)	4-8	m/s
Room temperature	19.5	°C
Temperature in stack enclosure at ground floor	17	°C
Air in base of stack	11.8	°C
Air at top of stack	14.1	°C
Air velocity in stack	0.6	m/s

Table 1: example measurements

Using the measured temperatures and airflow rate the model predicted a temperature at the top of the stack of 15.1°C which is higher than measured. We had noticed that the surface temperatures of the boxing within the stack enclosure were lower than the room temperature, which isn't surprising as the pipe surface temperature was as low as 13°C. Allowing for the thermal resistance of a 200mm x 200mm enclosure reduced the heat loss from the pipe by around 25% and reduced the predicted top temperature to 14.6°C.

The measured airflow rate (around 22m^3/h) and temperatures gave a heat loss via the air leaving the stack of 20W (1.7 W/K referenced to external air temperature) and the model estimated this at 22W (1.9 W/K). This compares with 82W (6.8 W/K) for the PHPP 8 approximation.

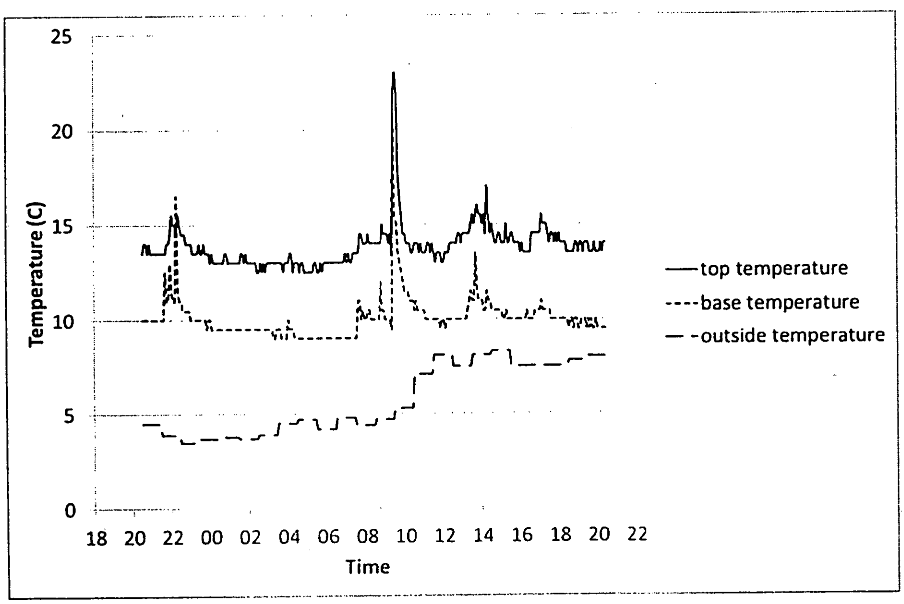

Figure 3: measured temperatures over 24 hours

Over a longer period of observation the temperature in the stack increases from time to time due to discharge of warm water into the drain but the temperature difference between top and bottom remains steady. Changes in outside air temperature do not have a strong immediate impact on temperatures in the SVP.

4 Analysis

Using the PHPP climate data and PHPP predicted ground temperatures for the site we looked at the monthly heat loss from the stack with standard internal conditions of 20°C.

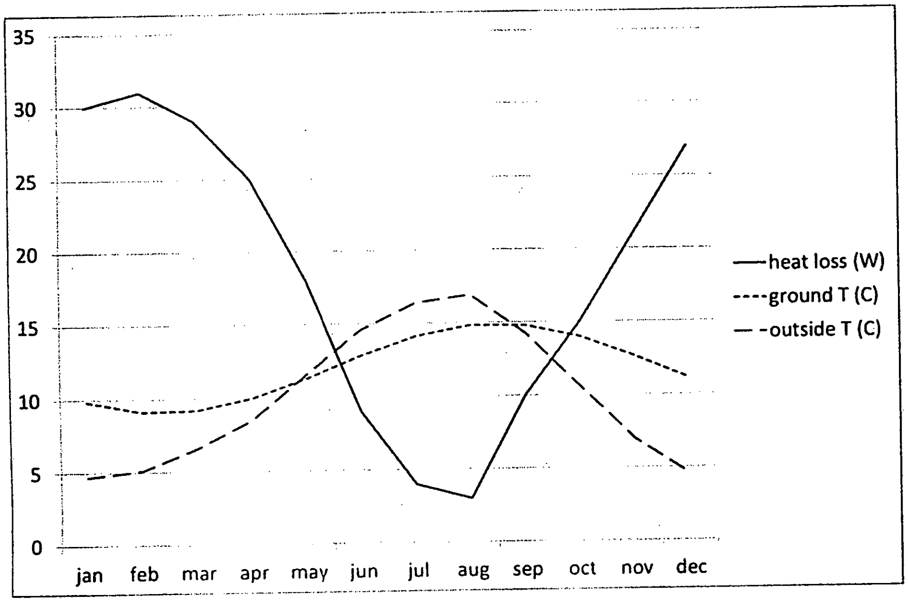

Figure 4: modelled annual heat loss

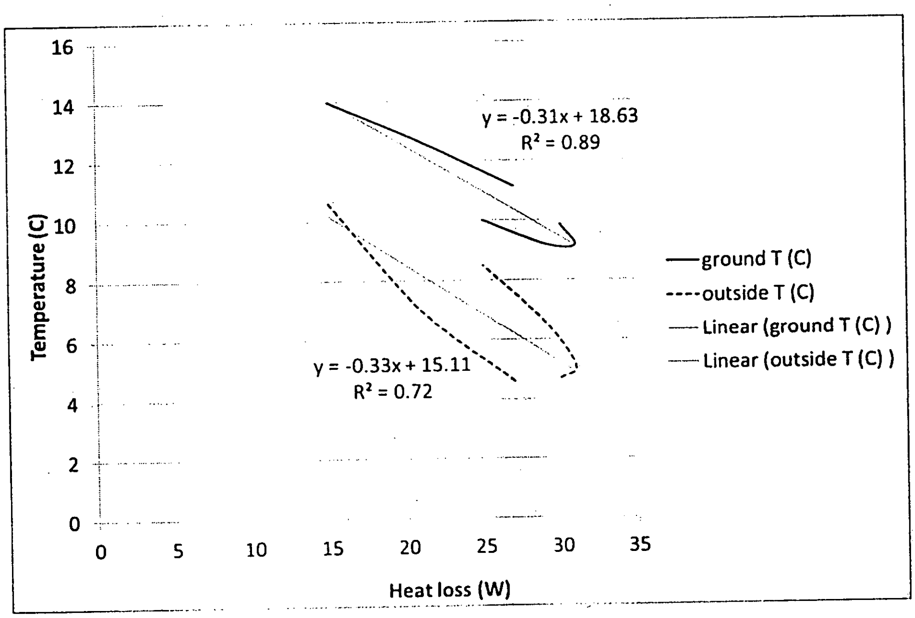

Figure 5: external and ground temperatures from fig 4 plotted against heat loss

Looking at the relationship between ground and air temperature and calculated heat loss (for Oct-Apr) shows a closer correlation with ground temperature.

We then modelled the insulation options for this house: 25mm of mineral fibre reduced heat loss to 0.9 W/K, 0.4 kWh/(m^2.a) and 50mm reduced heat loss to 0.7 W/K, 0.3 kWh/(m^2.a). This suggests that 25mm insulation is worth using but thicker insulation may not be justified.

We also explored throttling the airflow through the stack – a 50% reduction in air flow rate reduced the heat loss from 2 to 1.4 W/K. This was modelled by increasing the assumed length of sewer pipe to increase the total effective length. The reason seen for the non-linear response is that air entering the SVP remains cold and simply warms up more whilst travelling more slowly. If this approach were applied at a level which significantly reduced heat loss then restrictions to airflow out would also restrict airflow in and risk causing problems of pressure fluctuations in water seals which is the primary purpose of the vent.

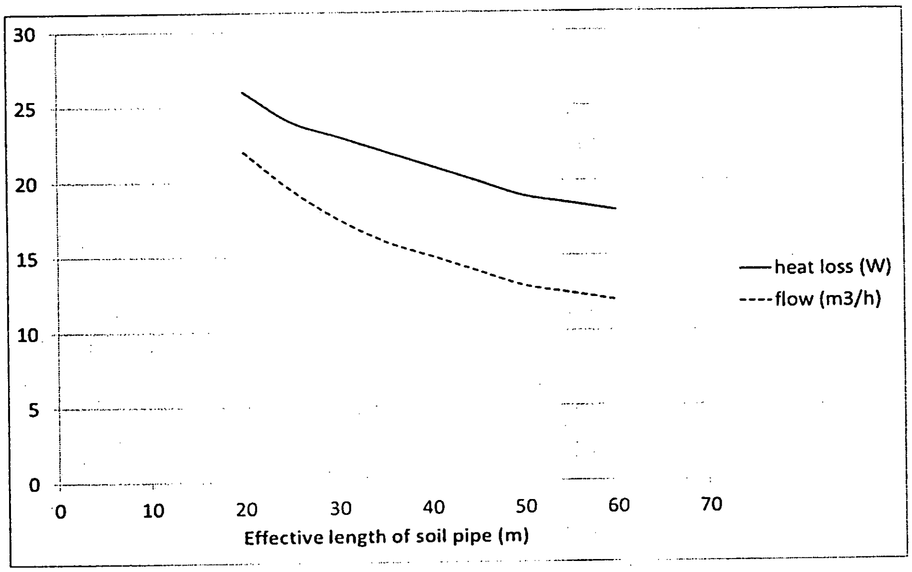

Figure 6: vent flowrate and heat loss against effective resistance in terms of pipe length

5 Conclusions

PHPP is the only domestic energy model we know which accounts for heat loss via the SVP, however the approximations in the PHPP model overestimate the heat loss by a large margin. Where the SVP is uninsulated or poorly insulated this has a significant impact on the predicted overall heating demand. For recent projects we have specified external vent pipes to avoid this penalty in the PHPP but this has a cost and visual impact that may not always be justified by the actual heat loss in the UK and similar climates.

The principle reason for the difference is the assumption in PHPP of a Ψ–value for a water filled pipe when the actual heat transfer is to air. A standard Ψ–value for a duct carrying air at winter ground temperature and 1 m/s would give a reasonable, yet conservative approximation. In our uninsulated SVP the average temperature increases by up to 2K, but when insulated the air temperature will be <1K above ground temperature, so we suggest treating this as a thermal bridge to ground rather than air.

Lloyd, Timothy

From: Baker, Carrie
Sent: Thursday, September 13, 2018 3:38 PM
To: Lloyd, Timothy
Subject: FW: Building Code Adoption and Appendix F

This one is for you!

Carrie

From: Daniel Congdon <dcongdon@missoulacounty.us>
Sent: Thursday, September 13, 2018 2:58 PM
To: Baker, Carrie <CBaker@mt.gov>; Cook, David <dcook@mt.gov>
Subject: Building Code Adoption and Appendix F

Good Afternoon,

I work at the Missoula Health Department and I am part of the Indoor Air Exposure Team. I am trying to stay up to date on the progress of the adoption of the new Residential Building Code. In particular, I am interested in opportunities to voice our support for the adoption of Appendix F, Radon Resistant New Construction (RRNC). I recently heard that Tim Lloyd retired. He is the one that I had been in contact with earlier this year.

Are you aware of when the adoption might happen, and when there may be an opportunity for public comment?

Thank you very much for your time.

Sincerely,

Daniel Congdon, RS

Environmental Health Specialist

Missoula City-County Health Dept

(406) 258-4867

Lloyd, Timothy

From: Lloyd, Timothy
Sent: Thursday, February 15, 2018 1:29 PM
To: daleh@ncat.org
Subject: FW: MT Energy Codes Collaborative Conf Call

Dale,

Appendices are not considered to be part of a code and legally enforceable unless they are specifically adopted by administrative rule. Below is the administrative rule regarding code adoption by certified local governments.

24.301.202 ADOPTION OF CODES

(1) The codes adopted by cities, counties, and towns must be the same as those adopted by the department. However, cities, counties, or towns need only adopt those codes, which they are certified to enforce; that is, plumbing, electrical, building or mechanical. The codes adopted by cities, counties, and towns must be the same edition with the same amendments as those adopted by the department. Each time the department modifies the codes, cities, counties, and towns must modify their codes to conform to the department's codes. The department will notify cities, counties, and towns of these code modifications, at which time they will have 90 days from receipt of the notice to conform their codes. Cities, counties, and towns shall notify the department in writing when the updated codes have been adopted and are being enforced. Such notification shall include a copy of the appropriate code adoption ordinance(s) or administrative action.

(2) An ordinance authorizing the adoption of a building code by administrative action must state, at a minimum:

(a) the type of codes which will be enforced, i.e., plumbing, electrical, building, or mechanical; and

(b) the individual, identified by position title, who has the authority to sign the administrative action.

(3) Discretionary provisions of a city, county, or town building code, i.e., provisions which are not mandated by the department, may not be adopted by administrative action.

Below are the only "discretionary" provisions for certified local governments. The Department can adopt code provisions and then let local governments decide if they want to adopt and enforce them.

24.301.134 OPTIONAL APPENDIX CHAPTERS FOR LOCAL GOVERNMENT ADOPTION

(1) The following appendix chapters of the International Building Code are adopted for use by local governments, in part or in whole, **if** the local government has specifically provided for their adoption. These appendix chapters are not adopted for use by the department:

(a) Appendix Chapter B (Board of Appeals); and

(b) Appendix Chapter H (Signs).

Here is the administrative rule governing the extent of local programs.

24.301.201 EXTENT OF LOCAL PROGRAMS

(1) A city, county, or town, as provided by 50-60-102 , MCA, may adopt codes to cover buildings within their respective jurisdictional areas. However, as provided by 50-60-102 , MCA, a city, county, or town may not cover residential buildings containing less than five dwelling units or their attached-to structures, any farm or ranch building and any private garage or private storage structure used only

for the owner's own use unless the local legislative body or board of county commissioners by ordinance or resolution makes the building code specifically applicable to those structures. A city, county, or town may accomplish this by making its building codes applicable to nonexempt building construction within the respective jurisdiction.

(2) When a city, county, or town is approved to enforce building, mechanical, electrical or plumbing codes for limited types of buildings, the Department of Labor and Industry, Building Codes Bureau retains authority to enforce building, mechanical, electrical and plumbing codes for all other buildings not covered by the city, county, or town and which are not exempt from department regulation.

Please feel free to contact me if you have any further questions.

Tim Lloyd
Bureau Chief

Montana Department of Labor & Industry
Business Standards Division
Building Codes/Weights and Measures
PHONE (406) 841-2053
tlloyd@mt.gov

From: Dale Horton [mailto:daleh@ncat.org]
Sent: Thursday, February 15, 2018 9:17 AM
To: Baker, Carrie <CBaker@mt.gov>
Subject: MT Energy Codes Collaborative Conf Call

Carrie: Thanks for participating in the phone call yesterday. I think that discussion will go a long way towards smoothing out the energy code upgrade conversations. Your perspective was really useful. I was to remind you of the question regarding the Appendix RA Solar-Ready Provisions. If the state adopts the 2018 IECC without removing this appendix do local jurisdictions have the option to adopt the appendix and require all new homes (that don't meet one of the two exceptions) to comply with the requirements of the appendix? Thanks again, Dale

Dale Horton, Architect
Energy Program Manager
National Center for Appropriate Technology
406/494-8653
daleh@ncat.org

NCAT

Lloyd, Timothy

From: Podolinsky, John
Sent: Wednesday, June 20, 2018 1:44 PM
To: Lloyd, Timothy
Cc: Baker, Carrie; Rouse, Bonnie; Andersen, Laura
Subject: FW: Submittal of Support letter for the Adoption of Appendix F into the IRC
Attachments: IRC_Radon_Support_06122018_FINAL.pdf

Good afternoon Mr. Lloyd,

The Montana Department of Environmental Quality's (DEQ) Radon Control Program supports the proposed adoption of Appendix F of the 2018 International Residential Code (IRC). Attached is a letter of support for the proposed adoption.

It would be gratefully appreciated if you would please be so kind as to inform me, Laura Anderson, or my supervisor, Bonnie Rouse, of perspective Appendix F hearing and testimony dates.

Please do not hesitate contacting me if you have questions about radon and/or radon resistance in new construction.

Thank you,

John Podolinsky
State of Montana, Dept. of Environmental Quality
Energy Bureau
Small Business Ombudsman (SBO)
Small Business Environmental Assistance Program (SBEAP)
http://deq.mt.gov/Energy/sbeap
Toll free: 800.433.8773
Radon Control Program
http://deq.mt.gov/Energy/radon
Toll free: 800.546.0483
Office ph: 406.444.6592
JPodolinsky@mt.gov

DEQ
Montana Department of Environmental Quality

Air, Energy & Mining Division

June 20, 2018

Tim Lloyd, Bureau Chief
Department of Labor and Industry, Building Codes Bureau
P.O. Box 1728
Helena, MT 59624-1728

Dear Mr. Lloyd,

The Montana Department of Environmental Quality (DEQ) Radon Control Program supports the proposed adoption of Appendix F of the 2018 International Residential Code (IRC). Appendix F contains new home construction techniques to mitigate radon gas aimed at reducing the numbers of radon-induced lung cancer cases in Montana. A few of the clear benefits follow.

Montana radon levels

- Most of Montana is categorized as Zone 1 for radon levels according to the US Environmental Protection Agency (EPA). This means most homes in Montana are at or above the radon action level of 4 picocuries of radon per liter of air (pCi/liter) where the EPA recommends homeowners take corrective measures to reduce exposure to radon gas including radon mitigation.
- According to the 2006 Montana Radon Study almost half the Montana homes tested for radon were at or exceeded the radon action level of 4pCi/liter of air.

Radon risks to health

- There is no safe exposure level to radon. The risk of lung cancer increases substantially with exposure to higher radon levels.
- Radon is the primary cause of lung cancer among people who have never smoked according to a 2009 study by the World Health Organization.
- Almost 21,000 radon-induced lung cancer deaths occur in the US each year. In Montana, roughly 7 out of 1000 non-smoking Montanan's could get lung cancer at the radon action level of 4 pCi/liter or air.

Radon mitigation is a logical, cost-effective addition to initial home building

- Incorporating radon resistance in new construction (RRNC) is simple, inexpensive, and more cost efficient than installing a radon mitigation system after a home has been built.
- According to Home Innovation Research Labs' Annual Builder Practices Survey 5960-16, RRNC installation costs in a single-family dwelling are $358, and $437 in a multi-family dwelling unit. The average cost of installing a radon mitigation system in a pre-existing home is $1,458.
- Reduced indoor radon levels may reduce the liability of home builders who incorporate RRNC.
- Home buyers are increasingly inquiring about radon and HUD now requires radon testing as part of its lending requirements on multi-family residences.

Thank you for considering our letter. We look forward to our continued participation in this process.

Sincerely,

Laura Rennick Andersen
Energy Bureau Chief

John Podolinsky
Radon Control Program

Steve Bullock, Governor I Tom Livers, Director I P.O. Box 200901 I Helena, MT 59620-0901 I (406) 444-2544 I www.deq.mt.gov

Lloyd, Timothy

From: Lloyd, Timothy
Sent: Tuesday, February 27, 2018 5:43 PM
To: Russell Murphy
Subject: Re: Montana code adoption meeting in Billings March 2nd

Thanks Russell

Tim

From: Russell Murphy <rgmurphyco@gmail.com>
Sent: Tuesday, February 27, 2018 2:53:27 PM
To: Lloyd, Timothy
Subject: Montana code adoption meeting in Billings March 2nd

Good afternoon Tim,

This is Russell Murphy, Building Inspector for Colstrip,MT and ICC Region II Board Secretary. Im hoping to make it to the code listening session in Billings on Friday March 2nd, but Ive had a darn cold that isn't improving at all. If I am not able to make it Dennis Hirsch told me to at least send you an email letting you know that I am in favor of adopting the complete 2018 IRC and IPC used as well.
I have read some articles from different building agencies and have found a majority of them in favor of using the IPC over the UPC method. It has been adopted in 36 states, including Wyoming and Washington in Region II. The main benefits Ive found in the articles when using the IPC is the cost savings, design, and installion flexibility it provides to the building projects. A mean savings of 17% in materials and 50% in labor where found in projects using IPC over UPC. Many plumbing applications are simpler than traditional applications and the IPC does not force a plumber to relearn everything they have learned.
I also feel that the 2018 IRC codes should be adopted in its entirety. Montana needs to stay up to date with new code policies with advancement in building technology nowadays. As a building inspector, people's life and safety is the number 1 priority when a new project is being constructed, and keeping Montana families safe is my number one priority.

Thank you for your time and I hope I can make it on Friday morning.

Thank you,
Russell

From the City of Bozeman, Building Division

Suggestion regarding IBC Chapter 11, 1107.6.6.2.2... R2 occupancies other than apartment houses, monasteries and convents.

My suggestion would be to allow all of the units in this type of R2 occupancy building with four or more units to be constructed as Type B adaptable units and provide an exception that would not require Type A accessible units.

Typically in this occupancy classification, the units are for sale rather than being rented. They are not hotels, motels or apartments. They are usually condos that are for sale. We've had a number of these types of unit built in the past 5 years with a lot more coming up. Providing the required accessible units has proved to be a hardship in several ways for the developers.

First, the units are selling fast and the developers are finding themselves stuck with accessible units that are not selling. The second issue is when a disabled person wants to buy a unit in a complex, but they don't like the location of the accessible unit that's been provided according to the code. They might want a unit on the 4th floor rather than the 2nd... or on the west side rather than the east side.

Also, it would be pretty unusual for a disabled customer to actually require all of the accessible features provided in a Type A unit. They might have a site or visual impairment... or they might need a wheelchair. They will rarely need all of the adaptable features. Purchasing an adaptable unit would allow a disabled buyer to have only the features that would benefit them which could bring their overall cost down for the unit.

Having an R2 building with all adaptable units would make the units easier to sell and would allow a disabled home buyer to purchase the unit they want and have only the accessible features they need.

This exception should not apply to R1 occupancies or R2 occupancies like apartment buildings where the units are available to the public and you never know who will show up or what their needs will be.

Lloyd, Timothy

From: Tony Sauro <TSauro@ci.missoula.mt.us>
Sent: Wednesday, February 28, 2018 8:25 AM
To: Lloyd, Timothy
Subject: Code Hearings

Tim;
It was great meeting you yesterday. Thanks again for holding the listening sessions across the State of Montana. I would love to help in any way possible with the 2018 Uniform Plumbing Code adoption and the State of Montana Plumbing amendments. Back in February of 2017 I did fill out an application to be on the Montana Board of Plumbers. I heard from the governor's office a few months ago and they said the governor has not had a chance to review my application. If I can help in any way feel free to e mail me back.

Thank You

Tony Sauro
City of Missoula
Plumbing / Medical Gas Inspector
(406)-239-1385
tsauro@ci.missoula.mt.us

Lloyd, Timothy

From: Breker, Jed on behalf of DLI BSD Building Codes
Sent: Wednesday, January 24, 2018 3:25 PM
To: Lloyd, Timothy
Cc: Baker, Carrie
Subject: FW: 2018 Building Codes.

Jed Breker
Montana Building Codes Bureau
Permit Tech & Licensing
buildingcodes@mt.gov
Office: 406-841-2056
Fax: 406-841-2050

From: David V. Gray [mailto:david.dvgarchandplan@gmail.com]
Sent: Wednesday, January 24, 2018 2:27 PM
To: DLI BSD Building Codes <buildingcodes@mt.gov>
Subject: 2018 Building Codes.

To Whom it May Concern,

I would be nice to have the section of the 2018 code that requires handrails on both sides of a residential and commercial stair to be amended so a handrail is only required on one side, if the stair width is required to be less than 44" wide. Having handrails on both sides of narrow stairs squeezes the exit width and creates a hazardous exit. The remaining exit width can easily be blocked by people and reduce the access of emergency equipment such as gurneys.

Respectfully,

David V. Gray LEED Green Associate
Principal Architect and Owner
DVG Architecture and Planning P.C.
david.dvgarchandplan@gmail.com
111 N. Higgins Ave #420
Missoula MT 59802
406-241-7707
www.dvgarchitects.com
DVG Architecture and Planning on Facebook
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www.houzz.com Profile

In item (22) of ARM 24.301.154, which states "Appendices do not apply unless specifically adopted by the department", does 'department' refer to the local jurisdiction or the State Department of Labor and Industry? *Just wanted to clarify if AHJ can adopt any appendices.

Some code issues to consider:

ARM 24.301.154 - IRC

Items (9) and (10) – Stair rise and run should conform with IRC and request removal of the amendment.

Item (13) Foundation Drainage – R405.1. Gutters and downspouts that may or may not remain in place or in good working order are not a sufficient substitute for foundation drains.

ARM 24.301.146 – IBC

The following code section should be addressed based on item (12) which removes the sprinkler requirements from certain 'R' occupancies.

We propose the following changes:

All 'R' occupancy sleeping rooms in non-sprinklered buildings shall have emergency escape and rescue openings. Section 1030.

Revise item (12) 1. b. to read: 9 or more occupants in other than 'R' occupancies (Dwelling units narrows the scope. Just clarifies the intent).

All 'R' occupancies above or below the level of exit discharge in non-sprinklered buildings shall have 2 exits or access to 2 exits – Tables 1006.3.3(1) & (2) presume that all "R" occupancies are fire sprinkled.

1006.3.3, ex 4 should add 'if equipped throughout with an automatic sprinkler system, or there are no sleeping rooms above or below the level of exit discharge).

Section 420.2 should be revised to add text that in 'R' occupancies without a fire sprinkler system, the separation walls between dwelling, sleeping units, and other occupancies shall be fire barriers instead of fire partitions.

Any corridors in 'R' occupancies without a fire sprinkler system should be 1-hr fire barriers with 45 minute rated doors.

Consider adding text to clarify sprinkler requirements in live/work units.

The ISPS should include residential provisions.

Lloyd, Timothy

From: Breker, Jed on behalf of DLI BSD Building Codes
Sent: Thursday, April 19, 2018 8:27 AM
To: Lloyd, Timothy
Cc: Baker, Carrie
Subject: FW: Plumbing code changes

Comments on the plumbing code.

Jed Breker
Permit Tech & Licensing

Montana Department of Labor & Industry
Business Standards Division
Building Codes Bureau
Office: 406-841-2056
Fax: 406-841-2050
buildingcodes@mt.gov

-----Original Message-----
From: RJ plumbing [mailto:rjsplumb1@gmail.com]
Sent: Thursday, April 19, 2018 8:13 AM
To: DLI BSD Building Codes <buildingcodes@mt.gov>
Subject: Plumbing code changes

To whom it my concern,

Hello my name is Ron Slaven (master plumber#2622), owner of RJ'S Plumbing LLC. Of Red Lodge, MT.. It has been brought to my attention that the board is considering adding to the codes that all domestic hot water piping be insulated.
I would like to voice my opinion on this matter. While this would add significant cost to the project it would also be difficult to administer to piping within the walls because of thickness of insulation and other piping within a stud wall. I believe the energy benefit would be mute in a conditioned space such as this as well.
I vote no on this proposal !

I also understand the board is considering allowing the discharge from a dishwasher to be looped high in the cabinet before being connected to a disposal or tubular wye type fitting omitting the need for a airgap device attached to the sink or p-trap and stand pipe below the sink.
This I vote yes on .

Sincerely
RJ Slaven
406-446-0295
406-425-0781
Sent from my iPad

Lloyd, Timothy

From: Baker, Carrie
Sent: Tuesday, September 18, 2018 9:52 AM
To: Lloyd, Timothy
Subject: FW: 2018 solar energy code ICC/NFPA
Attachments: 2018_isep.pdf

Here is the entire copy of the book if you wanted to take a look at it...

Carrie

From: Jeff Clawson <jclawson@kalispell.com>
Sent: Tuesday, September 18, 2018 9:49 AM
To: Baker, Carrie <CBaker@mt.gov>
Subject: RE: 2018 solar energy code ICC/NFPA

Carrie

Here is a copy for the state to review

Jeff Clawson, Building Official
City of Kalispell Building Department
Building Department
201 1st Ave. E.
Kalispell, MT 59901
406-758-7734

From: Baker, Carrie <CBaker@mt.gov>
Sent: Tuesday, September 18, 2018 9:32 AM
To: Jeff Clawson <jclawson@kalispell.com>
Subject: RE: 2018 solar energy code ICC/NFPA

Hi Jeff,

That is interesting. I didn't know solar had its own book! Thanks so much for sharing! I have passed this along to Tim Lloyd, as he is spear heading the code adoption.

Have a great rest of your day,

Carrie

From: Jeff Clawson <jclawson@kalispell.com>
Sent: Tuesday, September 18, 2018 7:39 AM
To: Baker, Carrie <CBaker@mt.gov>
Subject: 2018 solar energy code ICC/NFPA

Carrie

I thought this was interesting and the state may want to look at this when they adopt the new NEC

https://www.buildings.com/news/industry-news/articleid/21681/title/solar-energy-codes-book

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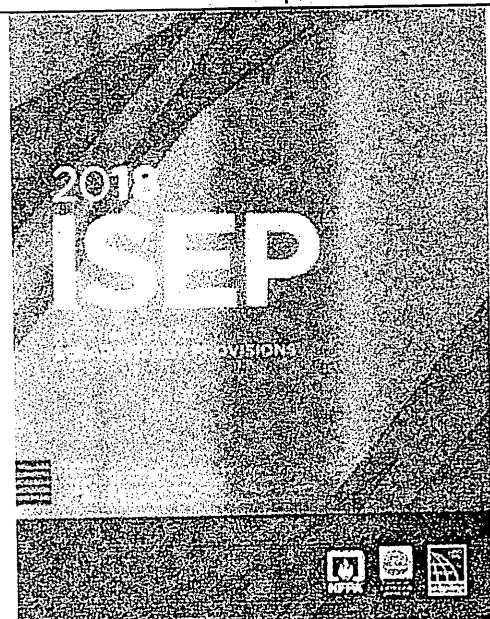

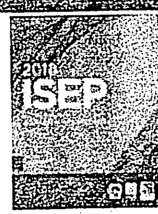

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Overview

Front Matter (Title Page, TOC, Preface and Forward)

Commercial Referenced Standards

Residential Referenced Standards

The ISEP meets the industry's need for a resource that contains the complete solar energy-related provisions from the 2018 International Codes and NFPA 70: 2017 NEC® National Electrical Code, and selected standards in one document. The ISEP is organized such that it provides the best and most comprehensive tool for the design, installation and administration of both solar thermal (or solar heating and cooling) and photovoltaic systems. Similar to the organization of the International Energy Conservation Code® (IECC®), the Solar Commercial and Residential provisions have been presented in separate parts, to make it user friendly and easy to apply. Three important solar referenced standards have been included in their entirety: Solar Rating & Certification Corporation (SRCC) Standard 100 (Minimum Standards for Solar Thermal Collectors); SRCC Standard 300 (Minimum Standards for Solar Water Heating Systems); and SRCC Standard 600 (Minimum Standards for Solar Thermal Concentrating Collectors). Additional resources, such as sample solar permitting forms and links to the U.S. Department of Energy solar site access, have also been included, making this 2018 ISEP the single, most comprehensive document for solar energy code provisions and standards in the nation.

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Jeff Clawson, Building Official
City of Kalispell Building Department
Building Department
201 1st Ave. E
Kalispell, MT 59901
406-758-7734

Lloyd, Timothy

From: Steve Snezek <steve@montanabia.com>
Sent: Tuesday, February 20, 2018 9:36 AM
To: Lloyd, Timothy
Cc: Byron Roberts; Bill Pierce; Ron Bartsch; Greg McCall
Subject: Further comments from MBIA on possible Radon Appendix and Tiny Home Appendix
Attachments: Lloyd letter February 14.docx

Tim,
Thank you again for working with us on the Building Codes adoption process.
Please see the attached letter as additional comments (subsequent to our Jan 24 2018 letter) regarding MBIA's position on a possible adoption of the Radon Appendix and Tiny Home Appendix.

I'll be at the Helena listening session on Monday.
Thanks,
steve

Stephen P. Snezek
Executive Director
Montana Building Industry Association
steve@montanabia.com
406-442-4479

February 20, 2018

Tim Lloyd
Montana Department of Labor and Industry
Building Codes Bureau
PO Box 200517
Helena, Montana 59624-1728

Dear Mr. Lloyd:
This letter is a supplement to MBIA's previous letter of January 24, 2018 in reference to the upcoming hearings on the proposed changes to the Montana Building Codes.

It has come to our attention that there may be some commenters who are proposing that Montana adopt the Radon Appendix (Appendix F) and the Tiny Homes Appendix (Appendix Q). While we do not have any comments this time on the Tiny Homes Appendix, we would not be in favor of adopting the Radon Appendix. Many of our members are already including passive systems in the homes they are building, and other clients are asking that systems be installed – with the knowledge that it will increase the cost of their home. But we do not think that requiring them would be prudent at this time. Requiring radon systems would not only increase the cost of every home, but would also add one more thing to the long list of potential liability issues that a builder must deal with.

Thank you for allowing us to comment, and if you have any further questions, please let us know.

Sincerely,

Stephen Snezek

Executive Director

MONTANA
BUILDING
INDUSTRY
ASSOCIATION

1717 ELEVENTH AVENUE
HELENA, MONTANA 59601
(406) 442-4479
montanabia.com

January 24, 2018

Tim Lloyd
Montana Department of Labor and Industry
Building Codes Bureau
PO Box 200517
Helena, Montana 59624-1728

Dear Mr. Lloyd:

The Montana Department of Labor and Industry is considering future rulemaking to adopt updated residential building codes, including consideration of the International Residential Code (IRC). The 1550 member Montana Building Industry Association along with the National Association of Homebuilders supports the concept of a coordinated set of national model building codes developed for use by state and local code enforcement jurisdictions. We feel that the IRC meets this objective.

Montana homebuilders have been following the development of the International Residential Code (IRC) with a great deal of interest. We feel that the IRC is written in clear and easy to understand code language whereby builders can tell at a glance the intent of the code. A simple and understandable code translates into a code that is also more easily enforceable. Throughout the country homebuilders have played a major role in the development of the IRC. The efficiency of builder operations would be improved by the consistency brought about by the IRC.

What follows is an initial list that represents those sections of the 2018 IRC and the 2018 IBC which are a concern for MBIA builders, and how those concerns can be addressed. As we receive more feedback from our members, we would reserve the opportunity to comment further.

Thank you so much for the opportunity to work with you.
Sincerely,

Steve

Stephen Snezek
Executive Director

1. Self Closing Devices

This amendment removes the requirement for all doors separating the garage from the interior dwelling to be equipped with a self-closing and latching device.

Revise as follows:

R302.5.1 Opening protection. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inches (35 mm) in thickness, solid or honeycomb core steel doors not less than 1 3/8 inches (35 mm) thick, or 20-minute fire-rated doors~~, equipped with a self-closing device~~.

Reason:

MBIA strongly disagrees with the new requirement for door closures on openings between the garage and the house. For many years, proponents argued that fires that originate in the garage could pass through these openings but failed to provide any reliable data or statistics. As a result, the committee and the governmental members repeatedly disapproved this requirement.

During the 2009-10 code development process, the proponents returned with a new reason to prevent the spread of carbon monoxide from vehicles and the by-products produced by burning thermoplastics. While the proponents were able to produce an extremely lengthy dissertation on the hazards of carbon monoxide and the number of false alarms created by carbon monoxide detectors, nowhere in their written or oral testimony did they link any statistical substantiation to need for closures on these openings nor has there been any other evidence produced by other parties.

2. Stair Geometry (8 ¼ Inch Riser)

This amendment revises the 2012 IRC to return stair geometry to the 8 ¼-inch riser by 9-inch tread depth of the 2006 IRC.

Revise as follows:

R311.7.5 Stair treads and risers. Stair treads and risers shall meet the requirements of this section. For the purposes of this section, dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.

R311.7.5.1 Risers. The riser height shall be not more than 8 ¼ inch (210mm) ~~7¾ inches (196 mm)~~. The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. Open risers are permitted provided that the openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below do not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

1. The opening between adjacent treads is not limited on spiral stairways.
2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.2 Treads. The tread depth shall be not less than 9 inches (229mm) ~~10 inches (254 mm)~~. The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

Reason:

This amendment retains the stair geometry requirements allowed under the Building Officials and Code Administrators National Building Code (BOCA). This amendment allows the continued use of the 8 ¼" x 9" geometry, the dimensions still accepted by many state and local jurisdictions across the country.

These dimensions, originally accepted in the first draft of the IRC and the historic dimensions in the Council of American Building Official's CABO One- and Two-family Building Code, adequately provide for stair safety in residential occupancies. No sound documentation or data has ever been presented demonstrating these proposed dimensions are any less safe or are a contributing factor in accidental residential falls than a stair geometry of 7 ¾"x 10".

The safety benefits of the 7 ¾" riser and 10" tread stair geometry are technically unsubstantiated and are not practical in many home designs. If the footprint of the house must be increased to accommodate the additional space needed, adequately sized living spaces are sacrificed without any demonstrated gain. This can lead to an economic hardship on first-time home buyers of smaller homes, and in particular for construction on smaller lots, infill projects, and townhomes.

As outlined in Section R101.3 of the IRC, the intent of the code is to provide minimum requirements for occupant safety and health. There is adequate substantiation to show that 8¼-inch x 9 inch geometry provides this minimum level of occupant safety.

3. Stair Geometry (8-Inch Riser)

This amendment revises the Internal Residential Code to coincide with the stair geometry to 8-inch riser by 9-inch tread depth as found in the UBC.

Revise as follows:

R311.7.5 Stair treads and risers. Stair treads and risers shall meet the requirements of this section. For the purposes of this section, dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.

R311.7.5.1 Risers. The riser height shall be not more than <u>8 inches (210 mm)</u> ~~7 3/4 inches (196 mm)~~. The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. Open risers are permitted provided that the openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below do not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

1. The opening between adjacent treads is not limited on spiral stairways.
2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.2 Treads. The tread depth shall be not less than <u>9 inches (229mm)</u> ~~10 inches (254 mm)~~. The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

Reason:

This amendment retains the stair geometry requirements allowed under the Uniform Building Code (UBC). This amendment allows the continued use of the 8" x 9" geometry, the dimensions still accepted by many state and local jurisdictions across the country. In fact, many adopt stair geometry requirements of 8 ¼" x 9".

The 8" x 9" geometry has always adequately provided for occupant safety in residential occupancies. No sound documentation or data has ever been presented demonstrating it is any less safe or a contributing factor in accidental residential falls than a stair geometry of 7 ¾" x 10" or other even more stringent geometries.

The safety benefits of the 7 ¾" riser and 10" tread stair geometry are technically unsubstantiated and are not practical in many home designs. If the footprint of the house must be increased to accommodate the additional space needed, adequately sized living spaces are sacrificed without any demonstrated gain. This can lead to an economic hardship on first-time home buyers of smaller homes, and in particular for construction on smaller lots, infill projects, and townhomes.

As outlined in Section R101.3 of the IRC, the intent of the code is to provide minimum requirements for occupant safety and health. There is adequate substantiation to show that 8-inch x 9 inch geometry provides this minimum level of occupant safety.

4. Guard Requirement

This amendment reinstates the guard requirement only for those areas where the elevation difference from the walking edge to the ground directly below is more than 30 inches.

Revise as follows:

R312.1.1 Where required. Guards shall be located along open-sided walking surfaces of all decks, porches, balconies, including stairs, ramps and landings that are located more than 30 inches measured vertically to the floor or grade below. ~~at any point within 36 inches (914 mm) horizontally to the edge of the open side~~ Insect screening shall not be considered as a guard.

Reason:

This amendment retains the provisions of previous editions of the IRC, where guardrails were required when the elevation difference between the walking surface was greater than 30 inches to the floor or grade directly below. The 2018 IRC now requires a guardrail where the elevation difference is greater than 30 inches from the walking surface to a horizontal point 36 inches adjacent to the leading edge of the walking surface to the grade or floor below. This change will now require the building official to carry a four-foot level to conduct inspections.

The proponent of this change referred to work conducted and reports written by the ICC Code Technology Committee (CTC). At no time during the public hearings was any technical justification presented to substantiate the change requiring the building official to measure 36 inches away from the leading edge of the walking surface or tread to determine when a guardrail should or should not be required. After reviewing the many reports from the CTC website, it is still unclear from where the 36-inch requirement was derived. There are no studies that can support claims that this will have an effect on reducing possible injuries. While the proponent promotes this as a means for consistent enforcement of the guard requirements, there is no evidence of increased risk to the safety of the occupant if the current method of measuring from the edge of the walking surface to grade below is used.

5. Footing Tables

This amendment replaces the existing footing tables in the IRC with revised tables providing more reasonable footing widths~~;~~ while still complying with accepted engineering practice and design standards

Revise as follows:

R403.1.1 Minimum size. The minimum width, W, and thickness, T, for concrete footings shall be in accordance with Tables R403.1(1) through R403.1(3) and Figure R403.1(1) or R403.1.3, as applicable, but not less than 12 inches in width and not less than 6 inches in depth. The footing width shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Footing projections, P, shall be not less than 2 inches (51 mm) and shall not exceed the thickness of the footing. Footing thickness and projection for fireplaces shall be in accordance with Section R1001.2. The size of footings supporting piers and columns shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1. Footings for wood foundations shall be in accordance with the details set forth in Section R403.2, and Figures R403.1(2) and R403.1(3).

Modify Tables R403.1(1), R403.1(2) and R403.1(3) with the following:

TABLE R403.1(1)
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION (inches)[a,b,c,d]

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
20 psf	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	15~~18~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	14~~16~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	19~~22~~ x 6	14~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6
	3 story—slab-on-grade	14 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	18~~19~~ x 6	14 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—plus basement	23~~25~~ x 8	17~~19~~ x 6	14~~15~~ x 6	12~~13~~ x 6	12 x 6	12 x 6
30 psf	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	12~~13~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	15~~19~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	15~~17~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	19~~23~~ x 6	14~~17~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6
	3 story—slab-on-grade	15 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	18~~20~~ x 6	14~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—plus basement	23~~26~~ x 8	17~~20~~ x 6	14~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6
50 psf	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	13~~16~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	17~~21~~ x 6	13~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	13~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	16~~19~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	21~~25~~ x 7	15~~19~~ x 6	12~~15~~ x 6	12 x 6	12 x 6	12 x 6
	3 story—slab-on-grade	16~~17~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	20~~22~~ x 6	15~~17~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6
	3 story—plus basement	24 x 8~~28 x 9~~	18~~21~~ x 6	15~~17~~ x 6	12~~14~~ x 6	12 x 6	12 x 6
70 psf	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	14~~18~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	18 x 6~~24 x 7~~	14~~18~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	14~~16~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	18~~21~~ x 6	13~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	22 x 7~~27 x 9~~	17~~20~~ x 6	13~~16~~ x 6	12~~14~~ x 6	12 x 6	12 x 6
	3 story—slab-on-grade	18~~19~~ x 6	13~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	21~~25~~ x 7	16~~18~~ x 6	13~~15~~ x 6	12 x 6	12 x 6	12 x 6
	3 story—plus basement	26 x 9~~30 x 10~~	19~~23~~ x 6	15~~18~~ x 6	13~~15~~ x 6	12~~13~~ x 6	12 x 6

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m2.

a. ~~Interpolation allowed. Extrapolation is not allowed.~~

b. ~~Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).~~

a. Linear interpolation of footing width is permitted between the soil bearing pressures in the table.

b. The table is based on the following conditions and loads: Building width: 32 feet; Wall height: 10 foot; Basement wall height: 10 foot; Dead loads: 20 psf roof and ceiling assembly, 10 psf floor assembly, 15 psf wall assembly
Live loads: Roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floor

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

d. Where the building width perpendicular to the wall footing is not greater than 32 feet, a 2 inch decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of decrease in bu

TABLE R403.1(2)
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER (inches)[a,b,c,d]

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH BRICK VENEER	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
20 psf	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	13~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	18~~21~~ x 6	13~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	16~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	19~~20~~ x 6	14~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	24~~26~~ x 8	18~~20~~ x 6	14~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6
	3 story—slab-on-grade	22~~20~~ x 6	16~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	25 x 9~~26 x 8~~	19 x 6	15 x 6	13 x 6	12 x 6	12 x 6
	3 story—plus basement	30~~32~~ x 11	22~~24~~ x 7	15~~19~~ x 6	15~~16~~ x 6	13~~14~~ x 6	12 x 6
30 psf	1 story—slab-on-grade	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	13~~16~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	18~~22~~ x 6	13~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	16 x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	19~~22~~ x 6	15~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	24 x 8~~27 x 9~~	18~~21~~ x 6	14~~16~~ x 6	12~~14~~ x 6	12 x 6	12 x 6
	3 story—slab-on-grade	22 x 7~~21 x 6~~	16 x 6	13 x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	25 x 9~~27 x 8~~	19~~20~~ x 6	15~~16~~ x 6	13 x 6	12 x 6	12 x 6
	3 story—plus basement	30~~33~~ x 11	22~~24~~ x 7	15~~20~~ x 6	15~~16~~ x 6	13~~14~~ x 6	12 x 6
50 psf	1 story—slab-on-grade	12~~13~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	15~~18~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	19 x 6~~24 x 7~~	15~~18~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—slab-on-grade	17~~18~~ x 6	13~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	21~~24~~ x 7	16~~18~~ x 6	13~~14~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—plus basement	25 x 9~~29 x 10~~	19~~22~~ x 6	15~~18~~ x 6	13~~15~~ x 6	12~~13~~ x 6	12 x 6
	3 story—slab-on-grade	23~~27~~ x 7	17~~18~~ x 6	14~~13~~ x 6	12 x 6	12 x 6	12 x 6
	3 story—with crawl space	27 x 10~~29 x 9~~	20~~22~~ x 6	16~~17~~ x 6	13~~14~~ x 6	12 x 6	12 x 6
	3 story—plus basement	31~~35~~ x 12	24~~26~~ x 8	16~~21~~ x 6	16~~17~~ x 6	13~~15~~ x 6	12~~13~~ x 6
70 psf	1 story—slab-on-grade	14~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	16~~20~~ x 6	12~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	21 x 7~~26 x 8~~	16~~20~~ x 6	13~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6
	2 story—slab-on grade	19~~20~~ x 6	14~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	22 x 7~~26 x 8~~	17~~19~~ x 6	13~~15~~ x 6	12~~13~~ x 6	12 x 6	12 x 6
	2 story—plus basement	27 x 10~~32 x 11~~	20 x 6~~24 x 7~~	16~~19~~ x 6	13~~16~~ x 6	12~~14~~ x 6	12 x 6
	3 story—slab-on-grade	25 x 9~~26 x 8~~	19 x 6	15 x 6	12~~13~~ x 6	12 x 6	12 x 6
	3 story—with crawl space	28 x 10~~31 x 11~~	21~~23~~ x 7	17~~19~~ x 6	14~~16~~ x 6	12~~13~~ x 6	12 x 6
	3 story—plus basement	33~~37~~ x 13	25~~28~~ x 9	17~~22~~ x 6	16~~18~~ x 6	14~~16~~ x 6	12~~14~~ x 6

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m2.

~~a. Interpolation allowed. Extrapolation is not allowed.~~

~~b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but~~

~~not less than 6 inches thick).~~

a. Linear interpolation of footing width is permitted between the soil bearing pressures in the table.
b. The table is based on the following conditions and loads: Building width: 32 feet; Wall height: 10 foot; Basement wall height: 10 foot; Dead loads: 20 psf roof and ceiling assembly, 10 psf floor assembly, 45 psf wall assembly
Live loads: Roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floor
c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.
d. Where the building width perpendicular to the wall footing is not greater than 32 feet, a 2 inch decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of decrease in building width.

TABLE R403.1(3)
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS WITH CAST-IN-PLACE CONCRETE OR ~~FULLY~~ PARTIALLY-GROUTED CONCRETE MASONRY WALL CONSTRUCTION (inches)[a,b,c,d]

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH CMU OR CONCRETE	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
20 psf	1 story—slab-on-grade	12~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	14~~19~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	19 x 6~~25 x 8~~	14~~19~~ x 6	12~~15~~ x 6	12~~13~~ x 6	12 x 6	12 x 6
	2 story—slab-on-grade	17 x 6~~23 x 7~~	13~~18~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	21 x 7~~29 x 9~~	16~~22~~ x 6	13~~17~~ x 6	12~~14~~ x 6	12 x 6	12 x 6
	2 story—plus basement	25 x 9~~35 x 12~~	19 x 6~~26 x 8~~	15~~21~~ x 6	13~~17~~ x 6	12~~15~~ x 6	12~~13~~ x 6
	3 story—slab-on-grade	24 x 8~~32 x 11~~	18 x 6~~24 x 7~~	14~~19~~ x 6	12~~16~~ x 6	12~~14~~ x 6	12 x 6
	3 story—with crawl space	28 x 10~~38 x 14~~	21 x 7~~28 x 9~~	17~~23~~ x 6	14~~19~~ x 6	12~~16~~ x 6	12~~14~~ x 6
	3 story—plus basement	32 x 12~~43 x 17~~	24 x 8~~33 x 11~~	19~~26~~ x 8	16~~22~~ x 6	14~~19~~ x 6	12~~16~~ x 6
30 psf	1 story—slab-on-grade	12~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	14~~20~~ x 6	12~~15~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	19 x 6~~26 x 8~~	14~~20~~ x 6	12~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6
	2 story—slab-on-grade	17 x 6~~24 x 7~~	13~~18~~ x 6	12~~15~~ x 6	12 x 6	12 x 6	12 x 6
	2 story—with crawl space	21 x 7~~30 x 10~~	16~~22~~ x 6	13~~18~~ x 6	12~~15~~ x 6	12~~13~~ x 6	12 x 6
	2 story—plus basement	25 x 9~~36 x 13~~	19~~27~~ x 8	15~~21~~ x 6	13~~18~~ x 6	12~~15~~ x 6	12~~13~~ x 6
	3 story—slab-on-grade	12 x 8~~33 x 12~~	18 x 6~~25 x 7~~	15~~20~~ x 6	12~~17~~ x 6	12~~14~~ x 6	12 x 6
	3 story—with crawl space	28 x 10~~39 x 14~~	21 x 7~~29 x 9~~	17 x 6~~23 x 7~~	14~~19~~ x 6	12~~17~~ x 6	12~~14~~ x 6
	3 story—plus basement	32 x 12~~44 x 17~~	24 x 8~~33 x 12~~	19 x 6~~27 x 8~~	16~~22~~ x 6	14~~19~~ x 6	12~~17~~ x 6
50 psf	1 story—slab-on-grade	13~~17~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	16~~22~~ x 6	12~~17~~ x 6	12~~13~~ x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	20 x 6~~28 x 9~~	15~~21~~ x 6	12~~17~~ x 6	12~~14~~ x 6	12 x 6	12 x 6
	2 story—slab-on-grade	19 x 6~~27 x 8~~	14~~20~~ x 6	12~~16~~ x 6	12~~13~~ x 6	12 x 6	12 x 6
	2 story—with crawl space	23 x 8~~32 x 11~~	17 x 6~~24 x 7~~	14~~19~~ x 6	12~~16~~ x 6	12~~14~~ x 6	12 x 6
	2 story—plus basement	27 x 10~~38 x 14~~	20 x 6~~28 x 9~~	16~~23~~ x 6	13~~19~~ x 6	12~~16~~ x 6	12~~14~~ x 6
	3 story—slab-on-grade	13 x 9~~35 x 13~~	19 x 6~~27 x 8~~	15~~21~~ x 6	13~~18~~ x 6	12~~15~~ x 6	12~~13~~ x 6
	3 story—with crawl space	29 x 11~~41 x 15~~	22 x 7~~31 x 10~~	18 x 6~~24 x 7~~	15~~20~~ x 6	13~~17~~ x 6	12~~15~~ x 6
	3 story—plus basement	34 x 13~~47 x 18~~	25 x 9~~35 x 12~~	20 x 6~~28 x 9~~	17 x 6~~23 x 7~~	14~~20~~ x 6	13~~17~~ x 6
70 psf	1 story—slab-on-grade	15~~19~~ x 6	12~~14~~ x 6	12 x 6	12 x 6	12 x 6	12 x 6
	1 story—with crawl space	17 x 6~~25 x 7~~	13~~18~~ x 6	12~~15~~ x 6	12 x 6	12 x 6	12 x 6
	1 story—plus basement	22 x 7~~30 x 10~~	16~~23~~ x 6	13~~18~~ x 6	12~~15~~ x 6	1213 x 6	12 x 6
	2 story—slab-on-grade	20 x 6~~29 x 9~~	15~~22~~ x 6	12~~17~~ x 6	1214 x 6	12 x 6	12 x 6
	2 story—with crawl space	24 x 8~~34 x 12~~	18 x 6~~26 x 8~~	14~~21~~ x 6	12~~17~~ x 6	12~~15~~ x 6	12~~13~~ x 6
	2 story—plus basement	28 x 10~~40 x 15~~	21 x 7~~30 x 10~~	17 x 6~~24 x 7~~	14~~20~~ x 6	12~~17~~ x 6	12~~15~~ x 6
	3 story—slab-on-grade	14 x 10~~38 x 14~~	20 x 6~~28 x 9~~	16~~23~~ x 6	14~~19~~ x 6	12~~16~~ x 6	12~~14~~ x 6
	3 story—with crawl space	31 x 12~~43 x 16~~	23 x 8~~32 x 11~~	18 x 6~~26 x 8~~	15~~21~~ x 6	15~~18~~ x 6	12~~16~~ x 6
	3 story—plus basement	35 x 14~~49 x 19~~	26 x 9~~37 x 13~~	21 x 7~~29 x 10~~	18 x 6~~24 x 7~~	15~~21~~ x 6	13~~18~~ x 6

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m2.
~~a. Interpolation allowed. Extrapolation is not allowed.~~
~~b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).~~

a. Linear interpolation of footing width is permitted between the soil bearing pressures in the table.
b. The table is based on the following conditions and loads: Building width: 32 feet; Wall height: 10 foot; Basement wall height: 10 foot; Dead loads: 20 psf roof and ceiling assembly, 10 psf floor assembly, 55 psf wall assembly

Live loads: Roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floor

c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.

d. Where the building width perpendicular to the wall footing is not greater than 32 feet, a 2 inch decrease in footing width and 1 inch decrease in footing depth is permitted for every 4 feet of decrease in building width.

Reason:

Builders using the new footing tables introduced in the 2015 IRC have found the footing widths required by the table are significantly larger than those required by previous editions of Table R403.1, which dated back to the CABO codes. In many cases they were wider than an engineering analysis would suggest. A careful review of the calculations underlying the 2015 IRC tables found a number of cases where load assumptions and determinations were overly conservative, and a few cases where the calculations were actually unconservative. Problems with the assumptions and calculations included the following:

- *The original calculations apply the full ground snow load to the roof. The actual roof snow load per ASCE 7 is 70% of the ground snow load or 20 pounds per square foot, whichever is greater.*
- *The original calculations apply a 100 pound per square foot weight for above-grade concrete or masonry walls, representing a solid or fully-grouted 8" CMU wall. Such walls are more likely to be either 8" CMU with reinforcing @ 48" o.c. or 8" insulated concrete forms, both of which have a 55 pound per square foot weight.*
- *The original calculations use only the ASCE 7 load combination that applies a 0.75 factor for concurrent roof/snow and floor live loads, ignoring the load combinations that apply just the roof/attic LL, just the snow load, or just the total floor live loads.*
- *The original calculations are based on tributary width, yet Footnote #2 adds 2 inches of footing width for every 2 feet of additional* ***building width****. As a result of confusing building and tributary width, the footnote adds twice as much footing width as is necessary based on the loads!*

In addition, many engineers either ignore the weight of below-grade foundation walls and footings in calculations or use a reduced load to account for the difference between the density of the soil and the density of concrete or masonry used in the footings and walls. The justification is that existing soils, which generally have dry densities of 105 to 125 pounds per cubic foot, are being replaced by concrete or masonry materials with densities of 135 to 150 pounds per cubic foot. The assumption is that the additional weight of the foundation walls and footings is not sufficient to cause additional compression and settlement of the soil under footing bearing pressures to a degree that would harm the structure.

Other key changes in the revised code text and footing tables include:

- *The original footnote allowing footing width and depth to be adjusted is converted into two footnotes. One footnote requires an increase in footing width and depth when the building width perpendicular to a wall footing exceeds 32 feet. The second footnote permits, but does not require, a decrease in footing width and depth for a building width of 32 feet or narrower.*
- *The charging text is revised to clarify the minimum width of a footing shall not be less than 12 inches and depth shall not be less than 6 inches. Previously, the limitation on depth was buried in a footnote.*

These revised tables correct the inconsistencies in the load assumptions and calculations. In addition, the calculations for the revised tables apply a differential density of 50 pcf in lieu of the full density of concrete and masonry, recognizing common practice. The result is footing widths for one- and two-family dwellings that are more in line with historic practice, while still technically justified under engineering standards and accepted practices.

6. Residential Fire Sprinklers

This amendment would delete the mandatory requirement for residential sprinklers from the International Residential Code.

Revise as follows:

Delete Section R313 entirely

~~**SECTION R313**~~
~~**AUTOMATIC FIRE SPRINKLER SYSTEMS**~~
~~**R313.1 Townhouse automatic fire sprinkler systems.** An automatic residential fire sprinkler system shall be installed in townhouses.~~
~~**Exception:** An automatic residential fire sprinkler system shall not be required where additions or alterations are made to existing townhouses that do not have an automatic residential fire sprinkler system installed.~~
~~**R313.1.1 Design and installation.** Automatic residential fire sprinkler systems for townhouses shall be designed and installed in accordance with Section P2904 or NFPA 13D.~~
~~**R313.2 One- and two-family dwellings automatic fire systems.** An automatic residential fire sprinkler system shall 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.~~
~~**R313.2.1 Design and installation.** Automatic residential fire sprinkler systems shall be designed and installed in accordance with Section P2904 or NFPA 13D.~~

Reason:

Since the inclusion of the mandatory requirement for residential sprinklers in the 2009 IRC, more than 42 states have amended or passed legislation removing the residential sprinkler mandate for new one- and two-family dwellings. Of those states, 27 prohibit communities from requiring fire sprinkler systems from being installed. It is important to note that the voluntary installation of residential sprinklers is still allowed.

The median age of one- and two-family housing in the U.S. is 35 years, and that number continues to increase. These older homes are more likely to have outdated electrical systems, appliances, use space heaters or display other characteristics that lead to a greater risk of a fire starting. Newer homes have fire blocking, hardwired smoke alarms and egress windows installed to today's codes, all of which increase the chances of surviving a fire. ***Even as homes built to today's residential code get older, they will continue to provide protection for families through their improved safety.***

While questions regarding construction code requirements intended to increase the safety of homes cannot, and should not, be decided solely on the issue of cost, it is reasonable to ask if there is a demonstrated state- or region-specific need for the requirement or if an acceptable level of safety can be achieved through other, less expensive means. The cost of an incremental increase in the margin of safety can be quite high.

Higher regulatory costs have real consequences for working American families. These regulations end up pushing the price of housing beyond the means of many teachers, police officers, firefighters and other middle-class workers. Every $838 increase in construction costs adds an additional $1,000 to the final price of the home, and in the U.S., over 150,000 households would no longer qualify for a mortgage based on that $1,000 increase to a median-priced home. The average cost of a sprinkler system is $6,000.

Mandating costly incremental increases in safety will only protect those who can afford them and will often decrease safety for those who cannot. Families who cannot qualify to purchase homes due to the increased costs from mandatory code requirements such as fire sprinklers will have to live in housing that is less safe, because that housing was built to less stringent code requirements.

7. Protection of Building Envelope

This amendment eliminates the requirement to provide an exterior-rated door at the top of a stairway that is enclosed by breakaway walls and provides access to a dwelling elevated on piers or piles in a coastal flood zone.

Revise as follows:

~~**R322.3.5.1 Protection of building envelope.** An exterior door that meets the requirements of Section R609 shall be installed at the top of stairs that provide access to the building and that are enclosed with walls designed to break away in accordance with Section R322.3.4.~~

Reason:

This amendment deletes the requirement added in the 2015 IRC that an exterior door be provided at the top of a stairway enclosed by breakaway walls and providing access to a dwelling located in a Coastal A Zone or Zone V special flood hazard area and elevated on piers or piles. While having a door at the top of such a stair may be good practice, the additional requirements associated with it being an exterior door are overly conservative, particularly if the door at the bottom of the enclosed stair is also an exterior door. By requiring compliance with all of the requirements of Section R609, the specified door would need to have a design pressure rating consistent with the design wind speed for the site, the door frame would need to be stiffened to resist the loads from such a door, proper anchorage of the door to the frame would need to be provided, and the door opening would need head, jamb, and sill flashing. The minimum added cost to provide a standard exterior door with flashing in lieu of a standard interior door is around $300; a hurricane wind-rated door would add an additional $200-$300 to the minimum costs.

It is noted that this requirement does not appear in the basic construction requirements of the National Flood Insurance Program in accordance with 44 CFR 60.3. It is also not specified as a practice that a community would earn credit for mandating and enforcing under FEMA's Community Rating Service, and would not lead to discounted flood insurance premiums.

8. Solar Photovoltaic Roof Systems

This amendment corrects language copied from the International Fire Code to address solar photovoltaic panels installed on the roof of a one- and two-family dwelling.

Revise as follows:

R324.7 Access and pathways. Roof access, pathways and spacing requirements shall be provided in accordance with Sections R324.7.1 through R324.7.2.5.

Exceptions:

1. Detached garages and accessory structures to one and two-family *dwellings* and *townhouses,* such as parking shade structures, carports, solar trellises and similar structures.
2. Roof access, pathways and spacing requirements need not be provided where an alternative ventilation method *approved* by the code official has been provided or where the code official has determined that vertical ventilation techniques will not be employed.

R324.7.1 Roof access points. Roof access points shall be located in areas that do not require the placement of ground ladders over openings such as windows or doors, and located at strong points of building construction in locations where the access point does not conflict with overhead obstructions such as tree limbs, wires or signs.

R324.7.2 Solar photovoltaic systems. Solar photovoltaic systems shall comply with Sections R324.7.2.1 through R324.7.2.5.

R324.7.2.1 Size of solar photovoltaic array. Each photovoltaic array shall be limited to 150 feet by 150 feet (45 720 by 45 720 mm). Multiple arrays shall be separated by a clear access pathway not less than 3 feet (914 mm) in width.

R324.7.2.2 Hip roof layouts. Panels and modules installed on *dwellings* with hip roof layouts shall be located in a manner that provides a clear access pathway not less than 3 feet (914 mm) in width from the eave to the ridge on each roof slope where panels and modules are located. The access pathway shall be located ~~at a structurally strong location on the building capable of supporting the live load of fire fighters~~ <u>along the structural members of the roof framing to support any person</u> accessing the roof.

> **Exception:** These requirements shall not apply to roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less.

R324.7.2.3 Single ridge roofs. Panels and modules installed on *dwellings* with a single ridge shall be located in a manner that provides two, 3-foot-wide (914 mm) access pathways from the eave to the ridge on each roof slope where panels or modules are located.

> **Exception:** This requirement shall not apply to roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less.

R324.7.2.4 Roofs with hips and valleys. Panels and modules installed on *dwellings* with roof hips or valleys shall not be located less than 18 inches (457 mm) from a hip or valley where panels or modules are to be placed on both sides of a hip or valley. Where panels are to be located on one side only of a hip or valley that is of equal length, the 18-inch (457 mm) clearance does not apply.

> **Exception:** These requirements shall not apply to roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less.

~~**R324.7.2.5 Allowance for smoke ventilation operations.** Panels and modules installed on dwellings shall not be located less than 3 feet (914 mm) below the roof ridge to allow for fire department smoke ventilation operations.~~

> ~~**Exception:** Where an alternative ventilation method approved by the code official has been provided or where the code official has determined that vertical ventilation techniques will not be employed, clearance from the roof ridge is not required.~~

Reason:

This change is suggested based on two reasons. First, there is no reference in any of the ICC codes which specifically quantifies the weight of a fully geared up fire fighter. In addition, the provision for the access and the ability of the roof to support the live load of an individual should not be limited to the fire service. Solar PV panels will require cleaning and maintenance by the installer, electricians will need to periodically access *it to repair or replace components, and owners will need to clear debris and perform other housekeeping items. Secondly, while the IRC does take in to consideration the safety of occupants and fire service personnel, the IRC is not a fire service manual and should not include operational requirements for attacking fires from an offensive or defensive position. The IRC is a standalone building code for one- and two family dwellings and townhouses and it is not a fire operation manual.*

9. Mezzanines

This amendment removes IBC language that does not apply to mezzanines within one- and two family dwellings.

Revise as follows:

R325 MEZZANINES

R325.1 General. Mezzanines shall comply with Section R325.

R325.2 Mezzanines. The clear height above and below mezzanine floor construction shall be not less than 7 feet 2134 mm).

R325.3 Area limitation. The aggregate area of a mezzanine or mezzanines shall be not greater than one-third of the floor area of the room or space in which they are located. The enclosed portion of a room shall not be included in a determination of the floor area of the room in which the *mezzanine* is located.

R325.4 Means of egress. The means of egress for mezzanines shall comply with the applicable provisions of Section R311.

R325.5 Openness. Mezzanines shall be open and unobstructed to the room in which they are located except for walls not more than ~~42 inches (1067 mm)~~ 36 inches (914 mm) in height, columns and posts.

> ~~**Exceptions:**~~
> ~~1. Mezzanines or portions thereof are not required to be open to the room in which they are located, provided that the aggregate floor area of the enclosed space is not greater than 10 percent of the mezzanine area.~~
> ~~2. In buildings that are not more than two stories above *grade plane* and equipped throughout with an automatic sprinkler system in accordance with NFPA 13R, Appendix S, a mezzanine having two or more means of egress shall not be required to be open to the room in which the mezzanine is located.~~

Reason:

During the code hearings, the residential code committee approved a modified version of the proposal which extracted language dealing with mezzanines directly from the IBC. The committee modified the height of the wall between the mezzanine and the room below to have walls no greater than 36 inches in height to be coordinated with the guard heights in the IRC.

This change also deletes the two exceptions to the openness requirements of the mezzanine, which were extracted directly from the IBC and have no bearing on a mezzanine that would be constructed in a one- and two family dwelling or townhouse. The second exception also references automatic sprinklers system that are inappropriate for the IRC (NFPA 13R is four-story multifamily).

10. Foundation Anchorage

This amendment provides an exception to the requirement for attaching bottom plates of braced wall panels on the interior of a dwelling to foundations with anchor bolts. The exception applies in low-wind, low-seismic areas where gypsum board is used as the bracing method for the interior wall in question.

Revise as follows:

R403.1.6 Foundation anchorage. Wood sill plates and wood walls supported directly on continuous foundations shall be anchored to the foundation in accordance with this section.

Cold-formed steel framing shall be anchored directly to the foundation or fastened to wood sill plates anchored to the foundation. Anchorage of cold-formed steel framing and sill plates supporting cold-formed steel framing shall be in accordance with this section and Section R505.3.1 or R603.3.1.

Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of *braced wall panels* at building interiors on monolithic slabs and all wood sill plates shall be anchored to the foundation with minimum 1/2-inch diameter (12.7 mm) anchor bolts spaced a maximum of 6 feet (1829 mm) on center or *approved* anchors or anchor straps spaced as required to provide equivalent anchorage to 1/2-inch-diameter (12.7 mm) anchor bolts. Bolts shall extend a minimum of 7 inches (178 mm) into concrete or grouted cells of concrete masonry units. The bolts shall be located in the middle third of the width of the plate. A nut and washer shall be tightened on each anchor bolt. There shall be a minimum of two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. Interior bearing wall sole plates on monolithic slab foundations that are not part of a *braced wall panel* shall be positively anchored with approved fasteners. Sill plates and sole plates shall be protected against decay and termites where required by Sections R317 and R318.

Exceptions:

1. Walls 24 inches (610 mm) total length or shorter connecting offset braced wall panels shall be anchored to the foundation with a minimum of one anchor bolt located in the center third of the plate section and shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
2. Connection of walls 12 inches (305 mm) total length or shorter connecting offset braced wall panels to the foundation without anchor bolts shall be permitted. The wall shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
3. Where the basic wind speed in accordance with Figure R301.2(4)A does not exceed 115 miles per hour (51 m/s), the seismic design category is A or B and Method GB in accordance with Section R602.10 is used for a *braced wall line* on the interior of the dwelling, anchor bolts shall not be required for the wood sole plates of the *braced wall panels*. Positive anchorage with approved fasteners shall be provided.

Reason:

This amendment revises the language for anchorage of light-frame wood stud walls to the foundations of the house. As currently stated, the provisions require anchor bolts for the portions of a wall on the interior of a dwelling that are designated as braced wall panels for a braced wall line passing through the dwelling. To provide the required 7–inch embedment depth, a thickened slab or other continuous footing would be necessary. Chapters 4 and 6 of the IRC do not explicitly require a continuous foundation in these locations in low-wind, low-seismic areas, and they are not traditionally provided. If interpreted and enforced by plan reviewers and inspectors in these areas, disputes and project delays will result and/or home owners will incur significant additional construction costs.

The ICC Ad-Hoc Committee on Wall Bracing revised this section during the 2007/2008 code cycle with the intent of ensuring that sufficient anchorage is provided along braced wall lines inside a dwelling to transfer lateral loads to either monolithic (thickened) slab foundations or continuous footings. While NAHB agrees that providing a continuous load path is important, the new language is overly broad in its application and not technically justified for many common conditions. The typical bracing method used for braced wall lines on the interior of a one- or two-story dwelling in a low-wind, low-seismic area is Method GB, consistent with *the use of gypsum board as the typical interior wall finish material. The allowable shear capacity for Method GB when used on both sides of a braced wall is 200plf (pounds per linear foot). The standard fastener schedule, Table R602.3(1), specifies 3-16d nails at 16" spacing for fastening the bottom plate of a braced wall panel on the interior of a dwelling to floor framing below (such as a raised floor system over a crawlspace or pier-and-beam foundation). This standard nailing provides a 200plf allowable capacity, as would many typical post-installed anchors (e.g. wedge or expansion anchors) that are short enough to be installed in just a slab-on-grade without the need for thickened footings, or even power-actuated fasteners. 1/2" diameter anchor bolts at 6-foot spacing are not necessary for the proper anchorage of these walls.*

The proposed amendment provides an exception to the requirement that an interior wall that also used as part of a braced wall line be fastened to a slab-on-grade with anchor bolts, rather than other methods of making a "positive connection" such as wedge or expansion anchors, power fasteners, or concrete nails. The exception is limited to areas of low wind and low seismic hazards and to walls braced using gypsum board, with its lower allowable shear capacity.

11. Air Leakage Rate Correction (Climate Zones 1-8)

This amendment modifies the requirement from 3 air changes per hour (ACH) to 5 ACH in climate zones 1-8.

Revise 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 of 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 *code 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 *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

Table N1105.5.2 (1) [R405.5.2 (1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	Air leakage rate of 5 air changes per hour in Climate Zones 1 ~~and 2, and 3 air changes per hour in Climate Zones 3~~ through 8 at a pressure of 0.2 inches w.g (50 Pa). The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than 0.01 × *CFA* + 7.5 × (*Nbr* + 1) where: *CFA* = conditioned floor area *Nbr* = number of bedrooms Energy recovery shall not be assumed for mechanical ventilation.	For residences that are not tested, the same air leakage rate as the standard reference design. For tested residences, the measured air exchange rate[a]. The mechanical ventilation rated shall be in addition to the air leakage rate and shall be as proposed.

Footnotes remain unchanged

Reason:

Building tightness is an important part of an energy-efficient and comfortable house. However, 3 air changes (ACH) per hour at 50 Pascals is an extremely low target tightness, especially for smaller homes. The ASHRAE Handbook of Fundamentals shows that around 8% of U.S. homes achieve 3 ACH or less, 13% achieve 4 and less than 23% achieve 5. The proposed 5 ACH while still an aggressive tightness level will provide a tight, comfortable, energy-efficient home.

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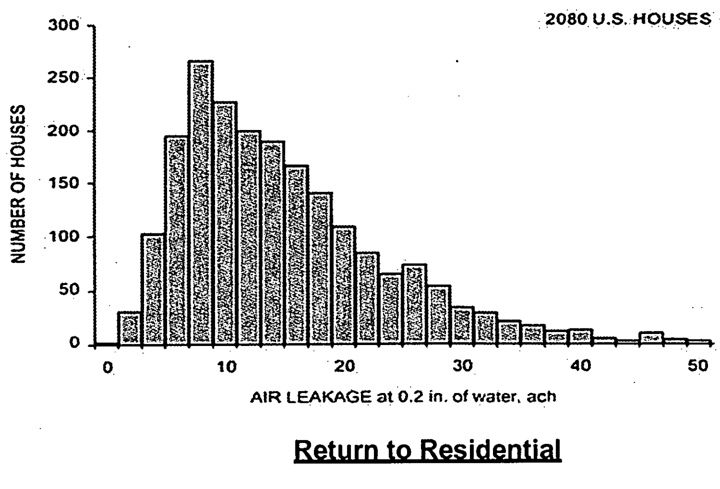

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12. Air Leakage Trade-Off

This amendment allows builders to trade improvements in other building energy components for less stringent building envelope pressure test results, provides flexibility in meeting the air-tightness requirements and provides options for recovering from an unexpected air-tightness test failure.

Revise as follows:

N1102.4 (R402.4) Air leakage ~~(Mandatory)~~. The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections N1102.4.1 through N1102.4.4.

N1102.4.1 (R402.4.1) Building thermal envelope. The *building thermal envelope* shall comply with Sections N1102.4.1.1 and N1102.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

N1102.4.1.1 (R402.4.1.1) Installation (Mandatory). The components of the *building thermal envelope* as listed in Table N1102.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table N1102.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

N1102.4.1.2 (R402.4.1.2) Testing (Mandatory). The building or dwelling unit shall be tested ~~and verified as having an air leakage rate of not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8~~ for air leakage. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. 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 weather stripping or other infiltration control measures;
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
3. Interior doors, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

N1102.4.1.3 (R402.4.1.3) Leakage rate (Prescriptive). The building or dwelling unit shall have an air leakage rate not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section N1102.4.1.2.

Reason:

These modifications relocate the mandatory maximum air-tightness requirement and provide designers and builders the flexibility to trade off building tightness with other performance path measures when using the performance path. Currently the building tightness requirement is "mandatory" and the 3 and 5 ACH tightness levels, even under ideal circumstances, are very difficult to achieve. This amendment will provide energy neutral trade-offs, for expensive and sometimes unattainable requirements, by allowing other building improvements to be used to attain the same level of efficiency. This amendment does not change the stringency; it only increases its flexibility while achieving the required energy efficiency.

13. Prescriptive Table Requirements

This amendment replaces 2018 IRC Chapter 11 Tables N1102.1.2 and N1102.1.4 with tables from the 2009 IRC Chapter 11.

Delete Table N1102.1.2 and Table N1102.1.4 in their entirety and replace with the following:

TABLE N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, •]	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
1	1.20	0.75	0.30	30	13	3 / 4	13	0	0	0
2	0.65[j]	0.75	0.30	30	13	4 / 6	13	0	0	0
3	0.50[j]	0.60	0.30	30	13	5 / 8	19	5/13[f]	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5 / 10	19	10/13	10, 2ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5[h]	13 / 17	30[g]	10/13	10, 2ft	10/13
6	0.35	0.60	NR	49	20 or 13+5[h]	15 / 19	30[g]	15/19	10, 4ft	10/13
7 and 8	0.35	0.60	NR	49	21	19 / 21	38[g]	15/19	10, 4ft	10/13

For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. R-19 batts compressed into a nominal 2 x 6 framing cavity such that the R-value is reduced by R-1 or more shall be marked with the compressed batt R-value in addition to the full thickness R-value.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

c. "15/19" means R-15 continuous insulated sheathing on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.

d. R-5 shall be added to the required slab edge R-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure 301.1 and Table 301.1.

g. Or insulation sufficient to fill the framing cavity, R-19 minimum.

h. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.

i. The second R-value applies when more than half the insulation is on the interior of the mass wall.

j . For impact rated fenestration complying with Section R301.2.1.2 of the *International Residential Code* or Section 1608.1.2 of the *International Building Code,* the maximum U-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

TABLE N1102.1.4 (R402.1.4) EQUIVALENT U-FACTORS[a]

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor[b]	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.75	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.65	0.65	0.035	0.082	0.141	0.047	0.360	0.136
4 except Marine	0.40	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033	0.050	0.065

a. Non-fenestration U-factors shall be obtained from measurement, calculation or an approved source.
b. When more than half the insulation is on the interior, the mass wall U-factors shall be a maximum of 0.17 in Zone 1, 0.14 in Zone 2, 0.12 in Zone 3, 0.10 in Zone 4 except Marine, and the same as the frame wall U-factor in Marine Zone 4 and Zones 5 through 8.
c. Basement wall U-factor of 0.360 in warm-humid locations as defined by Figure 301.1 and Table 301.2.

Reason:

The increased table values in the 2012 IECC and the 2015 IECC did not show justification for the cost increases from the 2009 IECC. Studies indicate nationally almost a $6,000 increase to the cost of constructing a single-family detached dwelling with a 13-year simple payback. With statistics showing that for every $1,000 increase to the cost of construction nearly 206,000 potential home buyers will not qualify for a mortgage. This, increase disqualifies approximately 1.3 million families from purchasing a home every year. That equates to approximately $24,000,000 in potential taxes revenues never being generated for municipalities.

14. Wall R-Value/U-Factors Corrections (Climate Zone 6-8)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in climate zones 6, 7 & 8 published in the 2009 IRC Chapter 11.

Revise as follows:

TABLE N1102.1.2 (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 AND DEPTH	CRAWL SPACE[c] 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,i]	8/13	19	5/13f	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5[h,i]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5[h,i]	13/17	30g	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 or 13+5[h,i] ~~20+5 or 13+10[h,i]~~	15/20	30g	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20 or 13+5[h,i] ~~20+5 or 13+10[h,i]~~	19/21	38[g]	15/19	10, 4 ft	15/19

TABLE N1102.1.4 (R402.1.4) EQUIVALENT U-FACTORS[a]

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor[b]	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091c	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	~~0.045~~ 0.060	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	~~0.045~~ 0.060	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:

The prescriptive wall requirement increased to R-20+R5 in climate zones 6, 7 and 8 of the 2012 IRC Chapter 11. The additional cost for this is estimated at $1,819 for 1,016 square feet of wall. This makes the simple payback between 26 and 55 years depending on the climate zone. This also will create a negative cash flow for the consumer in all cases.

Climate Zone	Representative City	Basement Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
6	Minneapolis, MN	R-20->R-20+5	$33/yr	$1,819 ($1.79/ft2)	55 years
7	Bemidgi, MN	R-20->R-20+5	$41/yr	$1,819 ($1.79/ft2)	44 years
8	Fairbanks, AK	R-20->R-20+5	$71/yr	$1,819 ($1.79/ft2)	26 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481.

15. Mechanical Equipment Trade-Off

This amendment reinstates the performance option in IRC Chapter 11 to reduce prescriptive requirements by installing HVAC equipment with higher energy-efficiency performance ratings than required by the code.

Revise as follows:

TABLEN1105.5.2 (1) (R405.5.2 (1))
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems [d,e]	~~As proposed for other than electric heating without a heat pump, Where the proposed design utilizes electric heating without a heat pump the standard reference design shall be an air source heat pump meeting the requirements of Section R403 of the IECC-Commercial Provisions.~~ Fuel type: same as proposed design Efficiencies: - Electric: air-source heat pump with prevailing federal minimum standards -Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards -Nonelectric boilers: natural gas boiler with prevailing federal minimum standards -Capacity: sized in accordance with Section R403.6	~~As proposed~~ As proposed As proposed As proposed As proposed
Cooling systems[d, f]	~~As proposed~~ -Fuel type: Electric -Efficiency: in accordance with prevailing federal minimum standards -Capacity: sized in accordance with Section N1103.6	~~As proposed~~ As proposed As proposed As proposed
Service Water Heating [d,e,f,g]	~~As proposed~~ -Fuel type: same as proposed design -Efficiency: in accordance with prevailing federal minimum standards -Use: gal/day = 30 + 10 × N_{br} -Tank temperature: 120°F ~~-Use: same as proposed design~~	~~As proposed~~ As proposed As proposed Same as standard reference Same as standard reference ~~gal/day = 30 + (10 × N_{br})~~

Footnotes remain unchanged

Reason:

This amendment serves to retain energy-neutral equipment trade-off provisions from 2006 IRC Chapter 11 for heating systems, cooling systems, and service water heating. By retaining these, builders can optimize a code-compliant house design by using energy-efficient equipment. Quite often, the use of this high-efficiency equipment provides a more cost-effective solution to achieve code compliance. Eliminating this ability discourages the concept of the "house as a system" approach which is a cornerstone of building science.

Rejecting this amendment will create a disincentive to install state-of- the-art, energy-efficient equipment. It will increase the cost of construction by driving builders to often use less efficient equipment while increasing the cost of construction.

Significant improvements in the efficiency of HVAC and water heating equipment have been made in the *last 20 years. With the increased emphasis on new and improved technologies, this trend is expected to continue and will result in even higher energy savings in future years. If builders are forced to comply with the energy code by installing requirements which are not cost effective, there will be a resistance to install higher efficiency equipment. This could end up hurting energy efficiency in the long term: For instance, consumers in homes with non-condensing furnaces will be less likely to install a higher efficiency condensing replacement furnace because of the additional cost to run an exhaust vent.*

Industries such as log home manufacturers may no longer be able to construct to projected higher envelope requirements. The combination of increases in envelope thermal requirements, building tightness and duct tightness combined with the elimination of energy-neutral trade-offs pose a serious threat to the viability of the log home industry. There are practical limitations to the thickness of log home walls, increases in log diameter have an exponential increase to the cost of logs, making log walls with a U-factor of 0.082 or lower prohibitively expensive.

16. Rooms Containing Fuel Burning Appliances

This amendment removes the requirement to insulate, seal and separate from the thermal envelope the area surrounding fuel burning appliances.

Revise as follows:

Delete section and do not replace.

~~**N1102.4.4 (R402.4.4) Rooms containing fuel-burning appliances.** In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.2, where the walls, floors and ceilings shall meet not less than the basement wall *R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.~~

~~**Exceptions:**~~

~~1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.~~
~~2. Fireplaces and stoves complying with Section R402.4.2 and Section R1006 of the *International Residential Code*.~~

Reason:

This was a new section to the 2015 IECC and has proven to be confusing and is being misinterpreted.

- *No data was shown verifying a problem existed*
- *No energy savings potential was shown.*
- *No cost data was provided to justify the increase to the cost of construction.*
- *A study done by Home Innovation Research Labs finds the cost of meeting this requirement would be $878 for a home with space heating or water heating equipment in the basement.*

E1. Air Leakage Trade-Offs

This Amendment allows builders to trade improvements in other building energy components for less stringent building envelope pressure test results. This performance option provides flexibility in meeting the air tightness requirements and provides options for recovering from an unexpected air tightness test failure.

Revise as follows:

R402.4 Air leakage ~~(Mandatory)~~. The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.4.

R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation (Mandatory). The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

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

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

R402.4.1.3 Leakage rate (Prescriptive). The building or dwelling unit shall have an air leakage rate not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

Reason:

These modifications relocate the mandatory maximum air-tightness requirement and provide designers and builders the flexibility to trade off building tightness with other performance path measures when using the performance path. Currently the building tightness requirement is "mandatory" and the 3 and 5 ACH tightness levels, even under ideal circumstances, are very difficult to achieve. This amendment will provide energy neutral trade-offs, for expensive and sometimes unattainable requirements, by allowing other building improvements to be used to attain the same level of efficiency. This amendment does not change the stringency; it only increases its flexibility while achieving the required energy efficiency.

E2. Prescriptive Table Requirements

This amendment replaces 2015 IECC Tables R402.1.2 and R402.1.4 in the residential section of the 2015 with the following tables from the 2009 IECC.

Revise as follows:

Delete Table 402.1.1 and Table 402.1.3 in their entirety and replace with the following:

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
1	1.20	0.75	0.30	30	13	3 / 4	13	0	0	0
2	0.65[j]	0.75	0.30	30	13	4 / 6	13	0	0	0
3	0.50[j]	0.60	0.30	30	13	5 / 8	19	5/13[f]	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5 / 10	19	10/13	10, 2ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5[h]	13 / 17	30[g]	10/13	10, 2ft	10/13
6	0.35	0.60	NR	49	20 or 13+5[h]	15 / 19	30[g]	15/19	10, 4ft	10/13
7 and 8	0.35	0.60	NR	49	21	19 / 21	38[g]	15/19	10, 4ft	10/13

For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. R-19 batts compressed into a nominal 2 x 6 framing cavity such that the R-value is reduced by R-l or more shall be marked with the compressed batt R-value in addition to the full thickness R-value.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

c. "15/19" means R-15 continuous insulated sheathing on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.

d. R-5 shall be added to the required slab edge R-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure 301.1 and Table 301.1.

g. Or insulation sufficient to fill the framing cavity, R-19 minimum.

h. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.

i. The second R-value applies when more than half the insulation is on the interior of the mass wall.

j. For impact rated fenestration complying with Section R301.2.1.2 of the *International Residential Code* or Section 1608.1.2 of the *International Building Code,* the maximum U-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

TABLE 402.1.4
EQUIVALENT U-FACTORS[a]

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor[b]	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.75	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.65	0.65	0.035	0.082	0.141	0.047	0.360	0.136
4 except Marine	0.40	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033	0.050	0.065

a. Nonfenestration U-factors shall be obtained from measurement, calculation or an approved source.
b. When more than half the insulation is on the interior, the mass wall U-factors shall be a maximum of 0.17 in Zone 1, 0.14 in Zone 2, 0.12 in Zone 3, 0.10 in Zone 4 except Marine, and the same as the frame wall U-factor in Marine Zone 4 and Zones 5 through 8.
c. Basement wall U-factor of 0.360 in warm-humid locations as defined by Figure 301.1 and Table 301.2.
d. Foundation U-factor requirements shown in Table 402.1.3 include wall construction and interior air films but exclude soil conductivity and exterior air films. U-factors for determining code compliance in accordance with Section 402.1.4 (total *UA* alternative) of Section 405 (Simulated Performance Alternative) shall be modified to include soil conductivity and exterior air films.

Reason:
The increased table values in the 2012 IECC and the 2015 IECC did not show justification for the cost increases from the 2009 IECC. Studies indicate nationally almost a $6,000 increase to the cost of constructing a single-family detached dwelling with a 13-year simple payback. With statistics showing that for every $1,000 increase to the cost of construction nearly 206,000 potential home buyers will not qualify for a mortgage. This, increase disqualifies approximately 1.3 million families from purchasing a home every year. That equates to approximately $24,000,000 in potential taxes revenues never being generated for municipalities.

E3. Wall R-Value/U-Factors Corrections (Climate Zones 6-8)

This amendment reinstates the appropriate minimum wall assembly R-Values/U-Factors in climate zones 6, 7 & 8 published in the 2009 IRC Chapter 11.

Revise as follows:

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 AND DEPTH	CRAWL SPACE[c] 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,i]	8/13	19	5/13f	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5[h,i]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5[h,i]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 or 13+5h,i ~~20+5 or 13+10h,i~~	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20 or 13+5h,i ~~20+5 or 13+10h,i~~	19/21	38[g]	15/19	10, 4 ft	15/19

Footnotes remain unchanged

TABLE R402.1.4 EQUIVALENT U-FACTORS[a]

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor[b]	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091c	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	~~0.048~~ 0.057	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	~~0.048~~ 0.057	0.057	0.028	0.050	0.055

Footnotes remain unchanged

Reason:
The prescriptive wall requirement increased to R-20+R5 in climate zones 6, 7 and 8 in the 2012 IECC. The additional cost for this is estimated at $1,819 for 1,016 square feet of wall. This makes the simple payback between 26 and 55 years depending on the climate zone. This also will create a negative cash flow for the consumer in all cases.

Climate Zone	Representative City	Basement Wall R-Value Change	Energy Savings	Incremental Cost	Simple Payback
6	Minneapolis, MN	R-20->R-20+5	$33/yr	$1,819 ($1.79/ft2)	55 years
7	Bemidgi, MN	R-20->R-20+5	$41/yr	$1,819 ($1.79/ft2)	44 years
8	Fairbanks, AK	R-20->R-20+5	$71/yr	$1,819 ($1.79/ft2)	26 years

The energy modeling was done using the Energy Plus simulation engine and BEopt version 1.4, Cost figures came from ASHRAE RP-1481.

E4. Mechanical Equipment Trade-Off

This amendment reinstates the performance option to reduce prescriptive requirements by installing HVAC equipment with higher energy-efficiency performance ratings than required by the code.

Revise as follows:

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

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems [d, e]	~~As proposed for other than electric heating without a heat pump, Where the proposed design utilizes electric heating without a heat pump the standard reference design shall be an air source heat pump meeting the requirements of Section R403 of the IECC-Commercial Provisions.~~ Fuel type: same as proposed design Efficiencies: Electric: air-source heat pump with prevailing federal minimum standards Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards Nonelectric boilers: natural gas boiler with prevailing federal minimum standards Capacity: sized in accordance with Section R403.6	~~As proposed~~ As proposed As proposed As proposed As proposed
Cooling systems [d, e]	~~As proposed~~ Fuel type: Electric Efficiency: in accordance with prevailing federal minimum standards Capacity: sized in accordance with Section R403,6	~~As proposed~~ As proposed As proposed
Service Water Heating [d, e, f, g]	~~As proposed~~ Fuel type: same as proposed design Efficiency: in accordance with prevailing federal minimum standards Use: gal/day = 30 + 10 × *Nbr* Tank temperature: 120°F ~~Use: same as proposed design~~	~~As proposed~~ As proposed Same as standard reference Same as standard reference ~~gal/day = 30 + (10 × *Nbr*)~~

Footnotes remain unchanged

Reason:

This amendment serves to retain energy-neutral equipment trade-off provisions from the 2006 IECC for heating and cooling systems and service water heating. By retaining these, builders have an opportunity to optimize a code-compliant house design by using energy-efficient equipment. Quite often, the use of this high-efficiency equipment provides a more cost-effective solution to achieve code compliance. Eliminating this ability discourages the concept of the "house as a system" approach, which is a cornerstone of building science.

Rejecting this amendment will reduce any incentive to install state-of- the-art, energy-efficient *equipment. It will increase the cost of construction by driving builders to often use less efficient equipment.*

Significant improvements in the efficiency of HVAC and water heating equipment have been made in the last 20 years. With the increased emphasis on new and improved technologies, this trend is expected to continue and will result in even higher energy savings in future years. If builders are forced to comply with the energy code by installing requirements which are not cost-effective, there will be a resistance to install higher efficiency equipment. This could end up hurting energy efficiency in the long term, consumers which have non-condensing furnaces will be less likely to install a higher efficiency condensing replacement furnace because of the additional cost to run an exhaust vent.

Industries such as log home manufacturers may no longer be able to construct to projected higher envelope requirements. The combination of increases in envelope thermal requirements, building tightness and duct tightness combined with the elimination of energy neutral trade-offs pose a serious threat to the viability of the log home industry. There are practical limitations to the thickness of log home walls. Increasing requirements for the log diameter has a exponential increase in the cost of the logs, making log walls with a U- factor of 0.082 or lower prohibitively expensive

E5. Rooms Containing Fuel Burning Appliances

This amendment removes the requirement to insulate, seal and separate from the thermal envelope the area surrounding fuel burning appliances.

Revise as follows:

Delete section and do not replace.

~~**R402.4.4 (N1102.4.4) Rooms containing fuel-burning appliances.** In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.2, where the walls, floors and ceilings shall meet not less than the basement wall *R*-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.~~

~~**Exceptions:**~~

~~1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.~~
~~2. Fireplaces and stoves complying with Section R402.4.2 and Section R1006 of the *International Residential Code*.~~

Reason:

This was a new section to the 2015 IECC and has proven to be confusing and is being misinterpreted.

- *No data was shown verifying a problem existed*
- *No energy savings potential was shown.*
- *No cost data was provided to justify the increase to the cost of construction.*
- *A study done by Home Innovation Research Labs finds the cost of meeting this requirement would be $878 for a home with space heating or water heating equipment in the basement.*

B1. Canopies and Marquees

This amendment removes the requirement to design a multifamily building canopy with a flat or low-slope top surface using the higher live load associated with a marquee where such canopies cannot be accessed from a window or door above the canopy.

Revise as follows:

MARQUEE. A canopy that is supported entirely by a building, is constructed of noncombustible materials, and has a top surface which is sloped less than 25 degrees from the horizontal ~~and is located less than 10 feet (3.05 m) from operable openings above or adjacent to the level of the marquee~~.

TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS[g]

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (lbs.)
21. Marquees~~, except one- and two-family dwellings~~	75	—
25. Residential		
One- and two-family dwellings		
Uninhabitable attics without storage[i]	10	
Uninhabitable attics with storage [i, j, k]	20	
Habitable attics and sleeping areas[k]	30	
Canopies~~, including marquees~~	20	
All other areas	40	
Hotels and multifamily dwellings		
Private rooms and corridors serving them	40	
Public rooms[m] and corridors serving them	100	
26. Roofs		
All roof surfaces subject to maintenance workers		300
Awnings and canopies:		
Fabric construction supported by a skeleton structure	5 Nonreducible	
All other construction, except one- and two-family dwellings and occupiable canopies	20	
Ordinary flat, pitched, and curved roofs (that are not occupiable)	20	
Where primary roof members are exposed to a work floor, at single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs:		
Over manufacturing, storage warehouses, and repair garages		2,000
All other primary roof members		300
Occupiable roofs:		
Roof gardens	100	
Assembly areas	100[m]	
Canopies	75[n]	
All other similar areas	Note l	Note l

n. An occupiable canopy is a canopy that has a top surface which is sloped less than 25 degrees from the horizontal and is located less than 10 feet (3.05 m) from operable openings above or adjacent to the level of the canopy.

Reason:

This amendment revises the 2015 IBC language regarding canopies and marquees. Language approved initially for the 2012 IBC substantially changed the design requirements for many small *porch and patio roofs or canopies on residential buildings, particularly those located nowhere near public streets. Prior to the 2012 IBC, these roofs were designed for standard roof live loads or local ground snow loads (typically in the range of 20 or 30 pounds per square foot). These elements are now required to be designed for 75psf if they happen to be less than 10 feet vertically from a window above or horizontally from a window at the level of the canopy. This represents a substantial increase in design requirements for apartment or condominium complexes with these elements, as well as a substantial issue for renovations. An NAHB proposal amended the 2015 IBC to restore the traditional 20psf roof live load requirement for porches, patios, or canopies on one- and two-family dwellings, but the issue remains for multifamily buildings.*

This amendment makes two key changes. First, it revises the definition of a marquee to reflect the specific construction requirements provided in Section 3106.5. This fixes a conflict that was introduced when the longstanding definition of a "marquee" (an element generally associated with theaters) was amended to include elements that had previously been considered "canopies." Second, it adds a line item under "occupiable roofs" for canopies and establishes a 75psf live load requirement for a canopy that could be considered an "occupiable roof." As described in the new Footnote n, this would be a canopy with a flat or low-slope top surface which can be accessed from an operable window or other opening that is less than 10 feet above the top surface of the canopy or within 10 feet of either end of the canopy. These changes preserve the intent of what the National Council of Structural Engineering Associations' (NCSEA) Code Advisory Committee was trying to achieve – requiring a higher live load for a canopy that could be used as a means of egress or otherwise accessed by building occupants – without applying the term "marquee" to an element that most code users, not to mention the average person on the street, would call a "canopy". These changes would also remove the 75psf requirement from flat or low-slope canopies on multifamily buildings as long as they are not accessible as noted above.

B2. Deck and Balcony Loads

This amendment restores the deck live load for one- and two-family dwellings in the IBC to 40 psf, matching the IRC. This will maintain consistency for dwellings designed under either code, and allow the use of commonly-accepted prescriptive tables and details such as those in the American Wood Council's DCA 6 – Prescriptive Residential Wood Deck Construction Guide.

Revise as follows:

TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS[g]

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (lbs.)
5. Decks and balconies, except one- and two-family dwellings[h]	1.5 times the live load for the area served, not required to exceed 100	—
25. Residential One- and two-family dwellings Uninhabitable attics without storage[i] Uninhabitable attics with storage [i, j, k] Habitable attics and sleeping areas[k] Canopies, including marquees Decks and balconies[h] All other areas Hotels and multifamily dwellings Private rooms and corridors serving them Public rooms[m] and corridors serving them	 10 20 30 20 40 40 40 100	

Reason:

During the 2006/2007 code cycle, changes were approved for the IBC and IRC that removed separate loads for decks and balconies. Prior to the changes, decks were required to support a live load of 40 pounds per square foot and balconies a live load of 60 pounds per square foot. The difference was generally attributed to the frequent use of cantilevered construction for balconies. In the course of aligning the requirements, the IRC settled on 40 pounds per square foot for both decks and balconies, while the IBC required the load to match the occupancy served. For residential buildings, this was effectively 40 pounds per square foot; for office buildings, schools and other IBC occupancies this could be up to 100 pounds per square foot.

When a similar alignment was attempted in ASCE 7, the committee balked at reducing the balcony live load and chose to establish a load of 1.5 times the occupancy served. This restored residential balcony loads to 60 pounds per square foot but increased decks to the *same load. No evidence was presented to or brought forward by the committee showing that 40 pounds per square foot was inadequate for decks attached to one- and two-family dwellings, and changes in deck ledger attachments requiring the use of lag bolts or through-bolts instead of nails have addressed the most common issue leading to deck failures.*

In the 2018 edition of the IBC, the live load table was amended to match ASCE 7 (proposal S85-16). No attempt was made to separate out one- and two-family dwellings to keep them consistent with the IRC, which has maintained the 40 pound per square foot requirement. In fact, three proposals to amend the IRC (RB26, RB27 and RB190) were all disapproved. Neither the ASCE 7 committee (mostly made up of engineers specializing in high-rise buildings, stadiums, industrial facilities and other large structures) nor the IBC-Structural committee has chosen to recognize the lower risk associated with one- and two-family dwellings or the evolution in deck construction practices which have addressed the most significant contribution to deck failures.

This amendment restores a 40 pound per square foot live load for decks and balconies associated with one- and two-family dwellings built under the IBC. This will maintain consistency between the IBC and IRC, allowing the same plan to be constructed under either code with minimal revisions. This will also permit engineers and builders to make use of recognized prescriptive design tables and details such as those in the American Wood Council's "DCA 6 – Prescriptive Residential Wood Deck Construction Guide", which are based on a 40 pound per square foot live load.

B3. Emergency Elevator Communication Systems

This amendment limits the requirements for emergency elevator communication systems for the deaf, hard of hearing and speech impaired to elevators designated for public use.

Revise as follows:

3001.2 Emergency elevator communication systems for the deaf, hard of hearing and speech impaired. An emergency two-way communication system shall be provided that:

1. Is a visual and text-based and a video-based 24/7 live interactive system.
2. Is fully accessible by the deaf, hard of hearing and speech impaired, and shall include voice-onlyoptions for hearing individuals.
3. Has the ability to communicate with emergency personnel utilizing existing video conferencing technology, chat/text software or other approved technology.

Exception: An emergency elevator communication system for the deaf, hard of hearing and speech impaired is not required in elevators not designated for public use.

Reason:

The requirement for emergency elevator communication systems for the deaf, hard of hearing and speech impaired was added to the IBC for the 2018 edition. However, the new language applies to every elevator in a building, not just elevators that serve accessible means of egress or are available to the public. There are no exceptions for service or freight elevators or private residence elevators. This exceeds the current ICC A117.1 accessibility standard, ADA and the Fair Housing Act and goes well beyond the requirement for two-way communication systems in elevator lobbies per IBC Section 1009.8.

There are also no ASTM or other consensus standards for this technology to insure consistent enforcement of this code requirement. The open-ended nature of what constitutes a code-compliant system is problematic, and owners may be required to install equipment that is more or less than what was intended by this code change.

F1. Scoping of the International Fire Code

This amendment removes language that would apply the provisions of the International Fire Code on one- and two-family dwellings that are constructed using the International Residential Code.

Revise as follows:

IFC [A] 102.5 Application of residential code. Where structures are designed and constructed in accordance with the International Residential Code, the provisions of this code shall apply as follows:

1. Construction and design provisions: Provisions of this code pertaining to the exterior of the structure shall apply including, but not limited to, premises identification, fire apparatus access and water supplies. ~~Where interior or exterior systems or devices are installed, construction permits required by Section 105.7 of this code shall also apply~~.
2. Administrative, and operational ~~and maintenance~~ provisions: All such provisions of this code shall apply.

Reason:

This amendment addresses some of the controversy that has risen since the language was added to the code. One of the significant problems is found in the last sentence of the first application, regarding the construction permits required by section 105.7. All of the required construction permits that would apply to these types of structures, as indicated in this section, are already addressed within the scope of the IRC. The concept of the IRC being a single-source construction code is specifically stated within the commentary to R101.1, which says the intent of the IRC is to be a "stand-alone residential code that establishes minimum regulations for one- and two-family dwellings and townhouses." The IFC commentary to 102.5 further emphasizes this concept by stating "The IRC is designed and intended for use as a stand-alone code for the construction of detached one- and two-family dwellings and townhouses not more than three stories in height". As such, the construction of detached one- and two-family dwellings and townhouses is regulated exclusively by the IRC and not subject to the provision of any other I-Codes, other than to the extent specifically referenced. The intent of providing a stand-alone residential code is that there is no need for duplicative construction or permitting requirements within the I-Codes that would require a builder or home owner to get separate permits under the IRC and IFC for the same scope of work. Approval of this amendment will ensure the intent of the IRC scope, as a stand-alone construction document, is maintained while ensuring that the exterior fire protection features are still regulated under the scope of the IFC.

Another problem with the current language is the reference to all maintenance requirements of the IFC for IRC constructed structures. Prior to the approval of the model code language, there was no specific provision in the IFC that required maintenance for IRC structures in accordance with the IFC. If maintenance provisions apply, it raises the question: Is the fire service truly planning on enforcing the maintenance provisions in the IFC for fire alarm systems and carbon monoxide detectors in single family homes? And if so, how? In many states, once a one- and two-family dwelling or townhouse receives its certificate of occupancy there is no more involvement with the building official. The IFC states that it is the fire official's responsibility to ensure existing buildings meet the requirements of this code and that all buildings are maintained in accordance with its provisions. How many departments have requested entry to ensure that every existing one- and two-family dwelling is equipped with a carbon monoxide detector as required by the IFC? The current language of the IFC leaves the fire service open to liability if they are not enforcing the provisions of this code as it is written and adopted. Although some of the referenced standards in the IFC do not require maintenance on some of the systems in one- and two-family dwellings or townhouses, the inference is that maintenance is required if the term "maintenance" remains in Item 2 under Section 102.5.

Lloyd, Timothy

From: Lloyd, Timothy
Sent: Friday, November 30, 2018 7:23 AM
To: Baker, Carrie
Subject: Support for Tiny Homes

Carrie,

I received 44 emails in support of adopting Appendix Q, Tiny Homes that were all identical to the email on the following page.

Tim Lloyd
Bureau Chief

Montana Department of Labor & Industry
Business Standards Division
Building and Commercial Measurements Bureau
PHONE (406) 841-2053
tlloyd@mt.gov

Lloyd, Timothy

From: Baker, Carrie
Sent: Thursday, July 5, 2018 8:26 AM
To: Lloyd, Timothy
Subject: FW: Tiny House - Appenix Q - 2018 IRC

Carrie

From: Alicia Kinard [mailto:aliciakinard305@gmail.com]
Sent: Wednesday, July 4, 2018 10:56 AM
To: Baker, Carrie <CBaker@mt.gov>
Subject: Tiny House - Appenix Q - 2018 IRC

Ms Baker

1. Hi, my name is Alicia Kinard.
2. I'm emailing (or calling) to request that the state adopt Appendix Q: Tiny Houses from the 2018 IRC.
3. Thank you for your consideration of this important decision.

Thanks
Alicia Kinard

Lloyd, Timothy

From: Molly Brown <mollymassage2001@gmail.com>
Sent: Sunday, July 1, 2018 10:19 PM
To: Lloyd, Timothy
Subject: Tiny Houses Appendix Q

Hi Tim, my name is Molly Brown. I am in complete support of adopting Appendix Q from the IRC building codes!!! I would love to see Montana be Tiny friendly for those that want or need to have less and do more in life! There are many reasons why legalizing Tiny Homes would benefit many in the state of Montana and worldwide! Housing prices are only going up, so are rental prices. It seems nobody wants to rent to those that have animals, and if they do, the rent goes up. With housing prices up and wages staying the same a lot of people never get ahead in life and only fall backwards which leads to homelessness. So many people are living in their cars which is unacceptable. Giving residents of Montana the option of living smaller allows them to lead a fuller life for themselves and others. Making society conform into a box that hasn't changed in decades only hurts us. The world is changing and we need to change with it. The minimalist lifestyle is in full swing and we need to allow people of all ages to own, rent or rent to own a small slice of the American dream just like everyone else, just in a smaller footprint.

I have been following everything Tiny for 5 years now. I am in the process of downsizing in hopes of owing less and living more! I attended the Tiny House Jamboree in Arlington Texas last October and was able to see so many different Tiny Houses and meet some builders. I had a strict schedule in order to listen to the array of speakers talk on different topics all related to Tiny living. They are a wealth of information while being realistic and supportive of going Tiny. One of the speakers was Andrew Morrison who helped write the IRC code and took it to Kansas last year. He was instrumental in getting it passed there and he works hard for other states to realize how good this will be for their residents. Another key player in the Tiny world is Zack Giffin. He may be a professional skier, carpenter and Tiny house TV star on Tiny House Nation, but he is more than that! You can find some videos of him speaking at the Tiny House Jamboree 2016 in Colorado Springs CO. He makes many valid points when it comes to housing. He also has a TED Talk which I would recommend watching.

Tim, I could easily write for another hour on why allowing Tiny's to be legal is a good idea, but I don't want to take up your time until you think this is seriously going forward, So I will wrap this up....I am available to email or talk to you or anyone who has any questions regarding anything Tiny. I am here for guidance and support if you need anything. Thank you for considering Tiny Houses in Montana!! Molly Brown, my #503-502-2694 and my email is mollymassage2001@gmail.com

Lloyd, Timothy

From: Baker, Carrie
Sent: Tuesday, July 3, 2018 8:13 AM
To: Lloyd, Timothy
Subject: FW: Tiny House Appendix Q

Carrie

From: Rochelle Moore [mailto:rochellefmoore@gmail.com]
Sent: Monday, July 2, 2018 11:12 PM
To: Baker, Carrie <CBaker@mt.gov>
Subject: Tiny House Appendix Q

Hi,
My name is Rochelle Moore. Though I don't live in Montana, I think it's a rather beautiful state!
I'm emailing today because I'm asking you to support Appendix Q as part of supporting tiny homes. It's so important that they are legal in your state and many others. I understand how precarious people's housing stability can be - I work in the housing sector here in Seattle where home and apartment prices are pushing people out of their neighborhood. It's very sad.

Anyway, thank you for your time and consideration.

Best,
Rochelle Moore

Lloyd, Timothy

From: akmt0311 <akmt0311@gmail.com>
Sent: Tuesday, July 3, 2018 7:28 AM
To: Lloyd, Timothy; Baker, Carrie
Subject: Appendix Q: Tiny Houses

Good Morning,

I am emailing today to encourage you to adopt Appendix Q: Tiny Houses as part of the 2018 IRC.

Tiny houses can serve many purposes: in-law or "granny" flats when elders are no longer able to care for themselves, housing for a caregiver, inexpensive way to provide a living space for someone with special needs, inexpensive home for those without funds to buy a traditional place, and more.

I find this to be an important matter and thank you for your consideration.

Heather Hadley
Cascade MT

Lloyd, Timothy

From: BOB HENRY <bobhenryhenrybob@yahoo.com>
Sent: Tuesday, July 3, 2018 5:31 AM
To: Lloyd, Timothy
Subject: Tiny's

I understand your state is attempting to wrestle with the tiny house issue. As a tiny home owner I am in hopes you will consider a few things that will be very positive for many of your local communities. With the savings of investing in a tiny home the owners have a greater ratio of disposable income. This free income trickles back into the local economy thru local merchants. This greater demand requires more workers for these merchants and manufactures offering greater community growth. By allowing tiny homes you have allowed builders to "fill in" available smaller lots in the municipality. This growth will now generate modest property tax rather than having these parcels lay fallow and offering little to nothing to the local and state tax base. The local utilities are more economically utilized when spread across a broader base, so with the added population density the cost to operate local water and sewage services are shared across a much broader base to aid in economically offering these and other services . With correct placement tiny homes can and will be the answer to the decline many cities are experiencing. I am hoping the members of your board are forward thinkers that see the much more positive side of the tiny house "epidemic" !

Bob Henry

Oxford Indiana

Lloyd, Timothy

From:	Sunshine Zombiegirl <sunshinezombiegirl@gmail.com>
Sent:	Wednesday, July 4, 2018 2:27 PM
Subject:	Appendix Q: Tiny Houses from the 2018 IRC, the inclusion of tiny houses into code.

To Whom It May Concern:

My name is Kate Bohn. I'm emailing to request that Montana adopt Appendix Q: Tiny Houses from the 2018 IRC. I am not a resident of Montana at this time, but I am a proponent of tiny houses and better environmental, ecological, and sustainable living. I believe that tiny houses are the next step toward family tourism and a new means of industry, as well.

I appreciate you taking time to consider this important decision.

Sincerely,
Kate Bohn

Lloyd, Timothy

From: Stephen Brown <ginkgo@greatcape.com>
Sent: Wednesday, July 4, 2018 10:43 AM
To: Lloyd, Timothy
Cc: Baker, Carrie
Subject: tiny house regulations

Hello Tim

Stephen Brown here, checking in from Cape Cod, Massachusetts. I have been told that you might like some input on the upcoming Appendix Q legislation in Montana.

I own and operate a very rare 'old-fashioned Herbal Apothecary', and small (by Montana standards !) 15 acre medicinal plant farm which we affectionately have named-- the Great Cape Tiny Village..

My whole life has been spent trying to build a more sustainable community than the one I was born into 72 years ago. The modest three-small-bedroom house I was raised in the Boston suburbs has been destroyed and a mansion built in its place. These structures built by the rich, and often not even lived in for most of the year (especially here on Cape Cod) are NOT the way to go if we are ever to survive on this planet. We need MUCH smaller houses that real people, "the commons" , the working folks like you and me, can build by themselves and be affordable. PArt of my plan to make my property here on Cape Cod more sustainable is to build "tiny houses"
in the back part of the land. As in Montana the present building regulations make this VERY difficult to do.

So I hope that you and others will do all that you can to make Montana a model for the rest of our ailing country by passing this very important-- and FAR REACHING-- change in your building codes and laws. If you are successful you will be a beacon to other states who are trying to find their way into a brighter and better and more sustainable future.

If I can be of any assistance to you, do not hesitate to call or email.
Thank you very much for your efforts to help working folks.

Best wishes-- Stephen Brown
Great Cape Herbs, Brewster, Ma. 02631\
508 896 5900
ginkgo@greatcape.com
greatcape.com

Lloyd, Timothy

From: Heather Uva <hatuva25@gmail.com>
Sent: Tuesday, July 3, 2018 1:11 PM
To: Baker, Carrie; Lloyd, Timothy
Subject: Several bits of information on the Tiny Home Movement

Good Afternoon, Ms.Baker and Mr. Lloyd,
It has come to my attention that you are seeking public comment for proposed adoption of IRC Appendix Q. I wanted to provide some important information to you about what it really means to people on a fundamental level, and I know this looks like a long email, but I have tried to be as succinct as possible to respect your time.

Who is Interested?
It's a common knee-jerk reaction to say the Tiny Home Movement is about hippies, ne'erdowells, and hooligans, and that's understandable; this is a major shift away from traditional thinking and living. However, the reality these days is that the following people are finding it harder and harder to survive in today's society;

-Retirees living on a fixed income - squeezed by medications and treatments not covered by Medicaid/Insurance, while all other costs continue to rise;
-Disabled veterans living on a fixed income, often with the same issues, often compounded by PTSD complications who may find it difficult to maintain steady employment;
-People who lose their jobs due to factory closures and poor local economic conditions;
-People who lack the finances and ability to not work while re-attending school to develop more highly technical (and salaried) skills;
-People who work in food-service, agriculture, animal husbandry, or at entry-level industrial positions where wages are between minimum to $10/hour.
-People who have just gone through divorce or the death of a spouse or loved one.
-People who may have just graduated from higher education with large amounts of student loan debt as well as (often) a car loan, all incurred so that they can begin work in their career field, which is all especially difficult if they have children.
-People who may have to move often for their career or their spouse's career
-People who want to travel & live outdoors rather than be isolated and stationary.

This movement is ultimately about rejecting the "pay-check to pay-check" lifestyle, however, if you aren't able to radically increase your earning potential to get out of that hole, your next best option is to radically reduce your expenses. Nothing says it better than this guy: **this is a short video about a Teacher in Tulsa, Oklahoma, explaining all of his reasons for choosing the lifestyle, and he seems to hit every point that people discuss: https://youtu.be/ZNgJoylG-vA?t=276**

Who is concerned?
Concerned neighbors usually fall into two categories; those who fear their own property values will be affected, and those who fear Tiny Houses attract "the wrong element in society".

In terms of property values, it's important that homeowners are educated on how real estate appraisals are performed, and what potential comps would be used to evaluate their property. It will also be important to discuss tax implications, and how these changes could affect tax revenues for the localities involved (usually positive). One of the biggest boons, in my opinion, is that tiny homeowners have additional disposable income to support local businesses and service people, which is not a luxury many mortgage/rent-strapped citizens can claim to afford.

In terms of fears about "hooligans and hippies", in the video I provided above, that is more the typical picture of a person interested in a tiny home movement. These people want to enjoy spending time with their families, they want to travel, go back to school, lead a more sustainable lifestyle, etc. This movement is also fundamentally about a return to family values, both the rejection of isolation which seems to be built into most new subdivisions and the rejection of isolation which comes from not being able to afford to spend time with family.

Here's an article that is typical of press coverage of the "Not in My Neighborhood" attitude; it's not the article that's interesting, it's the comments.

If you haven't heard about "Pocket Neighborhoods", this really captures the feel of what it means to engage with neighbors in a community in ways many suburban and urban people feel they cannot these days.
http://pocket-neighborhoods.net/whatisaPN.html
https://www.ohio.com/akron/lifestyle/pocket-neighborhoods-promote-sense-of-community

This is about people being able to achieve financial security, being able to put money in the bank for emergencies or big dreams, being able to go back to school or put a loved one through college.

This is about people being able to feel more connection with family members and neighbors alike. Many of us struggle at a job that makes us feel so exhausted in our free time, we often would rather just stay home; couple that with the reduced earning power of a typical lifestyle, and it's cheaper just to stay home as well. This contributes to depression, isolation, and unhealthy ways of coping with stress. The Tiny Home Movement is about an upward spiral in quality of life, it's about a domino effect of positive consequences that come about when we lead more a more easily sustainable lifestyle.

Here is an important documentary about what local municipalities are doing to accommodate this change on a City/Town level;
https://www.youtube.com/watch?v=ZfLAKgJGc2g

I hope this information helps, and I do hope you consider adopting Appendix Q; I would be happy to discuss further if you would like me to do any additional research for you!
Kindly,
Heather T. Uva

Lloyd, Timothy

From: D. Lowery <ka0tt16@gmail.com>
Sent: Tuesday, July 3, 2018 11:23 AM
To: Lloyd, Timothy; Baker, Carrie
Subject: Appendix Q

Hi, my name is Don Lowery. I currently live in Oregon, but a friend of mine and I are looking to purchase some land to retire on and are looking in the state for a possible land purchase for our new home. I am emailing to request that Montana adopt **Appendix Q: Tiny Houses from the 2018 IRC**, so we could pursue our dreams of having our home being legal on the land we purchase.

Thank you for your consideration of this important decision.

Yours truly,
Don Lowery

Lloyd, Timothy

From: Kasper, Michael A <michael.a.kasper@jpmchase.com>
Sent: Tuesday, July 3, 2018 10:35 AM
To: Lloyd, Timothy; Baker, Carrie
Cc: 'Michael A. Kasper'
Subject: Appendix Q: Tiny Houses from the 2018 IRC

Hello Tim/Carrie,

I hope this email finds you both well.

I am emailing to request that Montana adopt Appendix Q: Tiny Houses from the 2018 IRC.

Of all of the 48 continental states that I have visited, Montana is by far the most beautiful and my personal favorite. Your state is truly an outdoorsman's dream, whether it's hiking in your forests, fishing in your streams and lakes, or camping in your wilderness and soaking it all in.

The tiny house movement aims to provide efficient, eco-friendly homes that are not only affordable to anyone but are incredibly environmentally friendly.
As one of the last states in this country to not have its natural treasures ruined by over-population or mass-industrialization, I respectfully request Appendix Q receive your consideration.

I wish you both a Happy 4th of July!

Regards,

Michael A. Kasper | VP | Alternative Investments | Corporate & Investment Bank | J.P. Morgan | 4 Chase Metrotech Center, 6th Floor, Brooklyn, NY 11245 | T: (212) 623-9826| michael.a.kasper@jpmorgan.com

PS: Even though I do not live in Montana at present, I plan on living there one day and visiting as much as possible in the meantime. And what better way to appreciate your glorious state than from the comfort a tiny house!

Lloyd, Timothy

From:	Baker, Carrie
Sent:	Tuesday, July 3, 2018 8:13 AM
To:	Lloyd, Timothy
Subject:	FW: Tiny House Appendix Q

Carrie

From: Rochelle Moore [mailto:rochellefmoore@gmail.com]
Sent: Monday, July 2, 2018 11:12 PM
To: Baker, Carrie <CBaker@mt.gov>
Subject: Tiny House Appendix Q

Hi,
My name is Rochelle Moore. Though I don't live in Montana, I think it's a rather beautiful state!
I'm emailing today because I'm asking you to support Appendix Q as part of supporting tiny homes. It's so important that they are legal in your state and many others. I understand how precarious people's housing stability can be - I work in the housing sector here in Seattle where home and apartment prices are pushing people out of their neighborhood. It's very sad.

Anyway, thank you for your time and consideration.

Best,
Rochelle Moore

Lloyd, Timothy

From: Susie Brown <chorbsolive@yahoo.com>
Sent: Sunday, July 1, 2018 8:55 PM
To: Lloyd, Timothy
Subject: In support of tiny houses appendix Q

Hi Tim,
My name is Susie. I am in support of legalizing tiny houses on wheels as affordable housing for our growing population. Since we are a tourist area and require more workforce in a lower paying sector, the need for housing is great. That does not mean 4 story concrete structures blocking our majestic views.
Please take this into consideration for those that want and choose to live simply.

Sent from my iPad

Lloyd, Timothy

From: Marianne Bradley-kopec <mycoveredwagon@yahoo.com>
Sent: Saturday, June 30, 2018 6:46 PM
To: Lloyd, Timothy
Subject: Appendix Q: Tiny Houses

Dear Bureau Chief Lloyd,

I am a former employee of The State of Montana. I worked at the Job Service in Hamilton until last October, when we were closed by the state due to financial cut backs.

I relocated to Utah because I was offered a job here. While Utah is a nice place to live, I miss Montana greatly and I am planning a move back to the Bitterroot this fall.

As a tiny house enthusiast and owner, I have followed the trend for years now and have supported the advocates working so diligenty to make tiny houses safe and legal.

When I return to Montana in a few short months, I would love to have the option to eventually live in a THOW (tiny house on wheels).

There are so many of us who wish to live in tiny houses houses and leave a much smaller footprint on the planet.

Please consider my request that the State of Montana adopt the Appendix Q: Tiny Houses from the 2018 IRC.

Thank you in advance for your consideration of this very important decision.

Most Sincerely,
Marianne Bradley-Kopec
Mycoveredwagon@yahoo.com
727-439-0001
Sent from Yahoo Mail on Android

Lloyd, Timothy

From: Dan Fitzpatrick <cityrenewal@hotmail.com>
Sent: Saturday, June 30, 2018 11:39 AM
To: Lloyd, Timothy; Baker, Carrie
Subject: Appendix Q

This is Dan Fitzpatrick.

My wife and I have been looking to relocate to Montana or at least have a home to visit frequently during the year. Being "empty nesters" we wish to dramatically downsize our housing and get rid of stuff! We have loved our visits to your state over the past several years and it may well be time to put down roots.

We understand that you are considering the adoption of regulations that would provide building codes that are friendlier to those of us wanting to live in smaller houses.

Thus, we would urge your adoption of Appendix Q of the 2018 IRC code for "tiny houses." These seem to be common sense building regulations to guide safe and secure construction of smaller homes.

One of the reasons we are considering Montana for a home, besides its obvious beauty, is that your state and its government officials seem to approach issues based on common sense and a "less is more" philosophy on government regulations. Adoption of Appendix Q certainly meets that criteria.

Thank you for your kind consideration.

Dan and Mary Fitzpatrick