

Passive conservation: Codifying the use of water-efficient technologies

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This article investigates how water efficiency professionals can use the code adoption process to implement increased water efficiency technologies. Beyond the US Energy Policy Act, many standards are used to codify water use efficiency throughout the United States. In Florida, for example, the International Plumbing Code is used and updated frequently through a consensus-based process described in this article. Conservation professionals assessing how

to increase water use efficiency can be integrated into the code adoption process, but few know where or how to become involved. They may also provide input by either becoming a member of a technical advisory committee or through public testimony. Standards development and code adoption processes are sometimes overlooked by conservation professionals, who can achieve passive conservation by participating in such processes.

KEYWORDS: *adoption, code, efficiency, integration, standard*

The requirements for maximum flow rates and consumption values for plumbing fixtures and fixture fittings (faucets and showerheads) have been included in product standards and referenced in US plumbing codes since the 1970s. Major requirement revisions were made in both product standards and codes during the 1990s after the US Energy Policy Act of 1992 (EPA Act) was implemented. EPA Act became effective in January 1994 for residential products and in January 1997 for commercial products. It federally mandated that most plumbing fixtures offered for sale in the United States have a maximum flow rate or flush volume rating. It also required that manufacturers develop new and more water-efficient plumbing fixtures to meet the new mandated requirements for the US market (Table 1).

In some instances, though, the adoption of water efficiency standards is undertaken by water agencies that develop set criteria to meet certain water use constraints specific to that locale. For example, under regulations governing water service to customers, East Bay Municipal Utility District (EBMUD; Oakland, Calif.) issued regulations that identify high-water-use efficiency requirements for new service connections. Included in EBMUD's regulations are requirements for indoor water use that apply US Environmental Protection Agency's WaterSense (www.epa.gov/watersense/) specifications for fixtures and fixture fittings as well as regulations on outdoor water use that list specific requirements for both landscape design and irrigation (EBMUD, 2011). This is one example of how an individual utility linked its need to increase efficiency with available, but not mandatory, water efficiency products and practices to meet its obligation to provide service. Such utility-driven regulations

can and sometimes do lead to increased efficiency requirements throughout regions and states (e.g., California).

Because technology is now available for newer, more water-efficient products that further improve on EPA Act levels, the larger focus for implementation is to codify these specifications at a state or local level. The recent introduction of progressive code modifications—such as the International Code Council's (ICC's) International Green Construction Code (IgCC) and the International Association of Plumbing and Mechanical Officials (IAPMO) Green Plumbing and Mechanical Code Supplement (2011)—allow uniform implementation of increased water efficiency standards. Along with increased efficiency for indoor fixtures (e.g., toilets, urinals, faucets), these modifications include outdoor water use efficiency and alternative supplies. Because many water supply entities are charged with developing and maintaining adequate water supplies and conserved water is considered one tool to optimize existing supply sources, understanding the link between standard and code development and implementation is a critical yet essentially untapped water resource optimization tool.

HOW AND WHY PRODUCT STANDARDS AND CODES ARE DEVELOPED

Understanding the effects of a new product standard on a geographic area is intricately linked to what a standard is, how it is developed, and how it is to be implemented. It is important to remember that standards are not laws. Standards are first formulated by organizations, such as the American Society of Mechanical Engineers (ASME), Canadian Standards Association International (CSA), IAPMO, ICC, NSF International (formerly

known as National Sanitation Foundation), and others, through deliberate, well-defined, consensus-based processes. Standards are recommended for acceptance by either following the American National Standards Institute (ANSI) process or through other methods of acceptance. Although the majority of organizations follow the ANSI guidelines for standards development, others such as ASTM International (formerly the American Society for Testing and Materials) and CSA do not (Martin, 2011). After this lengthy process is complete, standards are available for adoption in model codes, state codes, or other regulatory instruments. In regard to plumbing, the two primary model codes used are the International Plumbing Code produced by ICC and the Uniform Plumbing Code produced by IAPMO.

When EPAcT was enacted, a federal pre-emption on state implementation of more stringent standards was created unless the state first obtained permission from the US Department of Energy. This pre-emption made it difficult for states to establish more stringent standards in the best interest of the public, but it did create consistent requirements throughout the United States.

Because of ongoing water resource sustainability issues, water efficiency professionals created new voluntary specifications to spur development and use of even more water-efficient products than those specified in EPAcT. The WaterSense program promotes, certifies, and labels a new set of flow rate and consumption requirements, along with important performance-based requirements for water-efficient fixtures (Table 1). The WaterSense program requirements include maximum water consumption levels at least 20% lower than those of the EPAcT, along with performance specifications to ensure a continued high level of operability. Some water supply and planning agencies have shown interest in the implementation of WaterSense specifications into state and local building codes, but this requires the specifications to be written into the appropriate ASME standards.

As of 2011, three states—California, Georgia, and Texas—have mandated new, more water-efficient requirements, based on WaterSense specifications without prior consent of the federal government. This raised the question of whether the federal pre-emption in EPAcT was still relevant because it appeared that the pre-emption did not deter states from adopting more stringent water fixture and fixture fittings requirements. When these three states implemented higher water efficiency specifications, the federal pre-emption ruling was still a factor regarding implementation of new standards or requirements. However, on Dec. 22, 2010, the US Department of Energy waived the federal pre-emption for standards related to water conservation of toilets, showers, urinals, and residential faucets. State and local governments are now no longer hindered from adopting more stringent water efficiency standards than those in EPAcT for these products. Alternatively, the pre-emption could technically be reinstated if the ASME standards are revised.

STANDARDS AND CODE INTEGRATION IN POLICY

Generally, standards are developed before code development by an organization using an acceptable consensus-based process. This is intended to minimize special-interest-group domination

of standards development committees. The process set forth by ANSI is the most common process used for development of plumbing product standards by standards development organizations (Demarco, 2011). Among those organizations accredited to develop standards for plumbing products and components are ASME, ASTM International, AWWA, American Society of Sanitary Engineering, CSA, Cast Iron Soil Pipe Institute, IAPMO, ICC, International Safety Equipment Association, National Fire Protection Association, NSF International, and Underwriters Laboratories.

Three code development organizations develop model plumbing codes. These codes can be adopted by any state or jurisdiction, based on state or local policy, and can be modified within their discretion. In terms of plumbing codes, the IAPMO, develops the Uniform Plumbing Code. This version of plumbing code is primarily adopted in the western part of the United States. Another code development organization, the ICC, develops the International Plumbing Code. The ICC is more common in the eastern United States. The last code development organization is the Plumbing Heating and Cooling Contractors Association, which develops the National Standards Plumbing Code that is used in parts of Maryland and throughout New Jersey. Several states and local governments do not adopt a model plumbing code but choose to develop their own. Such states include Wisconsin, Massachusetts, and Kentucky (see map on page E95). Table 2 shows code language in use by state.

FLORIDA-SPECIFIC INTEGRATION PROCEDURES

Model codes and standards are transformed and adopted into building codes through a detailed and deliberate process that can ultimately end in rule modification. On the basis of an evaluation of available model codes, the state of Florida uses the ICC model building, plumbing, mechanical, and fuel/gas codes. The Florida Building Code updating process operates on a three-year cycle that coordinates with the three-year process ICC uses to update its model codes.

Because Florida uses the International Plumbing Code, any changes to the adopted ICC model codes made during the previous three years are first evaluated by the Florida Building

TABLE 1 Historical flow ratings for fixtures

Fixture	WaterSense	EPAcT 1994	1980–94	Pre-1980
Toilets	1.28 gpf	1.6 gpf	3.5–4.5 gpf	5.0 gpf
Urinals	0.5 gpf	1.0 gpf	1.5–4.5gpf	5.0–7.0 gpf
Showerheads	2.0 gpm	2.5 gpm	2.75–4.0 gpf	5.0–8.0 gpm
Faucets	2.0 gpm	2.5 gpm	2.75–3.0 gpm	3.0–7.0 gpm
Prerinse spray valves	1.3 gpm	1.6 gpm*		

EPAcT—US Energy Policy Act of 1992

*EPAcT, 2005.

TABLE 2 Versions of plumbing codes adopted by state

State/District	Version Adopted
Alabama	IPC 2009
Alaska	UPC 2009
Arizona	Local adoption
Arkansas	IPC 2006
California	UPC 2009
Colorado	IPC 2009
Connecticut	IPC 2003
Delaware	IPC 2009
D.C.	IPC 2006
Florida	IPC 2006
Georgia	IPC 2006
Hawaii	UPC 2006
Idaho	UPC 2006
Illinois	Illinois Plumbing Code
Indiana	IPC 2009
Iowa	UPC 2009
Kansas	IPC 2006
Kentucky	Kentucky State Plumbing Code
Louisiana	Louisiana State Plumbing Code
Maine	UPC 2009
Maryland	NSPC 2006
Massachusetts	Massachusetts State Plumbing Code
Michigan	IPC 2009
Missouri	IPC 2009
Minnesota	2009 Minnesota State Plumbing Code
Mississippi	IPC 2006
Montana	UPC 2009
Nebraska	Local adoption
Nevada	UPC 2009
New Hampshire	IPC 2009
New Jersey	NSPC 2009
New Mexico	UPC 2009
New York	IPC 2006
North Carolina	IPC 2006
North Dakota	UPC 2009
Ohio	IPC 2006
Oklahoma	IPC 2009
Oregon	UPC 2009
Pennsylvania	IPC 2009
Rhode Island	IPC 2009
South Carolina	IPC 2006
South Dakota	UPC 2009
Tennessee	IPC 2006
Texas	Local adoption
Utah	IPC 2009
Vermont	IPC 2009
Virginia	IPC 2009
Washington	UPC 2009
West Virginia	IPC 2009
Wisconsin	Wisconsin State Plumbing Code
Wyoming	Local adoption

IPC—International Plumbing Code, NSPC—National Standards Plumbing Code, UPC—Uniform Plumbing Code

The adopted FBC modifications are then filed with the Department of Community Affairs. Modifications are considered final and are incorporated into the FBC, but are not considered rules until administrative procedure requirements are followed. By law there is a minimum of six months before new rules become effective. The six-month period allows manufacturers time to increase production of new products and sell down previous inventory, while allowing rule challenges to occur (Blair, 2009). After the six-month period or the rule-challenge process, codes are adopted by rule and given an implementation date. If a challenge is filed, there is a delay until the challenge is heard and resolved. The FBC adoption process takes about 12 months, but can last as long as 18 months (Figure 1). Another component to this process is the “glitch cycle.” The glitch cycle is separate from the normal adoption cycle and should only occur in nonadoption years to correct minor inconsistencies between standards and codes in existing rules. Florida state law allows for the glitch cycle to occur every year between full-blown code adoption cycles (i.e., three years).

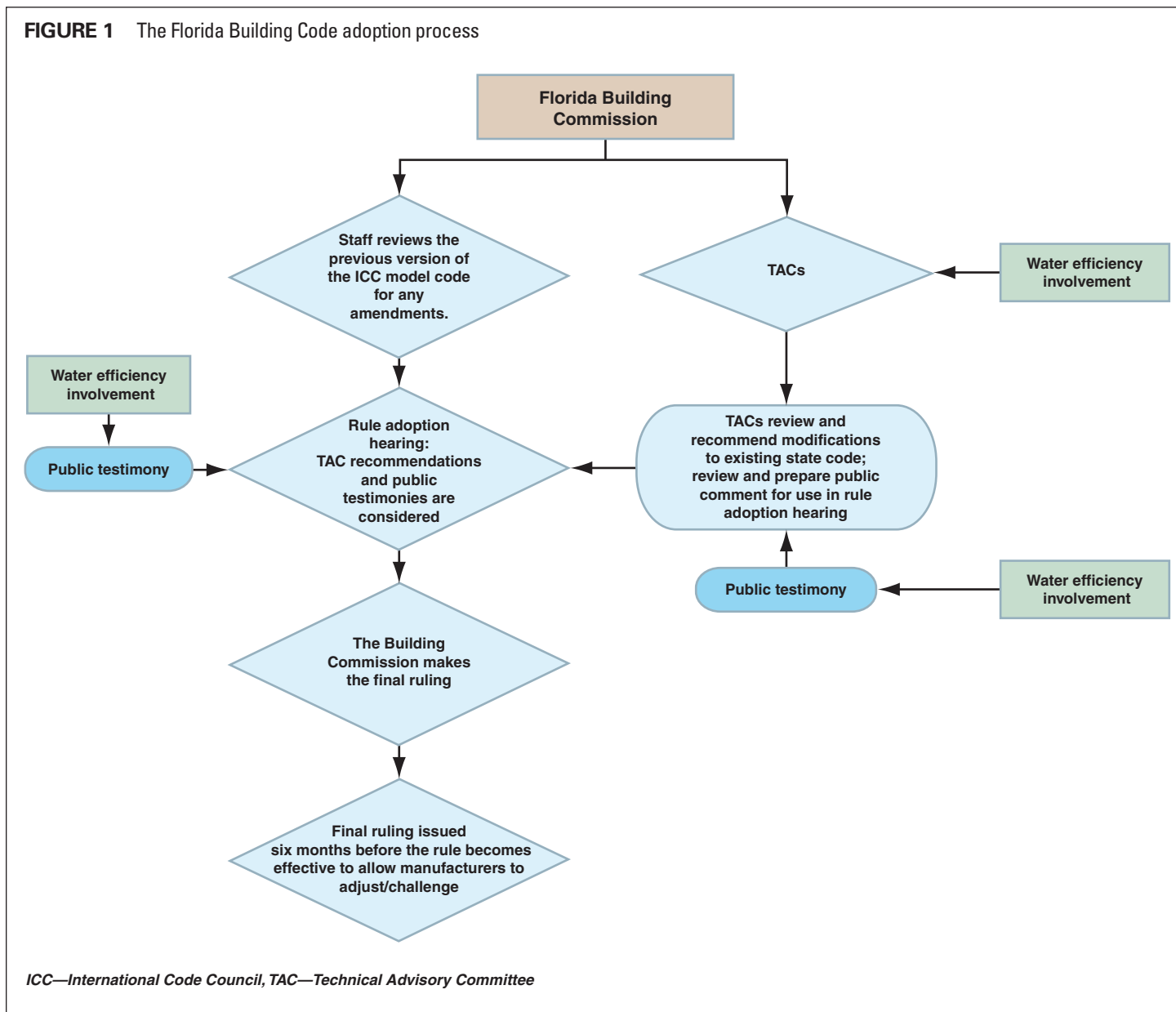
The building code developmental processes in most states can be characterized as a controlled stakeholder process, and Florida is no different. Anyone who determines that applicable code development will affect them or their business interests are able to contribute recommendations. They may contribute either by applying to become a member of a TAC or by submitting recommendations through public comments, reviewed in depth by both the TAC and the FBC. To apply to become a TAC member, stakeholders must exhibit interest by contacting the director of the FBC and documenting that they have expertise in the TAC field they are applying to. Depending on availability of open seats and the FBC’s discretion, the FBC will meet and decide whether to accept stakeholders’ informal application.

WHO IS RESPONSIBLE FOR BUILDING CODES?

When analyzing the disbursement of model building codes in the United States, it is important to understand who is responsible for the implementation process at the state and local levels. To be involved in the code adoption process, water efficiency professionals must find out who is in charge of adopting codes in their jurisdiction—for instance, are the codes in a jurisdiction being implemented statewide? If so, are local jurisdictions able to amend the state’s model code?

Two methods are used by states to advance code implementation: the statewide model code and the home rule code development process. As identified in the previous section, Florida’s statewide mandated model building code does not allow local jurisdictions to adopt less stringent standards than specified in the current edition of the state building code. However, in some states, including Florida, local jurisdictions may amend the state building code if their amendment does not require less stringent standards than those enforced statewide. Therefore, counties and cities may also promote more progressive code modifications using such tools as the IgCC or the IAPMO Green Plumbing and Mechanical Code Supplement. For example, effective April 2011, Boynton Beach became the first city in Florida to adopt IgCC as a local voluntary green code (ICC, 2011). A complete list of the current US jurisdictions that have adopted these code modifications is shown in Table 3.

FIGURE 1 The Florida Building Code adoption process



The second method of code implementation, home rule, allows local municipalities and jurisdictions to adopt building codes. This occurs in Arizona, where the task of code adoption is relegated to each county. This region has become relatively progressive in terms of adopting water-efficient codes. Unfortunately, home rule can create a multitude of contrasting codes following differing standards and/or model codes. If codes and standards differ, this causes manufacturers to design and specify equipment and product types needing to adhere to different jurisdiction codes rather than being able to manufacture one standard product for sale and use throughout the state.

INTEGRATION THROUGH LEGISLATION OF WATER-EFFICIENT REQUIREMENTS INTO STATE CODES

The provisions contained in all codes can be superseded by federal, state, or local legislation, such as EAct, revisions to

EAct, or state laws discussed previously, that establish more restrictive water efficiency requirements. For example, in March 2010 Georgia Governor Sonny Perdue enacted the Georgia Water Stewardship Act, which among other items required strict specifications in regard to water efficiency. Governor Perdue did this without the consent of the Georgia Building Commission and instead acted on a recommendation from his Water Contingency Task Force (State of Georgia, 2009). This task force was a collaboration of more than 80 stakeholder groups comprising government employees, businesses, and environmental organizations. This collaborative effort proved to be both efficient and intuitive, with the resulting output being created by individuals with different interests. This essentially lessened discontent among formally affected parties. Similar methods may have been at the root of water efficiency changes both in California and Texas. Table 4 shows several other state and local jurisdictions

TABLE 3 Examples of current adoption of green codes*

Jurisdiction	Code
South Dakota	IAPMO GPMCS
LADWP	IAPMO GPMCS†
City of Houston, Texas (voluntary)	IAPMO GPMCS
Oregon	IAPMO GPMCS/ICC IgCC
Florida (voluntary)	ICC IgCC
Rhode Island (voluntary)	ICC IgCC
City of Phoenix, Ariz. (voluntary)	ICC IgCC

IAPMO GPMCS—International Association of Plumbing and Mechanical Officials, Green Plumbing and Mechanical Code Supplement, ICC IgCC—International Code Council, International Green Construction Code, LADWP—Los Angeles Department of Water and Power

*This a partial list of adopted green code supplements and is subject to change.
†Water Conservation Ordinance, only. The remaining is California Green Building Code.

that have used legislation or ordinances to enhance water efficiency requirements.

Although this can and has been done, building commissions may be skeptical of legislative intent. In some cases, they may see it as an effort to sidestep or disenfranchise the commission. If a government takes this route, it might lessen chances of a healthy relationship with building commissions on future changes to building codes. Alternatively, commissions may be reticent to increase efficiency in

code requirements, even though national code development agencies have created green supplements.

CODIFYING OPTIONS: LEGISLATION VERSUS CONVENTIONAL BUILDING CODE PROCESS

Taking a legislative stance on water resource and conservation issues is viable, but there may be a degree of uncertainty associated with output consistency. In the legislative process, there can be an accelerated language development approach versus the conventional building code adoption process, but technical inconsistencies may appear based on author expertise. Although the more prescribed code development method is slower than legislation, there is a well-defined deliberative process integrating language-development expertise with technical expertise. In the Georgia case, Gov. Perdue incorporated a diverse group of individuals into the policy-making process, ensuring quality product development (a hybrid approach). However, enacted legislation was not based on a set of standards developed through a consensus-based approach. Rather, requirements were developed through this hybrid task force process.

CONCLUSION

The methods government entities use to adopt water efficiency requirements into code are sometimes misunderstood. The code adoption process varies by state, county, and even city. In some

TABLE 4 State and local standards actions—plumbing

Jurisdiction	Reference	Status	Plumbing Efficiency Provisions (Maximum Water Consumption—gallons)							Effective Date of Mandate (100%)
			Water Closets	Flushing Urinals	Faucets			Showerheads	Waterless Urinals	
					Private Lavatory	Public Lavatory	Kitchen			
State										
California	AB715	Enacted 2007	1.28 gpf	0.5 gpf					Included	Jan. 1, 2014
Texas	HB2667	Enacted 2009	1.28 gpf	0.5 gpf					Included	Jan. 1, 2014
Georgia	SB370	Enacted 2010	1.28 gpf + WS*	0.5 gpf + WS	1.5 gpm + WS		2.0 gpm	2.5 gpm	Included†	Jul. 1, 2012
Washington	SB5948	Rejected by legislature 2009	1.28 gpf	0.5 gpf					Included	Jan. 1, 2014
Colorado	Bill 5	In development	1.28 gpf	0.5 gpf					Not mentioned	Jul. 1, 2016
Local										
New York City	NYC Plumbing Code, Table 604.4	Enacted 2010	1.28 gpf + WS*	0.5 gpf + WS	1.5 gpm + WS	0.5 gpm	2.2 gpm	2.0 gpm	Unclear	Jul. 1, 2012
Miami-Dade County	Florida Building Code (amended), Table 604.4	Enacted 2008	1.28 gpf	0.5 gpf	1.5 gpm	0.5 gpm	1.5 gpm	1.5 gpm	Included	Jan. 1, 2009 (new construction)

Adapted from AWE, 2011

WS—WaterSense

*WS requirement applicable to tank-type toilets only
†Provides only for vitreous china non-water urinals; there are no provisions for non-water urinals made of composites

cases, states may opt to use the home rule method delegating the task of code adoption to the local jurisdiction. In others, they will conduct the code adoption process at the state level, mandating a statewide building code and in some rare cases using legislation as a means to pass water efficiency requirements. What is consistent, however, is the role the code adoption process plays in allowing for water efficiency requirements to become integrated into systems of government. It is evident that water efficiency professionals can and should apply their efforts toward adoption of new and more water efficient requirements into codes affecting their local service area/jurisdiction. Whether it is lobbying for legislation, contributing to a TAC, or providing public comment, the path to codifying water efficiency requirements is a path to increased resource sustainability.

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