



STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

1500 Jefferson Street SE • P.O. Box 41449 • Olympia, Washington 98501
(360) 407-9277 • fax (360) 586-9088 • e-mail sbcc@des.wa.gov • www.sbcc.wa.gov

Final Cost Benefit Analysis for the 2021 Uniform Plumbing Code

I. Code Adoption and Significant legislative Rules

1. Introduction

The Washington State Building Code Council (SBCC) is required to adopt and maintain the state building code, as provided in chapters 19.27, 19.27A, and 70.92 RCW, and the state legislature. The primary objective of the Council is to encourage consistency in the building code throughout the state of Washington and to maintain the building code consistent with the state's interest as provided in RCW 19.27.020. The statewide code adoption process is defined in WAC 51-04 and the Council by-laws. Since 1985, the Council has been responsible for the adoption to update to new editions of the model codes per RCW 19.27.074, including the Uniform Plumbing Code (UPC). The UPC is updated every three years by the International Association of Plumbing & Mechanical Officials (IAPMO). The code development process conducted by the model code organization is open to all interest groups within the design and construction industry and from governmental organizations.

The Council adopts the building codes in accordance with the Administrative Procedures Act (APA). The general procedures for rulemaking are laid out in part III of the Act (RCW 34.05.310 through RCW 34.05.395). Administrative rules governing the procedures for agency rulemaking have been adopted by the Office of the Code Reviser and are found at WAC 1-21-005 through WAC 1-21-180.

2. Adoption of 2021 International Residential Code

The Council is filing a **final** rule to adopt the 2021 edition of the Uniform Plumbing Code (UPC), WAC 51-56. The Preproposal Statement of Inquiry (CR 101) to initiate the development of the 2021 UPC, as adopted through WAC 51-56, was filed as WSR 22-02-060 on January 4, 2022. **The proposed rule (CR-102) to adopt the 2021 UPC with State Amendments was files as WSR 22-17-153 on August 23, 2022.**

On February 18, 2022, the Council opened a submittal period for proposals for statewide amendments to the 2021 UPC. All stakeholders and interested parties could submit proposals to meet the legislative goals. All proposals are submitted in writing on the appropriate form with the indicated supporting documentation. Each proponent is required to identify if the proposed amendment has an economic impact and estimate the costs and savings of the proposal on construction practices, users and/or the public, the enforcement community, and operation and maintenance.



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The Council has adopted a definition of cost-effectiveness based on RCW 39.35 as recommended by Department of Commerce. A guide on how to evaluate cost-effectiveness is therefore defined by the Council as a code change that has a net present savings over a 50-year life cycle of a building utilizing the Life Cycle Cost Tool (LCCT) as developed by the Washington State Office of Financial Management (OFM). The methodology of the LCCT is based on the NIST Handbook 135 methodology and utilizes specific inputs as determined by the Council with guidance from the Washington State Department of Commerce. The cost effectiveness analysis uses the average useful life years from Appendix 7 of the BOMA Preventive Maintenance Guidebook for all building components that are evaluated. Each submitted code change proposal that is not editorial or explanatory is required to include this analysis. The proponents are also allowed to use an alternate cost benefit analysis.

In considering amendments to the model code, the Council established and consulted with a technical advisory group (TAG), including representatives of appropriate state agencies, local governments, general contractors, building owners and managers, design professionals, utilities, and other interested parties. The TAG was tasked with reviewing the proposals, identifying pros and cons and whether it helped achieve the broader goals of ensuring buildings and facilities constructed in the state are safe and healthy for building occupants, accessible to persons with disabilities and the elderly, and energy efficient. The TAG also discussed whether modifications were needed to ensure the provisions were correlated with other requirements, technically feasible, commercially available, and cost-effective to building owners and tenants, or if changes were necessary to mitigate any disproportionate impact on small business.

Six proposals were submitted during the submittal period. After hours of discussions, the TAG recommended approval of three proposals as submitted or as modified. The Council approved four proposals to be included in the CR-102. Only one proposal was identified by the proponent and the TAG as having a cost (increase). However, staff research showed that Proposal #21-GP2-100 is necessary to avoid conflicts between the International Building Code and the Uniform Plumbing Code. It increases the construction cost compared to the existing requirements in UPC. However, both codes apply to new construction, and if there is a conflict between IBC and UPC, the more stringent requirement would apply. Therefore, the cost will be driven by the IBC with or without 21-GP2-100.

The proposed rule adopts by reference the 2021 UPC with new and existing amendments. Many of the existing amendments are modified to incorporate changes to the model codes or to clarify language. There are three significant changes to the model code with economic impact. However, the model code changes are exempt under RCW 19.85.025(3) and RCW 34.05.310 (4)(c), and are not part of this analysis.



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The public hearing process consists of a public comment period and public hearings. The Council received written comments between August 23, 2022, and October 14, 2022. Oral testimony was received at two public hearings – one in Yakima (September 30, 2022) and one in Olympia (October 14, 2022). After the public hearings, the Council held a work session to review testimony and receive clarification on issues raised by Council members. The Council recommended several modifications to the initial proposal; the 2021 IRC with State amendments, as modified, was adopted at the meeting on November 18, 2022.

The local enforcement authority having jurisdiction administers the codes through the building and/or fire departments. Administrative procedures for state building code compliance are established and will not be changed by the adoption of the 2021 UPC. All businesses, including small businesses, will employ the same types of professional services for the design and construction of buildings and systems to comply with the state building code. The proposed rule updates the state building code and does not require additional equipment, supplies, labor, or other services. Services needed to comply with the building code are existing within the construction industry as required by the local authority having jurisdiction.

The proposed rule makes the UPC consistent with national standards. Businesses with new products or updated test or design standards are recognized in the updated building code. The update will result in some cost outlay for some businesses for specific building projects, for a transition period. Other businesses would see an increase in revenue. The primary intent of the amendments is to improve the safety features in buildings and provide consistency and fairness across the state, for a predictable business environment. The amendments should result in enhanced safety and value in buildings.

II. Code Proposals Identified as Significant.

1. Summary of Probable Benefits vs Probable Costs.

Only Proposal #21-GP2-100 was identified by the proponent and the TAG as having a cost increase. However, staff research showed that Proposal #21-GP2-100 is necessary to avoid conflicts between the International Building Code and the Uniform Plumbing Code. It increases the construction cost compared to the existing requirements in UPC. However, both codes apply to new construction, and if there is a conflict between IBC and UPC, the more stringent requirement would apply. Therefore, the cost will be driven by the IBC with or without 21-GP2-100.



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2. List of Code Proposals.

Date: 3/28/2022

Log # [21-GP2-021R](#)

Proponent and description: *City of Bellevue – D. Keith Nicholson; 2021 UPC Section 608.5 – Discharge Piping*

Compliance with RCW 34.05.328 Significant legislative rules, other selected rules

(1)(a) Clearly state in detail the general goals and specific objectives of the statute that the rule implements

[RCW 19.27.020 - Purposes—Objectives—Standards.](#)

The purpose of this chapter is to promote the health, safety and welfare of the occupants or users of buildings and structures and the general public by the provision of building codes throughout the state. Accordingly, this chapter is designed to effectuate the following purposes, objectives, and standards:

- (1) To require minimum performance standards and requirements for construction and construction materials, consistent with accepted standards of engineering, fire and life safety.
- (2) To require standards and requirements in terms of performance and nationally accepted standards.
- (3) To permit the use of modern technical methods, devices and improvements.
- (4) To eliminate restrictive, obsolete, conflicting, duplicating and unnecessary regulations and requirements which could unnecessarily increase construction costs or retard the use of new materials and methods of installation or provide unwarranted preferential treatment to types or classes of materials or products or methods of construction.
- (5) To provide for standards and specifications for making buildings and facilities accessible to and usable by physically disabled persons.
- (6) To consolidate within each authorized enforcement jurisdiction, the administration and enforcement of building codes.



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(1)(b) Determine that the rule is needed to achieve the general goals and specific objectives stated under (a) of this subsection, and analyze alternatives to rule making and the consequences of not adopting the rule:

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(1)(d) Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented:

The proposed amendment provides a safe drainage of the T&P relief termination. Retaining full size and avoiding a reduction from crimping or crushing of the T&P line. A catastrophic event can occur with a crimped or crushed relief drain.

The proposed amendment is needed to address a critical life/safety need, and to clarify the intent of the code. There is no economic impact and construction cost associated with it.

(1)(e) Determine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection:

There are no alternatives to this procedure. If the rule is not adopted, this will be a violation of the State Law, which will affect the promotion of fire and life safety in buildings consistent with accepted standards.

(1)(f) Determine that the rule does not require those to whom it applies to take an action that violates requirements of another federal or state law:



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The primary objective of the Council is to encourage consistency in the building code throughout the state, and to maintain the building code consistent with the state's interest. The rule does not require those to whom it applies to take an action that violates requirements of another federal or state law.

(1)(g) Determine that the rule does not impose more stringent performance requirements on private entities than on public entities unless required to do so by federal or state law:

The adoption and amendment of the 2021 UPC do not impose more stringent performance requirements on private entities than on public entities.

(1)(h) Determine if the rule differs from any federal regulation or statute applicable to the same activity or subject matter and, if so, determine that the difference is justified by the following:

This does not differ from any federal regulations or statute applicable to the same activity.

(1)(i) A state statute explicitly allows the agency to differ from federal standards; or

(1)(ii) Substantial evidence that the difference is necessary to achieve the general goals and specific objectives stated under (a) of this subsection; and

(1)(iii) Coordinate the rule, to the maximum extent practicable, with other federal, state, and local laws applicable to the same activity or subject matter.



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Date: 4/07/2022

Log # [21-GP2-038](#)

Proponent and description: *Ed Holmes; 2021 UPC Appendix M – Peak Water Demand Calculator*

Compliance with RCW 34.05.328 Significant legislative rules, other selected rules

(1)(a) Clearly state in detail the general goals and specific objectives of the statute that the rule implements

[RCW 19.27.020 - Purposes—Objectives—Standards.](#)

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- (3) To permit the use of modern technical methods, devices and improvements.
- (4) To eliminate restrictive, obsolete, conflicting, duplicating and unnecessary regulations and requirements which could unnecessarily increase construction costs or retard the use of new materials and methods of installation or provide unwarranted preferential treatment to types or classes of materials or products or methods of construction.
- (5) To provide for standards and specifications for making buildings and facilities accessible to and usable by physically disabled persons.
- (6) To consolidate within each authorized enforcement jurisdiction, the administration and enforcement of building codes.

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(1)(d) Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented:

Proposal for adoption of Appendix M, Peak Water Demand Calculator in the Washington state plumbing code. This appendix is adopted as optional, not mandatory, allowing use of its provisions and guidance in the installation and sizing of potable water distribution systems within the state.

The proposed amendment is needed to address a critical life/safety need, and to clarify the intent of the code. There is no economic impact and construction cost associated with it.

(1)(e) Determine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection:

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(1)(f) Determine that the rule does not require those to whom it applies to take an action that violates requirements of another federal or state law:

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interest. The rule does not require those to whom it applies to take an action that violates requirements of another federal or state law.

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(1)(h) Determine if the rule differs from any federal regulation or statute applicable to the same activity or subject matter and, if so, determine that the difference is justified by the following:

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Date: 5/24/2022

Log # [21-GP2-057](#)

Proponent and description: *WABO – Micah Chappell; 2021 UPC Section 913 – Air Admittance Valve*

Compliance with RCW 34.05.328 Significant legislative rules, other selected rules

(1)(a) Clearly state in detail the general goals and specific objectives of the statute that the rule implements

[RCW 19.27.020 - Purposes—Objectives—Standards.](#)

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(1)(d) Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented:

The proposed amendment would allow air-admittance valves within the UPC.

The proposed clarifies the intent of the code. It is proposed as optional; there is no economic impact and construction cost associated with it.

(1)(e) Determine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection:

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Date: 2/14/2022

Log # [21-GP2-100](#)

Proponent and description: *WABO – Jon Siu; 2021 UPC Chapter 11 – Secondary Roof Drain Sizing*

Compliance with RCW 34.05.328 Significant legislative rules, other selected rules

(1)(a) Clearly state in detail the general goals and specific objectives of the statute that the rule implements

[RCW 19.27.020 - Purposes—Objectives—Standards.](#)

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(1)(d) Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented:

This proposal aligns the UPC with the requirements for rain loading on roofs in ASCE 7, and with the 2021 IBC rain load requirements. Without this change, secondary drainage systems could be undersized, which could result in damage to roofs and possibly, collapse.

ASCE 7-16 Section 8.2 requires secondary drainage systems to be designed for a shorter-duration, more intense rainstorm (15-minute duration/100-year return period) than the primary drain systems (60-minute duration/100-year return period). The UPC sizing tables and rainfall rate maps in the 2021 IBC are based on the 60-minute/100-year event. Because the 15-minute/100-year rate works out to about double the 60-minute/100-year rate, 2021 IBC Section 1611.1 allows the designer to use twice the mapped rates in the code.

The exceptions allow the secondary drainage system to be designed for the normal rainfall rate (60-minute/100-year event) if the roof structure is designed to sustain the additional loads resulting from the larger event (either double the rainfall rate, or the specific 15-minute/100-year rainfall rate for the locality), taking the smaller drains into account. In this case, the rainwater will accumulate above the secondary drains since the secondary drains are not sized for the larger storm. The roof structure will then need to be analyzed for ponding instability to verify the additional loads will not induce progressive deflection (ponding instability), and that the structure's strength is adequate to resist the additional loads (per ASCE 7-16 Section 8.4). As a note, mapped 15-



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minute/100-year rainfall rates are not readily available for many parts of Washington State, so while NOAA has documents that describe how to calculate the rate, engineers may want to rely on the doubled rainfall rate in their analysis.

Note that the current code requires doubling the rainfall rate for vertical leaders that receive water from a combined primary and secondary drain systems (2021 UPC Section 1101.12.2.2.2). Since this pipe is already appropriately sized, it is not necessary to change the requirements in that section.

Based on conversations with colleagues who enforced the UPC, structural engineers and plumbing system designers rarely, if ever, coordinate on issues such as this. Therefore, the prescriptive portion of this proposal simplifies design, construction, and enforcement by requiring the secondary drain systems to be designed for twice the normal rainfall rate. This requirement carries through from the secondary drain on the roof all the way to the discharge. Most plumbing designers will use the rainfall rates in UPC Appendix D and the tables in Chapter 11 rather than consulting with the structural engineer or the IBC, so this proposal will ensure that the secondary drainage systems are properly sized and will avoid conflicts between codes. If the plumbing system designer does not want to size secondary systems based on double the normal rainfall rate, an engineered solution will be necessary, and the exceptions will require collaboration between the structural engineers and the plumbing system designers—preferably before the roof structure design is complete.

Construction Cost: *Unable to determine. Among other factors, it will depend on the size of the building (more stories => spread out the cost over more square footage or more units), the number of secondary roof drains required (which depends on the size of the roof), size of piping, and separate vs combined primary & secondary drainage systems.*

There are too many variables (design options) to give a “correct” answer. One option is to increase the pipe size. Going from a 3” PVC pipe to a 4” PVC pipe (one option) is estimated to be an increase of 27% for each lineal foot of pipe for the secondary system (based on Home Dept costs for Schedule 40 pipe). If the primary and secondary drainage systems combine into a single vertical leader (a common design), the vertical leader is already required to be sized for twice the rainfall rate, so any increase in cost will be confined to the cost of horizontal piping of the secondary drainage system. However, the total increase in cost is likely to be a very small fraction of the overall cost of the building.

Code Enforcement: *This will depend on how strictly the code is enforced. Some jurisdictions do more than others. If everything is enforced, the increase in time should*



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be minimal—just comparing the callouts for the pipe sizes or number of roof drains to the code requirements. Inspection should be minimal as well—expect to see a larger pipe or more pipes for secondary drains.

Note that the simplification in this proposal will result in the elimination of a potential increase in work for both structural plan reviewers and structural design engineers. Without this change, if IBC Section 1611.1 and ASCE 7-16 Section 8.2 were to be strictly enforced, the structural plan reviewers would need to ask the structural design engineer to provide ponding calculations because the secondary roof drain system would likely be designed for the 60/100 rainfall rate in the UPC.

Small Business Impact: *This will depend on whether the small business owns the building or leases. If leases, any increase will be buried in the lease cost but shared with other tenants. If they own the building, they will have to pick up the costs. However, as noted above, the cost increase will be minimal compared to the overall construction costs.*

Housing Affordability: *Similar to small business impacts. If the building is primarily residential, this will mostly affect larger buildings with flat roofs. More apartments in the building => more sharing of the cost. Given the overall cost increase is minimal, the impacts to housing affordability should be minimal.*

Other: *As with many other structure-related regulations, the benefits will only be realized by building owners if there is a large event—in this case, a very large rain event over a short period of time, combined with clogging of the primary drain system. If the secondary drains are under-designed, they will not be able to drain the roof fast enough, and ponding may cause damage to the roofing and the roof structure. In extreme cases, roofs have collapsed from ponding.*

Council Staff Research: *Only Proposal #21-GP2-100 was identified by the proponent and the TAG as having a cost increase. However, staff research showed that this proposal is necessary to avoid conflicts between the International Building Code and the Uniform Plumbing Code. It increases the construction cost compared to the existing requirements in UPC. However, both codes apply to new construction, and if there is a conflict between IBC and UPC, the more stringent requirement would apply. Therefore, the cost will be driven by the IBC with or without 21-GP2-100.*

(1)(e) Determine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it



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that will achieve the general goals and specific objectives stated under (a) of this subsection:

There are no alternatives to this procedure. If the rule is not adopted, this will be a violation of the State Law, which will affect the promotion of fire and life safety in buildings consistent with accepted standards.

(1)(f) Determine that the rule does not require those to whom it applies to take an action that violates requirements of another federal or state law:

The primary objective of the Council is to encourage consistency in the building code throughout the state, and to maintain the building code consistent with the state's interest. The rule does not require those to whom it applies to take an action that violates requirements of another federal or state law.

(1)(g) Determine that the rule does not impose more stringent performance requirements on private entities than on public entities unless required to do so by federal or state law:

The adoption and amendment of the 2021 UPC do not impose more stringent performance requirements on private entities than on public entities.

(1)(h) Determine if the rule differs from any federal regulation or statute applicable to the same activity or subject matter and, if so, determine that the difference is justified by the following:

This does not differ from any federal regulations or statute applicable to the same activity.

(1)(i) A state statute explicitly allows the agency to differ from federal standards; or

(1)(ii) Substantial evidence that the difference is necessary to achieve the general goals and specific objectives stated under (a) of this subsection; and

(1)(iii) Coordinate the rule, to the maximum extent practicable, with other federal, state, and local laws applicable to the same activity or subject matter.



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3. Modifications Made to CR-102

3.1 Modifications Made to Proposals

3.1.1

Log # [21-GP2-057](#)

Proponent and description: WABO – Micah Chappell; 2021 UPC Section 913 – Air Admittance Valve

The proposal language was removed after the public comment period and the public hearings and approved by the Council. During the Council meeting it was decided that the benefit of these devices was overshadowed by the detriment to the health for the occupants of structures employing them. There is no intended change in regulatory effect; there is no need for modifications to the preliminary cost benefit analysis.