All questions are displayed as
Question : Correct Answer : Wrong Answer : Wrong Answer : Wrong Answer
Answer order is randomized for students

Introduction

Image credit: National Park Service

Hello and welcome to At Your Pace Online's three-hour class on the 2018 IPC and energy conservation! By taking this course, you will understand how the IPC has been updated, and you will be better informed and more prepared for the green economy and the road ahead.

As part of your biennial renewal process, one hour must be dedicated to energy conservation coursework, according to the Utah Office of Administrative Rules R156-55a-303b.

> *Construction Trades Licensing Act Rule R156-55a-303b.*
>
> *Continuing Education - Standards.*
>
> *(1) (d) Contractors with a renewal cycle that ends after January 1, 2020, shall complete at least one of their six continuing education hours in energy conservation.*

This course will satisfy the requirement for one hour of energy conservation continuing education, as well as two hours of code updates, for a total of three hours of required core education.

Challenges and Opportunities

Image credit: pexels.com

As a contractor in the U.S., you may feel challenged by trying to stay informed about energy conservation code. Perhaps you are looking for cost savings or ways you can be more aligned with green building and energy efficient practices. Rest assured the challenges we face are not without opportunities for growth. In this course we will move you forward in the right direction. And the content of this course is generally suitable for all contractor professionals. During this hour, we are going to cover key concepts, important definitions, and news and resources. Most of all, the class will cover the current energy codes, particularly the 2015 Energy Conservation Code for residential buildings, (adopted by Utah with amendments). And briefly we will touch on the 2018 Energy Conservation Code for commercial buildings.

Team Effort

This information includes ideas that may or may not obviously affect your day-to-day operations; however, energy conservation is a team effort, with your role being a very important one in the trades industry. By working together, our communities can address the 21st century demands for safe, efficient, and sustainable measures. Everyone is a stakeholder in this, from policymakers, your customers, your colleagues, and of course you and your business.

Course Outline

This course contains four sections, with each section ending with a straightforward question followed by multiple choice answers. The Q&A is not intended to trip you up, but rather, move you easily from section to section while verifying that you understand the content just covered. There is no final exam.

The outline is as follows:

1. To start, this class will provide a general overview of energy conservation, starting with basic concepts and key definitions.
2. Second, this class will discuss energy conservation code. We will refer to the IECC 2015 Residential Provisions (with Utah amendments) and the 2018 IECC Commercial Provisions.
3. Next, we will touch on news and trends including some statewide news that may possibly affect your work sector in the months ahead.
4. We will wrap up the course with some helpful resources and links to websites you may want to refer to later.

About the Material

Please keep in mind the material here is presented as a one-hour introduction to energy conservation. It is not intended as a definitive or comprehensive interpretation of the rules, regulations, and principles surrounding energy conservation. Links may be provided to the full text of source material, because there is no substitute for reading the actual language, directly.

If you have any questions about the specific application of the information cited in this course as it relates to your own profession, please seek the guidance of an authorized code official.

Energy conservation is such an important topic, and we have a lot to cover. Let's get started.

ut_contractorce_Plumbing_and_HVAC_ce_11_q01

What version of the IECC is currently being used in Utah for commercial buildings?	2018	2015	2006	1992

Overview of Energy Conservation

Key Concepts

Image source: pexels.com

Here we will cover several basic concepts to ensure you have a broad understanding of energy conservation in the trades industry. You may already be familiar with many, if not all, of these concepts. Hopefully, you will find something new to add to your professional knowledge base.

Energy Efficiency in Policies, Systems, and Design Standards

Energy efficiency is *a* great place to start. A simple definition of energy efficiency is reducing energy use within a system in order to achieve a strategic goal such as reducing costs and/or lightening environmental load without diminishing performance. Evidence of this overarching concept is reflected in many areas. Some examples are government policy, systems of various kinds, design standards, and more. Affected industries include building construction, renovation, engineering, the power grid, and manufacturing of equipment and materials. The concept of energy efficiency can be applied to all trades and may include computerized, automated processes.

Energy efficiency addresses the need for:

- Cost savings
- Reduced energy usage
- Conservation of natural resources

When we talk about cost savings, how much are we talking about? This will give you an idea:

The Utah Department of Energy says this,

“Energy cost savings for Utah resulting from the state updating its commercial and residential building energy codes in accordance with federal law are significant, estimated to be on the order of nearly $170 million annually by 2030.”

Source credit: energycodes.gov

What are some additional benefits of energy efficiency? Energy-efficient systems enhance the efficacy of:

- Construction
- Plumbing
- HVAC&R
- Electrical systems
- Landscaping
- Roofing
- Rainwater collection
- Compliance tracking

Energy efficiency helps everybody win, not just in terms of long-term cost savings and overall environmental sustainability, but also public safety and human health. Energy efficiency can also boost communities across Utah and the United States by opening up new business opportunities. One example is the need for professionals who can analyze energy loss by utilizing thermography; (more on this later).

Conservation

Image credit: pexels.com

Conservation (of energy and natural resources) is a key principle that appears likely to become ever more important for contractors. Many of the recent changes to code are part of a growing movement within Utah and beyond, toward recognizing and dealing with the need for reducing energy waste thereby using less energy. Tradesmen such as yourself are showing strong leadership in responding to these needs.

Consistent conservation requires, among other things:

- energy-efficient design,
- more efficient equipment,
- less energy loss through leakages, and
- changed behavior on the part of consumers.

In addition, using alternative, renewable energy sources of course lessens the demand on current systems.

The Smart Grid

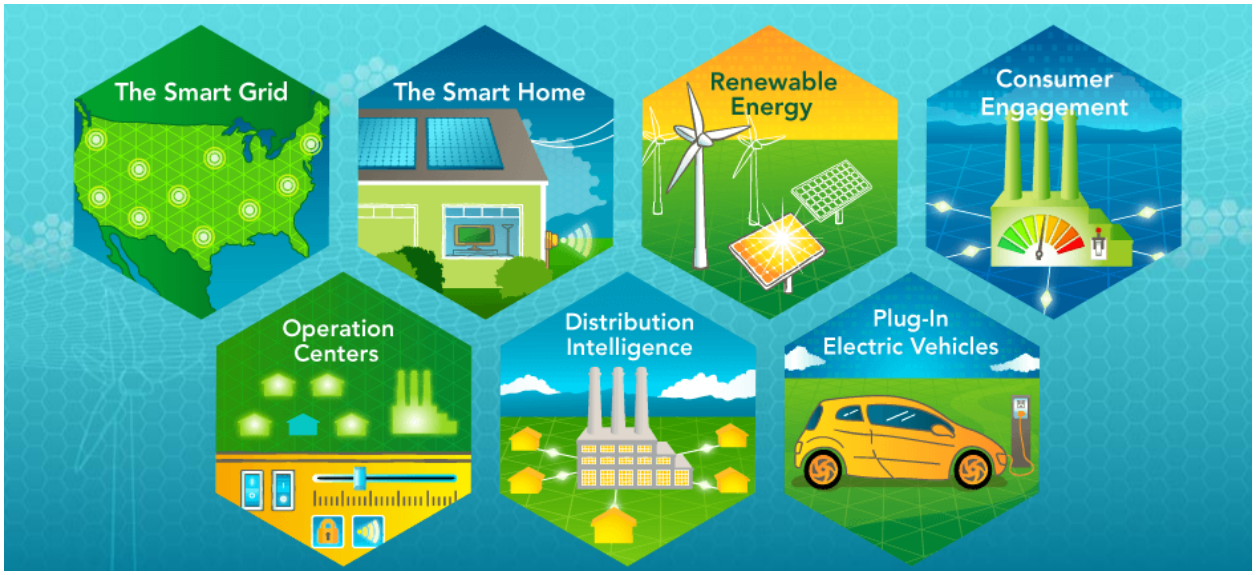


Image credit: smartgrid.gov

When people use the term smart grid, they are referring to the electrical power grid's evolved status in the 21st century, from one where infrastructure created a passive load on the grid, to one where structures actually become partners with energy providers. This partnership means it is a two-way street; it reflects a flexible dynamic within the electricity sector. This is all thanks to digital technological advancements and a commitment to improved energy efficiency.

The smart grid allows for new approaches to solving energy needs, such as *transactive energy*, which we will go over in just a moment.

According to smartgrid.gov, some of the benefits of having a smart grid include:

- More efficient transmission of electricity
- Quicker restoration of electricity after power disturbances
- Reduced operations and management costs for utilities, and ultimately lower power costs for consumers
- Reduced peak demand, which will also help lower electricity rates

- Increased integration of large-scale renewable energy systems
- Better integration of customer-owner power generation systems, including renewable energy systems
- Improved security

International Energy Conservation Standards

Energy efficiency and energy conservation are global concerns. Fortunately, there are organized standards in place, when it comes to energy conservation code. Indeed, the ***International Energy Conservation Code® (IECC®)*** is a worldwide model code developed by the nonprofit association called *the International Code Council (ICC)*. This code is recognized by federal law in the United States and has been adopted by, adapted for, and enforced by government agencies.

The IECC is used to:

- Ensure safety
- Ensure affordability
- Ensure sustainability

The IECC addresses energy conservation requirements for all aspects of energy use, including

- heating and ventilating
- lighting
- water heating
- power usage for appliances and building systems

It is worth noting that energy-efficient design principles incorporate energy-efficient systems as part of the overall design plan. The more closely the design follows energy-efficient standards, the better the energy conservation performance will be, when paired with skilled workmanship and the proper materials.

Transactive Energy

Transactive energy is a concept along the same lines as the smart grid. It provides one solution to the energy conservation needs that a smart grid supports. The premise is that stakeholders in the market are empowered to have more flexibility in their roles as producers and consumers of electrical energy. It gives the end user or consumer of electricity more information and control over their own energy consumption using close-to-real-time data. For those who produce and sell renewable energy, the data tells them when it is most cost effective to do so. Transactive energy thus exemplifies smart technology being used to adapt to, and overcome energy use

challenges facing us all.

Definitions

Here you will find definitions related to energy conservation. These definitions are, with a couple exceptions, copied from the IECC Chapter 2, Definitions.

Air Barrier

An air barrier is one or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

Air Curtain

An air curtain is a device, installed at the building entrance, that generates and discharges a laminar air stream intended to prevent the infiltration of external, unconditioned air into the conditioned spaces, or the loss of interior, conditioned air to the outside.

Home Energy Rating System (HERS) and Energy Rating Index (ERI)

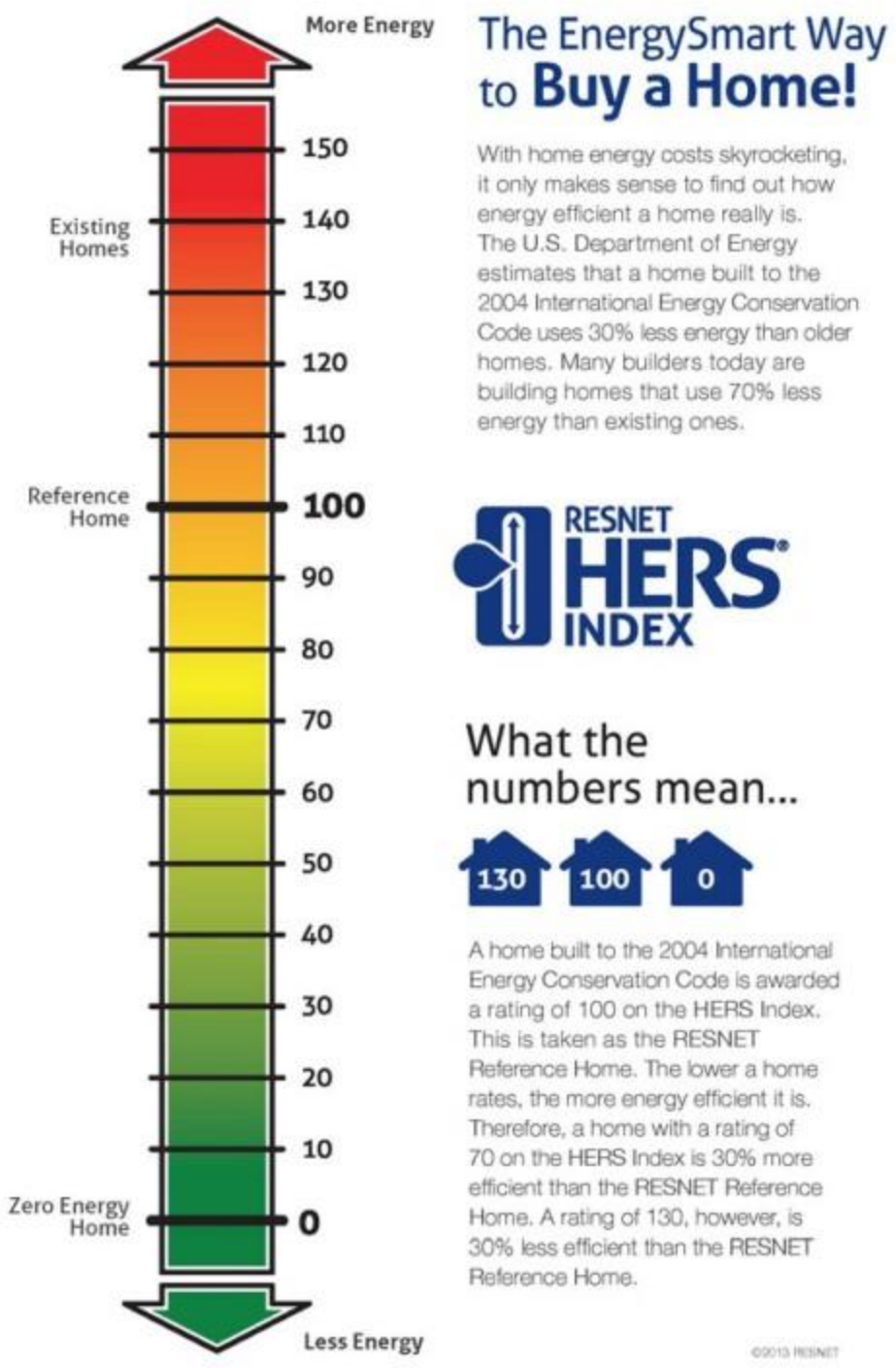


Image credit: resnet.us

The HERS index measures a home's energy efficiency. This number is based on a variety of factors including how efficient the building's thermal envelope is. The lower the HERS index, the less energy the home uses and the better its energy performance. A typical resale home scores

130 to 140 on the HERS Index, while a standard new home is commonly awarded a rating of 100.

The HERS index is part of Utah's energy code, so home builders who wish to comply with the voluntary "Energy Rating Index" (ERI) program must achieve a score between 65 and 69, depending on where in Utah the home is built.

The rating was developed by the nonprofit RESNET, intended to be incorporated into software that can be used by certified HERS inspectors who give a single score for the energy efficiency (or lack thereof) for the entire home. It is designed to be incorporated into real estate listings as well as to have the expense of HERS inspection included in closing costs.

Although a focus of HERS is on the building envelope, there are several ways other contractors besides builders (e.g., plumbers) can contribute. For example, critical elements of a low score include an efficient water heater, well-insulated hot water piping, parallel hot water circulation or other forms of energy-saving provision of hot water, solar water heating, water conserving fixtures, etc.

Consumers appreciate the Home Energy Rating System because it is clearly presented and allows them access to green building principles in a simplified way. In addition, homeowners, developers, and state and local building officials who use skilled Home Energy Raters can benefit from the market forces of a Home Energy Rating Index to go beyond minimum code requirements.

The following is an official definition of the ERI:

> **N1106.3 (R406.3) Energy rating index.** The Energy Rating Index (ERI) shall be a numerical integer value that is based on a linear scale constructed such that the *ERI reference design* has an Index value of 100 and a *residential building* that uses no net purchased energy has an Index value of 0. Each integer value on the scale shall represent a 1 percent change in the total energy use of the rated design relative to the total energy use of the *ERI reference design*. The ERI shall consider all energy used in the *residential building*.

Climate Zone

A climate zone is defined as a geographical region based on climate criteria as specified in energy code. Please see the following map of Utah's climate zones, organized by county. The map reflects simplified building envelope requirements for windows, insulation, and foundations.

IECC Compliance Guide for Homes in Utah

Code: 2015 International Energy Conservation Code

Step-by-Step Instructions

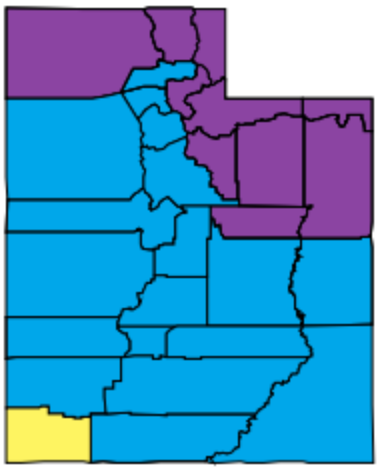
1. Using the climate zone map to the right, match the jurisdiction to the appropriate IECC climate zone. Use the simplified table of IECC building envelope requirements (below) to determine the basic prescriptive requirements for the thermal envelope associated with the jurisdiction.
2. Use the "Outline of 2015 IECC Requirements" printed on the back of this sheet as a reference or a categorized index to the IECC requirements. Construct the building according to the requirements of the IECC and other applicable code requirements.

The 2015 International Energy Conservation Code

The 2015 IECC was developed by the International Code Council (ICC) and is currently available to states for adoption. The IECC is the national model standard for energy-efficient residential construction recognized by federal law. Users of this guide are strongly recommended to obtain a copy of the IECC and refer to it for any questions and further details on compliance. To obtain a copy of the 2015 IECC, contact the ICC or visit www.iccsafe.org. IECC compliance training is also available from many sources.

Limitations

This guide is an energy code compliance aid for Utah based upon the simple prescriptive option of the 2015 IECC. It does not provide a guarantee for meeting the IECC. This guide is not designed to reflect the actual energy code, with amendments, if any, adopted in Utah and does not, therefore, provide a guarantee for meeting the state energy code. For details on the energy code adopted by Utah, including how it may differ from the IECC, please contact your local building code official. Additional copies of this guide are available on www.reca-codes.com.



CLIMATE ZONE 6			
Box Elder	Daggett	Rich	Wasatch
Cache	Duchesne	Summit	
Carbon	Morgan	Uintah	

CLIMATE ZONE 5			
Beaver	Iron	Salt Lake	Utah
Davis	Juab	San Juan	Wayne
Emery	Kane	Sanpete	Weber
Garfield	Millard	Sevier	
Grand	Piute	Tooele	

CLIMATE ZONE 3
Washington

	Windows			Insulation				Foundation		
	Fenestration U-Factor	Skylight U-Factor	Glazed Fenestration SHGC	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement Wall R-Value	Slab R-Value and Depth	Crawl Space Wall R-Value
Zone 6	0.32	0.55	NR	49	20+ 5 or 13+10	15/20	30	15/19	10, 4 ft	15/19
Zone 5	0.32	0.55	NR	49	20 or 13 + 5	13/17	30	15/19	10, 2 ft	15/19
Zone 3	0.35	0.55	0.25	38	20 or 13 + 5	8/13	19	5/13	0	5/13

NR indicates No Requirement

source credit: ASE.org

Energy Analysis

Energy analysis is a method for estimating the annual energy use of the *proposed design* and *standard reference design* based on estimates of energy use.

Energy Cost

Energy cost is the total estimated annual cost for purchased energy for the building functions regulated by this code, including applicable demand charges.

Energy Simulation Tool

An energy simulation tool is an *approved* software program or calculation-based methodology that projects the annual energy use of a building.

On-Site Renewable Energy

On-site renewable energy is energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or the internal heat of the earth. The energy system providing on-site renewable energy shall be located on the project site.

R-Value

R-value or Thermal Resistance, is the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area.

U-Factor

U-factor, or Thermal Transmittance, is the coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films.

Zero Energy Home

A zero energy home is a residential building that uses no net purchased energy and has an index (ERI) value of 0.

ut_contractorce_Plumbing_and_HVAC_ce_11_q02

What is a Home Energy Rating System (HERS)	A way to assess a home's energy efficiency	Where a home is situated in a climate zone	A way to assess solar power capability	A mortgage calculation

index?				

Thermal Envelope

Let's talk about a **building's thermal envelope**. As a contractor, you may know a lot about insulation, vapor barriers and other elements that are part of its assembly. But maybe you don't use the term much. It's everything from the windows, exterior walls, floor, ceiling, and weatherstripping. These boundaries enclose what we call "conditioned space" vs "unconditioned space". That's energy code jargon, for parts of the home or building that keep you comfortable in winter and cool in summer.

The spaces inside the home contain either warm air or cool air, and variable moisture levels. Depending on the age, design, construction, and equipment, the energy efficiency of the home might be a challenge, especially in older buildings. Air leaks out in places and comes in under narrow gaps, like the door to your garage, for example.

Have you heard of thermography? More and more HVAC and General contractors are using a process called Building Envelope Thermography to determine where there are energy losses. To do this, they use a special thermal camera and analyze the results to identify where the issues lie.

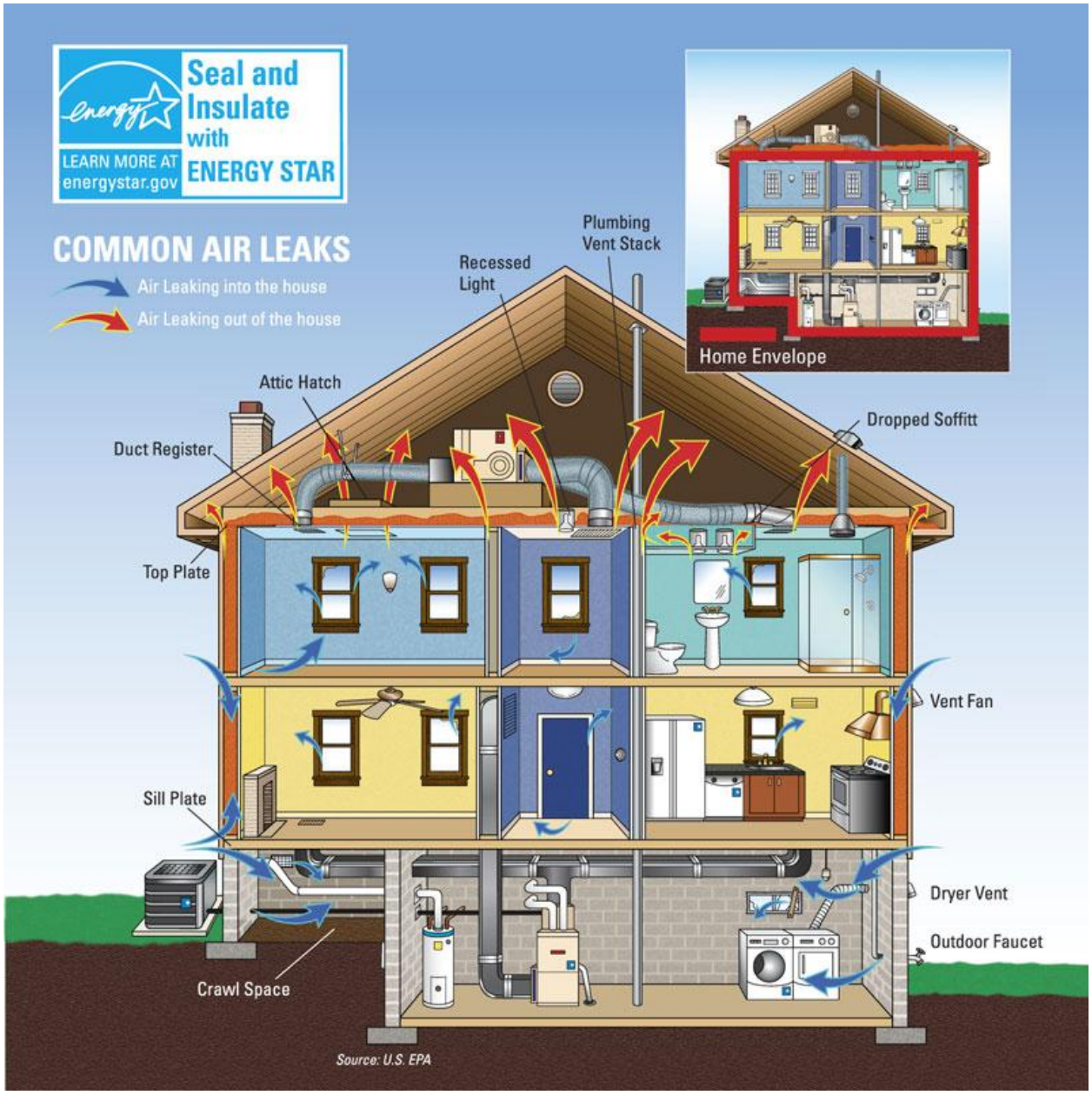


Image credit: energystar.gov

Notice the red line in the illustration (upper right corner); it outlines the building envelope. In the larger home, notice where the moisture, warm and cool air may be coming in and going out. Is the building “drafty” in the winter? Is it losing too much cool air in summer? That’s most likely due to energy inefficiency from a loose-fitting thermal envelope.

In layman’s terms, you might think of the concept in this way:

Image credit: pexels.com

This money represents cost savings for the consumer. They've just lowered their electric bill, thanks to construction or renovation that is up to code. They've also protected their real estate investment by protecting its durability and longevity. This is a win-win, for conserving dollars as well as energy. In this analogy, things like double-paned windows and thick roof insulation have literally added up.

ut_contractorce_Plumbing_and_HVAC_ce_11_q03

True or False: Windows, exterior walls, floor, ceiling, and weatherstripping are elements of a building's	True	False		

thermal envelope.				

Energy Conservation Code

Source: pexels.com

In this section we will discuss energy conservation code in more detail.

About the International Code Council (ICC)

The International Codes® (I-Codes®) are published by the ICC, a membership organization we mentioned earlier. It is based in Washington, D.C. and is dedicated to building safety and fire prevention. In their own words, the ICC is “the leading global source of model codes and standards and building safety solutions that include product evaluation, accreditation, technology, training, and certification. The Code Council's codes, standards, and solutions are used to ensure safe, affordable, and sustainable communities and buildings worldwide.”

History of the IECC

The first edition of the IECC in 1998 was an extension of a 1995 Model Energy Code created by the Council of American Building Officials (CABO) along with subsequent changes approved through the CABO Code Development Procedures. CABO assigned all rights and responsibilities to the ICC in 1998. Current protocols are for a new edition of the IECC to be published every three years. The 2012 edition presented the code as originally issued in 1998 with changes promulgated for the 2000, 2003, 2006 and 2009 editions as well as further

changes approved through the ICC Code Development Process through 2010.

The edition released in 2018 marked the 20 year anniversary of the IECC. In February 2019, Utah lawmakers adopted the 2018 I-Codes® (except the IRC and residential provisions of the IECC.) The ICC published the 2021 version of the IECC in December 2020.

Code Development Process

The IECC is maintained for appropriateness and incorporates latest developments through a review process that includes considering proposed changes submitted by code enforcement officials, industry representatives, design professionals and other interested parties. The ICC requests that anyone submitting code change proposals ascertain which code development committee is responsible for the section of the code for which a change is proposed.

There is a new platform online to encourage participation in the code development process. It is called cdpACCESS® and can be visited here or you may contact ICC staff at cdpACCESS@iccsafe.org.

Note that the IECC is designed to be adopted by, adapted for, and enforced by government agencies. The ICC has no direct role in ensuring that its standards are followed.

Purpose of the IECC

Image credit: ICC

Let's talk about the purpose of the International Energy Conservation Code. The ICC describes the IECC building code standards as follows:

Internationally, code officials recognize the need for a modern, up-to-date energy conservation code addressing the design of energy-efficient building envelopes and installation of energy-efficient mechanical, lighting and power systems through requirements emphasizing performance.

This comprehensive energy conservation code establishes minimum regulations for energy-efficient buildings using prescriptive and performance-related provisions. It is founded on broad-based principles that make possible the use of new materials and new energy-efficient designs.

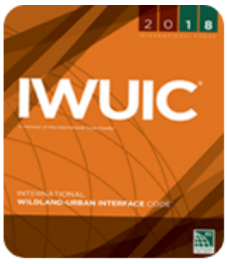
As you are aware, the list of I-Codes® includes:

- *the International Building Code®*
- *International Existing Building Code®*
- *International Fire Code®*
- *International Fuel Gas Code®*
- *International Green Construction Code™*
- *International Mechanical Code®*
- *ICC Performance Code®*
- *International Plumbing Code®*
- *International Private Sewage Disposal Code®*
- *International Property Maintenance Code®*
- *International Residential Code®*
- *International Swimming Pool and Spa Code™*
- *International Wildland-Urban Interface Code®*
- *International Zoning Code®*

2018 International Green Construction Code

2018 International Existing Building Code

2018 International Swimming Pool and Spa Code



2018 International Wildland Urban Interface Code

2018 International Private Sewage Disposal Code

2018 ICC Performance Code for Buildings and Facilities

2018 International Zoning Code

2018 International Solar Energy Provisions

Jurisdiction

Most jurisdictions apply the IECC to their own codes in different ways. The code can be used anywhere from in its entirety and used as the code for a specific jurisdiction, or with select sections of the code added to a particular state jurisdiction code.

As mentioned previously, the current codes in use in the state of Utah are:

- 2015 IECC for Residential Provisions, with Utah amendments
- 2018 IECC Commercial Provisions

Commercial and Residential Provisions

The IECC contains separate provisions for commercial buildings and for low-rise residential buildings. Each set of provisions, IECC—Commercial and IECC—Residential, is separately applied to buildings within its respective scope. According to the American Council for an Energy Efficient Economy (ACEEE), in 2019 “the Utah legislature passed HB 218, adopting the 2018 International Energy Conservation Code (IECC) for commercial provisions in its entirety. The amended 2015 IECC remains the statewide residential energy conservation code.”

IECC 2015 Residential

Scope and Organization

Scope: The 2015 IECC applies to residential buildings and the building sites and associated systems and equipment.

How is the 2015 IECC organized?

Chapters	Subjects
1–2	Administration and definitions
3	Climate zones and general materials requirements
4	Energy efficiency requirements
5	Existing buildings
6	Referenced standards

The 2015 IECC is organized into chapters and chapter sections for either residential or commercial application. Each code is identified with a letter (CE for commercial or RE for residential) number (1, 2, 3, 4, or 5) for each chapter, then 01, 02, etc. for each section within that chapter. Thus, R404 would designate chapter 4, section 4 for residential applications. Individual codes under this chapter and section would be enumerated as R404.1 or, if additional subcategories of the code are needed, R404.1.1, R 404.1.2, etc.

What follows is a brief summary of each chapter's topics.

Chapters 1-2 Administration and Definitions

Chapter 1 identifies the scope - which buildings and structures come under its purview and the means for ensuring due process and equal protection under the law when administering and enforcing the IECC. Chapter 2 provides definitions of the terms used in the code, listed alphabetically.

Chapter 3 General Requirements

Climate has a major impact on the energy use of most buildings. This chapter delineates the climate zones that establish the exterior design conditions. It also delineates interior design conditions that are used as a basis for assumptions in heating and cooling load calculations and basic material requirements for insulation materials and fenestration [window, door, etc.] materials. The code establishes many requirements such as wall and roof insulation *R*-values, window and door thermal transmittance requirements (*U*-factors) as well as provisions that affect the mechanical systems based upon the climate where the building is located. This chapter contains information that will be used to properly assign the building location into the correct climate zone and is used as the basis for establishing requirements or elimination of requirements.

Chapter 4 Energy Efficiency

Chapter 4 contains the technical requirements for energy efficiency. It contains the design and construction energy efficiency requirements for the building envelope, the heating and cooling system and the service water heating system of most commercial buildings and residential buildings greater than three stories in height above grade.

Chapter 5 Existing Buildings

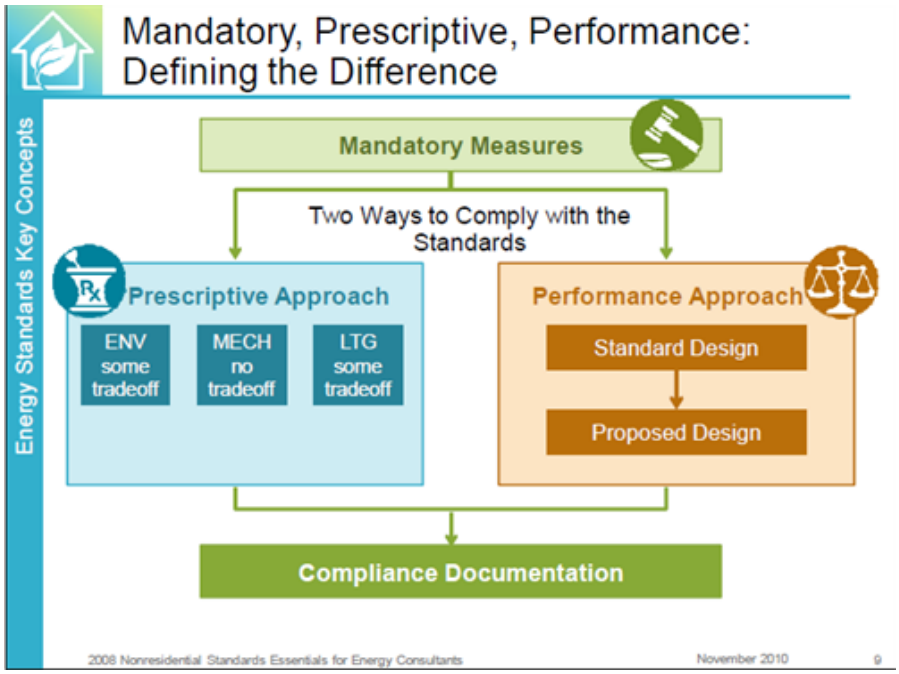
This chapter's code "shall control the *alteration, repair, addition* and change of occupancy of existing buildings and structures."

Chapter 6 Referenced Standards

The code contains numerous references to standards that are used to regulate materials and methods of construction. Compliance with referenced standards is necessary for code compliance. By providing specifically adopted standards, the construction and installation requirements necessary for compliance with the code can be readily determined and available on an equal basis to the code official, contractor, designer, and owner. Chapter 6 lists all of the referenced standards, alphabetically, by acronym of the promulgating agency of the standard.

It is vital that contractors and installers stay current with the most recent published standards in order to ensure that the work is fully code compliant and offers the best possible product to customers.

Mandatory vs. Prescriptive vs Performance Application of the Codes



The IECC is a combination of mandatory standards that must be followed, prescriptive requirements that spell out exactly how something is to be done, and performance requirements that outline what the required level of performance is and leave it up to the designer how this is to be achieved.

The IECC is compatible with building codes that prefer to emphasize performance requirements over prescriptive requirements. The advantage of prescriptive codes is that designers and builders can operate without ambiguity. The advantage of performance requirements (a series of objectives all buildings must meet while leaving open how these objectives will be met) is that it fosters change and innovation in building design. Regardless of how the IECC is being applied, through mandatory, prescriptive, or performance standards, the designers and builders must demonstrate how the proposed design will meet each objective when applying for a building permit.

2015 IECC Residential Provisions with Amendments

Chapter 4 Residential Energy Efficiency, Section R401.2

In Section R401.2 Compliance, the code states:

> *Projects shall comply with one of the following:*
>
> *(1) Sections R401 through R404.*
>
> *(2) Section R405 and the provisions of Sections R401 through R404 labeled*

"Mandatory."

(3) An energy rating index (ERI) approach in Section R406.

(4) Compliance may be shown by demonstrating a result, using the software RESCheck 2012 Utah Energy Conservation Code, of 5 percent better than code.

Utah has made the following replacement for number (4).

Note that we will be presenting the amended code using highlighted text to set off the changes.

Amendment, R401.2:

> *4. Compliance may be shown by demonstrating a result, using the software RESCheck 2012 Utah Energy Conservation Code, of:*
>
> *(a) on or after January 1, 2017, and before January 1, 2019, 3 percent better than code;*
>
> *(b) on or after January 1, 2019, and before January 1, 2021, 4 percent better than code;*
>
> *(c) after January 1, 2021, 5 percent better than code.*

In other words, it may be helpful to know that the Utah RESCheck pass rate increased incrementally over time from 3% to 4% better than code, and is now up to 5% better than code, effective January 1, 2021.

Chapter 4, Section R402 Building Thermal Envelope

In subsection R402.1 General (Prescriptive), the requirements for the building thermal envelope are specified as well as any exceptions. The following table is presented, containing insulation and fenestration requirements.

Table R402.1.2 Insulation and Fenestration Requirements by Component

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, j]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & 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]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5[h]	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]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

In a series of footnotes, a new final footnote ”j” was added to Table R402.2 according to the State Construction and Fire Codes Act. In essence, Utah created footnote “j” to itemize requirements for log wall construction.

Amendment, R402.1.2:

> *(5) In IECC, Table R402.2, in the column entitled MASS WALL R-VALUE, a new footnote j is added as follows:*
>
> *j. Log walls complying with ICC400 and with a minimum average wall thickness of 5 inches or greater shall be permitted in Zones 5 through 8 when overall window glazing has a .31 U-factor or lower, minimum heating equipment efficiency is, for gas, 90 AFUE, or, for oil, 84 AFUE, and all other component requirements are met.*

Note: There is a correction to the table number. Please note that Table R402.1.2 not R402.2 is the table actually being referred to in the code amendment.

To summarize the change, Utah added footnote “j” to specify how to succeed with compliance via wall thickness, wall insulation, and window/fenestration energy efficiency requirements for log walls.

Chapter 4, Section R402.4 Air Leakage (Mandatory)

This section refers to installation of components in the building’s thermal envelope, i.e., air barriers and insulation, as the first option for compliance (R402.4.1.1) and blower door testing (R402.4.1.2) as the second option.

For this particular Utah amendment, there was a change to the requirements for blower door testing:
In IECC, Section R402.4.1, in the first sentence, the word "and" is deleted and replaced with the word "or".

Thus the code was amended to read as follows, for subsection R402.4.1:

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

To summarize, the code either had a typo or was purposefully modified to give an either/or option instead of dual compliance requirements.

Chapter 4, Section R402.4.1.2 Testing (2nd Option)

This subsection describes air leakage testing requirements along with those for third party verification. The changes made by Utah are displayed in the paragraph below, with changes highlighted for you and deletions showing as struck-through text:

Amendment, R402.4.1.2:

> *~~The building or dwelling unit~~ A single-family dwelling shall be tested and verified as having an air leakage rate not exceeding ~~five~~ 3.5 air changes per hour ~~in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8~~. A multi-family dwelling and townhouse shall be tested and verified as having an air leakage rate of not exceeding five air changes per hour. Testing shall be conducted in accordance with ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved ~~third~~ party. The following parties shall be approved to conduct testing: Parties certified by BPI or RESNET, or licensed contractors who have completed training provided by Blower Door Test equipment manufacturers or other comparable training. 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.*

In other words, this part of the Utah code describes its test option parameters so contractors can comply with thermal envelope requirements regarding air leakage, including who is approved to do the testing within the state of Utah.

The amendment added or changed, among other things:

- The maximum air leakage rate requirement from 3 to 3.5 air changes per hour in climate zones 3 to 8 for single-family homes in Utah.
- the maximum air leakage rate requirement for multi-family dwellings and townhouses to be 5 air changes per hour.
- wording on climate zones 1 and 2 since they are irrelevant in Utah; these were removed.

Chapter 4, Section R403 Systems, R403.3.3 Duct Testing (Mandatory)

Sticking with the building envelope theme but going now to the Systems section and Ducts subsection, we have code R403.3.3 to examine. In this case, the Utah amendment to the Exception allows for a slower, incremental increase to match the Exception's 80% rule for ducts inside the building envelope. The amended code also elaborates on what parties are approved for testing in Utah. Here is the code:

> *R403.3.3 Ducts shall be pressure tested to determine air leakage by one of the following methods:*

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

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

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

Utah's amendment reflects several changes to the Exception code language that follows next:

R403.3.3 Exception: ~~A~~ The duct air leakage test ~~shall not be~~ is not required ~~where the ducts and air handlers are~~ for systems with all air handlers and at least 80% of all ducts (measured by length) located entirely within the building thermal envelope.

Please note that Utah outlined a chronologically incremental replacement to the Exception for duct air leakage, from January 2017 to the present; as of January 2021, the 80% rule is in effect:

(i.) on or after January 1, 2017, and before January 1, 2019, with: "Exception: The total leakage test is not required for systems with all air handlers and at least 65% of all ducts (measured by length) located entirely within the building thermal envelope.";
(ii.) on or after January 1, 2019, and before January 1, 2021, with: "Exception: The duct air leakage test is not required for systems with all air handlers and at least 75% of all ducts (measured by length) located entirely within the building thermal envelope."; and
(iii.) on or after January 1, 2021, with: "Exception: The duct air leakage test is not required for systems with all air handlers and at least 80% of all ducts (measured by length) located entirely within the building thermal envelope."

With regard to testing, the Utah amendment added this after the R403.3.3 Exception:

The following parties shall be approved to conduct testing:

1. Parties certified by BPI or RESNET.

2. Licensed contractors who have completed training provided by Duct Test equipment manufacturers or other comparable training.

So to summarize:

- The 2015 IECC code says the leakage test is not required where the ducts and air handlers are located 100% within the building envelope, whereas, Utah code says the leakage test is not required for systems in which all air handlers and at least 80% of the ducts (measured in length) are within the building

envelope.

- The Utah amendment gives details on what parties are approved for testing, i.e., certified BPI/RESNET parties, and those who have completed the necessary training outlined in the code.

Chapter 4, Section R403 Systems, R403.3.4 Duct Leakage (Prescriptive)

Continuing on with this section but analyzing R403.3.4 Duct Leakage (Prescriptive), we find that Utah maximum leakage measurements are different than the 2015 IECC; you can see the changes in the box below.

Amendment, R403.3.4 Duct Leakage (Prescriptive)

Utah code changes are highlighted in orange and 2015 IECC numbers are struck through where they were replaced:

The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. *Rough-in test: The total leakage shall be less than or equal to ~~4~~ 8 cubic feet per minute (~~113.3~~ 170 L/min) per 100 square feet (9.29 m^2) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to ~~3~~ 6 cubic feet per minute (~~85~~ 114.6 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.*

2. *Postconstruction test: Total leakage shall be less than or equal to ~~4~~ 6 cubic feet per minute (~~113.3~~ 169.9 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.*

We have two things to note regarding the above amendment:

- According to UpCodes.com, there is a small typo or inaccuracy in the Utah State Construction and Fire Codes Act. For both references to 6 cubic feet per minute in subsection 1 and 2 above, the corresponding L/min should be the same, 169.9 L/min not 114.6 L/min. UpCodes describes it this way: “The equivalent of 8 cubic feet per minute in L/min is 226.5 while 6 cubic feet per minute in L/min is 169.9.”

- A historical note about subsection 2: it is worth noting that Utah again had a chronologically incremental change in its requirements for maximum duct leakage, for the time period January 2017 to the present. The final decrease (from 8, to 7, and now to 6) is in effect as of this writing. Here are the details:

  (i.) on or after January 1, 2017, and before January 1, 2019, the number 4 is changed to 8 and the number 113.3 is changed to 226.5;
  (ii.) on or after January 1, 2019, and before January 1, 2021, the number 4 is changed to 7 and the number 113.3 is changed to 198.2; and
  (iii.) on or after January 1, 2021, the number 4 is changed to 6 and the number 113.3 is changed to 169.9.

To summarize changes to R403.3.4, the amended Utah code has less restrictive requirements than the 2015 IECC as far as maximum allowable duct leakage. Codifying less leakage means better energy efficiency, so Utah is moving in the direction of improved energy conservation.

Chapter 4, Section R403 Systems, R403.6 Ventilation (Mandatory) R403.6.1 Whole-House Mechanical Fan Efficacy

R403.6.1 In Utah code, fan efficacy language now includes the term “whole house” mechanical ventilation system, with a slight modification of the contents of the corresponding table. You can see in Table R403.6.1 below, the addition of HRV or ERV, for fan location, along with the air flow rate minimum (CFM), minimum efficacy per watt, and air flow rate maximum (CFM).

> *When installed to function as a whole house ~~M~~mechanical ventilation system fans shall meet the efficacy requirements of Table R403.6.1*
> *Exception: Where whole-house mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.*

And here you can review the table data, with the amendment additions showing in the top row, highlighted in orange:

Table R403.6.1 Mechanical Ventilation Fan Efficacy:

Fan Location	Air Flow Rate Minimum (CFM)	Minimum Efficacy (CFM/WATT)	Air Flow Rate Maximum (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range Hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	<90
Bathroom, utility room	90	2.8 cfm/watt	Any

To summarize, this Utah amendment added some verbiage regarding whole-house ventilation system fans and a row to the fan efficacy requirements table.

Chapter 4, Section R406 Energy Rating Index Compliance Alternative, R406.4

In subsection R406.4 on the Energy Rating Index compliance topic the code states:

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

To illustrate the change Utah made to this subsection, here is a modified Table R406.4 we created for Maximum Energy Rating Index, showing Utah's current ("UTAH Amended") Energy Rating Index (ERI), alongside the relevant-to-Utah climate zone ERIs (climate zones 3, 5, and 6), from the 2015 IECC Table R406.4.

R406.4 Maximum Energy Rating Index (modified)

Climate Zone	*UTAH Amended*	*IECC ERI*
3	*65*	*51*
5	*69*	*55*
6	*68*	*54*

As you can see Utah's maximum ERI numbers (65, 68, and 69) are higher than the IECC ERI (51, 54, 55) for Utah's three climate zones (3, 5 and 6). The lower the number, the more energy-efficient the home is, so Utah is working its way toward IECC standards.

Commercial Energy Conservation Code 2018

Pixabay.com

In 2019, the Utah legislature adopted the 2018 IECC for commercial provisions in its entirety (HB 218). The IECC—Commercial Provisions apply to all buildings except for residential buildings three stories or less in height. This is based on the Chapter 2 definition of "commercial building".

Definition of a Commercial Building
All buildings that are not included in the definition of residential building

Definition of a Residential Building
Includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and Group R-2, R-3, and R-4 buildings three stories or less in height above grade plane

Hence the IECC—Commercial Provisions covers residential buildings four stories or greater in height.

Scope and Arrangement of the 2018 IECC

The scope of this code is *commercial buildings* (as defined above) and the buildings' sites and associated systems and equipment.

The format of the 2018 IECC--Commercial Provisions is consistent with the format used in the 2015 IECC. There is a Scope and Administration chapter, a Definitions chapter, a General Requirements chapter, chapter 4 containing energy efficiency requirements, plus one on existing buildings. The final chapter lists Referenced Standards.

Chapter 4 Commercial Energy Efficiency

Chapter 4 of the 2018 IECC--Commercial Provisions contains the energy-efficiency-related requirements for the design and construction of most types of commercial buildings and residential buildings greater than three stories in height above grade. In addition to energy conservation requirements for the building envelope, this chapter contains requirements that impact energy efficiency for the HVAC systems, the electrical systems and the plumbing systems. It should be noted, however, that requirements are contained in other codes that have an impact on energy conservation. For instance, requirements for water flow rates are regulated by the *International Plumbing Code.*

Chapter 4 contains the following main section headings:

- C402 Building Envelope Requirements
- C403 Building Mechanical Systems
- C404 Service Water Heating (Mandatory)
- C405 Electrical Power and Lighting Systems

- C406 Additional Efficiency Package Options
- C407 Total Building Performance
- C408 Maintenance Information and System Commissioning

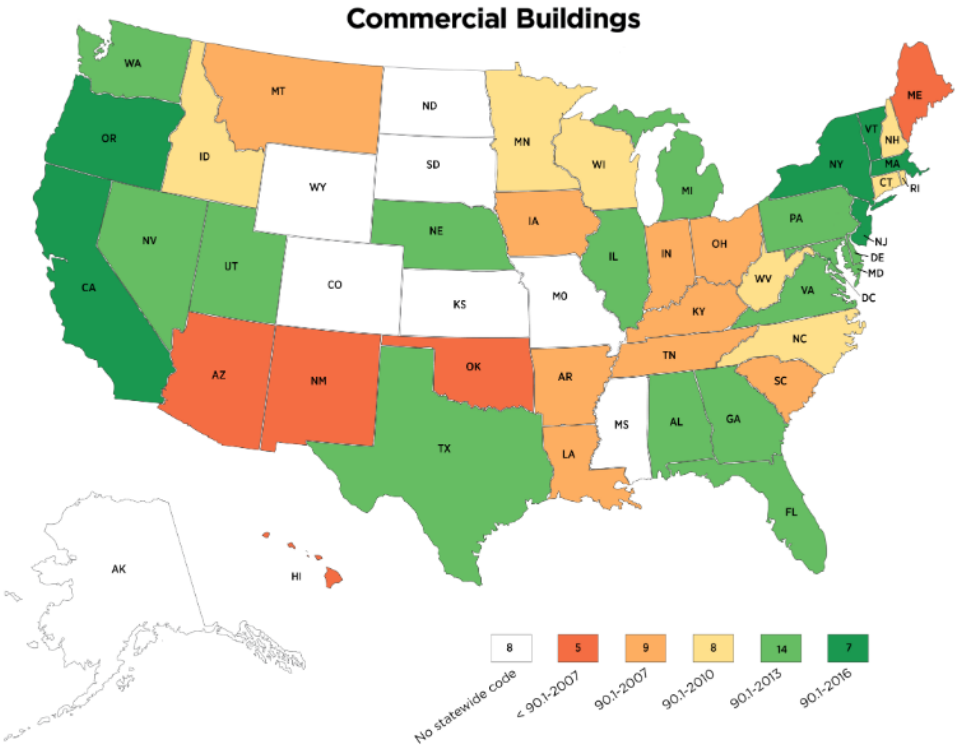
Key Changes

Here is a list copied from the ICC of key changes that are reflected in the 2018 IECC—Commercial Provisions compared to the previous edition:

- Log homes designed in accordance with the standard ICC400, Standards on the Design and Construction of Log Structures, are exempt from the building thermal envelope requirements of the IECC.
- The maximum allowable fenestration U-factors in Table R402.1.2 (for the prescriptive compliance path) for climate 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 the 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.
- 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.

Status of Utah Energy Conservation Code Application

The United States Department of Energy provided an assessment of Utah's current energy savings impacts, based on a quantitative analysis from data as of December 2020. Please see the map below. It shows impacts for commercial buildings, not residential.



DOE

The map shows the “green” states leading the way in commercial building energy conservation performance, with Utah a light green. The new quantitative approach illustrated by this map, according to the DOE, is much more accurate than what was used before. The previous approach “consisted of a simpler qualitative review of state code titles and provisions.”

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The IECC 2018 Commercial Provisions include:	Residential buildings higher than three stories	Single-story family homes	Two-story family homes	Three-story family homes

News

Coronavirus Response

Image credit: pexels

The ICC and the National Environmental Health Association have launched a pandemics task force; the ICC has promised to stay on any pandemic news and how it may affect your business. “This new task force – made up of building safety, health and other experts – will develop resources to prepare buildings and communities worldwide for disease-related threats.”

A press release from ICC states:

> *“The coronavirus pandemic has underscored that safe buildings are essential to maintaining public health,” said Code Council Chief Executive Officer Dominic Sims, CBO. “A community’s ability to defend against such disasters as pandemics depends on the safety of the homes, buildings and infrastructure that serve its citizens. We are extremely proud to collaborate with NEHA on this pandemic task force.”*

Meanwhile in Utah, the state’s pandemic response plan web page and guidance for the general public can be found here.

Despite the global pandemic and economic fallout of 2020, Utah keeps moving forward with strategies toward more energy-efficient technologies, materials, and practices. Leadership and knowledgeability when it comes to energy conservation are critical now more than ever. Changes affecting one sector today inevitably impact another tomorrow. Looking ahead, the more that tradesmen communicate and collaborate with each other and all stakeholders for the improvement of energy conservation, the more promising our outcomes will be.

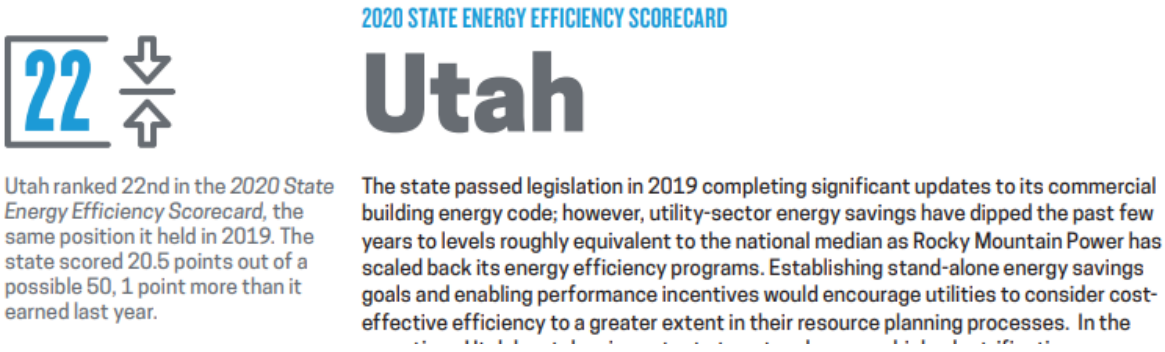
Energy Efficiency in Utah

nps.gov

Utah has shown evidence of its commitment to energy efficiency in several important ways. One example is legislation to advance vehicle electrification across the state. The state government is directing plans for a statewide electric vehicle (EV) charging network and other EV-supportive policies. As of this writing, there is $6 million for electric vehicle charging stations to be installed in rural areas, according to an article about the governor's 2021 budget plan.

Did you know Utah has a state efficiency scorecard? The American Council for an Energy Efficient Economy (ACEEE) maintains records for all 50 states' energy efficiency scores. By earning 20.5 points out of a possible 50, Utah ranked 22nd overall, the same position it held in 2019. In 2019 Utah earned 19.5 points total; this means our point total went up in the last year by 1 point. To view any scorecard, visit ACEEE's page here. Not surprisingly, many states had to adjust priorities in light of the pandemic; however, progress was made, and strategies are in place to move forward.

The image below shows part of the 2020 Energy Efficiency Scorecard for Utah:



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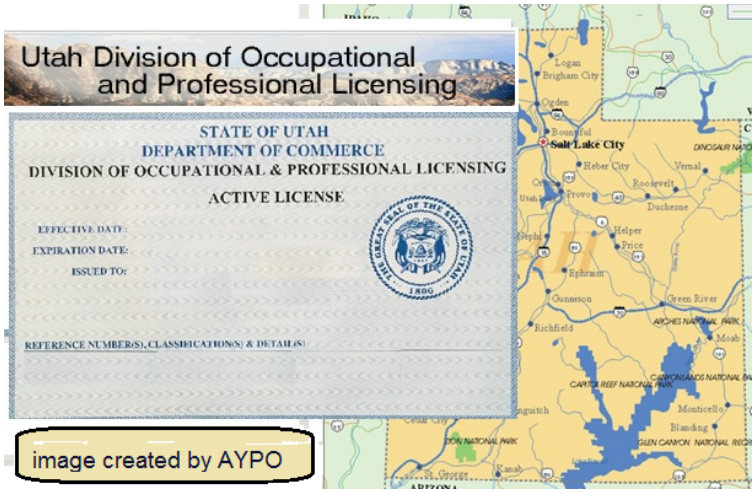
What is Utah's energy efficiency state ranking according to ACEEE?	22	5	45	37

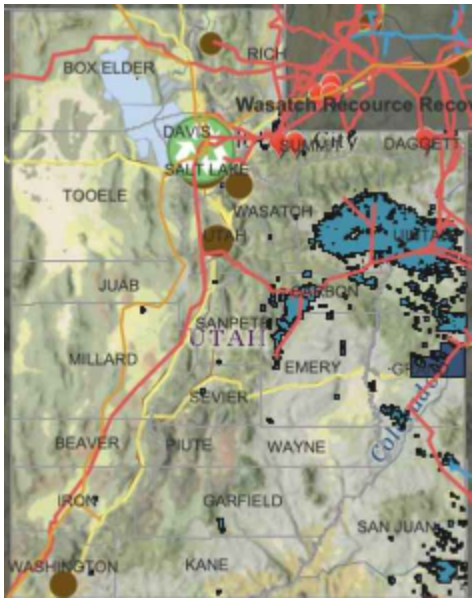
State and National Resources

DOPL



The Utah Division of Occupational and Professional Licensing (DOPL) is a state agency within Utah's Department of Commerce. You can learn information about the laws that govern the licensing of many different occupations and how to obtain or renew your license. DOPL is also an enforcement body, so DOPL performs an investigative function, looking into any unlawful or unprofessional practices that fall within its purview. According to their site, DOPL is discontinuing paper licenses and will be sending out all license certificates by email.

The Governor's Office of Energy Development



Energy Map of Utah, Image credit: energy.utah.gov

The Utah Governor's Office of Energy Development (energy.utah.gov) is housed within the Utah Environment and Natural Resources state agency. You can learn all about energy efficiency programs in Utah here, including cash incentives and discounts for electric and gas utilities, for example. Here you can learn about "all things energy code" including Utah HERS Raters' contact information. Tel#: (801) 538-8732

The U.S. Department of Energy

Image credit: facebook page for Utah's Deer Creek Park

The United States Department of Energy (DOE) offers a wide variety of information about energy conservation, including training tools, training resources and compliance information. If you have time, check out this great resource called The Energy Economy.

To aid training and enforcement programs, DOE provides compliance resources, as well as training modules, training curricula and presentations. The ICC, ASHRAE, and other organizations also supply tools and materials to support energy code training. Communication and information exchange to prepare the code community to verify compliance also must occur.

ASHRAE

ASHRAE, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, is a good resource for training and tools. You can find a wonderful brochure on their website, ashrae.org, regarding Energy Efficiency. To read the brochure, click here.

ACEEE

The American Council for an Energy Efficient Economy (ACEEE) “was founded in 1980 by leading energy researchers who were concerned about U.S. dependence on foreign oil. Since then, by significantly improving energy efficiency across all sectors, the United States has halved its energy use relative to the size of the economy. Efficiency now saves more energy each year than the nation uses from any other single energy resource. It also saves money, creates jobs, improves grid reliability, and by reducing harmful emissions, cleans the air and improves people’s health.”

They have a state and local policy database covering energy efficiency policies; you can visit Utah’s page, here.

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Utah’s Office of Energy Development is housed in what	Environment and Natural Resources	Economic Development	Information Technology	General Services

governmental agency?				

Utah Amendments to the 2018 IPC

In this portion of the class, we will look at the amendments made by the State of Utah when adopting the 2018 International Plumbing Code as the basis for the state's plumbing code.

There are about 70 amendments to cover. Where possible, several related amendments will be dealt with together. Most of the amendments are fairly simple and straight-forward. They generally fall into four categories:

- Revising the language to tailor the code to Utah;
- Deleting model codes so that they don't apply to Utah;
- Adding details to the requirements in the model code; and
- Adding references to specific Utah statutes or administrative rules that supersede plumbing code requirements.

This part of the class will employ a similar cut-and-paste approach to the one used to show changes to the model code. In this case, the language from the model code that's deleted is shown struck-through and the language added by amendment is highlighted.

Each amendment will be discussed briefly to clarify the nature of the amendment. If the code being amended was also covered as a significant change to the model 2018 IPC, there will be a brief discussion of how the amendment and model code change fit together. Numerous links are also provided either to any model codes cited or to the statutes and rules referenced in the amendments.

Introduction

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> **Section 425 Water Closets**
> **425.3.4 Access required.** All parts in a flush tank shall be ~~accessible~~ provided with *access* for repair and replacement.

Each amendment will be discussed briefly to clarify the nature of the amendment. If the code being amended was also covered as a significant change to the model 2018 IPC, there will be a brief discussion of how the amendment and model code change fit together. Numerous links are also provided either to any model codes cited or to the statutes and rules referenced in the amendments.

Amendments to Chapters 1 and 2

There are no amendments to Chapter 1.

An amendment on the IPSDC was enacted then discarded. The amendment read:

> *A new IPC, Section 101.2.1, is added as follows: "For clarification, the International Private Sewage Disposal Code is not part of the plumbing code even though it is in the same printed volume."*

The IPSDC was published in the same volume as the IPC through the 2015 edition but, as of the 2018 edition, is not printed with the IPC. It's now a separate publication. The amendment was therefore no longer needed.

Amended Definitions – Backflow, Contamination, Cross-Connection, and Potable Water

These amendments provide useful references to several Utah-specific statutes and rules, such as those that govern the qualifications for backflow assembly testers.

The most interesting amendments are the definition of contamination as an “actual hazard” that can either poison or cause diseases in the people of Utah and the addition of the words “potential connection” to the definition for cross connection. These additional words clarify that prevention of cross connection means eliminating any arrangement that has any potential of mixing water of unknown or uncertain origin and quality with the potable water supply.

The revised or added definitions to the 2018 IPC are as follows:

BACKFLOW. Pressure created by any means in the water distribution system, which by being in excess of the pressure in the water supply mains causes a potential backflow condition.

~~**Backpressure, low head.** A pressure less than or equal to 4.33 psi (29.88 kPa) or the pressure exerted by a 10-foot (3048 mm) column of water.~~

Backsiphonage. The backflow of potentially contaminated water into the potable water system as a result of the pressure in the potable water system falling below atmospheric pressure of the plumbing fixtures, pools, tanks, or vats connected to the potable water distribution piping.

CERTIFIED BACKFLOW PREVENTER ASSEMBLY TESTER. A person who has shown competence to test Backflow prevention assemblies to the satisfaction of the authority having jurisdiction under Utah Code, Subsection 19-4-104(4).

CONTAMINATION (HIGH HAZARD). An impairment of the quality of the potable water that creates an actual hazard to the public health through poisoning or through the spread of disease by sewage, industrial fluids, or waste.

(98) Section 202, the following definition is added: **HIGH HAZARD.** See Contamination.

CROSS CONNECTION. Any physical connection or potential connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other either water of unknown or questionable safety or steam, gas or chemical, whereby there exists the possibility for flow from one system to the other, with the direction of flow depending on the pressure differential between the two systems (see “Backflow”).

POTABLE WATER. Water free from impurities present in amounts sufficient to cause disease or harmful physiological effects and conforming to the Utah Code, Title 19, Chapter 4, Safe Drinking Water Act, and Title 19, Chapter 5, Water Quality Act, and ~~bacteriological and chemical quality requirements of the Public Health Service Drinking Water Standards or~~ the

regulations of the public health authority having jurisdiction.

(109) Section 202, the following definition is added: "**LOW HAZARD.** See Pollution."

Amended Definitions on Transfer Fluids

These definitions delete references in the 2015 IPC to hydrochlorofluorocarbon, chlorofluorocarbon, and carbon refrigerants that were widely used until the 1990s but are now heavily regulated and therefore out of common use. The nontoxic transfer fluids of mineral oil and propylene glycol (a nontoxic alternative antifreeze**)** are kept.

It's worth noting that the same amendment in 2015 also cut the reference to a Gosselin rating of 1, but that clause from the model code is retained for the 2018 IPC. That allows alternatives to the fluids listed in this definition, as long as they rate "1" on the Gosselin scale of toxicity.

ESSENTIALLY NONTOXIC TRANSFER FLUID. Fluids having a Gosselin rating of 1, including propylene glyco~~l;~~ and mineral oil~~; polydimethylsiloxane; hydrochlorofluorocarbon, chlorofluorocarbon and carbon refrigerants; and FDA-approved boiler water additives for steam boilers~~.

ESSENTIALLY TOXIC TRANSFER FLUID. Soil, waste, or gray water and ~~fluids having a Gosselin rating of 2 or more, including ethylene glycol, hydrocarbon oils, ammonia refrigerants and hydrazine~~ any fluid that is not an essentially nontoxic transfer fluid under this code.

Definitions Added to the 2018 IPC by Amendment

Where evaporation of the trap seal is an issue, deep seal traps may be appropriate. Deep seal traps have vertical depths of 4 inches or more, collecting a deeper liquid trap which won't evaporate as quickly. These traps can also prevent large volumes of wastewater to pass without pushing the trap seal liquid out into the horizontal piping. They are similarly less vulnerable to siphonage, back-siphonage, or back-pressure.

That doesn't mean they should be used in situations where there is no need for a deep seal trap. They need more space and are more expensive, but more importantly they take more water pressure down the fixture drain to clear and maintain drainage flow velocity, so they can impair the performance of the sanitary drainage system.

The amendment for a deep seal trap is brought forward from the 2015 Utah Plumbing Code. The two injection well definitions are brand new to the 2018 code.

DEEP SEAL TRAP. A manufactured or field fabricated trap with a liquid seal of 4” or larger.

MOTOR VEHICLE WASTE DISPOSAL WELL. An injection well that discharges to the subsurface by way of a floor drain, septic system, French drain, dry well, or similar system that receives or has received fluid from a facility engaged in vehicular repair or maintenance activities, including an auto body repair shop, automotive repair shop, new and used car dealership, specialty repair shop, or any other facility that does any vehicular repair work. A motor vehicle waste disposal well is subject to rulemaking under Section 1-5-104 regarding underground injection.

INJECTION WELL. A bored, drilled, or driven shaft whose depth is greater than the largest surface dimension; or a dug hole whose depth is greater than the largest surface dimension; or an improved sinkhole: or a subsurface fluid distribution system the primary purpose for which is the subsurface emplacement of fluids. Injection wells are subject to the regulations of the Utah Underground Injection Control Program, Utah Administrative Code R317-7.

Injection wells associated with single family residences are not subject to R317-7."

Utah Office of Administrative Rules

Rule R317-7. Underground Injection Control (UIC) Program. As in effect on July 1, 2019

Table of Contents

Amendments to Chapter 3

303.4 Certification of Plumbing Materials

303.4 is a central code section in the model 2018 IPC. The expanded scope of this code was a significant change to the 2018 IPC.

Utah adds useful details specific to backflow prevention device certification. The same Exception was added to this code in 2015.

Section 303 Materials.
303.4 Third-party certification. Plumbing products and materials required by the code to be in compliance with a referenced standard shall be listed by a *third-party certification agency* as complying with the referenced standards. Products and materials shall be identified in accordance with Section 303.1.

> **Exception:** Third-party certification for backflow prevention assemblies will consist of any combination of two certifications, laboratory or field. Acceptable third-party laboratory certifying agencies are ASSE, IAPMO, and USC-FCCCHR. USC-FCCCHR currently provides the only field testing of backflow protection assemblies. Also see www.drinkingwater.utah.gov and Division of Drinking Water Rule, Utah Administrative Code, R309-305-6105-12(4).

311.1 Employee Toilet Facilities

This Section of the IPC is cited by code officials nationwide as one of the most often violated provisions. It requires that construction worker toilet facilities of the non-sewer type, conforming to ANSI Z4.3 (i.e., portable toilets) must be provided for construction workers as well as maintained “in a sanitary condition.” Utah deletes this provision, by amendment, and refers instead to the IBC on the grounds that it is the responsibility of the general contractor, not a plumber, to provide such facilities. The IBC does not specifically address this need; OSHA rules require portable toilets only for jobsites of ten or more workers.

On a practical level, there are many ways for meeting this need without Section 311.1 including having working toilets within easy access (such as on another floor, etc.)

~~**Section 311 Toilet Facilities for Workers.**~~
~~**311.1 General.** Toilet facilities shall be provided for construction workers and such facilities shall be maintained in a sanitary condition. Construction worker toilet facilities of the non-sewer type shall conform to PSAI Z4.3.~~

312.2 & 312.5 Air Tests for DWV and Water Supply Systems

The model IPC forbids testing plastic piping with air, fearing that the pressure potential of air is far greater than that of water. In other words, a poorly calibrated air test can damage the piping or even result in a destructive explosion if air is used to test plastic pipe. The model code clarifies how an air test for metallic pipe should be conducted.

Utah adds the following provisions that do allow for an air test of plastic DWV pipe, but only if the following applies:

Section 312 Tests and Inspections.
312.2 Drainage and vent air test. Plastic piping shall not be tested using air. An air test shall be made by forcing air into the system until there is a uniform gauge pressure of 5 psi (34.5

kPa) or sufficient to balance a 10-inch (254 mm) column of mercury. This pressure shall be held for a test period of not less than 15 minutes. Any adjustments to the test pressure required because of changes in ambient temperatures or the seating of gaskets shall be made prior to the beginning of the test period. Where water is not available at the construction site or where freezing conditions limit the use of water on the construction site, plastic drainage and vent pipe may be permitted to be tested with air. The following procedures shall be followed:

1. Contractor shall recognize that plastic is extremely brittle at lower temperatures and can explode, causing serious injury or death.

2. Contractor assumes all liability for injury or death to persons or damage to property or for claims for labor and/or material arising from any alleged failure of the system during testing with air or compressed gasses.

3. Proper personal protective equipment, including safety eyewear and protective headgear, should be worn by all individuals in any area where an air or gas test is being conducted.

4. Contractor shall take all precautions necessary to limit the pressure within the plastic piping.

5. No drain and vent system shall be pressurized in excess of 6 psi as measured by accurate gauges graduated to no more than three times the test pressure.

6. The pressure gauge shall be monitored during the test period, which should not exceed 15 minutes.

7. At the conclusion of the test, the system shall be depressurized gradually, all trapped air or gases should be vented, and test balls and plugs should be removed with caution.

A similar change is made to Section 312.5 providing for air testing of plastic water supply piping with the highlighted text, below, added to the end of this IPC Section:

312.5 Water supply system test. Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested and proved tight under a water pressure not less than the working pressure of the system; or, for piping systems other than plastic, by an air test of not less than 50 psi (344 kPa). This pressure shall be held for not less than 15 minutes. The water utilized for tests shall be obtained from a potable source of supply. The required tests shall be performed in accordance with this Section and Section 107. Where water is not available at the construction site or where freezing conditions limit the use of water on the construction site, plastic water pipes may be permitted to be tested with air. The following procedures shall be followed:

1. Contractor shall recognize that plastic is extremely brittle at lower temperatures and can explode, causing serious injury or death.

2. Contractor assumes all liability for injury or death to persons or damage to property or for claims for labor and/or material arising from any alleged failure of the system during testing with air or compressed gasses.

3. Proper personal protective equipment, including safety eyewear and protective headgear, should be worn by all individuals in any area where an air or gas test is being conducted.

4. Contractor shall take all precautions necessary to limit the pressure within the plastic piping.

5. Water supply systems shall be pressure tested to a minimum of 50 psi but not more than 80 psi as measured by accurate gauges graduated to no more than three times the test pressure.

6. The pressure gauge shall be monitored during the test period, which should not exceed 15 minutes.

7. At the conclusion of the test, the system shall be depressurized gradually, all trapped air or gases should be vented, and test balls and plugs should be removed with caution.

312.10.3 Tester Qualifications

312.10 and Subsections 312.10.1 and 312.10.2 in the model 2018 IPC cover the inspection and testing of backflow prevention assemblies but neglect to address qualifications for testers. Utah adds those provisions by amendment.

312.10.3 Tester Qualifications. Testing shall be performed by a Utah Certified Backflow Preventer Assembly Tester in accordance with Utah Administrative Code, R309-305.

Utah Office of Administrative Rules

Rule R309-305. Cross Connection Control and Backflow Prevention Certification.

Table of Contents

Amendments to Chapter 4 – Fixtures, Faucets, and Fixture Fittings

Table 403.1 Minimum Number of Required Plumbing Fixtures

Table 403.1 is probably the most heavily amended series of requirements in the IPC. Most states make wholesale changes to the Table. Utah makes only minor revisions and some notable additions to the Table. A minor revision is the deletion of footnote (a), removing the requirement to refer to the IBC to determine occupant load.

The amendment to footnote (e) modifies the newly added footnote (f) in the 2018 IPC that was covered in the other class on significant changes. The newly added footnote is adopted with the reference to the ISPSC replaced with reference to Utah Health Department rules.

The other two notable additions to the Table provide diaper changing facilities in footnote (f) and modify required number of sinks for child care occupancies in footnote (g). The footnote on child care center sinks is altered from the amendment to the 2015 IPC. The 2015 footnote referred users to Department of Health rules and now refers users to administrative rules.

TABLE 403.1
MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES[a] (See Sections 403.1.1 and 403.2)

NO.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS: SEE SECTION 419.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER[f]
			MALE	FEMALE	MALE	FEMALE			
5	Institutional	Adult day care and child day care	1 per 15		1 per 15		1	1 per 100	1 service sink[g]

~~a. The fixtures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction of the number of persons indicated. The number of occupants shall be determined by the *International Building Code*.~~

~~b.~~a. Toilet facilities for employees shall be separate from facilities for inmates or care recipients.

~~c~~ b. A single-occupant toilet room with one water closet and one lavatory serving not more than two adjacent patient sleeping units shall be permitted provided that each patient sleeping unit has direct access to the toilet room and provision for privacy for the toilet room user is provided.

~~d~~ c. The occupant load for seasonal outdoor seating and entertainment areas shall be included when determining the minimum number of facilities required.

~~e~~ d. For business and mercantile classifications with an occupant load of 15 or fewer, service sinks shall not be required.

~~f~~ e. The required number and type of plumbing fixtures for outdoor public swimming pools shall be in accordance with ~~Section 609 of the *International Swimming Pool and Spa Code*~~ the Department of Health's regulation R392-302 Design, Construction, and Operation of Public Pools, Section 25 Restroom and Shower Facilities."

f. When provided, in public toilet facilities, there shall be an equal number of diaper changing

facilities in male toilet rooms and female toilet rooms. Diaper changing facilities shall meet the requirements of ASTM F2285-04 (2010) Standard *Consumer Safety Performance Specifications for Diaper Changing Tables for Commercial Use*.

g: Non-residential child care facilities shall comply with the additional sink requirements of Utah Administrative Code R381-100-9, R381-70-9, and R381-60-9.

406.3 Pans for Washing Machines

This Section is comprised of 406.1 [Water connection] and 406.2 [Waste connection] in the model 2018 IPC. Utah adds 406.3 to provide for a drainage pan for washing machines by referencing Section 504.7, which governs drainage pans under water heaters. This Utah amendment intends to use the guidance the IPC provides for the installation of a drain pan for a water heater for a washing machine safe pan, even though the dimension, circumstances, and other considerations differ.

406.3 Automatic clothes washer safe pans. Safe pans, when installed under automatic clothes washers, shall be installed in accordance with Section 504.7.

413.5 & 413.6 Public Toilet Rooms & Motor Vehicle Waste Disposal Wells

Utah had revised the amendment to 413.5 in 2015 to read “All public toilet rooms **in A & E occupancies and M occupancies with restrooms having multiple water closets or urinals** shall be equipped with at least one floor drain.” *[text added for 2015 in bold].* Utah jettisons this added text for 2015 and reverts to the simpler language of the amendment in 2012.

Section 413.6 is a newly added provision for Utah. It is part of an attempt to more aggressively oversee motor vehicle repair facilities drainage into the ground in order to better protect Utah’s groundwater. The definition for an injection well, covered earlier in this Lesson, is another aspect of this effort.

Section 413 Floor and Trench Drains.
413.1 Approval. *See 2018 IPC for text.*

413.2 Floor drains. *See 2018 IPC for text.*

413.3 Size of floor drains. *See 2018 IPC for text.*

413.4 Public laundries and central washing facilities. *See 2018 IPC for text.*

413.5 Public toilet rooms. All public toilet rooms shall be equipped with at least one floor drain.

413.6 Prohibition of motor vehicle waste disposal wells. New and existing motor vehicle waste disposal wells are prohibited. A motor vehicle waste disposal well associated with a single family residence is not subject to this prohibition.

423.3 Water Temperature Limitation for Specialty Sinks

This was a newly added provision to the 2015 IPC, requiring the installation of water temperature limiting devices in footbaths, pedicure baths, and head shampoo sinks. Utah chose not to adopt this new provision in 2015 and similarly amends the 2018 IPC, not adopting this Section for Utah.

Section 423 Specialty Plumbing Fixtures.
~~**423.3 Footbaths and pedicure baths.** The water supplied to specialty plumbing fixtures, such as pedicure chairs having an integral foot bathtub and footbaths, shall be limited to not greater than 120°F (49°C) by a water-temperature-limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70 or CSA B125.3.~~

Amendments to Chapter 5 – Water Heaters

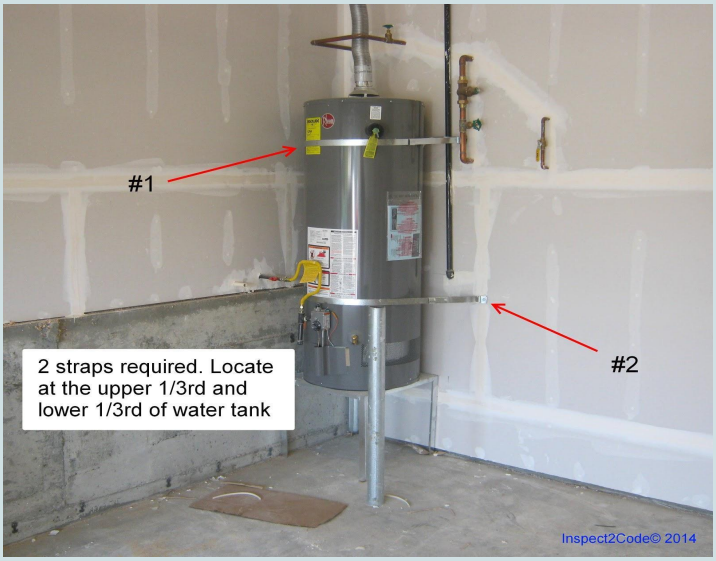
502.4 Seismic Supports for Water Heaters

The model IPC refers users to the IBC in place of providing details on seismic supports. The

IBC provision referred to is **P2801.8** **(Water heater seismic bracing)** that specifies earthquake-prone zones where water heaters must be “anchored or strapped in the upper one-third and in the lower one-third of the appliance to resist a horizontal force equal to one-third of the operating weight of the water heater”.

Utah amended this code section in 2012, replacing the reference to the IBC with a code that provides direct guidance. This amended code is brought forward to 2018.

502.4 Seismic supports. ~~Where earthquake loads are applicable in accordance with the *International Building Code*, water heater supports shall be designed and installed for the seismic forces in accordance with the *International Building Code*.~~As a minimum requirement, water heaters shall be anchored or strapped to resist horizontal displacement caused by earthquake motion. Strapping shall be at points within the upper one-third and lower one-third of the appliance’s vertical dimensions.



504.6 T&P Valve Discharge Piping Requirements

This is a newly added amendment for 2018. It adds a limit on directional changes for T&P valve discharge piping.

504.6 Requirements for discharge piping. The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air gap located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.
4. Serve a single relief device and shall not connect to piping serving any other relief

device or equipment.

5. Discharge to the floor, to the pan serving the water heater or storage tank, to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed so as to flow by gravity.
10. Terminate not more than 6 inches (152 mm) above and not less than two times the discharge pipe diameter above the floor or flood level rim of the waste receptor.
11. Not have a threaded connection at the end of such piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials listed in Section605.4 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.
14. Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.
15. Be installed as per manufacturer's installation instructions, not to exceed 180 degrees in directional change.

504.7 Required Pan

Where leakage from the water heater can cause damage, the IPC requires a pan to be installed. Utah adds a design option for a drain from the pan, clarifying in the added Subsection 504.7.3 that this pan equipped with a drain is not to be used as a receptor for any other discharges.

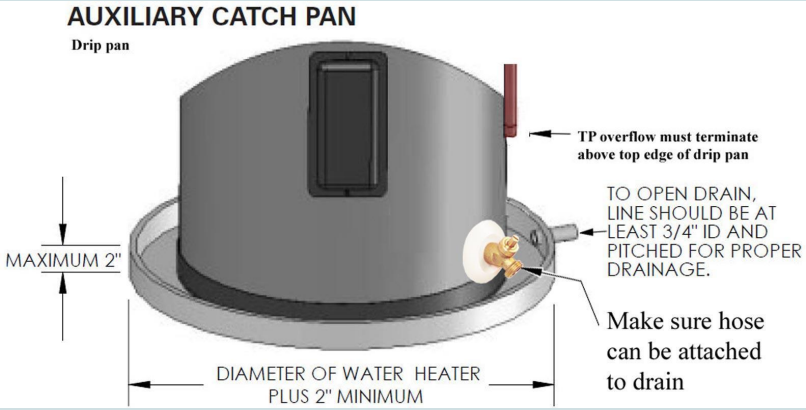
504.7 Required pan. *See 2018 IPC for text.*

504.7.1 Pan size and drain. *See 2018 IPC for text.*

504.7.2 Pan drain termination. The pan drain shall extend full size and terminate over a suitably located indirect waste receptor or floor drain or extend to the exterior of the building and terminate not less than 6 inches (152 mm) and not more than 24 inches (610 mm) above the adjacent ground surface. Where a pan drain was not previously installed, a pan drain shall not be required for a replacement water heater installation. When permitted by the code official, the pan drain may be directly connected to a soil stack, waste stack, or branch drain. The pan drain shall be individually trapped and vented as required in Section 907.1. The pan drain shall not be directly or indirectly connected to any vent. The trap shall be provided with a trap primer conforming to ASSE 1018 or ASSE 1044, a barrier type floor drain trap seal protection device meeting ASSE 1072, or a deep seal p-trap.

504.7.3 Pan Designation. A water heater pan shall be considered an emergency receptor designated to receive the discharge of water from the water heater only and

shall not receive the discharge from any other fixtures, devices, or equipment.



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True or False: Utah only requires seismic strapping for water heaters in zones designated as prone to earthquakes by the U.S. Geological Survey	False	True		

Utah Amendments to the 2018 IPC, Part 2

Amendments to Chapter 6 – Water Supply and Distribution

Section 602.3 Water Required; Individual Water Supply & 607.18 Protection of Individual Water Supplies

A well tapped in northwest Utah

This is a significant revision to the 2018 IPC for Utah. The same amendment had been adopted in 2012 and 2015. It deletes all the specifics for alternate potable water sources from the model codes and replaces them with Utah-specific regulations.

A related revision to the model IPC deletes all of the provisions of Section 608.18, replacing them with a reference to 602.3.

602.3 Individual water supply. Where a potable public water supply is not available, individual sources of potable water supply shall be utilized provided that the source has been developed in accordance with Utah Code, Sections 73-3-1, 73-3-3, and 73-3-25, as administered by the Department of Natural Resources, Division of Water Rights. In addition, the quality of the water shall be approved by the local health department having jurisdiction. The source shall supply sufficient quantity of water to comply with the requirements of this Chapter.

~~**602.3.1 Sources.** Dependent on geological and soil conditions and the amount of rainfall, individual water supplies are of the following types: drilled well, driven well, dug well, bored well, spring, stream or cistern. Surface bodies of water and land cisterns shall not be sources of individual water supply unless properly treated by *approved* means to prevent contamination. Individual water supplies shall be constructed and installed in accordance with the applicable state and local laws. Where such laws do not address all of the requirements set forth in NGWA-01, individual water supplies shall comply with NGWA-01 for those requirements not addressed by state and local laws.~~

~~**602.3.2 Minimum quantity.** The combined capacity of the source and storage in an individual water supply system shall supply the fixtures with water at rates and pressures as required by this chapter.~~

~~**602.3.3 Water quality.** Water from an individual water supply shall be *approved* as potable by the authority having jurisdiction prior to connection to the plumbing system.~~

~~**602.3.4 Disinfection of system.** After construction, the individual water supply system shall be purged of deleterious matter and disinfected in accordance with Section 610.~~

~~**602.3.5 Pumps.** Pumps shall be rated for the transport of potable water. Pumps in an~~

~~individual water supply system shall be constructed and installed so as to prevent contamination from entering a potable water supply through the pump units. Pumps shall be sealed to the well casing or covered with a water-tight seal. Pumps shall be designed to maintain a prime and installed such that ready *access* is provided to the pump parts of the entire assembly for repairs.~~

~~**602.3.5.1 Pump enclosure.** The pump room or enclosure around a well pump shall be drained and protected from freezing by heating or other *approved* means. Where pumps are installed in basements, such pumps shall be mounted on a block or shelf not less than 18 inches (457 mm) above the basement floor. Well pits shall be prohibited.~~

608.18 Protection of individual water supplies. ~~An individual water supply shall be located and constructed so as to be safeguarded against contamination in accordance with Sections 608.18.1 through 608.18.8~~ See Section 602.3 for requirements.

Section 604 Design of Building Water Distribution System

Utah adds a Subsection to 2018 IPC Section 604.4. This amendment was revised in 2015 to clarify that it's intended as a requirement for food service establishments.

604.4 Maximum flow and water consumption. *See 2018 IPC for text.*
604.4.1 Manually operated metering faucets for food service establishments. Self closing or manually operated metering faucets shall provide a flow of water for at least 15 seconds without the need to reactivate the faucet.

606.5.11 Prohibited Water Pressure Booster Systems

Utah amends the Section regarding systems used to increase water supply pressure by adding an additional Subsection (606.5.11).

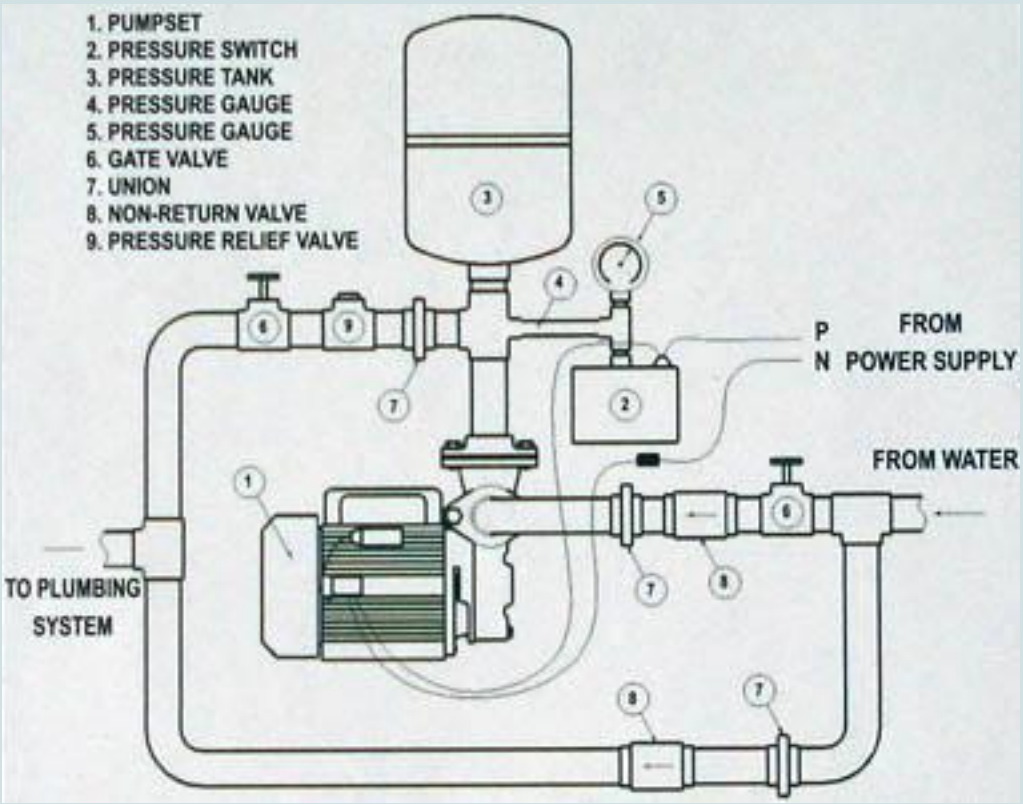
It goes without saying that, when a pump draws water more rapidly from a water main in order to boost the water pressure within a structure, it will have an impact on the pressure within the water main. It's unlikely, in most installations, that the effect will be significant enough to raise any concerns regarding water pressure available to downstream customers. Only a larger structure, industrial facility, or group of structures would be prone to such an effect and it's assumed that such installations would work with the water utility to boost supply without the

need for excessive use of water boosters.

Nevertheless, this Subsection is added for the State of Utah to allow for enforcement where a water pressure booster negatively impacts downstream customers.

Section 606 Installation of the Building Water Distribution System.
606.5 Water pressure booster systems. Water pressure booster systems shall be provided as required by Sections 606.5.1 through ~~606.5.10~~ 606.5.11.

606.5.11 Prohibited installation. In no case shall a booster pump be allowed that will lower the pressure in the public main to less than the minimum water pressure specified in Utah Administrative Code R309-105-9.



608.1.2 Specific Installation Criteria for Backflow Prevention Assemblies

Utah amends this Section 608.1 significantly. The first amendment is simply to add two words to 608.1, making it consistent with Utah's Safe Drinking Water Act and Water Quality Act.

Subsection 608.1.1 that had been added by amendment to previous editions of the IPC drops one provision when brought forward for 2018. It had previously ended with the phrase "and to insure the safety of the backflow technician," but deletes that provision for 2018 because it is both vague and unnecessary.

As in previous editions of the plumbing code, Utah adds considerable guidance on installation of backflow preventers. These details supplement or replace the details in the model IPC Table 608.1.

There is one new provision added in 2018 by amendment. It applies to reduced pressure principle assemblies, under 608.1.2.1(a). The amendment as adopted in 2015 prohibited installation in a pit. The 2018 amendment adds the following: "...or below grade where the relief port could be submerged in water, or where fumes could be present at the relief port discharge."

Section 608 Protection of Potable Water Supply.
608.1 General. A potable water supply system shall be designed, installed and maintained in such a manner so as to prevent contamination and pollution from nonpotable liquids, solids or gases being introduced into the potable water supply through cross connections or any other piping connections to the system. Backflow preventer applications shall conform to Table 608.1, except as specifically stated in Sections 608.2 through 608.17.10.

608.1.1 General Installation Criteria. An assembly shall not be installed more than five feet above the floor unless a permanent platform is installed. The assembly owner, where necessary, shall provide devices or structures to facilitate testing, repair, and maintenance.

608.1.2 Specific Installation Criteria.

608.1.2.1 Reduced Pressure Principle Backflow Prevention Assembly. A reduced pressure principle backflow prevention assembly shall be installed as follows:

a. The assembly shall not be installed in a pit or below grade where the relief port could be submerged in water, or where fumes could be present at the relief port discharge.

b. The relief valve of the assembly shall not be directly connected to a waste disposal line, including a sanitary sewer, storm drain, or vent.

c. The assembly shall be installed in a horizontal position, unless the assembly is listed or approved for vertical installation in accordance with Section 303.4.

d. The bottom of each assembly shall be installed a minimum of 12 inches above the ground or the floor.

e. The body of the assembly shall be a minimum of 12 inches from any wall, ceiling, or obstacle, and shall be readily accessible for testing, repair, and maintenance.

608.1.2.2 Double Check Valve Backflow Prevention Assembly. A double

check valve backflow prevention assembly shall be installed as follows:

a. The assembly shall be installed in a horizontal position unless the assembly is listed or approved for vertical installation.

b. The bottom of the assembly shall be a minimum of 12 inches above the ground or the floor.

c. The body of the assembly shall be a minimum of 12 inches from any wall, ceiling, or obstacle, and shall be readily accessible for testing, repair, and maintenance.

d. If installed in a pit, the assembly shall be installed with a minimum of 12 inches of clearance around all sides of the vault, including the floor and roof or ceiling, with adequate room for testing and maintenance.

608.1.2.3 Pressure Vacuum Breaker Assembly and Spill Resistant Pressure Vacuum Breaker Assembly. A pressure vacuum breaker assembly and spill resistant pressure vacuum breaker assembly shall be installed as follows:

a. The assembly shall not be installed in an area that could be subject to backpressure or back drainage conditions.

b. The assembly shall be installed a minimum of 12 inches above all downstream piping and the highest point of use.

c. The assembly shall be a minimum of 12 inches from any wall, ceiling, or obstacle, and shall be readily accessible for testing, repair, and maintenance.

d. The assembly shall not be installed below ground or in a vault or pit.

e. The assembly shall be installed in a vertical position.

608.3, 608.6 & 608.7 Protection of Potable Water Supply Devices, Chemicals, and Cross-Connection Control

608.3 is revised by adding the same two words that were added to 608.1 in order to make this Section consistent with Utah's Safe Drinking Water Act and Water Quality Act.

608.6 and 608.7 are revised in a similar manner to the amended definition for "Cross Connection". As discussed in a previous Lesson, Utah added the words "potential

connection" to the definition for cross connection in order to clarify that prevention of cross connection means eliminating any arrangement that has any potential of mixing water of unknown or uncertain origin and quality with the potable water supply. The revisions to 608.6 and 608.7 are made for the same reason.

Section 608 Protection of Potable Water Supply.
608.3 Devices, appurtenances, appliances and apparatus. Devices, appurtenances, appliances and apparatus intended to serve some special function, such as sterilization, distillation, processing, cooling, or storage of ice or foods, and that connect to the water supply system, shall be provided with protection against backflow, ~~and~~ contamination, or pollution of the water supply system.

608.6 Chemicals and Other Substance. Chemicals and other substances with the potential to create a condition of either contamination or pollution or that produce either toxic conditions, taste, odor or discoloration in a potable water system shall not be introduced into, or utilized in, such systems.

608.7 Cross connection control. Cross connections shall be prohibited, except where *approved* backflow prevention assemblies, backflow prevention devices or other means or methods are installed to protect the potable water supply. Any connection between potable water piping and sewer-connected waste shall be protected by an air gap in accordance with Section 608.14.1.

608.8 Stop-and-Waste Valves

This Section is amended by Utah to permit stop-and-waste valves where the model IPC prohibits them. This change in the parent text of 608.8 makes the Exception unnecessary – if there's no prohibition, you don't need an exception. This amendment allows for underground release from the valves as long as they are installed in compliance with the manufacturer's instructions.

608.8 ~~Valves and outlets prohibited~~ Stop-and-waste valves installed below grade. ~~Potable water outlets and combination stop-and-waste valves shall not~~ Combination stop-and-waste valves shall be permitted to be installed underground or below grade. ~~A~~ ~~f~~Freeze-proof yard hydrants that drain~~s~~ the riser into the ground ~~shall be~~ are considered to be ~~as having a stop-and-waste valve below grade~~ stop-and-waste valves and shall be permitted. A stop-and-waste valve shall be installed in accordance with a manufacturer's recommended installation instructions.

> ~~**Exception:** Freeze-proof yard hydrants that drain the riser into the ground shall be permitted to be installed, provided that the potable water supply to such hydrants is protected in accordance with Section 613.13.2 or 613.13.5, and the hydrants and the piping from the backflow preventer to the hydrant are identified in accordance with Section 608.9.~~

608.12 Potable Water Tanks

The addition of the NSF standard to 608.12 was a significant change to the 2018 IPC discussed in the class on changes to Chapters 1-6. The amendment by Utah is retained from earlier editions of the IPC and now reiterates requirements that have been added to the model IPC. NSF 61 is the industry standard testing and certification protocol for drinking water system components.

608.12 Potable water tanks. Where in contact with potable water intended for drinking water, water tanks, coatings for the inside of tanks and liners for water tanks shall conform to NSF 61. The interior surface of a potable water tank shall not be lined, painted or repaired with any material that changes the taste, odor, color or potability of the water supply when the tank is placed in, or returned to, service. The coating and installation shall conform to NSF Standard 61 and application of the coating shall comply with the manufacturer's instructions.

608.14 Backflow Protection

Utah modifies 608.14.3 to restrict backflow prevention devices with an atmospheric vent to non-commercial boilers where the boiler water is not chemically treated for corrosion control, which is commonplace in commercial installations but not as common in residential boilers. Humidifiers were newly added to 2018 IPC codes on backflow prevention and they are added here by amendment as suitable for those with atmospheric vents.

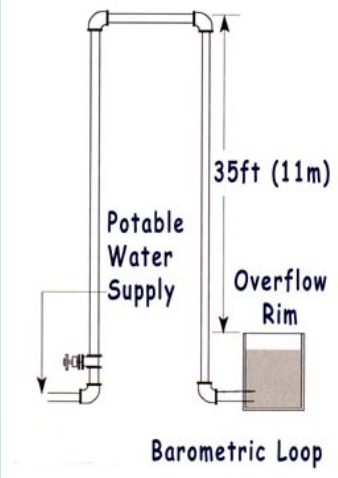
Section 608.14.4 (Barometric loop) from the model IPC is deleted by amendment. A barometric loop is a section of supply piping that abruptly rises to a height of approximately 35 feet and then returns back down to the originating level intended to protect against back-siphonage. Utah deletes the code for this form of protection in favor of the far more reliable and easily checked and installed assemblies provided for in the 2018 IPC.

This amendment to 608.14.8 removes reference to the standard ASSE 1055 in favor of the air gap requirements and list of approved backflow preventers for chemical dispensers available under Section 608.16.7.

608.14.3 Backflow preventer with intermediate atmospheric vent. Backflow preventers with intermediate atmospheric vents shall conform to ASSE 1012 or CSA B64.3. These devices shall be permitted to be installed on residential boilers only, without chemical treatment, where subject to continuous pressure conditions, and humidifiers in accordance with Section 608.17.10. The relief opening shall discharge by *air gap* and shall be prevented from being submerged.

~~**608.14.4 Barometric loop.** Barometric loops shall precede the point of connection and shall extend vertically to a height of 35 feet (10 668 mm). A barometric loop shall only be utilized as an atmospheric-type or pressure-type vacuum breaker.~~

608.14.8 Chemical dispenser backflow devices. Backflow devices for chemical dispensers shall comply with Section 608.16.7 ~~ASSE 1055 or shall be equipped with an *air gap* fitting.~~



608.16.7 Chemical dispensers. Where chemical dispensers connect to the potable water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.14.1, 608.14.2, 608.14.5, 608.14.6, 608.14.8 or 608.14.9.

608.16 Protection of Potable Water Outlets

These amended requirements in Section 608.16 support the amendments made to other backflow prevention requirements in Chapter 6.

608.16 Protection of potable water outlets.
608.16.3 Protection by a backflow preventer with intermediate atmospheric vent. ~~Openings and outlets~~ Connections to residential boilers only, without chemical treatment, and humidifiers shall be protected by a backflow preventer with an intermediate atmospheric vent.

608.16.4 Protection by a vacuum breaker. Openings and outlets shall be protected by atmospheric-type or pressure-type vacuum breakers. Vacuum breakers shall not be installed under exhaust hoods or similar locations that will contain toxic fumes or vapors. **Atmospheric Vacuum Breakers -** The critical level of the vacuum breaker shall be set ~~not less than~~ a minimum of 6 inches (152 mm) above the *flood level rim* of the fixture or device. ~~Fill valves shall be set in accordance with Section 415.3.1. Vacuum breakers shall not be installed under exhaust hoods or similar locations that will contain toxic fumes or vapors.~~ Pipe-applied vacuum breakers shall be installed not less than 6 inches (152 mm) above the *flood level rim* of the fixture, receptor or device served. No valves shall be installed downstream of the atmospheric vacuum breaker. The atmospheric vacuum breaker shall not be installed where it

may be subjected to continuous pressure for more than 12 consecutive hours at any time. **Pressure Vacuum Breaker -** The critical level of the pressure vacuum breaker shall be set a minimum of 12 inches (304 mm) above the flood level of the fixture or device.

608.16.4.2 Hose connections. Sillcocks, hose bibbs, wall hydrants and other openings with a hose connection shall be protected by an atmospheric-type or pressure-type vacuum breaker or a permanently attached hose connection vacuum breaker. Add-on backflow prevention devices shall be non-removable. In climates where freezing temperatures occur, a listed self-draining frost proof hose bibb with an integral backflow preventer shall be used.

608.17 Connections to the Potable Water System; Drink Dispensers & Boilers

This Subsection was added to the 2018 IPC and discussed in the class on significant changes to Chapters 1-6. The new Subsection separates coffee and noncarbonated beverage dispensers from the backflow requirements for carbonated beverage dispensers in order to allow ASSE 1024 devices. This Utah amendment reverses the change to the 2018 model code and still requires the same backflow prevention as for carbonated beverages (an ASSE 1022 device).

608.17.1.2 Coffee machines and noncarbonated drink dispensers. The water supply connection to each coffee machine and each noncarbonated beverage dispenser shall be protected against backflow by a backflow preventer conforming to ASSE 1022 ~~or ASSE 1024,~~ or protected by an *air gap*.

608.17 Connections to the Potable Water System; Additives; Chemical Dispensers, Cleaning Equipment & Car Washes

Automatic fire sprinkler systems are becoming a more important part of the many plumbing businesses. Increased code provisions requiring these systems in both commercial and residential structures also means that awareness of the dangers of cross contamination, particularly where additives or nonpotable sources are part of the supply for the sprinklers. There are many instances where such sources may enhance the system, but they also require the safety provisions in 608.17.4.1 [Additives or nonpotable source] from the model 2018 IPC. An Exception is added for Utah by amendment.

608.17.5 [Chemical dispensers] This amendment clarifies the connection requirements for chemical dispensers in order to coordinate with the requirements of the Department of Environmental Quality. The reference to 608.1.2 in this Subsection guides the user to the “Specific Installation Criteria” for backflow preventers added by Utah amendment (as discussed earlier in this Lesson). The amendment to 608.17.2 [Connections to boilers] is made for similar reasons.

Subsection 608.17.8 [Portable cleaning equipment] is amended for Utah to allow fewer alternatives for backflow protection than are allowed in the model IPC.

Utah adds Subsection 608.17.11 to the model IPC in order to ensure that the water supply for car washes used by the public are protected against backflow.

608.17.2 Connections to boilers. The potable supply to the boiler shall be ~~equipped with a backflow preventer with an intermediate atmospheric vent complying with ASSE 1012 or CSA B64.3. Where conditioning chemicals are introduced into the system, the potable water connection shall be~~ protected by an air gap or a reduced pressure principle backflow preventer, complying with ASSE 1013, CSA B64.4 or AWWA C511.

> **Exception:** The potable supply to a residential boiler without chemical treatment may be equipped with a backflow preventer with an intermediate atmospheric vent complying with ASSE 1012 or CSA CAN/CSA-B64.3."

608.17.4.1 Additives or nonpotable source. Where systems under continuous pressure contain chemical additives or antifreeze, or where systems are connected to a nonpotable secondary water supply, the potable water supply shall be protected against backflow by a reduced pressure principle backflow prevention assembly or a reduced pressure principle fire protection backflow prevention assembly. Where chemical additives or antifreeze are added to only a portion of an automatic fire sprinkler or standpipe system, the reduced pressure principle backflow prevention assembly or the reduced pressure principle fire protection backflow prevention assembly shall be permitted to be located so as to isolate that portion of the system. Where systems are not under continuous pressure, the potable water supply shall be protected against backflow by an air gap or an atmospheric vacuum breaker conforming to ASSE 1001 or CSA B64.1.1.

> **Exception:** All class 1 and 2 systems containing chemical additives consisting of strictly glycerin (C.P. or U.S.P. 96.5 percent grade) or propylene glycol shall be protected against backflow with a double check valve assembly. Such systems shall include written certification of the chemical additives at the time of original installation and service or maintenance.

608.17.5 Chemical dispensers. Where chemical dispensers connect to the potable water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.14.1, 608.14.2, 608.14.5, 608.14.6, or 608.14.8~~ or 608.14.9~~. Installation shall be in accordance with Section 608.1.2. Chemical dispensers shall connect to a separate dedicated water supply line, and not a sink faucet.

608.17.8 Portable cleaning equipment. Where the portable cleaning equipment connects to the water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.14.1~~,~~ or 608.14.2~~, 608.14.3, 608.14.7 or 608.14.8~~.

608.17.11 Automatic and coin operated car washes. The water supply to an automatic or

coin operated car wash shall be protected in accordance with Section 608.14.1, or 608.14.2.

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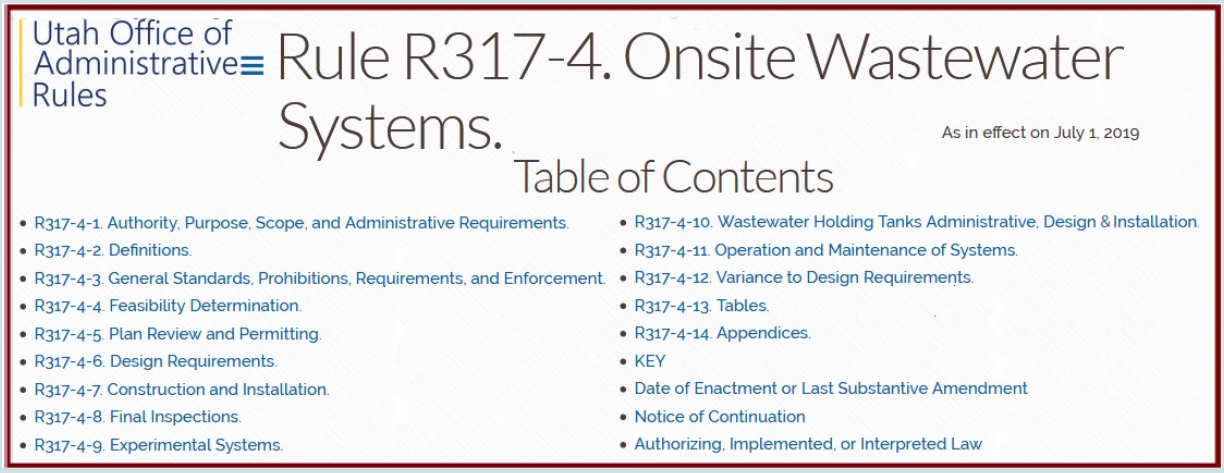
Section 608.14.4 (Barometric loop) is adopted by Utah from the 2018 IPC, amended as follows:	It is not adopted for Utah; Section 608.14.4 is deleted by amendment	Utah modifies 608.14.4 by amendment to require that barometric loop have a minimum height of 35 feet	Utah modifies 608.14.4 to require that barometric loop have a minimum height of 5 feet	Utah modifies 608.14.4 to require that barometric loop be kept at a minimum pressure of 5 psi

Utah Amendments to the 2018 IPC, Part 3

Amendments to Chapter 7 – Sanitary Drainage

701.2 Sewer Required

Section 701.2 in the model 2018 IPC is deleted and replaced with the following:


Utah Office of Administrative Rules

Rule R317-4. Onsite Wastewater Systems.

As in effect on July 1, 2019

Table of Contents

- R317-4-1. Authority, Purpose, Scope, and Administrative Requirements.
- R317-4-2. Definitions.
- R317-4-3. General Standards, Prohibitions, Requirements, and Enforcement.
- R317-4-4. Feasibility Determination.
- R317-4-5. Plan Review and Permitting.
- R317-4-6. Design Requirements.
- R317-4-7. Construction and Installation.
- R317-4-8. Final Inspections.
- R317-4-9. Experimental Systems.
- R317-4-10. Wastewater Holding Tanks Administrative, Design & Installation
- R317-4-11. Operation and Maintenance of Systems.
- R317-4-12. Variance to Design Requirements.
- R317-4-13. Tables.
- R317-4-14. Appendices.
- KEY
- Date of Enactment or Last Substantive Amendment
- Notice of Continuation
- Authorizing, Implemented, or Interpreted Law

701.2 ~~Connection to sewer~~ Sewer required. Every building in which plumbing fixtures are installed and all premises having drainage piping shall be connected to a public sewer where the sewer is accessible and is within 300 feet of the property line in accordance with Utah Code, Section 10-8-38; or an approved private sewage disposal system in accordance with Utah Administrative Code, Rule R317-4, as administered by the Department of Environmental Quality, Division of Water Quality. ~~Sanitary drainage piping from plumbing fixtures in buildings and sanitary drainage piping systems from premises shall be connected to a public sewer, where available or. Where a public sewer is not available, the sanitary drainage piping and~~

~~systems shall be connected to a private sewage disposal system in compliance with state or local requirements. Where state or local requirements do not exist for private sewage disposal systems, the sanitary drainage piping and systems shall be connected to an approved private sewage disposal system that is in accordance with the International Private Sewage Disposal Code.~~

> ~~**Exception:** Sanitary drainage piping and systems that convey only the discharge from bathtubs, showers, lavatories, clothes washers and laundry trays shall not be required to connect to a public sewer or to a private sewage disposal system provided that the piping or systems are connected to a system in accordance with Chapter 13 or 14.~~

701.8 Food Service Area Drainage Piping

The earlier Lesson in this class explained the reasoning for the deletion of this Section from the model 2018 IPC. Utah has opted to retain the Section and reinserts it just as published in the model 2015 IPC. In other words, while the model IPC removed the prohibition of exposed soil and waste pipes above food service areas, Utah retains the prohibition. It would be worthwhile to review the reasons why the model IPC dropped the prohibition in order to clarify how best to apply Section 701.8.

701.8 Drainage piping in food service areas. Exposed soil or waste piping shall not be installed above any working, storage, or eating surfaces in food service establishments.

712.3.3 Sump Discharge Pipe Design

Utah revises wording on acceptable materials and adds stainless and galvanized steel and cast iron as permissible materials.

Section 712 Sumps and Ejectors.
712.3 Sump Design.
712.3.3 Discharge pipe and fittings. Discharge pipe and fittings serving sump pumps and ejectors shall be constructed of materials in accordance with Sections 712.3.3.1 and 712.3.3.2.

> **712.3.3.1 Materials.** Pipe and fitting materials shall be constructed of copper or ~~copper-alloy,~~ brass, CPVC, ductile iron, PE, stainless steel, cast iron, galvanized steel, or PVC.
>
> **712.3.3.2 Ratings.** Pipe and fittings shall be rated for the maximum system operating pressure and temperature. Pipe fitting materials shall be compatible with the pipe material. Where pipe and fittings are buried in the earth, they shall be suitable for burial.

Amendments to Chapter 8 – Indirect/Special Waste

802.1 Where Required

A newly added provision to the 2015 IPC required each well of a multi-compartment sink to drain separately. Utah opted not to adopt this new provision in 2015 and similarly amends the 2018 IPC to delete the requirement.

As a result, food handling establishments in Utah do not need to conform to the changes to the model IPC mandating multiple-compartment sinks to discharge independently to a waste receptor.

Section 802 Indirect Wastes.
802.1 Where Required.

802.1.1 Food handling. Equipment and fixtures utilized for the storage, preparation, and handling of food shall discharge through an indirect waste pipe by means of an *air gap*. ~~Each well of a multiple-compartment sink shall discharge independently to a waste receptor.~~

Amendments to Chapter 9 – Vents

903.1 and 903.6 Vent Terminals

Rather than set a standard clearance for plumbing vent pipes that extend through a roof, the model IPC leaves a blank space in Section 903.1 for the state to fill. Utah sets the minimum clearance at 12 inches.

Utah adds a similar clearance requirement to vents extending through a wall to outside air by placing that requirement at the end of Section 903.6.

Section 903 Vent Terminals.
903.1 Roof extension. Open vent pipes that extend through a roof shall be terminated not less than [~~NUMBER~~12 inches (304.8mm)] inches (mm) above the roof. Where a roof is to be used for assembly or as a promenade, observation deck, sunbathing deck or similar purposes, open vent pipes shall terminate not less than 7 feet (2134 mm) above the roof.

Section 903 Vent Terminals.
903.6 Extension through the wall. Vent terminals extending through the wall shall terminate at a point not less than 10 feet (3048 mm) from a lot line and not less than 10 feet (3048 mm) above average ground level. Vent terminals shall not terminate under the overhang of a structure with soffit vents. Side wall vent terminals shall be protected to prevent birds or

rodents from entering or blocking the vent opening. Vents extending through the wall shall terminate not less than 12 inches from the wall with an elbow pointing downward.

905.4 Vertical Rise of Vent

Utah adds a design option for venting floor drains, floor sinks, and bathtubs to Section 905.4. This could be needed when significant portions of the vent must be installed below the fixture's flood level rim, such as a floor drain where the distance to a wall exceeds the trap arm distance such that the vent would have to be placed in a horizontal position, below flood rim, until it could turn vertically in the wall.

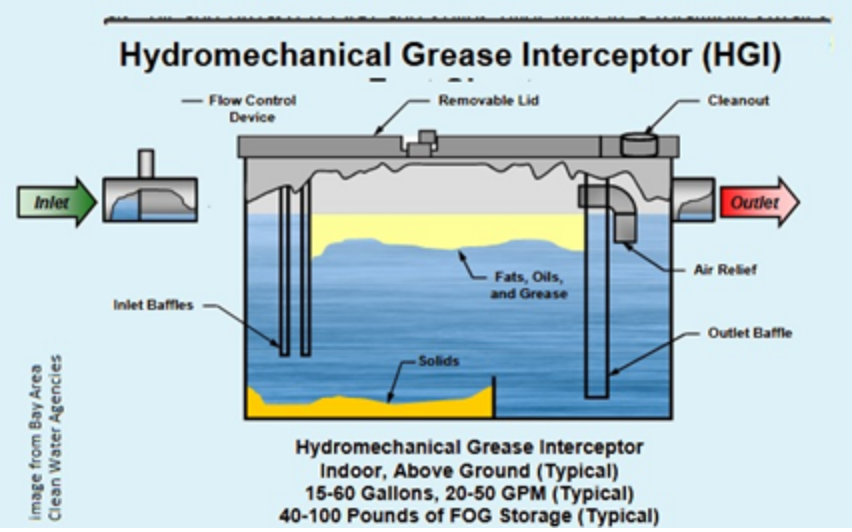
Great care should be used with this design option. As mandated in 905.3, "Every dry vent connecting to a horizontal drain shall connect above the centerline of the horizontal drain pipe." Furthermore, the venting cannot connect with vents to other fixtures until six inches above the highest fixture served in order to ensure that if there is a stoppage and an overflow condition, the waste from one fixture won't flow between fixtures by way of the vents.

Section 905 Vent Connections and Grades.
905.4 Vertical rise of vent. Every dry vent shall rise vertically to a point not less than 6 inches (152 mm) above the *flood level rim* of the highest trap or trapped fixture being vented. Horizontal dry vents below the *flood level rim* shall be permitted for floor drain, floor sink, and bathtub installations when installed in accordance with Sections 702.2, 905.2 and 905.3 and provided with a wall clean-out.

Exception: Vents for interceptors located outdoors.

Amendments to Chapter 10 – Traps, Interceptors, and Separators

1003.3.8 Direct Connection



This is a minor revision, newly adopted for this edition of the plumbing code. It specifies that interceptors that rely on gravity for grease separation must be directly connected to the drainage system and ultimately the building sewer. Hydromechanical grease interceptors are not covered by this Subsection in Utah.

SECTION 1003 INTERCEPTORS AND SEPARATORS.
1003.3.8 Direct connection. The discharge piping from a gravity grease interceptor shall be directly connected to the sanitary drainage system.

Amendments to Chapter 11 – Storm Drainage

Alternate Methods & Combined Sewer

Subsection 1106.1.1 was added for Utah by amendment in 2015 and is carried forward to 2018. It allows for alternative sizing methods in storm drain sizing, for example where siphonic draining is employed.

The Section from the IPC that permits a combined storm and sanitary sewer as long as the two systems connect independently to the public sewer is newly deleted by Utah amendment. As of the 2018 code, this is no longer permitted. Utah, along with every other state, has been moving away from combined storm and sanitary sewers.

1106.1.1 Alternate Methods. An approved alternate storm drain sizing method may be allowed.

~~**Section 1109 COMBINED SANITARY AND STORM PUBLIC SEWER.**~~
~~**1109.1 General.** Where the *public sewer* is a combined system for both sanitary and storm water, the *storm sewer* shall be connected independently to the *public sewer*.~~

Amendments to Chapter 12 – Special Piping and Storage Systems

There are no Utah amendments to this Chapter.

Amendments to Chapter 13 – Nonpotable Water Systems

Section 1301 General

Subsection 1301.4.1, is added to the Utah plumbing code in order to supplement Section 1301.4 that requires a permit for this type of installation.

Utah adds some guidance to backflow prevention requirements in 1301.5 and makeup water requirements in 1301.9.4.

Chapter 13 Nonpotable Water Systems
Section 1301 General.
1301.4.1 Recording. The existence of a nonpotable water system shall be recorded on the deed of ownership for the property. The certificate of occupancy shall not be issued until the documentation for the recording required under this section is completed by the property owner."

1301.5 Potable water connections. Where a potable water system is connected to a nonpotable water system, the potable water supply shall be protected against backflow by a reduced pressure backflow prevention assembly or an *air gap* installed in accordance with Section 608."

1301.9.4 Makeup water. Where an uninterrupted supply is required for the intended application, potable or reclaimed water shall be provided as a source of makeup water for the storage tank. The makeup water supply shall be protected against backflow by a reduced pressure backflow prevention assembly or an *air gap* installed in accordance with Section 608. A full-open valve located on the makeup water supply line to the storage tank shall be provided. Inlets to the storage tank shall be controlled by fill valves or other automatic supply valves installed to prevent the tank from overflowing and to prevent the water level from dropping below a predetermined point. Where makeup water is provided, the water level shall not be permitted to drop below the source water inlet or the intake of any attached pump.

Inspection and Testing of Backflow Prevention Assemblies

These first two Subsections are amended to remove mention of backwater valves; Subsection 1304.4.2 is amended to add backwater valves. All three Subsections are amended to add more detailed guidance on the Sections that govern testing of these devices.

1302.12.4 Inspection and testing of backflow prevention assemblies. ~~The testing of~~ Testing of a backflow preventer~~s and backwater valves~~ shall be conducted in accordance with ~~Section 312.10~~ Sections 312.10.1, 312.10.2, and 312.10.3.

1303.15.6 Inspection and testing of backflow prevention assemblies. ~~The testing of backflow preventers and backwater valves~~ Testing of a backflow prevention assembly shall be conducted in accordance with ~~Section 312.10~~ Sections 312.10.1, 312.10.2, and 312.10.3."

1304.4.2 Inspection and testing of backflow prevention assemblies. ~~The testing of~~ Testing of a backflow preventer~~s~~ or backwater valve shall be conducted in accordance with ~~Section 312.10~~Sections 312.10.1, 312.10.2, and 312.10.3.

Amendments to Chapter 14 – Subsurface Landscape Irrigation Systems

Chapter 14 was newly added to the IPC in 2015. It was not adopted by Utah. In place of the new Chapter, Utah adopted the following provisions by amendment that refer users to the specific administrative codes for Utah that regulate such installations:

1401 Subsurface Landscape Irrigation Systems. Graywater recycling systems utilized for subsurface irrigation for single-family residences shall comply with the requirements of UAC R317-401, Graywater Systems. Graywater recycling systems utilized for subsurface irrigation for other occupancies shall comply with UAC R317-3, Design Requirements for Wastewater Collection, Treatment, and Disposal Systems, and UAC R317-4, Onsite Wastewater Systems."

This amendment regarding subsurface landscape irrigation systems is intended to coordinate the IPC with the requirements of the Utah Department of Health and the Utah DEQ to allow for the use of graywater recycling systems in single family residential areas. It should be noted that some of the administrative rules referenced in the amended Section 1401 are primarily directed to purposes other than landscape irrigation. There are some rules that apply, however, such as the following:

UAC R317-3.11.4 Use of Treated Domestic Wastewater Effluent Where Human Exposure is Likely (Type I)

A. Uses Allowed

1. Residential irrigation, including landscape irrigation at individual houses.

2. Urban uses, which includes non-residential landscape irrigation, golf course irrigation, toilet flushing, fire protection, and other uses with similar potential for human exposure. Internal building uses of treated effluent will not be allowed in individual, wholly-owned residences; and are only permitted in situations where maintenance access to the building's utilities is strictly controlled and limited only to the services of a professional plumbing entity. Projects involving effluent reuse within a building must be approved by the local building code official.

3. Irrigation of food crops where the applied reuse water is likely to have direct contact with the edible part. Type I water is required for all spray irrigation of food crops.

4. Irrigation of pasture for milking animals.

5. Impoundments of wastewater where direct human contact is likely to occur.

6. All Type II uses listed in 11.5.A below.

In addition, R317-401-6. Irrigation Fields provides extensive details on the state's requirements for such installations.

Amendments to Chapter 15 – Referenced Standards

Cross Control Manual

One of the most widely used industry standards on cross connection control is added by amendment to Chapter 15 in the 2018 IPC:

Cross Connection Control Manual, University of Southern California, Kaprielian Hall 300 Los Angeles CA

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Utah adds the Subsection 1301.4.1 [Recording] to Chapter 13 of the IPC by amendment. What does this amended code provision require?	It requires that the existence of a nonpotable water system must be recorded on the deed of ownership for the property	It requires that a permit application for the installation of a gray water recycling system must be filed with the County Recorder as well as with the building code official having authority	It requires that the maintenance log for a gray water recycling system must be recorded with the Utah Division of Occupational and Professional Licensing	It requires that the maintenance log for a gray water recycling system must be available for review when requested by the Utah Division of Occupational and Professional Licensing

Significant Changes to Chapter 7 – Sanitary Drainage

Introduction

The 2018 International Plumbing Code (IPC) is intended to work in conjunction with the other model codes published by the ICC, including the following:

- 2018 International Building Code;
- 2018 International Residential Code;
- 2018 International Existing Building Code;
- 2018 International Mechanical Code;
- 2018 International Fuel Gas Code; and
- 2018 International Energy Conservation Code.

This portion of the class covers changes made to the model IPC during the 2015-2018 code review cycle, for Chapter 7. In each case, the change will be shown in a "cut-and-paste" format, with deleted text from the 2015 IPC ~~struck through~~ and any newly added text highlighted. If the entire Section is new to this edition of the IPC, the entire Section is highlighted. An example of the format is shown below:

Section 425 Water Closets
425.3.4 Access required. All parts in a flush tank shall be ~~accessible~~ provided with *access* for repair and replacement.

Each change is discussed to clarify the nature of the revision, the reasons for the change, and any effects on working professionals. This discussion is based primarily on the deliberations of the Technical Committees, supplemented by reactions in industry blogs and publications. Where reference is made to other codes or when it would provide additional useful information, a link is provided either within the cut-and-paste format or in the discussion that follows.

Explanatory Text at the Head of Chapter 7

About this Chapter: Chapter 7 regulates the methods and piping systems that remove water that has served a purpose such as flushing water closets, bathing, culinary activities, and equipment discharges. The types of materials, drainage fitting and the connection methods are covered for these systems that begin at the receiving fixtures and end at the point of disposal for the liquid waste. A design method for a gravity flow system of vertical and horizontal piping is provided based on the probability of flows from specific fixtures. Vacuum and pumped types of liquid waste removal methods are also regulated by this Chapter.

One of the wholesale changes made to the newest edition of the IPC is the addition of a short explanatory statement at the beginning of each Chapter.

The wording to the explanatory statement to Chapter 7 is interesting in that it refers to removing "water that has served a purpose." Sanitary drainage systems are often described as carrying effluent, wastewater, or other term that emphasizes how the contents of this system differ from water supply piping. It's worth remembering that what's transported through sanitary drainage systems is still largely water, with hydrodynamics nearly the same as the water supply.

The explanation adds that it's water that has "served a purpose". In other words, the system is engineered with a relatively predictable flow, unlike (for example) systems designed to transport rainwater from roofs to a point of disposal.

As this introductory paragraph points out, the system runs from the point of connection to the fixture or equipment to the point of disposal, all of which is covered in Chapter 7. Most of the Chapter is devoted to systems that rely on gravity but pumped and vacuum-based systems are also covered in this Chapter.

701.2 Connection to Sewer Systems

701.2 Connection to sewer ~~Sewer~~ required. ~~Buildings in which plumbing fixtures are installed and premises having drainage piping~~ Sanitary drainage piping from plumbing fixtures in buildings and sanitary drainage piping systems from premises shall be connected to a public sewer~~, where available or~~. Where a public sewer is not available, the sanitary drainage piping and systems shall be connected to a private sewage disposal system in compliance with state or local requirements. Where state or local requirements do not exist for private sewage disposal systems, the sanitary drainage piping and systems shall be connected to an

approved private sewage disposal system that is in accordance with the *International Private Sewage Disposal Code*.

Exception: Sanitary drainage piping and systems that convey only the discharge from bathtubs, showers, lavatories, clothes washers and laundry trays shall not be required to connect to a public sewer or to a private sewage disposal system provided that the piping or systems are connected to a system in accordance with Chapter 13 or 14.

Most jurisdictions apply state and local laws when it comes to regulating private sewage disposal systems. As a result, they do not and cannot use the International Private Sewage Disposal Code (IPSDC). For these jurisdictions, reference to the IPSDC in Section 701.2 has no material value.

On the other hand, there are some jurisdictions that do not have state and local laws for private sewage disposal. In those cases, the IPSDC provides regulations for waste disposal. The Section is revised for 2018 to provide more useful guidance to those municipalities that benefit from reference to the IPSDC. Providing municipalities a way to regulate private sewage disposal systems by way of the IPSDC (where regulations have historically been limited or nonexistent) would be of great benefit to the community.

Of greater significance, this Section as published in 2015 might tend to get in the way of gray water systems. The strict language – that all sanitary drainage must empty into either a public sewer or private sewage system – doesn't provide the leeway to capture and utilize gray water.

The 2018 IPC therefore adds an Exception to allow for gray water to be diverted from the sewer or private sewage disposal system so that it can be processed by systems in accordance with Chapters 13 or 14.

701.8 Drainage Piping above Food Areas

This Section is deleted from the 2018 IPC without substitution.

~~**701.8 Drainage piping in food service areas.** Exposed soil or waste piping shall not be installed above any working, storage, or eating surfaces in food service establishments.~~

There are several reasons to delete these provisions from the IPC. For one, the wording is confusing. What does "exposed" piping mean? What if it's exposed but on the other side of the ceiling above a food service area? Is any form of containment sufficient? How would encasing the piping prevent dripping, anyway, unless there's some design that prevents it, such as a drip pan within the enclosure?

This Section appears to be a relic of an earlier time when the quality and workmanship of sanitary drainage pipes and fittings was not at the levels attained in a modern plumbing system. It was intended to address a tendency for soil and waste piping joints to leak, even when the

piping is installed in accordance with the code and pressure-tested in the presence of a code official. This shouldn’t be a concern. For that matter, if there really is a significant problem with joints failing, the solution would not be just to make sure the failures don’t occur over food service preparation and storage areas. The issue would have to be addressed in EVERY installation of drainage systems, in referenced standards, codes, and inspections so that the problem doesn’t affect homes, businesses, and institutions.

Furthermore, if food preparation and storage areas really do need additional protection against leakage from above (no matter how unlikely), shouldn’t other types of overhead installations be prohibited? Installation of fire sprinklers overhead and, for that matter, overhead ductwork, could leak or have condensation on the outside surfaces that would carry away accumulated dirt and grime and drip down on food prep surfaces.

If, on the other hand, current practices make leaking joints of soil and waste pipes rare, this Section becomes unnecessary and burdensome.

Deleting this Section makes the IPC consistent with the Food Code issued by the FDA that does not contain any prohibitions of soil and waste piping above food preparation and storage areas. On the other hand, the Food Code emphasized the "cleanability" of surfaces above food preparation areas. Pipes and pipe hangers would be difficult to clean, so exposed sanitary drainage or water supply pipe installation above food preparation areas (but not food storage areas) is still a poor design. Any design considerations for installing pipes above food areas, such as encasing them, is not a matter for the IPC but for other building codes.

The Section is therefore not revised, but deleted.

702.3 Polypropylene Piping for Building Sewer

2018 International Plumbing Code

CHAPTER 7 SANITARY DRAINAGE

First Printing: Aug 2017

702.3 Building sewer pipe.

Building sewer pipe shall conform to one of the standards listed in Table 702.3.

TABLE 702.3
BUILDING SEWER PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters, including SDR 42 (PS 20), PS 35, SDR 35 (PS 45), PS 50, PS 100, PS 140, SDR 23.5 (PS 150) and PS 200; with a solid, cellular core or composite wall	ASTM F1488; ASTM D2751
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Concrete pipe	ASTM C14; ASTM C76; CSA A257.1M; CSA A257.2M
Copper or copper-alloy tubing (Type K or L)	ASTM B75; ASTM B88; ASTM B251
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F714
Polypropylene (PP) plastic pipe	ASTM F2736; ASTM F2764; CSA B182.13
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488
Polyvinyl chloride (PVC) plastic pipe in sewer and drain	

Added to 2018 IPC

~~Portion of Table shown~~

TABLE 702.3 BUILDING SEWER PIPE

MATERIAL	STANDARD
Polypropylene (PP) Plastic Pipe	ASTM F2736; ASTM F2764; CSA B182.13

This code change supports other changes to the 2018 IPC that provide Polypropylene (PP) sanitary sewer pipe as an option for numerous applications. Use of PP sewer piping is an accepted industry practice. PP is widely used in sewer trunk lines through the United States. It has been used for this purpose in Europe for many years, without any issues arising.

Incorporating the current ASTM and CSA standards for Polypropylene (PP) sanitary sewer pipe into the IPC code allows engineers, designers, and sewer authorities that use the IPC to specify PP pipe in their systems.

703.4 Reuse of Buried Drain and Sewer Piping

703.4 Existing building sewers and drains. ~~Existing building sewers and drains shall connect with new building sewer and drainage systems only where found by examination and test to conform to the new system in quality of material. The code official shall notify the owner to make the changes necessary to conform to this code.~~ Where the entire sanitary drainage system of an existing building is replaced, existing building drains under concrete slabs and existing building sewers that will serve the new system shall be internally examined to verify that the piping is sloping in the correct direction, is not broken, is not obstructed and is sized for the drainage load of the new plumbing drainage system to be installed.

This Section as published in the 2015 IPC did not provide clear guidance or purpose. It seems to require that existing building sewers and drains have the same quality of material as any newly installed drainage piping that drains into it regardless of whether the existing building sewer is performing well. How do you judge equality in material if the building sewer is made from metallic components and the drainage system made of plastic? What if the new drainage piping is in an extension to the structure and connects to the existing sanitary drainage system which then connects to the existing building drain – would this type of connection also trigger a need to replace the building drain?

“Testing” of old, existing buried building drains or building sewers might not ever be successful, eliminating the possibility for their reuse. As such piping relies on non-pressurized gravity flow, a test means very little. What is important is a visual internal examination (typically by video camera equipment) to make sure that the piping is viable for reuse. This is especially beneficial where the piping would be difficult to replace such as where it crosses under parking lots and streets.

Consider the massive expense and inconvenience involved in tearing through the slab, excavating, possibly needing to excavate beneath streets, etc., that are likely to arise when replacing the building drain. There has to be a significant risk to keeping the existing building

drain and benefit to replacing it to justify this disruptive and expensive of a code. If the existing building sewers and drains are performing well, there would not be sufficient cause to require their replacement in these circumstances.

The provisions from the 2015 IPC are therefore deleted in their entirety and replaced with new provisions that focus directly on legitimate concerns when reusing buried drain and sewer piping. Those concerns are, furthermore, specified: that the buried drain and sewer piping is examined to verify that it is properly sloped and sized and not broken or obstructed.

These changes bring the IPC into alignment with the IRC that adopted a similar code change for the 2015 edition.

704.1 Grease-Laden Waste Piping Slope

704.1 Slope of horizontal drainage piping. Horizontal drainage piping shall be installed in uniform alignment at uniform slopes. The slope of a horizontal drainage pipe shall be not less than that indicated in Table 704.1 except that where the drainage piping is upstream of a grease interceptor, the slope of the piping shall be not less than 1/4 inch per foot (2-percent slope).

TABLE 704.1 SLOPE OF HORIZONTAL DRAINAGE PIPE

SIZE (inches)	MINIMUM SLOPE (inch per foot)
2½ or less	1/4[a]
3 to 6	1/8[a]
8 or larger	1/16[a]

For SI: 1 inch = 25.4 mm, 1 inch per foot = 83.33 mm/m.

a. Slopes for piping draining to a grease interceptor shall comply with Section 704.1.

Drainage piping upstream of a grease interceptor, that conveys grease-laden effluent to the interceptor could easily become clogged if the effluent is allowed to cool. The grease would begin to coagulate, blocking the flow, which would increase the likelihood of the effluent cooling upstream, causing more coagulation of grease and snowballing into a blocked drain.

This revision addresses this potential problem by increasing the slope for grease-laden waste in order to increase the velocity of the effluent and deliver it to the interceptor before it cools.

Many plumbing engineers and designers are already routinely increasing the slope of drainage piping upstream of a grease interceptor. The IPC, however, lacked any code requirement to do so. This revision for 2018 brings the IPC up-to-date with industry practices and ensures that proper slopes will be used, where needed for grease-laden piping.

704.2 Reduction of Pipe Size

This change to the IPC clarifies and expands the permissible reductions of pipe size.

Although other factors apply (such as friction), proper functioning of drainage piping relies primarily on the following two factors:

- Relative elevation; and
- Relative pressure.
    - Fluid will flow, naturally, from a point of higher elevation to a point of lower elevation and from a place of higher pressure to a place of lower pressure.
    - If the two factors conflict (for example, higher elevation is at lower pressure than the desired destination), the resulting hydrodynamics depend on the relative weight of the differences.

Water pressure depends on numerous variables but, all other things being equal, water is under greater pressure in a smaller diameter pipe than a larger diameter pipe. If the pipe in question is directly vertical, the effects of gravity will counteract any adverse change in pressure due to going from a larger to a smaller pipe diameter with only a very mild disruption in flow. In a horizontal run of pipe, on the other hand, reduction in pipe diameter may result in a pressure differential sufficient to push the fluid back up against gravity and create a backflow hazard.

For that reason, the IPC prohibits reduction in size in the direction of flow for drainage piping.

Changes in Exceptions to 704.2

Section 704 Drainage Piping Installation.

704.2 ~~Change~~ Reduction in pipe size in the direction of flow. The size of the drainage piping shall not be reduced ~~in size~~ in the direction of the flow. ~~A 4-inch by 3-inch (102 mm by 76 mm) water closet connection shall not be considered as a reduction in size.~~ The following shall not be considered as a reduction in size in the direction of flow:

1. A 4-inch by 3-inch (102 mm by 76 mm) water closet flange.

2. A water closet bend fitting having a 4-inch (102 mm) inlet and a 3-inch (76 mm) outlet provided that the 4-inch leg of the fitting is upright and below, but not necessarily directly connected to, the water closet flange.

3. An offset closet flange.

There are some long-standing exceptions to the prohibition against reducing drainage pipe size in the direction of flow. The flushing action in a water closet adds considerable pressure upstream. That fact as well as design considerations at the point where a toilet bowl connects to drainage piping both requires and permits the use of a fitting that's larger at its entry than its exit, usually referred to as a water closet flange.

The revision of the 2018 IPC retains this exception, moving it from the parent text to item #1 in a list. This revision is not a change in the code in any way, other than in the organization of this Section.

The 2018 IPC also adds a commonly used fitting as list item #2 of Section 704.2. A water closet bend fitting is installed differently but serves the same purpose and is permitted for use for the same reasons as a water closet flange. The newly added Exception clarifies that this fitting may only be used if properly oriented, with the larger entry of the fitting facing up so that the flushing action, assisted by gravity, can navigate the transition to the smaller diameter fitting outlet without an interruption of flow. The fitting is not permitted by the IPC if it's sideways (i.e., oriented so that the exit is on the same plane as the point of entry).

The provision doesn't require the water closet bend to be directly attached to the water closet flange because it presumes that any length of pipe between them would have to be vertical if the fitting is oriented as mandated by code.

Item #3 is added to this Section in order to clarify a situation that isn’t always properly enforced. An offset closet flange doesn’t decrease in diameter from inlet to outlet. As such, they have always been permitted by the IPC and have been used for decades. Offset closet flanges are also listed in the standard ASTM D2665 (for PVC fittings) and ASTM D3311 for the patterns and dimensions of DWV fittings. Both of these standards are included by reference in Table 702.4, providing a basis for approval of offset closet flanges.

However, since they have also not been explicitly permitted by the IPC, some code officials incorrectly judge these fixtures to be a code violation. Offset closet flanges are either standard in design or designed to fit the circumstances but, either way, their configuration appears likely to restrict flow. Because some offset closet flanges are especially "restrictive looking", code officials didn't want to start allowing some types and not other types and the IPC provided no guidance in what would make this fitting acceptable or unacceptable.

The addition of item #3 in Section 704.2 guides code users and inspectors to the list of acceptable offset closet flange fittings in Table 704.2 (by reference).

As mentioned earlier, some offset closet fittings are produced to fit the need. Any fitting that is not marked with a pipe standard (such as ASTM D3311) would need to be approved under Section 105.2 [Alternative design, materials and methods].

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Section 704.2 in the 2018 IPC [Reduction in pipe size in the direction of flow] provides an Exception for water closet flanges of the following dimensions:	4 inches at the inlet and 3 inches at the outlet	4 inches at the inlet and 3-1/2 inches at the outlet	4 inches at the inlet and 2 inches at the outlet	4 inches at the inlet and 4 inches at the outlet

Conclusion

With that, we complete our introduction to energy conservation, as well as our look at how the 2018 IPC was revised during the 2015-2018 code review cycle, including Utah amendments.

The class only covered Chapter 7. Even though it was a relatively small selection of changes, there were still a number of important changes to this chapter that you, as a professional, must be aware of.

Some important changes made to this chapter include the removal of unnecessary code prohibiting piping above food areas, updated requirements for the reuse of buried drain and sewer piping, and the allowance for polypropylene plastic piping to be used for storm sewers.

Thank you for taking this class, and we wish you the best in your career!

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Due to the updates made to the IPC, it is now allowed to use which of the following for storm sewers?	Polypropylene pipe	Vitrified clay pipe	Cast-iron pipe	Concrete pipe