

GEW39-11

603.1.1.1

Proponent: Bob Beauregard, American Public Gas Association, representing self (bbeauregard@apga.org), Bruce Swiecicki, P.E., National Propane Gas Association, representing self; (bswiecicki@npga.org)

Revise as follows:

603.1.1.1 zEPI determination. *Building zero energy performance index (zEPI) shall be determined in accordance with Section 603.3 and Equation 6-3.*

$$zEPI = 57 \times (PD - RE - WE) / RD \quad \text{(Equation 6-3)}$$

Where:

~~PD = Total annual energy delivered to~~ Annual energy use of the proposed design and consumed on site, as determined in accordance with Section 603. ~~Energy and power delivered from offsite sources shall be converted using Tables 603.1.1(1) and 603.1.1(2).~~

~~RE = Total annual energy savings from renewable energy derived on site~~

~~RD = Total annual energy used by~~ Annual energy use of a standard reference design, determined in accordance with Section 603

~~WE = Total annual energy savings from waste energy recovery~~

~~PD, RE, RD and WE~~ shall all be expressed in consistent units of energy in accordance with Section 603.1.1.

Reason: This revision corrects the incorrect and biased equation that double-counts renewable energy and waste energy in the zEPI determination. It also provides proper linkage with annual energy use as defined in Section 603.1.1. The reference to Tables 603.1.1 reinforces the underlying philosophy that all energy used by the building and not only that which is consumed on site, should be accounted for.

Section 603.1.1 currently contains inconsistent definitions for energy use. The intent of zEPI is to count total “net” annual energy use for fuels and electricity at the utility meter, which becomes the portion of the energy “covered by this code”. This means that “annual energy use” as defined in Section 603.1.1 is not the energy used for building functions “consumed on site” that does include the renewable component and waste energy component. Rather it is the building’s energy use after accounting for on-site renewable energy and waste heat recovery (i.e., energy delivered at the meter). For example, photovoltaic panels produce electricity that is used by the building, or under certain circumstances such as net metering, sent back to the grid if not used at that time by the building. Regardless, the effect is to reduce net annual energy delivered at the utility meter.

As “annual energy use” is defined in PV 2.0, RE and WE are already excluded from PD. Yet RE and WE are subtracted again from PD in Equation 6-2, thereby counting the RE and WE savings twice. This is arithmetically incorrect. More importantly, it inappropriately places building energy efficiency measures at an inequitable disadvantage compared to RE and WE measures. The revised equation provides equitable treatment of all energy efficiency options along with renewable energy and waste energy recovery based on their effect on the nation’s primary energy consumption and CO₂e emissions. Otherwise this provision inappropriately and significantly incentivizes designers to incorporate renewables and waste heat recovery options at the expense of more affordable and cost-effective energy efficiency measures that reduce the building energy consumption and peak electric demand by the same amount. This bias increases the cost of the green building without coincident energy or environmental benefit, and should not be inadvertently incentivized in the zEPI determination.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

603.1.1-SWIECICKI-BEAUREGARD

GEW47-11

603.1.1.1

Proponent: Robert L. Beauregard, American Public Gas Association, representing self (bbeauregard@apga.org), Mark E. Krebs, Laclede Gas Company, representing self (MKrebs@lacledegas.com), Neil P. Leslie, P.E., Gas Technology Institute, representing self (Neil.Leslie@gastechnology.org)

Revise as follows:

603.1.1 Annual energy use. The annual energy use shall include all energy used for *building* functions covered by this code minus any renewable energy or *waste energy recovery* savings derived on the site.

603.1.1.1 zEPI determination. *Building zero energy performance index (zEPI)* shall be determined in accordance with Section 603.3 and Equation 6-3.

$$zEPI = 57 \times (PD - RE - WE) / RD \quad \text{(Equation 6-3)}$$

Where:

PD = ~~Total annual energy delivered to~~ Annual energy use of the proposed design and consumed on site, as determined in accordance with Section 603.

RE = ~~Total annual energy savings from renewable energy derived on site~~

RD = ~~Total annual energy used by~~ Annual energy use of a standard reference design, determined in accordance with Section 603

WE = ~~Total annual energy savings from waste energy recovery~~

PD, RE, and RD ~~and WE~~ shall all be expressed in consistent units of energy in accordance with Section 603.1.1.

Reason: This revision corrects the incorrect and biased equation that double-counts renewable energy and waste energy in the zEPI determination. It also provides proper linkage with annual energy use as defined in Section 603.1.1.

Section 603.1.1 currently contains inconsistent definitions for energy use. The intent of zEPI is to count total "net" annual energy use for fuels and electricity at the utility meter, which becomes the portion of the energy "covered by this code". This means that "annual energy use" as defined in Section 603.1.1 is not the energy used for building functions "consumed on site" that does include the renewable component and waste energy component. Rather it is the building's energy use after accounting for on-site renewable energy and waste heat recovery (i.e., energy delivered at the meter). For example, photovoltaic panels produce electricity that is used by the building, or under certain circumstances such as net metering, sent back to the grid if not used at that time by the building. Regardless, the effect is to reduce net annual energy delivered at the utility meter.

As "annual energy use" is defined in PV 2.0, RE and WE are already excluded from PD. Yet RE and WE are subtracted again from PD in Equation 6-2, thereby counting the RE and WE savings twice. This is arithmetically incorrect. More importantly, it inappropriately places building energy efficiency measures at an inequitable disadvantage compared to RE and WE measures. The revised equation provides equitable treatment of all energy efficiency options along with renewable energy and waste energy recovery based on their effect on the nation's primary energy consumption and CO_{2e} emissions. Otherwise this provision inappropriately and significantly incentivizes designers to incorporate renewables and waste heat recovery options at the expense of more affordable and cost-effective energy efficiency measures that reduce the building energy consumption and peak electric demand by the same amount. This bias increases the cost of the green building without coincident energy or environmental benefit, and should not be inadvertently incentivized in the zEPI determination.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

603.1.1.1-LESLIE-BEAUREGARD-KREBS

GEW220-11

609.12 (New), 609.12.1 (New), 609.12.2 (New)

Proponent: Robert Dewey, representing U.S. Department of Energy (robert.dewey@ee.doe.gov)

Add new text as follows:

609.12 Rough-ins for future photovoltaic systems. Conduit not less than 1-1/2 inch in size shall be installed from the future site for the photovoltaic (PV) system to the main electric service panel or room that provides the electric service for the *building*. Conduit not less than 3/4 inch in size shall be installed to provide for instrumentation wiring.

609.12.1 Main Panel Rating. The main electrical service entrance panel for the *building* shall have a bus bar rating that is at least the sum of the main service entrance over current device rating plus the rating of the output overcurrent device on the photovoltaic system.

609.12.2 Space for future utility interactive inverter. Space for a future utility-interactive photovoltaic inverter shall be identified and reserved.

Reason: To add appropriate provisions for rough-ins for future PV systems.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

609.12 (NEW)-DEWEY

GEW242-11

611.1

Proponent: Amy Costello, P.E., representing Armstrong World Industries, Inc.

Revise as follows:

611.1 Renewable energy systems requirements. *Buildings* that consume energy shall comply with this section. Each *building* or surrounding lot or *building site* where there are multiple *buildings* on the *building site* shall be equipped with one or more renewable energy systems in accordance with this section.

Renewable energy systems shall meet the requirements of Section 611.2 for *solar photovoltaic* systems, Section 611.3 for wind systems, or Section 611.4 for solar water heating systems, and Section 611.5 for performance monitoring and *metering* of these systems as *approved* by the code official. These systems shall be commissioned according to the requirements of Section 612. Where feasible, renewable energy generated shall be used directly at the point of use through direct or distribution to appliances and equipment.

Reason: Adding this new language is important because systems that use direct current (DC) instead of converting direct current to alternative current (AC) save energy associated with the conversion. It is estimated that 10-20% of the total energy provided is lost during the conversion. Low voltage systems that use direct current reduce overall building energy use, work more efficiently with alternative energy sources such as solar and wind energy and reduce the amount of wiring, transformers, etc. required. (References: <http://hightech.lbl.gov/dc-powering/> and <http://www.lbl.gov/Science-Articles/Archive/EETD-DC-power.html>)

Cost Impact: The code change proposal will not increase the cost of construction. It also may reduce the overall operating costs of the building as it uses renewable energy more efficiently.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.1-COSTELLO.doc

GEW243-11

202, 303.2, 611 (New)

Proponent: Dave Hewitt, New Buildings Institute (dave@newbuildings.org); Amy Schmidt, The Dow Chemical Company (ASchmidt4@dow.com)

Revise as follows:

303.2 Additional elective. Where required in accordance with Section 705.1 or Section 611.1 Exception 1, the total number of *project electives* indicated in Table 302.1 shall be increased by one.

Delete Section 611 and substitute as follows:

SECTION 611 BUILDING RENEWABLE ENERGY SYSTEMS

611.1 Renewable energy systems requirements. Each building or building site shall be equipped with one or more renewable energy systems in accordance with Section 611.2 that have the capacity to provide not less than two percent of the annual energy used within the building for mechanical and service water heating equipment and lighting regulated in Chapter 5 of the *International Energy Conservation Code*, and that capacity shall be demonstrated in accordance with Sections 611.1.1 or 611.1.2. These systems shall be metered in accordance with Section 604.4.7.

611.1.1 Building performance-based compliance. Performance-based compliance shall be based on building annual energy use calculations in accordance with Section 603.

611.1.2 Building prescriptive compliance. Prescriptive compliance, shall be based on building annual energy use calculations in accordance with Section 603 or demonstrate that the renewable energy system provides not less than 0.30 watts per square foot of conditioned floor area.

Exceptions:

1. Where it is determined that two percent of the buildings annual energy consumption can not be provided by a renewable energy system or combination of renewable energy systems, the building shall comply with one additional project elective in Section 613.3, Section 613.4, Section 613.6, or Section 613.7. Compliance with the additional elective shall be in addition to any requirements of Table 302.1.
2. Buildings using Section 506.4 to comply with Section 506 of the *International Energy Conservation Code*
3. For building occupancies listed below, where at least ten percent of the *building's* annual estimated hot water energy usage is met by a geothermal or solar water heating systems designed, constructed and installed in accordance with manufacturer's instructions:
 1. Group A-2, Restaurants and Banquet halls.
 2. Group F, Laundries.
 3. Group R-1, Boarding houses (transient), Hotels (transient), Motels (transient).
 4. Group R-2 occupancies.
 5. Group A-3, Health Clubs and Spas.
 6. Group I-2, Hospitals, Mental hospitals and Nursing homes.

611.2 Renewable energy systems. Renewable energy systems shall meet the requirements of Section 611.2.1 roof-mounted *solar photovoltaic panel systems*, Section 611.2.2 site located *photovoltaic panel system*, Section 611.2.3 *building integrated solar photovoltaic systems*, or Section 611.2.4 *wind energy systems*.

611.2.1 Roof-mounted photovoltaic panel systems. Roof-mounted photovoltaic panel systems shall be designed, constructed, and installed in accordance with Section 1509.6 of the International Building Code and NFPA 70.

611.2.2 Site located photovoltaic panel systems. Site located photovoltaic panel systems shall be designed, constructed, and installed in accordance with manufacturer's instructions.

611.2.3 Building integrated solar photovoltaic systems. Building integrated solar photovoltaic systems shall be designed, constructed and installed in accordance with Section 1507.17 of the International Building Code and NFPA 70.

611.2.4 Wind energy systems. Wind energy systems shall be designed, constructed and installed in accordance with manufacturer's instructions.

Delete without substitution:

~~**RENEWABLE ENERGY CREDIT (REC).** A REC represents the property rights to the environmental, social, and other non-power qualities of renewable electricity generation. A REC, and its associated attributes and benefits, is sold separately from the underlying physical electricity associated with an on-site renewable energy source. RECs allow organizations to support renewable energy development and protect the environment where renewable power products are not locally available. There are two approaches to verifying REC ownership and the right to make environmental claims: (1) REC contracts from a list of approved providers, including an audit of the chain of custody; and (2) REC tracking systems.~~

Add new definitions as follows:

BUILDING INTEGRATED PHOTOVOLTAIC (BIPV) SYSTEM. A system that incorporates photovoltaic modules, which convert solar radiation into energy, into the building envelope.

PHOTOVOLTAIC PANEL SYSTEM. A system that incorporates photovoltaic modules, which convert solar radiation into energy, into discrete panels that are installed on a building site or mounted on a building.

SOLAR WATER HEATING SYSTEM. A system that uses solar radiation to heat water to supply or supplement the building's hot water.

WIND ENERGY SYSTEM. A system installed on the building site or on the building that converts wind into energy.

Reason: Renewable Energy Systems are crucial to goals for net zero energy buildings. This proposal rewrites Section 611 Building Renewable Energy Systems of the IGCC Public Version 2.0 in order to bring clarity and enforceability to the use of renewable energy on buildings and building sites. Companion changes to this Section 611 rewrite are required for Chapter 2 Definitions and Section 303.2, which are submitted as part of this proposal.

The following is a breakdown of the reasons for the reorganization of Section 611.

Section 611.1

1. The charging paragraph clearly states that there is a minimum requirement for 2% of the building's energy use for mechanical, lighting, and service water heating to be provided by renewable energy systems, along with a requirement for metering of these systems.
2. Instructions for demonstrating compliance with Section 611.1 are given for both performance and prescriptive compliance paths.

Exceptions:

The first exception recognizes that there are circumstances where the 2% renewable energy minimum cannot be reached. In this case, an additional energy efficiency project elective as listed must be selected. This will ensure that the energy efficiency of the building is not degraded by the unavailability of renewable energy for that project.

The second exception allows the use of the Additional Efficiency Package Option, Section 506.4 On-Site Supply of Renewable Energy to meet the requirements of this section. This option in the IECC requires that 3% of the building's energy use be met by on-site renewable energy.

The third exception is granted to certain occupancies where there are high volume hot water demands. In these cases, if 10% of the hot water in these buildings is met by solar hot water systems, then the 2% minimum for renewable energy is not required. For other occupancies where the hot water demand is relatively low, it would be much more beneficial to provide 2% of their annual energy usage with photovoltaic or wind systems.

Section 611.2

This section describes the various types of renewable energy systems that may be used individually or in combination to satisfy the 2% minimum set forth in Section 611.1. Photovoltaic systems and wind energy systems are the two major types of renewable energy systems included in the IGCC.

Photovoltaic systems are further broken down into three types, each with "pointers" to applicable installation requirements in the International Building Code. Definitions for each type of PV system are proposed for Chapter 2.

Photovoltaic Panels are PV modules incorporated into discrete panels that are installed either on the building or on the building site. In the case of roof top mounted systems, installation details are listed in Section 1509.6 of the IBC. Panels located on the building site are installed in accordance with the manufacturer's installation instructions.

Building integrated photovoltaic systems (BIPV) are PV modules incorporated into the building envelope such that, in the case of roof BIPV, the system not only generates electricity but also forms the roof covering. Because these products provide dual function, BIPV installation must also meet roof covering requirements found in Section 1507.17 of the IBC.

Wind energy systems are recognized as another renewable energy source and must be placed in accordance with the manufacturer's installation instructions.

This proposal deletes the opportunity to offset the use of renewable energy by purchasing Renewable Energy Credits (RECs). This deletion is based on the fact that RECs are not uniformly regulated or available. There is also considerable controversy over their ability to equally reduce a building's carbon footprint. Therefore they should not be included as an exception for renewable energy systems at this time because a commitment to purchase RECs would in many cases be unenforceable and would not demonstrate equivalence with the energy options in the section.

Chapter 2:

Definitions are added to Chapter 2 to distinguish between the different types of renewable energy systems available in the marketplace. The definition for Renewable Energy Credit (REC) has been deleted.

Section 303.2

The revision to Section 303.2 Additional Elective, is submitted to require one additional energy project elective from Section 613 for those cases where the minimum 2% renewable energy threshold cannot be met. This requirement will ensure that the energy efficiency of the building will not be degraded because of the unavailability of renewable energy.

Cost Impact: Increase enforceability of this Section of the IGCC.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

REC-SCHMIDT-HEWITT

GEW244-11

611.1, 611.5 (New)

Proponent: Thomas Phillips, Target Corporation (Thomas.Phillips@target.com)

Revise as follows:

611.1 Renewable energy systems requirements. *Buildings* that consume energy shall comply with this section. Each *building* or surrounding lot or *building site* where there are multiple *buildings* on the *building site* shall be equipped with one or more renewable energy systems in accordance with this section. Renewable energy systems shall meet the requirements of Section 611.2 for *solar photovoltaic* systems, Section 611.3 for wind systems, ~~or~~ Section 611.4 for solar water heating systems, Section 611.5 for alternative renewable energy systems, and Section 611.6 for performance monitoring and *metering* of these systems as *approved* by the code official. These systems shall be commissioned according to the requirements of Section 612.

Exceptions:

1. *Buildings* or *building sites* where there are multiple *buildings* on the *building site* providing at least two percent of the total estimated annual energy use of the *building*, or collective *buildings* on the site, with on-site renewable energy using a combination of renewable energy generation systems meeting the requirements of Section 611.2, 611.3, ~~or~~ 611.4, or 611.5.
2. Where not less than four percent of the total annual *building* energy consumption from renewable generation takes the form of a ten-year commitment to *renewable energy credit* ownership, confirmed by the code official.
3. Where the combined application of on-site generated renewable energy and a commitment to *renewable energy credit* ownership as confirmed by the code official, totals not less than four percent of the total annual *building* energy consumption from renewable generation.
4. Where the building's energy consumption is reduced by four percent beyond the adopted energy code of the jurisdiction as determined by the registered design professional.

611.1.1 Building performance-based compliance. *Buildings* and surrounding property or *building sites* when there are multiple *buildings* on the *building site*, that seek compliance with this code in accordance with Section 602.3.2, performance-based compliance, shall be equipped with one or more renewable energy systems that have the capacity to provide not less than two percent of the total calculated annual energy use of the *building*, or collective *buildings* on the site, with on-site renewable energy in accordance with Section 603.

611.1.2 Building prescriptive compliance. *Buildings* and surrounding property or *building sites* where there are multiple *buildings* on the *building site*, that seek compliance with this code in accordance with Section 602.3.1, Prescriptive compliance, shall be equipped with one or more renewable energy systems that have the capacity to provide not less than two percent of the total estimated annual energy use of the *building*, or collective *buildings* on the *building site*, with on-site renewable energy by calculation demonstrating that on-site renewable energy production has a rating of not less than 1.75 *Btu/hr* or not less than 0.50 watts per square foot of conditioned floor area, and using any single or combination of renewable energy generation systems meeting the requirements of Sections 611.2, 611.3, ~~or~~ 611.4, or 611.5.

611.5 Alternative renewable energy systems. Alternative renewable energy systems shall be designed, constructed and sized to provide not less than two percent of the total estimated annual electric energy consumption of the *building*, or collective *buildings* on the *building site* in accordance with Section 611.1.1 or 611.1.2.

611.5 611.6 Renewable energy system performance monitoring and metering. Renewable energy systems shall be *metered* and monitored in accordance with Sections ~~611.5.1~~ 611.6.1 and ~~611.5.2~~ 611.6.2.

(Renumber subsequent sections)

Reason: There is a need to include alternative renewable energy systems such as geothermal , or hydro-based power. Adding section 611.5 resolves this need.

Section 611.1, Exception 4 is proposed to recognize that small scale solar arrays, turbines or alternative renewable systems may not be economical to install or maintain, and may not be appropriate for many buildings, particularly in urban areas where shading or wind speed is limited, and alternative renewable methods are nearly impossible to install. Providing this exception allows another compliance path which decreases overall carbon footprint more than the addition of a renewable on site, similar to Exception 2.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.1-PHILLIPS.doc

GEW246-11

202, 303.2, 611 (New), 611.1 (New), 611.1.1 (New), 611.1.2 (New), 611.2 (New), 611.2.1 (New), 611.2.2 (New), 611.2.3 (New), 611.2.4 (New), 611.2.5 (New)

Proponent: Dan Adamson, Solar Energy Industries Association (ccovington@seia.org)

Revise as follows:

303.2 Additional elective. Where required in accordance with Section 705.1 or Section 611.1 Exception 1, the total number of *project electives* indicted in Table 302.1 shall be increased by one.

Delete and substitute as follows:

~~**SECTION 611
BUILDING RENEWABLE ENERGY SYSTEMS**~~

**SECTION 611
BUILDING RENEWABLE ENERGY SYSTEMS**

611.1 Renewable energy systems requirements. Each building or building site shall be equipped with 1 or more renewable energy systems in accordance with Section 611.2 that have the combined capacity to provide at least 2 percent of the annual energy use of the building or building site. These systems shall be metered in accordance with Section 604.4.7.

611.1.1 Building performance-based compliance. Performance-based compliance shall be based on building annual energy use calculations in accordance with Section 603.

611.1.2 Building prescriptive compliance. Prescriptive compliance shall be based on building annual energy use calculations in accordance with Section 603 or demonstrate that the renewable energy system provides not less than 1.75 btu/hr or not less than 0.50 watts per square foot of conditioned floor area.

Exceptions:

1. Where it is determined that 2 percent of the building's annual energy consumption cannot be provided by a renewable energy system or combination of renewable energy systems, the building shall comply with one additional project elective from Section 613. This shall be in addition to the requirements of Table 302.1.
2. Where not less than 4 percent of the total annual building energy consumption from renewable generation takes the form of a ten-year commitment to a certified or verified renewable energy credit ownership, confirmed by the code official.
3. Where the combined application of on-site generated renewable energy and a 10 year commitment to a certified or verified renewable energy credit ownership as confirmed by the code official, totals not less than 4 percent of the total annual building energy consumption from renewable generation.

611.2 Renewable energy systems. Renewable energy systems shall meet the requirements of Section 611.2.1 roof-mounted *solar photovoltaic systems*, Section 611.2.2 site-located *photovoltaic system*, Section 611.2.3 *building-integrated solar photovoltaic systems*, Section 611.2.4 *wind energy systems*, or Section 611.2.5 *solar thermal systems*.

611.2.1 Roof-mounted photovoltaic systems. Roof-mounted *photovoltaic systems* shall be designed, constructed, and installed in accordance with Section 1509.6 of the *International Building Code* and *NFPA 70*.

611.2.2 Site-located photovoltaic systems. Site-located photovoltaic systems shall be designed, constructed, and installed in accordance with manufacturer's instructions.

611.2.3 Building-integrated photovoltaic systems. Building-integrated solar photovoltaic systems shall be designed, constructed and installed in accordance with Section 1507.17 of the International Building Code and NFPA 70.

611.2.4 Wind energy systems. Wind energy systems shall be designed, constructed and installed in accordance with manufacturer's instructions.

611.2.5 Solar thermal systems. Solar thermal systems shall be designed, constructed, and installed in accordance with the International Mechanical Code Chapter 14.

Add new definitions as follows:

SECTION 202 DEFINITIONS

BUILDING-INTEGRATED PHOTOVOLTAIC (BIPV) SYSTEM. A system that incorporates photovoltaic modules, which covert solar radiation into energy, into the building envelope.

PHOTOVOLTAIC SYSTEM. A complete set of components for converting sunlight into electricity by the photovoltaic process, including the photovoltaic equipment and balance of system and tracking components. A photovoltaic system includes either flat-plate photovoltaic equipment or concentrating photovoltaic equipment.

SOLAR THERMAL SYSTEM. A system that uses solar energy to provide space heating or cooling, hot water heating, swimming pool heating, or process heating.

SOLAR WATER HEATING SYSTEM. A system that uses solar radiation to heat water to supply or supplement the building's hot water.

WIND ENERGY SYSTEM. A system installed on the building site or on the building that uses a wind turbine to convert wind energy into electricity.

Reason: Renewable Energy Systems are crucial to our goal for net zero energy buildings. This proposal rewrites Section 611 Building Renewable Energy Systems of the IGCC Public Version 2.0 in order to bring clarity and enforceability to the use of renewable energy on buildings and building sites. Companion changes to this Section 611 rewrite requires additions for Chapter 2 Definitions and Section 303.2, which are submitted as part of this proposal.

The following is a breakdown of the reasons for the reorganization of Section 611.

Section 611.1

1. The charging paragraph clearly states that there is a minimum of 2% of the buildings energy use to be provided by renewable energy systems, along with a requirement for metering of these systems.
2. Instructions for demonstrating compliance with Section 611.1 is given for both performance and compliance paths.
3. Exceptions:

The first exception recognizes that there are circumstances where the 2% renewable energy minimum cannot be reached. In this case, an additional project elective shown in Section 613 must be selected. This will ensure that the energy efficiency of the building is not degraded by the unavailability of renewable energy for that project.

The second and third exceptions recognize the use of Renewable Energy Credits as a means to comply with this section

Section 611.2

This section describes the various types of renewable energy systems that may be used individually or in combination to satisfy the 2% minimum set forth in Section 611.1. Solar systems and wind energy systems are the two major types of renewable energy systems included in the IGCC.

Photovoltaic systems are further broken down into three types, each with "pointers" to applicable installation requirements in the International Building Code. Definitions for each type of Photovoltaic System are proposed for Chapter 2. As the purpose of the IGCC is to serve as an overlay code, detailed installation requirements are not required.

The insulation requirement is removed to encourage the use of solar photovoltaic technology in all geographic areas. The performance verification requirements have been removed, as duplicative of the metering requirements. Additionally, methods of verification are inconsistent and difficult to enforce.

Building-integrated photovoltaic systems (BIPV) are PV modules incorporated into the building envelope such that, in the case of roof BIPV, the system not only generates electricity but also forms the roof covering. Because these products provide dual function, BIPV installation must also meet roof covering requirements found in Section 1507.17 of the IBC.

Wind energy systems are recognized as another renewable energy source and must be placed in accordance with the manufacturer's installation instructions.

Solar thermal systems are recognized as a source of space heating or cooling, and for hot water heating. Solar thermal systems must be installed in accordance with the applicable codes, incorporated by reference.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.1-ADAMSON

GEW247-11

611.2.1, 611.2.1.2 (New), 611.3.1.3

Proponent: Jonathan Siu, representing City of Seattle Department of Planning & Development (jon.siu@seattle.gov)

Revise as follows:

611.2.1 Requirements. The installation, inspection, maintenance, repair and replacement of *solar photovoltaic systems* and all system components shall comply with the manufacturer's instructions, Sections 611.2.1.1 through ~~611.2.1.4~~ 611.2.1.2, and NFPA 70.

611.2.1.2 Solar photovoltaic modules. Solar photovoltaic modules shall be listed and labeled in accordance with UL 1703.

~~**611.3.1.3 Solar photovoltaic modules.** Solar photovoltaic modules shall be listed and labeled in accordance with UL 1703.~~

Reason: As written in PV2, the requirement for solar photovoltaic modules is mislocated in the section relating to wind energy systems. This proposal relocates the requirement to the appropriate section that actually relates to solar photovoltaic systems.

A very acceptable modification the Committee could approve would be to delete Section 611.3.1.3 without replacement (i.e., delete the added Section 611.2.1.2 in the proposal). The IGCC is an overlay code, meaning the requirements in the other I-codes still apply. In the 2009/2010 code cycle the same requirement for listing of photovoltaic panels was introduced into the IBC and IRC through code change proposal S22-09/10. The entire item was approved as modified by the committee (the section on the listing requirement was not modified), and the item did not receive a public comment. Since it will be included in the 2012 editions of the IBC and IRC, the requirement is covered there, and it is not necessary to include it in the IGCC.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611-SIU

GEW248-11

611.2, 611.2.1, 611.2.1.1, 611.2.2

Proponent: Robert J. Davidson, Davidson Code Concepts, LLC, representing self
(rjd@davidsoncodeconcepts.com)

Revise as follows:

611.2 Solar photovoltaic systems. *Solar photovoltaic* systems shall be designed, constructed and sized to provide not less than two percent of the total estimated annual electric energy consumption of the *building*, or collective *buildings* on the *building site* ~~in accordance with Section 611.1.1 or 611.1.2.~~

Exception: Solar photovoltaic systems are not permitted to be used to comply with section 611.1 where building sites with total global insolation levels lower than 2.00 kwh/m2/day as calculated in accordance with NREL SERI TR-642-761.

611.2.1 Requirements. ~~The installation, inspection, maintenance, repair and replacement of *solar photovoltaic systems* and all system components shall comply with the manufacturer's instructions, Sections 611.2.1.1 through 611.2.1.4, and NFPA 70.~~

611.2.1.1 Roof-mounted solar photovoltaic systems. ~~Where *solar photovoltaic systems* are installed on roofs, the roof shall be constructed to support the loads imposed by such modules. *Solar photovoltaic systems* and supporting structure shall be constructed of noncombustible materials or fire-retardant-treated wood equivalent to that required for the roof construction. Not less than four feet of clearance shall be provided between any portion of a roof-mounted *solar photovoltaic* array and roof-mounted equipment, *skylights*, access hatches and similar *building* components that could hinder access to the *solar photovoltaic* array.~~

611.2.2 611.2.1 Performance verification. *Solar photovoltaic* systems shall be tested upon installation to verify that the installed performance meets the design specifications. A report of the tested performance shall be provided to the *building* owner.

Reason: The installation of solar photovoltaic systems is regulated by the International Building Code, the International Fire Code and NFPA 70, all three of which comprise a typical construction code. (For those jurisdictions that utilize the NFPA 1 Fire Code, similar language is being added to that code).

Since the installation requirements, including structural, electrical, marking and clearance paths on roofs is covered by those codes, there is no need for the language proposed for strike out and deleting same will eliminate potential conflicts.

The language remaining, i.e., performance level of power generated for sustainability credit, is appropriate for the IgCC.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.2-DAVIDSON

GEW249-11

611.2

Proponent: Robert Dewey, representing U.S. Department of Energy (robert.dewey@ee.doe.gov)

Revise as follows:

611.2 Solar photovoltaic systems. *Solar photovoltaic* systems shall be designed, constructed and sized to provide not less than ~~two~~⁵ percent of the total estimated annual electric energy consumption of the *building*, or collective *buildings* on the *building site* in accordance with Section 611.1.1 or 611.1.2.

Exception: Solar photovoltaic systems are not permitted to be used to comply with section 611.1 where building sites with total global insolation levels lower than 2.00 kWh/m²/day as calculated in accordance with NREL SERI TR-642-761.

Reason: The 2012 IECC contains a provision that requires 3% of the electrical energy to be provided with a PV system as one of three energy efficient options that buildings must meet to comply with the IECC. The 2% in the IgCC could be viewed as a conflict with that provision and at 3% would simply mandate what is one of three options that must be satisfied in the IECC. Inclusion of the 5% ensures there is no conflict with the IECC and provides additional energy efficiency that the IgCC is intended to ensure, but within an upper boundary limit (5%) that is considered reasonable.

Cost Impact: The code change proposal will increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.2-DEWEY

GEW250-11

611.2.1.2(New), 611.2.1.3 (New), 611.2.1.4 (New), 611.3.1.2, 611.3.1.3, 611.3.1.4

Proponent: Kathleen Petrie, representing City of Seattle, Department of Planning and Development (Kathleen.petrie@seattle.gov)

Add new text as follows:

611.2.1.2 Roof and wall penetrations. Roof and wall penetrations shall be flashed and sealed to prevent entry of water, rodents and insects.

611.2.1.3 Solar photovoltaic modules. Solar photovoltaic modules shall be listed and labeled in accordance with UL 1703.

611.2.1.4 Inverters. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

Delete without substitution:

~~**611.3.1.2 Roof and wall penetrations.** Roof and wall penetrations shall be flashed and sealed to prevent entry of water, rodents and insects.~~

~~**611.3.1.3 Solar photovoltaic modules.** Solar photovoltaic modules shall be listed and labeled in accordance with UL 1703.~~

~~**611.3.1.4 Inverters.** Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.~~

Reason: The submittal for comment 6-299 proposed to add new text to section 611.2 that were misnumbered. Proposed sections 611.3.1.2, 611.3.1.3, 611.3.1.4 should have been 611.2.1.2, 611.2.1.3, 611.2.1.4. As a result, 611.3.1.2, 611.3.1.3, 611.3.1.4 were added to section 611.3. Therefore, these sections should be removed from 611.3 and inserted appropriately into 611.2.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

611.2-PETRIE

GEW251-11

611.2.1, 611.2.1.1, 611.2.2

Proponent: Bob Eugene, representing Underwriters Laboratories Inc, and UL Environment Inc (Robert.Eugene@us.ul.com)

Revise as follows:

611.2.1 Requirements. The installation, inspection, maintenance, repair and replacement of *solar photovoltaic systems* and all system components shall comply with the manufacturer's instructions, Sections 611.2.1.1 through ~~611.2.1.4~~, International Fire Code, International Building Code and NFPA 70.

~~**611.2.1.1 Roof-mounted solar photovoltaic systems.** Where *solar photovoltaic systems* are installed on roofs, the roof shall be constructed to support the loads imposed by such modules. Solar photovoltaic systems and supporting structure shall be constructed of noncombustible materials or fire-retardant-treated wood equivalent to that required for the roof construction. Not less than four feet of clearance shall be provided between any portion of a roof mounted *solar photovoltaic* array and roof mounted equipment, *skylights*, access hatches and similar *building* components that could hinder access to the *solar photovoltaic* array.~~

~~**611.2.2**~~ **611.2.1.1 Performance verification.** *Solar photovoltaic* systems shall be tested upon installation to verify that the installed performance meets the design specifications. A report of the tested performance shall be provided to the *building* owner.

Reason: The IGCC is an overlay code for the IBC and the IFC. The 2012 editions of the IBC and IFC have more detailed requirements for the installation, inspection, maintenance, repair and replacement of the solar photovoltaic systems that are roof mounted, ground mounted, and integral with the roof covering.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.2.1-EUGENE

GEW252-11

611.2.1, 611.2.1.1, 611.2.1.2 (New)

Proponent: Bill McHugh, Chicago Roofing Contractors Association

Revise as follows:

611.2.1 Requirements. The installation, inspection, maintenance, repair and replacement of *solar photovoltaic systems* and all system components shall comply with the manufacturer's instructions, requirements of the *International Fire Code, International Building Code Chapter 15 and 16, Sections 611.2.1.1 through 611.2.1.4, and NFPA 70.*

611.2.1.1 Roof-mounted solar photovoltaic systems. Where *solar photovoltaic systems* are installed on roofs, the roof assembly shall be constructed to support the loads imposed by such modules. Solar photovoltaic systems and supporting structure shall be constructed of noncombustible materials or fire-retardant-treated wood equivalent to that required for the roof construction. Not less than four feet of clearance shall be provided between any portion of a roof mounted *solar photovoltaic* array and roof mounted equipment, *skylights*, access hatches and similar *building* components that could hinder access to the *solar photovoltaic* array.

611.2.1.2 Installation, inspection, maintenance and repair. The installation, inspection, maintenance and repair and replacement of building integrated solar photovoltaic systems shall comply with the manufacturers' instructions from the roof covering and solar photovoltaic manufacturer, and requirements of the *International Fire Code, International Building Code, Chapters 15 and 16,*

Reason: The systems installed on the roof comply with the same standards for wind uplift and fire resistance as the rest of the roof assembly components as a system. Firefighters must deal with these systems in a fire event, while the building owner and manager must live with the system for the life of the building as defined by this code.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee:	AS	AM	D
Assembly:	ASF	AMF	DF

611.2.1-McHUGH

GEW253-11

611.2.1

Proponent: Alan Shuman, representing National Association of State Fire Marshals
(ashuman@sfm.ga.gov)

Revise as follows:

611.2.1 Requirements. The installation, inspection, maintenance, repair and replacement of *solar photovoltaic systems* and all system components shall comply with the manufacturer’s instructions, Sections 611.2.1.1 through 611.2.1.4, the *International Fire Code* and NFPA 70.

Reason: The IFC in this cycle included comprehensive requirements for firefighter access to roofs equipped with PV systems, marking of system components, etc. These are firefighter safety criteria that should be referenced in the IGCC, just as the electrical code is referenced.

Cost Impact: This code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.2.1-SHUMAN

GEW254-11

611.2.1, 611.2.1.1

Proponent: Jonathan Siu, representing City of Seattle Department of Planning & Development (jon.siu@seattle.gov)

Revise as follows:

611.2.1 Requirements. The installation, inspection, maintenance, repair and replacement of *solar photovoltaic systems* and all system components shall comply with the manufacturer's instructions, Sections 611.2.1.1 through ~~611.2.1.4~~, and NFPA 70.

611.2.1.1 Roof-mounted solar photovoltaic systems. ~~Where solar photovoltaic systems are installed on roofs, the roof shall be constructed to support the loads imposed by such modules. Solar photovoltaic systems and supporting structure shall be constructed of noncombustible materials or fire-retardant-treated wood equivalent to that required for the roof construction.~~ Not less than 4 feet of clearance shall be provided between any portion of a roof mounted *solar photovoltaic* array and roof mounted equipment, *skylights*, access hatches and similar *building* components that could hinder access to the *solar photovoltaic* array. Access to and around photovoltaic systems shall be provided in accordance with Section 605 of the *International Fire Code*.

Reason: The deletion of the referenced subsections is editorial, since they do not exist in IGCC PV2.

Since the IGCC is an overlay code (other I-codes still apply), the first sentence is unnecessary, since the requirement is covered by the IBC.

The second sentence is confusing at best, and overly restrictive at its worst, since it can be easily read that "supporting structure" means the roof framing members (and all members supporting them). This would mean that a photovoltaic system could not be mounted on a wood structure. And if the roof framing and supporting structure can be of combustible materials, is there a reason why any secondary supporting structure for the modules by themselves cannot be combustible? Any requirement for construction of the modules themselves should be covered in reference standards.

There are requirements for spacing between and around photovoltaic modules contained in the IFC in addition to this requirement. These were introduced to the 2012 IFC via code change proposal F30-09/10 (approved as modified by public comment). Since the IGCC is an overlay code, this additional sentence could also be deleted as a modification by the committee, but its inclusion could serve as a useful cross reference to closely related requirements.

Cost Impact: The code change proposal will not increase the cost of construction. Construction costs could be lower, depending on the circumstances

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.2.1-SIU

GEW255-11

611.2.1.1

Proponent: Michael D. Fischer, Kellen Company, representing Asphalt Roofing Manufacturers Association (ARMA) (MFischer@kellencompany.com)

Revise as follows:

611.2.1.1 Roof-mounted solar photovoltaic systems. Where *solar photovoltaic systems* are installed on roofs, the roof shall be constructed to support the loads imposed by such modules in accordance with the applicable provisions of the *International Building Code*. Solar photovoltaic systems and supporting structure shall be constructed of noncombustible materials or fire-retardant-treated wood equivalent to that required for the roof construction. Not less than four feet of clearance shall be provided between any portion of a roof mounted *solar photovoltaic* array and roof mounted equipment, *skylights*, access hatches and similar *building* components that could hinder access to the *solar photovoltaic* array.

Reason: The current IgCC language includes a structural requirement to support imposed loads. The IBC contains clear guidance on how to deal with rooftop loads; this proposal provides a reference to those requirements.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.2.1.1-FISCHER

GEW256-11

611.2.1.1

Proponent: Mark S. Graham, representing National Roofing Contractors Association
(mgraham@nrca.net)

Revise as follows:

611.2.1.1 Roof-mounted solar photovoltaic systems. ~~Where solar photovoltaic systems are installed on roofs, the roof shall be constructed to support the loads imposed by such modules. Solar photovoltaic systems and supporting structure shall be constructed of noncombustible materials or fire-retardant-treated wood equivalent to that required for the roof construction. Not less than four feet of clearance shall be provided between any portion of a roof-mounted solar photovoltaic array and roof-mounted equipment, skylights, access hatches and similar building components that could hinder access to the solar photovoltaic array the installation, inspection, maintenance, repair and replacement of solar photovoltaic systems and all system components shall comply with Section 611.2.1, Section 605.11 of the International Fire Code and Chapters 15 and 31 of the International Building Code..~~

Reason: During ICC's 09/10 Code Development Cycle specific requirements applicable to roof-mounted solar photovoltaic systems were added to the 2012 Editions of the *International Fire Code* (F30-09/10 AMPC) and *International Building Code* (S15-09/10 AM, S22-09/10 S28-09/10 AM). Reference to the sections and chapters these requirements here in Section 611.2.1.1 provides for consistency between the I-codes and better facilities compliance and enforcement.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee:	AS	AM	D
Assembly:	ASF	AMF	DF

611.2.1.1-GRAHAM

GEW257-11

Figure 611.4

Proponent: Mark S. Graham, representing National Roofing Contractors Association (mgraham@nrca.net)

Delete without substitution:

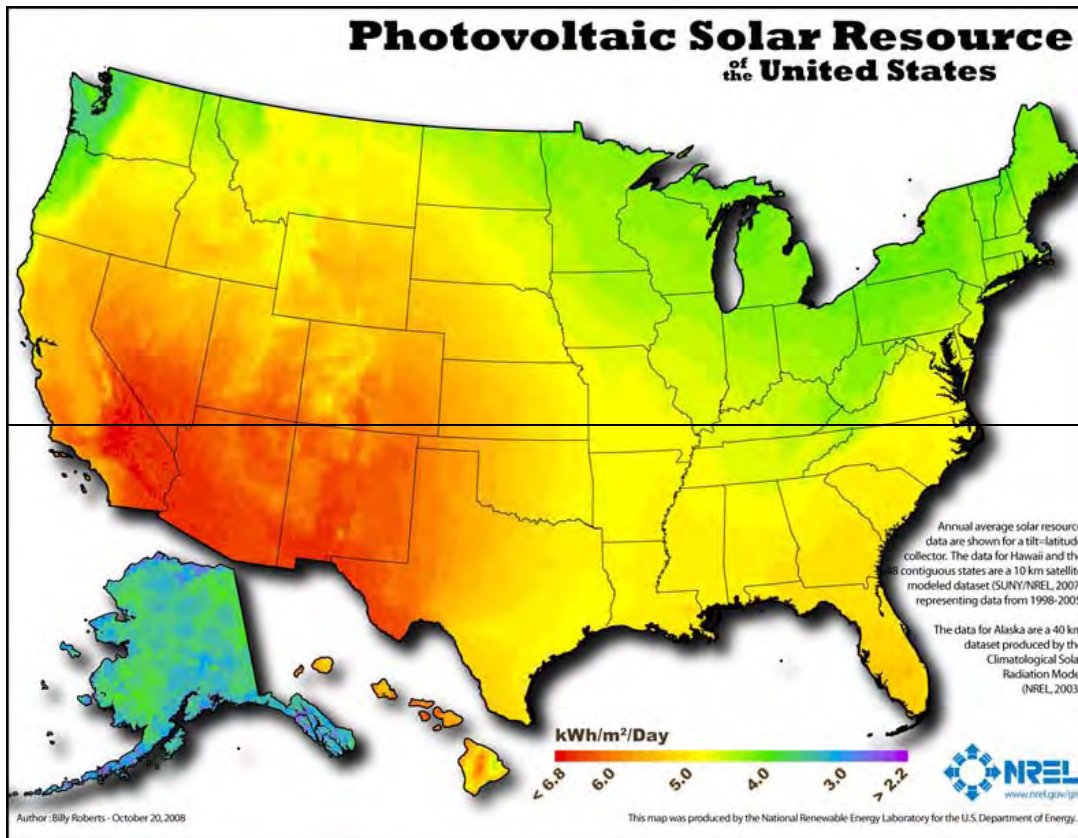


FIGURE 611.4 PHOTOVOLTAIC RESOURCE MAP (kWh/m²/day)

Reason: It doesn't appear Figure 611.4 is referenced in the text of IGCC Public Version 2.0 and, therefore, the figure doesn't appear to be applicable and should be omitted.

Cost Impact: The code change proposal will not increase the cost of construction.

Analysis: Presently no reference to figure in code.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

F611.4-GRAHAM.doc

GEW258-11

611.3.1.1, 611.3.1.2, 611.3.1.3, 611.3.1.4

Proponent: Robert J. Davidson, Davidson Code Concepts, LLC, representing self
(rjd@davidsoncodeconcepts.com)

Delete without substitution:

~~**611.3.1.1 Roof top set back.** Roof-top wind turbine installations shall be set back from the edge of the *building* a distance not less than two times tip height where tip height is defined as the height from the base of the tower to the top of one blade in the 12 o'clock position.~~

~~**611.3.1.2 Roof and wall penetrations.** Roof and wall penetrations shall be flashed and sealed to prevent entry of water, rodents and insects.~~

~~**611.3.1.3 Solar photovoltaic modules.** Solar photovoltaic modules shall be listed and labeled in accordance with UL 1703.~~

~~**611.3.1.4 Inverters.** Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.~~

Reason: The language proposed for deletion is language that is the authority and responsibility of the building, fire and electrical codes and as such is not needed in the IgCC and presents the possibility of conflict between the codes.

The building code has requirements for roof top structures along with requirements for roof and wall penetrations. The building code, fire code and electrical code have requirements for solar voltaic modules and the electrical code has requirements for the inverters.

Cost Impact: The code change proposal will not increase the cost of construction. There will be a reduction in cost.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.3-DAVIDSON

GEW260-11

611.3.1, 611.3.1.2

Proponent: Bill McHugh, Chicago Roofing Contractors Association

Revise as follows:

611.3.1 Installation, location and structural requirements. Wind energy systems shall comply with the manufacturer's instructions from the roof covering, wind energy and solar photovoltaic manufacturer, the requirements of the *International Fire Code*, and Chapters 15 and 16 of the *International Building Code*, and be located on the *building*, adjacent to the *building*, or on the *building site*.

611.3.1.2 Roof and wall penetrations. Roof and wall penetrations shall maintain the fire resistance of the roof or wall, be flashed and sealed to prevent entry of water, rodents and insects.

Reason: Wind energy systems provide new ways to harvest the rooftop and provide energy to buildings. Regardless of what type of energy harvesting system is installed on the roof, it must comply with the requirements of Chapter 15 and 16 of the International Building Code and requirements of the International Fire Code.

These codes set minimum requirements for fire safety for occupants and emergency responders.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.3.1-McHUGH

GEW261-11

611.3.1.2

Proponent: Bob Eugene, Underwriters Laboratories, representing Underwriters Laboratories and UL Environment Inc. (Robert.Eugene@us.ul.com)

Delete without substitution:

~~**611.3.1.2 Roof and wall penetrations.** Roof and wall penetrations shall be flashed and sealed to prevent entry of water, rodents and insects.~~

Reason: This requirement is already addressed in the International Building Code.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

611.3.1.2-EUGENE

GEW262-11

611.3.1.3

Proponent: Bob Eugene, Underwriters Laboratories Inc, representing Underwriters Laboratories Inc, and UL Environment Inc (Robert.Eugene@us.ul.com)

Delete without substitution:

~~**611.3.1.3 Solar photovoltaic modules.** Solar photovoltaic modules shall be listed and labeled in accordance with UL 1703.~~

Reason: This section does not apply to Wind Energy Systems.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.3.1.3-EUGENE

GEW263-11

611.3.1.3

Proponent: Frank Tse, representing Leviton Manufacturing Company, Inc. (FTSE@Leviton.com)

Revise as follows:

~~611.3.1.3~~ **611.2.1.2 Solar photovoltaic modules.** Solar photovoltaic modules shall be listed and labeled in accordance with UL 1703.

Reason: This device is part of the solar photovoltaic systems, which is contained in 611.2. Therefore, the more appropriate location is 611.2.1.3.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee:	AS	AM	D
Assembly:	ASF	AMF	DF

611.3.1.3-TSE

GEW264-11

611.3.1.4

Proponent: Bob Eugene, Underwriters Laboratories, Inc, representing Underwriters Laboratories Inc. and UL Environment Inc. (Robert.Eugene@us.ul.com)

Delete without substitution:

~~**611.3.1.4 Inverters.** Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.~~

Reason: These requirements are already covered in NFPA 70 and the 2012 International Building Code.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

611.3.1.4-EUGENE

GEW265-11

611.3.1.4

Proponent: Frank Tse, representing Leviton Manufacturing Company, Inc (FTSE@Leviton.com)

Revise as follows:

~~611.3.1.4~~ **611.2.1.4 Inverters.** Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

Reason: This device is part of the solar photovoltaic systems, which is contained in 611.2. Therefore, the more appropriate location is 611.2.1.4.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee:	AS	AM	D
Assembly:	ASF	AMF	DF

611.3.1.4-TSE

GEW266-11

611.4

Proponent: Steven Rosenstock, representing Edison Electric Institute (srosenstock@eei.org)

Revise as follows:

611.4 Solar water heating equipment. Solar water heating equipment shall comply with one of the following requirements:

1. Not less than ten percent of the *building's* annual estimated hot water energy usage shall be met by on-site solar water heating equipment.

2. Not less than 5 percent of the *building's* annual estimated hot water energy usage shall be met by on-site solar water heating equipment if the back-up service water heating system has a rated efficiency greater than 0.88 energy factor or 88 percent thermal efficiency.

Exceptions:

1. Solar water heating equipment is not required at building sites where annual average *solar insolation* totals not more than 3.5 (kwh/m²/day) in accordance with Figure 611.4.

2. On site solar water heating equipment is not required where at least 5 percent of *renewable energy credit* ownership is confirmed by the code official.

3. For the occupancy Groups identified, not less than five percent of the *building's* annual estimated hot water energy usage shall be met by on-site solar water heating equipment. If the back-up service water heating system has a rated efficiency greater than 0.88 energy factor or 88 percent thermal efficiency, then not less than 2.5 percent of the *building's* annual estimated hot water energy usage shall be met by on-site solar water heating equipment.

1. Group A-2, restaurants and banquet halls;

2. Group F, laundries;

3. Group R-1, transient boarding houses, hotels and motels;

4. Group R-2 *buildings*;

5. Group A-3, health clubs and spas

6. Group I-2, hospitals, mental hospitals and nursing homes.

Reason: The new text provides an incentive to install high efficiency back-up service water heating systems, so that water heating efficiency and energy savings are maximized during times when the solar water heating system puts out little or no hot water. It is also consistent with language in Section 608.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

611.4-ROSENSTOCK

GEW270-11

Table 303.1, 611.1

Proponent: Ron Nickson, National Multi Housing Council, representing National Apartment Association (rnickson@nmhc.org)

Revise as follows:

SECTION 611 BUILDING RENEWABLE ENERGY SYSTEMS ELECTIVE

611.1 Renewable energy systems requirements. ~~Buildings seeking a renewable energy system project elective in accordance with Table 303.1 and Section 303.4 that consume energy~~ shall comply with this section. Each *building* or surrounding lot or *building site* where there are multiple *buildings* on the *building site* shall be equipped with one or more renewable energy systems in accordance with this section. Renewable energy systems shall meet the requirements of Section 611.2 for *solar photovoltaic* systems, Section 611.3 for wind systems, or Section 611.4 for solar water heating systems, and Section 611.5 for performance monitoring and *metering* of these systems as *approved* by the code official. These systems shall be commissioned according to the requirements of Section 612.

Exceptions:

1. *Buildings* or *building sites* where there are multiple *buildings* on the *building site* providing at least two percent of the total estimated annual energy use of the *building*, or collective *buildings* on the site, with on-site renewable energy using a combination of renewable energy generation systems meeting the requirements of Section 611.2, 611.3, or 611.4.
2. Where not less than four percent of the total annual *building* energy consumption from renewable generation takes the form of a ten-year commitment to *renewable energy credit* ownership, confirmed by the code official.
3. Where the combined application of on-site generated renewable energy and a commitment to *renewable energy credit* ownership as confirmed by the code official, totals not less than four percent of the total annual *building* energy consumption from renewable generation.

611.1.1 Building performance-based compliance. *Buildings* and surrounding property or *building sites* when there are multiple *buildings* on the *building site*, that seek compliance with this code in accordance with Section 602.3.2, performance-based compliance, shall be equipped with one or more renewable energy systems that have the capacity to provide not less than two percent of the total calculated annual energy use of the *building*, or collective *buildings* on the site, with on-site renewable energy in accordance with Section 603.

611.1.2 Building prescriptive compliance. *Buildings* and surrounding property or *building sites* where there are multiple *buildings* on the *building site*, that seek compliance with this code in accordance with Section 602.3.1, Prescriptive compliance, shall be equipped with one or more renewable energy systems that have the capacity to provide not less than two percent of the total estimated annual energy use of the *building*, or collective *buildings* on the *building site*, with on-site renewable energy by calculation demonstrating that on-site renewable energy production has a rating of not less than 1.75 *Btu/hr* or not less than 0.50 watts per square foot of conditioned floor area, and using any single or combination of renewable energy generation systems meeting the requirements of Sections 611.2, 611.3, or 611.4.

611.2 Solar photovoltaic systems. *Solar photovoltaic* systems shall be designed, constructed and sized to provide not less than two percent of the total estimated annual electric energy consumption of the *building*, or collective *buildings* on the *building site* in accordance with Section 611.1.1 or 611.1.2.

Exception: Solar photovoltaic systems are not permitted to be used to comply with section 611.1 where building sites with total global insolation levels lower than 2.00 kWh/m²/day as calculated in accordance with NREL SERI TR-642-761.

611.2.1 Requirements. The installation, inspection, maintenance, repair and replacement of *solar photovoltaic systems* and all system components shall comply with the manufacturer's instructions, Sections 611.2.1.1 through 611.2.1.4, and NFPA 70.

611.2.1.1 Roof-mounted solar photovoltaic systems. Where *solar photovoltaic systems* are installed on roofs, the roof shall be constructed to support the loads imposed by such modules. Solar photovoltaic systems and supporting structure shall be constructed of noncombustible materials or fire-retardant-treated wood equivalent to that required for the roof construction. Not less than four feet of clearance shall be provided between any portion of a roof mounted *solar photovoltaic* array and roof mounted equipment, *skylights*, access hatches and similar *building* components that could hinder access to the *solar photovoltaic* array.

611.2.2 Performance verification. *Solar photovoltaic* systems shall be tested upon installation to verify that the installed performance meets the design specifications. A report of the tested performance shall be provided to the *building* owner.

611.3 Wind energy systems. Wind energy systems shall be designed, constructed and sized to provide not less than two percent of the total estimated annual electric energy consumption of the *building*, or collective *buildings* on the *building site* in accordance with Section 611.1.1 or 611.1.2.

611.3.1 Installation, location and structural requirements. Wind energy systems shall be located on the *building*, adjacent to the *building*, or on the *building site*.

611.3.1.1 Roof top set back. Roof-top wind turbine installations shall be set back from the edge of the *building* a distance not less than two times tip height where tip height is defined as the height from the base of the tower to the top of one blade in the 12 o'clock position.

611.3.1.2 Roof and wall penetrations. Roof and wall penetrations shall be flashed and sealed to prevent entry of water, rodents and insects.

611.3.1.3 Solar photovoltaic modules. Solar photovoltaic modules shall be listed and labeled in accordance with UL 1703.

611.3.1.4 Inverters. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

611.4 Solar water heating equipment. Not less than ten percent of the *building's* annual estimated hot water energy usage shall be met by on-site solar water heating equipment.

611.5 Renewable energy system performance monitoring and metering. Renewable energy systems shall be *metered* and monitored in accordance with Sections 611.5.1 and 611.5.2.

611.5.1 Metering. Renewable energy systems shall be metered separately from the *building's* electrical and fossil fuel meters. Renewable energy systems shall be *metered* to measure the amount of renewable electric or thermal energy generated on the *building site* in accordance with Section 604.

611.5.2 Monitoring. Renewable energy systems shall be monitored to measure the peak electric or thermal energy generated by the renewable energy systems during the *building's* anticipated peak electric or fossil fuel consumption period in accordance with Section 604.

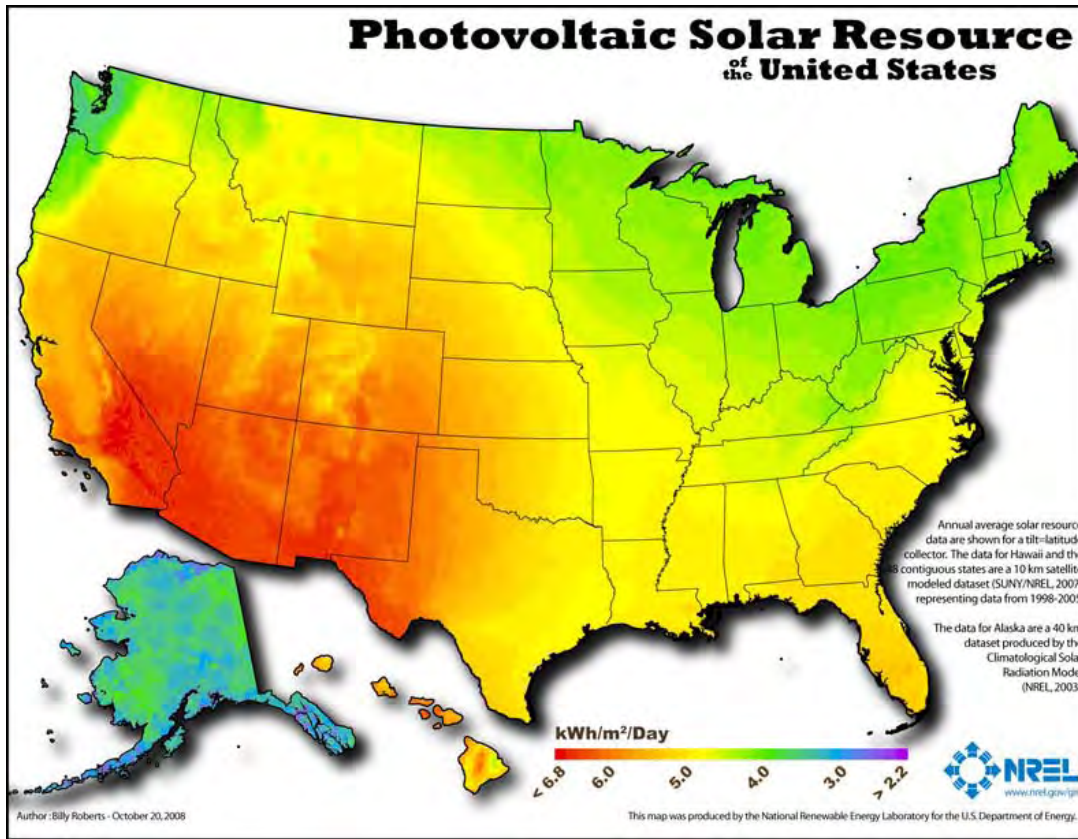


FIGURE 611.4 PHOTOVOLTAIC RESOURCE MAP (kWh/m²/day)

**TABLE 303.1
PROJECT ELECTIVES CHECKLIST**

Section	Description	Check the corresponding box to indicate each project elective selected.	Jurisdictional determination of non-availability
CH 6. ENERGY CONSERVATION, EFFICIENCY AND EARTH ATMOSPHERIC QUALITY			
<u>611</u>	<u>Building Renewable Energy Systems</u>	<input type="checkbox"/>	<input type="checkbox"/>
613.3	zEPI reduction project electives		
613.3	Project zEPI is at least 5 points lower than required by Table 302.1	<input type="checkbox"/>	<input type="checkbox"/>
613.3	Project zEPI is at least 10 points lower than required by Table 302.1	<input type="checkbox"/> (2 electives)	<input type="checkbox"/>
613.3	Project zEPI is at least 15 points lower than required by Table 302.1	<input type="checkbox"/> (3 electives)	<input type="checkbox"/>
613.3	Project zEPI is at least 20 points lower than required by Table 302.1	<input type="checkbox"/> (2 electives)	<input type="checkbox"/>
613.3	Project zEPI is at least 25 points lower than required by Table 302.1	<input type="checkbox"/> (4 electives)	<input type="checkbox"/>
613.3	Project zEPI is at least 30 points lower than required by Table 302.1	<input type="checkbox"/> (5 electives)	<input type="checkbox"/>
613.3	Project zEPI is at least 35 points lower than required by Table 302.1	<input type="checkbox"/> (6 electives)	<input type="checkbox"/>

Section	Description	Check the corresponding box to indicate each project elective selected.	Jurisdictional determination of non-availability
613.3	Project zEPI is at least 40 points lower than required by Table 302.1	<input type="checkbox"/> (8 electives)	<input type="checkbox"/>
613.3	Project zEPI is at least 45 points lower than required by Table 302.1	<input type="checkbox"/> (9 electives)	<input type="checkbox"/>
613.3	Project zEPI is at least 51 points lower than required by Table 302.1	<input type="checkbox"/> (10 electives)	<input type="checkbox"/>
613.4	Mechanical systems	<input type="checkbox"/>	<input type="checkbox"/>
613.5	Service Water Heating	<input type="checkbox"/>	<input type="checkbox"/>
613.6	Lighting Systems	<input type="checkbox"/>	<input type="checkbox"/>
613.7	Passive design	<input type="checkbox"/>	<input type="checkbox"/>

(Portions of Table not shown remain unchanged)

Reason: The purpose of this code change proposal is to make the installation of renewable energy systems a project elective instead of a nationwide mandate. On-site renewable energy is impractical for many buildings, expensive and does not provide a uniform benefit across geographic regions.

This text is impractical because many buildings would not have the space on a roof top or on the building site, especially on infill or urban lots, to provide wind, PV or other on-site renewable energy generation, nor to meet the solar water heating option. This is especially true for high rise buildings with a relatively small roof area compared to overall square footage. Likewise, buildings that are shaded by other taller buildings would be severely limited in using solar options.

DOE reports a typical energy intensity of 1 sqft of roof space needed for every 10 W PV. Given the limitations on renewable energy options, the proposed text would increase the likelihood that a building lot in a low density suburban area would be much more appealing than in an urban area.

Finally, the leap to renewable energy requirements for a green building adopts an unreasonable standard for a green building. Many green buildings throughout the world do not rely on on-site renewable technology, yet are models of leading edge building performance. There are too many alternatives available for achieving high performance in a building without resorting to technologies that are excessively expensive and have questionable benefits in many climate zones.

Cost Impact: The code change proposal will not increase the cost of construction, it will reduce the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

611.1-NICKSON

GEW271-11

Table 302.1, 611.1

Proponent: Don Surrena, representing National Association of Home Builders (NAHB)

Email Address: dsurrena@nahb.org

Revise as follows:

611.1 Renewable energy systems requirements. ~~Buildings~~ Where this section is indicated to be applicable in Table 302.1 ~~buildings~~ that consume energy shall comply with this section. Each ~~building~~ or surrounding lot or ~~building site~~ where there are multiple ~~buildings~~ on the ~~building site~~ shall be equipped with one or more renewable energy systems in accordance with this section.

Renewable energy systems shall meet the requirements of Section 611.2 for *solar photovoltaic* systems, Section 611.3 for wind systems, or Section 611.4 for solar water heating systems, and Section 611.5 for performance monitoring and *metering* of these systems as *approved* by the code official. These systems shall be commissioned according to the requirements of Section 612.

Exceptions:

1. *Buildings* or *building sites* where there are multiple *buildings* on the *building site* providing at least two percent of the total estimated annual energy use of the *building*, or collective *buildings* on the site, with on-site renewable energy using a combination of renewable energy generation systems meeting the requirements of Section 611.2, 611.3, or 611.4.
2. Where not less than four percent of the total annual *building* energy consumption from renewable generation takes the form of a ten-year commitment to *renewable energy credit* ownership, confirmed by the code official.
3. Where the combined application of on-site generated renewable energy and a commitment to *renewable energy credit* ownership as confirmed by the code official, totals not less than four percent of the total annual *building* energy consumption from renewable generation.

Revise Table as follows:

**TABLE 302.1
REQUIREMENTS DETERMINED BY THE JURISDICTION**

Section	Section Title or Description and Directives	Jurisdictional Requirements	
CH 6. ENERGY CONSERVATION AND EARTH ATMOSPHERIC QUALITY			
Table 602.1, 302.1, 302.1.1	<i>zEPI</i> of Jurisdictional Choice – The jurisdiction shall indicate a <i>zEPI</i> of 46 or less in Table 602.1 for each occupancy for which it intends to require enhanced energy performance.	See Table 602.1 and Section 302.1	
602.3.2.3	Total annual CO2e emissions limits and reporting	<input type="checkbox"/> Yes	<input type="checkbox"/> No
611	<u>Building Renewable Energy Systems</u>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
613.2	Post Certificate of Occupancy <i>zEPI</i> , energy demand, and CO2e emissions reporting	<input type="checkbox"/> Yes	<input type="checkbox"/> No

(Portions of table not shown remain unchanged)

Reason: Without the proper infrastructure to utilize the gathered information there is no justification for the expense to collect it or for the municipality to store and maintain the information. By allowing more choices for a municipality to make as their sophistication and needs grow allows various compliance levels that a municipality can select as a base, determined by their vision of the level of green for their own community. This level can by their choice become more stringent as environmental demands change. Allowing a

community the option to choose, ensures easier adoptability and larger participation by more communities and more versatility in increasing compliance requirements as their circumstances change.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

611.1-SURRENA

GG34-11

ALL CHAPTERS

Proponent: Craig Conner, Building Quality, representing self (craig.conner@mac.com)

THIS IS A 13 PART CODE CHANGE. PARTS I, II, III, IV, VII, VIII, IX, X, and XI WILL BE HEARD BY THE IGCC-GENERAL COMMITTEE. PARTS V, VI, XII, AND XIII WILL BE HEARD BY THE IGCC-ENERGY AND WATER COMMITTEE. PLEASE CONSULT THE TENTATIVE HEARING ORDERS FOR EACH COMMITTEE.

PART I – CHAPTER 1

Revise as follows:

SECTION 101 GENERAL

101.2 Scope. The provisions of this code shall apply to the design, construction, *addition, alteration, change of occupancy*, movement, enlargement, replacement, *repair*, equipment, location, maintenance, removal and demolition of every *building* or *structure* or any appurtenances connected or attached to such *buildings* or *structures* and to the site on which the *building* is located. Occupancy classifications shall be determined in accordance with the *International Building Code*;

This code shall not apply to the following:

1. Detached one-and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane in height with a separate means of egress.
2. Equipment or systems that are used primarily for industrial or manufacturing processes.
3. Temporary structures approved under Section 108 of the *International Building Code*.

101.3 Intent. ~~The purpose of t~~ This code is intended to safeguard the environment, public health, safety and general welfare through the establishment of requirements to reduce the negative ~~potential~~ impacts and increase the positive ~~potential~~ impacts of the built environment on the natural environment and *building* occupants, ~~by means of minimum requirements related to: conservation of natural resources, materials and energy; the employment of renewable energy technologies, indoor and outdoor air quality; and *building* operations and maintenance.~~ This code is not intended to abridge or supersede safety, health or environmental requirements under other applicable codes or ordinances.

SECTION 102 APPLICABILITY

102.1 General. This code is an overlay to the other International Codes. This code is not intended to be used as a standalone construction regulation document ~~or to abridge or supersede safety, health or environmental requirements under other applicable codes or ordinances.~~ ~~A *jurisdiction* intending to adopt this code without other ICC Codes is advised to make a detailed review of locally adopted codes to ensure that they adequately correlate with this code.~~

102.1.1 Code Conflicts. Where there is a conflict between a general requirement and a specific requirement of this code, the specific requirement shall be applicable. Where, in any specific case, different sections of the code specify different materials, methods of construction or other requirements, the most practical ~~and effective requirement to meet the intent of the code~~ restrictive shall govern.

102.4 Referenced codes and standards. The following codes, shall be considered part of the requirements of this code: the *International Building Code*, the *International Fuel Gas Code*, the *International Mechanical Code*, the *International Plumbing Code*, the *International Existing Building Code*,

International Property Maintenance Code, the International Fire Code, the International Energy Conservation Code, and the International Code Council Performance Code. The standards referenced elsewhere in this code, and those referenced standards listed in Chapter 12, shall be considered as part of the requirements of this code to the prescribed extent of each such reference. ~~It is the expressed intent of this code to require higher minimum standards relating to building performance than the corresponding minimum standards set by the referenced codes and standards, and in such cases, the higher minimum standards of this code shall take precedence.~~

102.4.2 Building. ~~The provisions of the International Building Code shall apply to the extent that such provisions establish minimum requirements to safeguard public health, safety and general welfare through structural strength, means of egress facilities, sanitation, adequate light and ventilation, and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations. The provisions of Chapter 4 of the International Building Code shall also apply.~~

102.4.3 Fuel Gas. ~~The provisions of the International Fuel Gas Code shall apply to the installation, alteration, repair and replacement of gas piping systems and components, gas appliances and related accessories as covered in this code. These requirements apply to gas piping systems extending from the point of delivery to the inlet connections of appliances and the installation and operation of gas appliances and related accessories.~~

102.4.4 Mechanical. ~~The provisions of the International Mechanical Code shall apply to the installation, alterations, repairs and replacement of mechanical systems, equipment, appliances, fixtures, fittings and appurtenances, including ventilating, heating, cooling, air conditioning and refrigeration systems, incinerators and other energy-related systems.~~

102.4.5 Plumbing. ~~The provisions of the International Plumbing Code shall apply to the installation, alteration, repair and replacement of plumbing systems, including equipment, appliances, fixtures, fittings, appurtenances, and medical gas systems.~~

102.4.6 Property maintenance. ~~The provisions of the International Property Maintenance Code shall apply to existing structures and premises; equipment and facilities; light, ventilation, space heating, sanitation, life and fire safety hazards; responsibilities of owners, operators and occupants; and occupancy of existing premises and structures.~~

102.4.7 Fire prevention. ~~The provisions of the International Fire Code shall apply to matters affecting or relating to: structures, processes and premises from the hazard of fire and explosion arising from the storage, handling or use of structures, materials or devices; conditions hazardous to life, property or public welfare in the occupancy of structures or premises; and the construction, extension, repair, alteration or removal of fire suppression and alarm systems or fire hazards in the structure or on the premises from occupancy or operation.~~

102.4.8 Energy. ~~The provisions of the International Energy Conservation Code shall apply to matters governing the design and construction of buildings for the effective use of energy.~~

102.4.9 Wildland-urban interface. ~~The provisions of the International Wildland-Urban Interface Code shall apply to matters related to the mitigation of risk to life and structures from intrusion of fire from wildland fire exposures and fire exposures from adjacent structures and to mitigate structure fires from spreading to wildland fuels.~~

102.4.10 Performance. ~~The provisions of the International Code Council Performance Code shall be permitted to apply to matters related to the approval of alternative materials and methods and to innovative approaches to code compliance.~~

102.4.11 Existing buildings. ~~The provisions of the International Existing Building Code shall apply to matters governing the design and construction of additions, alterations or renovations of existing buildings~~

as well as to changes in occupancy to the extent that such provisions establish minimum requirements to safeguard public health, safety and general welfare through structural strength, ~~means of egress facilities, sanitation, adequate light and ventilation, and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations.~~

102.4.12 Zoning. ~~The provisions of the *International Zoning Code* shall apply to matters governing zoning requirements related to the scope of this code.~~

SECTION 104 CONSTRUCTION DOCUMENTS

104.1 Information on construction documents. ~~Construction documents shall be dimensioned and drawn upon suitable material. Electronic media documents are permitted to be submitted where approved by the code official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that such work will conform to the provisions of this code and relevant laws, ordinances, rules and regulations, as determined by the code official. The construction documents shall contain a listing of the applicable project electives in accordance with Section 303, and shall include the applicable commissioning requirements in accordance with Section 903. Where special conditions exist, the code official is authorized to require additional construction documents.~~

105.6 Approved programs. The code official or other authority having jurisdiction shall be permitted to deem a national, state or local program to meet or exceed this code. Buildings approved in writing by such a program shall be considered in compliance with this code.

105.6.1 Specific approval. The code official or authority having jurisdiction shall be permitted to approve programs or compliance tools for a specified application, limited scope or specific locale. For example, a specific approval shall be permitted to apply to a specific section or chapter of the IGCC.

PART II – CHAPTER 3

Delete Chapter 3 and substitute as follows:

CHAPTER 3 **JURISDICTIONAL REQUIREMENTS AND PROJECT ELECTIVES**

CHAPTER 3 **GENERAL REQUIREMENTS**

SECTION 301 **SCOPE AND APPLICATION**

301.1 Scope. This chapter contains general requirements.

301.2 Application. Buildings shall meet either the requirements of ASHRAE/IESNA Standard 189.1, *Standard for the Design of High-Performance Green Buildings Except for Low-Rise Residential Buildings*, or the requirements contained in this code. Where the ASHRAE 189.1 compliance path is chosen, the administrative provisions of Chapter 1 of this code and the provisions of ASHRAE 189.1 shall apply and the remainder of this code shall not apply.

SECTION 302
SPACE WITHIN ASSEMBLIES

302.1 Space within assemblies. The space within building assemblies shall be large enough to accommodate the mechanical, electrical, plumbing and insulation systems installed within them, including those that must cross.

PART III – CHAPTER 4

Delete definitions as follows:

~~**VEGETATIVE ROOF.** An assembly of interacting components designed to waterproof and normally insulate a building's top surface that includes, by design, vegetation and related landscaping elements.~~

~~**Extensive vegetative roof.** A low profile roof with a growing medium less than 8 inches in depth, composed of plants that can thrive in a rooftop environment with limited water, shallow roots and sparse nutrients.~~

~~**Intensive vegetative roof.** A high profile roof with a growing medium 8 inches or more in depth that can support a wide range of vegetables, shrubs and small trees.~~

~~**HIGH OCCUPANCY VEHICLE.** A vehicle which is occupied by two or more people, when arriving and departing the site where parked, for not less than 75 percent of the vehicle trips; or as otherwise defined by state or local regulation.~~

~~**LOW EMISSION, HYBRID AND ELECTRIC VEHICLE.** Vehicles that achieve EPA Tier 2, California LEV-II, or a minimum of EPA LEV standards, whether by means of hybrid, alternative fuel, or electric power.~~

Revise as follows:

SECTION 401
GENERAL

401.1 Scope and intent. ~~The provisions of this chapter shall govern~~ provides requirements for the development and maintenance of building and building sites to minimize negative environmental impacts and to protect, restore and enhance the natural features and environmental quality of the site.

SECTION 402
PRESERVATION OF NATURAL RESOURCES

402.1 General. *(No change to text)*

Delete 402.2 without substitution.

402.3 Site design and development. ~~The design and development of *buildings* and associated site improvements shall comply with the site design, water management, vegetation management, soil management and waste management requirements of Sections 402.3.1 through 402.3.6.~~

402.3.1 Predesign site inventory and assessment. ~~An inventory and assessment of the natural resources and baseline conditions of the *building site* shall be submitted. The inventory and assessment shall:~~

1. Determine the location of any ~~protection areas~~ protected by applicable zoning or environmental regulations identified in Section 402.2 that are located on, or adjacent to the *building site*;
2. Determine ~~whether, and to the degree to which,~~ the native soils and hydrological conditions of the *building site* have been ~~disturbed and altered by previous use or development;~~

3. Where invasive plant species are defined by the jurisdiction, identify invasive vegetation plant species on the site for removal; and
4. Where preferred plant species are defined by the jurisdiction, identify native-preferred plant species on the site.

402.3.1.1 Submittal documents. The findings of the pre-design site ~~inventory and~~ assessment shall be included in the submittal documents for *permit* application.

402.3.2 Stormwater management. ~~Where this~~ This section is indicated to be applicable in Table 302.1, applies to stormwater management for systems, including, but not limited to, infiltration, evapo-transpiration, ~~rainwater harvest and runoff reuse.~~ Such systems shall be provided and maintained on the *building site or complex of building sites within the development.* Stormwater management systems shall address the increase in runoff that would occur resulting from development ~~on the building site~~ and shall either:

1. Manage rainfall on-site and size the management system to retain, at a minimum, the volume of a single storm which is equal to the *95th percentile rainfall event* and all smaller storms and maintain the predevelopment natural temperature of the runoff; or
2. Improve, maintain or restore the pre-development stable, natural runoff hydrology of the site, throughout the development or redevelopment construction process. Post construction Runoff rate and volume, duration, and temperature shall not exceed predevelopment rates. ~~The stormwater management system design shall be based, in part, on a hydrologic analysis of the building or development site.~~

403.3.2.1 404.2.4 Pervious and permeable pavement. Pervious and permeable pavements including open grid paving systems and open-graded aggregate systems shall have a percolation rate not less than ≥ 1.25 gallons per hour ~~minute~~ per square foot ($400 \text{ L/min} \times \text{m}^2$) and shall have not less than 6 inches (152 mm) of open graded base below the pavement or pavers. Pervious and permeable pavement shall be permitted where the use of these types of *hardscapes* does not interfere with fire and emergency apparatus or vehicle or personnel access and egress, utilities, or telecommunications lines. Aggregate used shall be of uniform size.

403.3.2.2. Adjoining lots. The stormwater management system shall not ~~redirect or concentrate off-site discharge that would cause increased erosion or other drainage related damage to adjoining lots or public property.~~

402.3.3 Outdoor water use. This section applies to water used external to the building for plantings and water features.

402.3.3 Landscape irrigation systems. ~~Irrigation of exterior landscaping shall comply with Sections 402.3.3.1 and 402.3.3.2.~~

402.3.3.1 Water for outdoor landscape irrigation. Water used for outdoor landscape irrigation shall be non-potable and shall comply with ~~Section 406.2~~ the requirements for non-potable water in Chapter 7.

Exceptions: *Potable* water is permitted to be used as follows:

1. During the establishment phase of newly planted landscaping. ~~The establishment phase shall be not longer than the following:~~
 - 1.1. 3 years for trees
 - 1.2. 2 years for shrubs
 - 1.3. 1 year for herbaceous cover plants
2. To irrigate food production.
3. To supplement *non-potable* water irrigation of shade trees ~~provided in accordance with Section 404.2.3.~~

4. *Potable* water is permitted for landscape irrigation where *approved* by local ordinance or regulation.

402.3.3.2 Irrigation system design and installation. Landscape irrigation systems shall:

1. Not contribute to the run-off from the site.
2. Be designed and installed to provide the minimum amount of irrigation for maintenance of to minimize the water required to maintain vegetation in the landscaping of the building site.
3. The systems shall Utilize one or more of the following: drip irrigation, subsurface, or subsoil and surface irrigation. The irrigation system shall be divided into zones based on the water needs of the plant materials.
4. Landscape irrigation systems shall Not direct water onto building exterior surfaces, foundations or exterior paved surfaces.

402.3.3.3 Plant selection. Plants selected for use on the building site shall comply with the following:

1. Invasive plant species, as defined by the jurisdiction, are prohibited.
2. Plants appropriate to the climate shall be selected. To the extent defined by the jurisdiction, preferred plant species shall be planted.
3. **402.3.5.7 Turf grass.** Not more than 40 percent of the area of the vegetated area of the building site shall be planted with turf grass. Calculations of the percentage vegetated area shall not include vegetative roof areas, or vegetated areas not external to inside the building, and areas not on the ground plane of the building.

Exceptions:

1. For schools and recreational facilities, the area dedicated to athletic fields is excluded from the calculation of vegetative areas. Schools, parks and recreational facilities are exempted.
2. Drought tolerant vegetation, as defined by the jurisdiction, is exempted.
3. Vegetated areas designed to collect and temporarily or permanently hold storm water run off are exempted.

402.3.3.4 402.3.4 Outdoor ornamental fountains and water features. Outdoor ornamental fountains and other water features ~~constructed or installed on a building site~~ shall be supplied with either municipally reclaimed water, air conditioning condensate water or collected *rainwater* complying with Section 406.2. Signage in accordance with Section 706.2 shall be posted at each outdoor fountain and water feature where *non-potable* water is used.

Exception: Where non-potable water is not available, then the use of potable water is permitted.

402.3.5.6 Invasive species. Where defined by the jurisdiction, invasive species shall not be planted on a building site. A management plan for the containment, removal and replacement of any invasive plants currently on the site shall be generated based on either published the jurisdiction's recommendations for the referenced invasive plant or guidance prepared by a qualified professional. Existing vegetation that is to be retained on a building site shall be protected as required by Section 402.3.5.2.

402.3.5.8 Documentation. ~~Documentation demonstrating compliance with Section 402.3.5 shall be provided as part of the submittal documents and during the construction and inspection process.~~

402.3.6 402.3.5 Management of vegetation, soils and erosion control. ~~During construction on a building site,~~ vegetation and soils shall be protected, selected and reused as provided in Sections 402.3.5.1 through 402.3.5.8.

402.3.7 402.3.6 Building site waste management plan. *A building site waste management plan shall be developed and implemented to recycle or salvage not less than 75 percent of the land-clearing debris*

and excavated soils. Land-clearing debris includes rock, trees, stumps and associated vegetation. The plan shall include provisions that address all of the following:

1. Materials to be diverted from disposal by ~~efficient usage~~, recycling or reuse on the *building site* shall be specified. Documentation supplied by the recycling or reuse facility collecting materials shall be provided as proof of compliance with this code.
2. Diverted materials shall not be sent to sites that are agricultural land, flood hazard areas or greenfield sites where development is prohibited by ~~Section 402.2~~.
3. The ~~effective~~ destruction and disposal of invasive plant species.
4. Where contaminated soils are removed, the methods of removal and location where the soils are to be treated and disposed.
5. The amount of materials to be diverted shall be specified and shall be calculated by weight or volume, but not both.
6. Where the site is located in a federal or state designated quarantine zone for invasive insect species, building site vegetation management shall comply with the quarantine rules.

Construction materials and waste and *hardscape* materials removed during site preparation shall be managed in accordance with Section 502.1.

SECTION 403 TRANSPORTATION IMPACT

403.1 Walkways and bicycle paths. Not less than one independent, paved walkway or bicycle path suitable for bicycles, strollers, pedestrians, and other forms of non-motorized locomotion connecting a street or other path to a building entrance shall be provided. Walkways and bicycle paths shall connect to existing paths or sidewalks, and shall be designed to connect to ~~any~~ planned future paths. Paved walkways and bicycle paths shall be designed to ensure and support stormwater management infrastructure including, but not limited to, pervious pavement.

~~**403.2 Changing and shower facilities.** Buildings with a total building floor area greater than 10,000 square feet (929 m²) and that are required to be provided with long term bicycle parking and storage in accordance with Section 403.3 shall be provided with on-site changing room and shower facilities. Not less than one shower shall be provided for each 200 occupants employees, or fraction thereof. He's deleted 403.3~~

~~**Exception:** Where only one changing room and shower facility is required, the changing room and shower facility shall be permitted to be a single facility available to all occupants.~~

~~**403.3 Bicycle parking and storage.** Long term and short term Bicycle parking shall comply with Sections 403.3.1 through 403.3.3. be designated on the site plan by a registered design professional and as specified in Table 403.3.~~

~~**403.3.1 Number of spaces.** The required minimum number of bicycle parking spaces shall be one per hundred occupant load, with a minimum of four bicycle parking spaces. Occupant load shall be determined based upon the occupied floor area of each primary use or occupancy of building. Section 1004 of the International Building Code. Accessory occupancy areas shall be included in the calculation of primary occupancy area.~~

Exceptions:

1. Long term Bicycle parking shall not be required where the *total building floor area* is less than ~~2,500~~ 1000 square feet (~~232~~ 46 m²).
2. Subject to the approval of the *code official*, the number of bicycle parking spaces shall be permitted to be reduced due to *building site* characteristics including, but not limited to, isolation from other development.
3. Bicycle parking shall not be required for R occupancies.

Bicycle parking spaces for multiple buildings shall be permitted to be combined, provided that the spaces are sufficient for the combined occupant load of the buildings.

403.3.2 Description of spaces. ~~403.3.1 Short term bicycle parking.~~ ~~Short term Bicycle parking spaces shall comply with all of the following:~~

1. Shall be provided with illumination of not less than 1 footcandle at the parking surface;
2. ~~Shall be located at the same grade as the sidewalk, or at a location reachable by ramp or accessible route;~~
3. Shall have an area of not less than 18 inches (457 mm) by 60 inches (1524 mm) per bicycle;
4. Shall be provided with a rack or other facility for locking or securing each bicycle.

403.3.3 Location of spaces. The location of bicycle parking shall be designated on the site plan. Bicycle parking shall comply with the following:

1. Bicycle parking spaces shall be located within 300 feet of main entrance the building.
2. Bicycle parking shall be located at the same grade as the sidewalk, or at a location reachable by ramp or accessible route.

Exception: Where directional signage is provided at the main *building* entrances, ~~short term bicycle parking~~ shall be permitted to be located inside a *building* or at locations not visible from the main entrance, provided that such a location is accessible.

~~403.3.2 Long term bicycle parking.~~ ~~Long term bicycle parking shall comply with all of the following:~~

1. ~~Shall be located on the same site and within the building or within 300 feet of the main entrances;~~
2. ~~Shall be provided with illumination of not less than 1 footcandle at the parking surface;~~
3. ~~Shall have an area of not less than 18 inches (457 mm) by 60 inches (1524 mm) per bicycle; and~~
4. ~~Shall be provided with a rack or other facility for locking or securing each bicycle.~~

~~Not less than 50 percent of long term bicycle parking shall be within a building or provided with a permanent cover including, but not limited to, roof overhangs, awnings, or bicycle storage lockers.~~

~~Vehicle parking spaces, other than those required by Section 403.4 and for the accessible parking required by the *International Building Code*, shall be permitted to be used for the installation of long term bicycle parking spaces.~~

~~403.4 Vehicle parking.~~ ~~Where either Section 403.4.1 or 403.4.2 is indicated to be applicable in Table 302.1, parking provided at a building site shall comply with this section. Parking spaces required by this section shall be those in the parking facility that are located on the shortest route of travel from the parking facility to a building entrance, but shall not take precedence over parking spaces that are required to be accessible in accordance with the *International Building Code*. Where buildings have multiple entrances with adjacent parking, parking spaces required by this section shall be dispersed and located near the entrances. Such parking spaces shall be provided with approved signage that specifies the permitted usage.~~

~~403.4.1 High occupancy vehicle parking.~~ ~~Where employee parking is provided for a building that has a total building floor area greater than 10,000 square feet (929 m²) and that has a building occupant load greater than 100, at least 5 percent, but not less than 2, of the employee parking spaces provided shall be designated as preferred parking for high occupancy vehicles. For the purpose of this section, preferred parking is considered to be those parking spaces in the parking facility that are located on the shortest route of travel from the employee parking area to a building entrance. Preferred parking shall not take precedence over parking spaces that are required to be accessible in accordance with the *International Building Code*.~~

403.4.2 Low emission, hybrid, and electric vehicle parking. Where parking is provided for a *building* that has a *total building floor area* greater than 10,000 square feet (929 m²) and that has an *building occupant load* greater than 100, at least 5 percent, but not less than 2, of the parking spaces provided shall be designated as preferred parking for *low emission, hybrid, and electric vehicles*.

**TABLE 403.3
BICYCLE PARKING^a**

Occupancy	Specific Use	Short term spaces	Long Term spaces ^{b,c}
R-1	Hotel, motel, boarding houses	None	1 per 50 employees; not less than 2 spaces
R-2, R-3, R-4	All	None	None
A-1	Movie theaters	1 per 50 seats; not less than 4 spaces	1 per 50 employees; not less than 2 spaces
	Concert hall, Theaters other than for movies	1 per 500 seats	
A-2	Restaurants	1 per 50 seats; not less than 2 spaces	
A-3	Places of worship	1 per 500 seats	
	Assembly spaces other than places of worship	1 per 25,000 square feet; not less than 2 spaces	
A-4—A-5	All	1 per 500 seats	
B	All	1 per 50,000 square feet; not less than 2 spaces	1 per 25,000 square feet; not less than 2 spaces
F, H, S	All, except parking facilities	None	1 per 50 employees; not less than 2 spaces
M	All	1 per 25,000 square feet; not less than 2 spaces	1 per 50,000 square feet; not less than 2 spaces
S	Transit park and ride lots	None	1 per 20 vehicle parking spaces.
	Commercial Parking facility	1 per 20 vehicle parking spaces	None
I-2	All	1 per 25,000 square feet; not less than 2 spaces	1 per 50 employees; not less than 2 spaces
I-1	All	None	
E, I-4	Day Care	None	
E	Schools	None	1 per 10 students
Other	Outdoor recreation, parks	1 per 20 vehicle parking spaces; not less than 2 spaces	None

For SI: 1 minute per inch = min/25.4 mm;

- a. Requirements based on square feet shall be the *occupied floor area* of the occupancy or use.
- b. Employees shall be based on the number of full time equivalent employees during the largest shift.
- c. When a calculations results in a fraction of a space, the requirement shall be rounded to the next higher whole number.

SECTION 404 HEAT ISLAND MITIGATION

404.1 General. The heat island effect of *building* and *building site* development shall be mitigated in accordance with Sections 404.2 and 404.3.

404.2 Site Hardscape. In climate zones 1 through 6, as established in the *International Energy Conservation Code*, not less than 50 percent of the site *hardscape* shall be provided with one or any combination of options described in Sections 404.2.1 through 404.2.4. For the purposes of this section,

site *hardscape* shall not include areas of the site covered by *solar photovoltaic* arrays or *solar thermal* collectors.

404.2.1 Site hardscape materials. *Hardscape* materials shall have a minimum initial *Solar Reflectance Index* of 29 0.30 when determined in accordance with CRR-1 ASTM E1980 using a convection coefficient of 2.1 Btu/h-ft^2 ($12 \text{ W/m}^2\text{k}$).

Exception: Pervious concrete pavements shall be ~~allowed to be considered as a hardscape material that is deemed to comply with the criteria for solar reflectance and need not be tested in accordance with ASTM E1980.~~

404.2.2 Shading structures. ~~Where Shading is~~ shall be permitted to be provided by a elements of a building or other structure, or an element or component thereof, such building, structure, component or element shall comply with all of the following:

- ~~1. Where~~ Open trellis-type free standing structures such as, but not limited to, ~~covered walkways, and trellises or pergolas, are covered with native preferred species if defined by the jurisdiction plantings, the plantings shall be designed to achieve mature coverage within five years;~~
- ~~2. Parking shading structures shall comply with Section 404.3;~~
- ~~3. Shade provided onto the hardscape by an adjacent building or structure located on the same lot shall be calculated and credited toward compliance with this section based on the projected peak sun angle on the summer solstice.~~

404.2.3 Shade by trees. Where shading is provided by trees, such trees shall be selected and placed in accordance with all of the following:

1. Trees selected shall be those that are preferred plant species, if determined by the jurisdiction native to, or non-invasive and adaptive to, the region and climate zone in which the project site is located. Plantings shall be selected and sited to produce a hardy and drought resistant vegetated area;
2. *Construction documents* shall be submitted that show the planting location and anticipated ten year canopy growth of all trees and that show the contributions of existing tree canopies; and;
3. Shading calculations shall be shown on the *construction documents* demonstrating compliance with this section and shall include only those *hardscape* areas directly beneath the trees based on a ten year growth canopy. Duplicate shading credit shall not be granted for those areas where multiple trees shade the same *hardscape*.

404.2.4 Pervious and permeable pavement. ~~Pervious and permeable pavements including open grid paving systems and open graded aggregate systems shall have a percolation rate not less than 2 gallons per minute per square foot ($100 \text{ L/min} \times \text{m}^2$) and shall have not less than 6 inches (152 mm) of open graded base below the pavement or pavers. Pervious and permeable pavement shall be permitted where the use of these types of hardscapes does not interfere with fire and emergency apparatus or vehicle or personnel access and egress, utilities, or telecommunications lines. Aggregate used shall be of uniform size.~~

404.3 Roof coverings. ~~Not less than 75 percent of the roof surfaces of buildings located in climate zones 1 through 3, as established in the International Energy Conservation Code, shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods.~~

Exception: ~~Portions of roof surfaces where solar thermal collectors, solar photovoltaic systems, roof penetrations and associated equipment, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, or vegetative roofing systems are provided shall be permitted to be deducted from the roof surface required to comply with this section.~~

404.3.1 Roof solar reflectance and thermal emittance. Roof coverings shall be in accordance with the IECC. Values for Table 403.1 shall be determined in accordance with the CRRC-1 Standard. Where roof coverings are used for compliance with Section 404.3, roof coverings shall comply with Section 404.3.1.1 or 404.3.1.2. The values for solar reflectance and thermal emittance shall be determined by an independent laboratory accredited by a nationally recognized accreditation program. Roof products shall be labeled and certified by the manufacturer demonstrating compliance.

404.3.1.1 Roof products testing. Roof products shall be tested for a minimum three-year aged solar reflectance in accordance with ASTM E1918, ASTM C1549 or Test Method One of CRRC-1 Standard and thermal emittance in accordance with ASTM C1371 or ASTM E408, and shall comply with the minimum values in Table 404.3.1.

404.3.1.2 Solar reflectance index. Roof products shall be permitted to use a Solar Reflectance Index (SRI) where the calculated value is in compliance with Table 404.3.1 values for Minimum Aged SRI. The SRI value shall be determined using ASTM E1980 with a convection coefficient of 2.1 Btu/h-ft² (12 W/m²*k) based on three-year aged roof samples tested in accordance with the test methods in Section 404.3.1.1.

**TABLE 404.3.1
REFLECTANCE AND EMITTANCE**

Roof Slope	Minimum Aged Solar Reflectance	Minimum Aged Thermal Emittance	Minimum Aged SRI
Less than 2:12	0.55	0.75	60
2:12 or greater	0.30	0.75	25

404.3.2 Vegetative roofs. Roofs shall be covered with either an extensive or intensive vegetative roof. Vegetative roofs shall comply with Section 406.6.

**SECTION 405
SITE LIGHTING**

**SECTION 406
DETAILED SITE DEVELOPMENT REQUIREMENTS**

406.1 General. The provisions of this section shall govern the design and installation of site development systems and use of materials.

406.2 Non-potable water systems for irrigation systems. Non-potable water systems used for irrigation shall comply with the graywater, municipal reclaimed water and collected rainwater provisions of this section.

406.2.1 Graywater systems. Graywater systems used for landscape irrigation purposes shall be limited to subsurface and surface irrigation applications. Site development shall be done in accordance with the applicable provisions in IPC Appendix C – Gray Water Recycling Systems. The retention time for surface irrigation shall be 24 hours or less. Graywater to be used in graywater irrigation shall comply with the provisions of Section 708 other than Sections 708.6 and 708.12.6.5. Subsurface graywater systems shall be in accordance with Section 406.3. Graywater shall be filtered by a 100 micron or finer filter. The control panel for the graywater irrigation system shall be provided with signage in accordance with Section 706.2.

406.2.2 Municipal reclaimed water. Municipal reclaimed water used for landscape irrigation purposes shall be limited to subsurface applications. Reclaimed water used in irrigation systems shall comply with the provisions of Section 709 except for Section 709.5. Reclaimed water shall be filtered by a 100 micron or finer filter. The control panel for the reclaimed water irrigation system shall be provided with signage in accordance with Section 706.2

Exception: Subject to the approval of the *code official* based on the extent of purification occurring in reclamation process, *municipal reclaimed water* shall be permitted in sprinkler irrigation applications.

406.2.3 Collected rainwater. *Rainwater* collected on the surface of the *building site*, or from the roof surfaces of the *building*, and used for landscape irrigation purposes shall not be limited regarding the method of application. *Rainwater* collected from elevated *building* locations that is to be used in *building site* irrigation, shall be in compliance with the applicable provisions of Sections 706 and 707 ~~other than Sections 707.6, 707.12.1, 707.12.1.1 and 707.12.7.4.~~

Delete 406.3 without substitution.

406.4 Vegetation and soil protection. Vegetation and soil protection plans, where provided in accordance with Section 402.3.5, shall address the following:

1. Identification of existing vegetation located on a *building site* that is to be preserved and protected;
2. Identification of portions of the *building site* to be designated vegetation and soil protection areas (VSPAs) that are to be protected during the construction process from being affected by construction activities;
3. Specification of methods to be used such as temporary fencing or other physical barriers to maintain the protection of the designated vegetation and soil protection areas (VSPAs).
4. Specification of protected perimeters around trees and shrubs that are to be included in the designated vegetation and soil protection areas (VSPAs). Perimeters around trees shall be identified as a circle with a radius of not less than 1 foot (305 mm) for every inch (25.4 mm) of tree diameter with a radius of not less than 5 feet (1524 mm) and around shrubs shall be not less than twice the radius of the shrub.

Exception: *Approved* alternative perimeters appropriate to the location and the species of the trees and shrubs shall be permitted.

- ~~5. Specification of methods to protect the viability of the designated vegetation and soil protection areas (VSPAs) to support the remaining vegetation at the conclusion of the construction process including minimizing impacts on the existing stormwater drainage patterns associated with the VSPAs.~~
- ~~6. Identification of plans, methods and practices used to designate essential areas of soil and subsoil disturbance.~~

Delete 406.5.2 and 406.5.3 without substitution.

406.7 Vegetative Roof gardens and landscape roofs. ~~*Extensive and intensive vegetative roofs*~~ Roof gardens and landscape roofs, where provided in accordance with Section 404.3 shall comply with the following:

- ~~1. All plantings shall be selected according their United States Department of Agriculture hardiness zone classifications and shall be capable of withstanding the climate conditions of the *jurisdiction* and the micro-climate conditions of the *building site* including, but not limited to, wind, precipitation and temperature. Planting density shall provide foliage coverage, in the warm months, of not less than 80 percent within two years of the date of installation unless a different time period is established in the *approved design*. Plants shall be distributed to meet the coverage requirements. To the extent defined by the jurisdiction, *invasive plant* species shall not be planted. *preferred plant* species shall be planted. Selected plants shall not add to the potential for fire hazard in the event of severe drought.~~
- ~~2. The *engineered soil medium* shall be designed for the physical conditions and local climate to support the plants, and shall consist of non-synthetic materials. The planting design shall include measures to protect the *engineered soil medium* until the plants are established. Protection measures include, but are not limited to, installation of pre-grown vegetated mats or modules, tackifying agents, fiber blankets and reinforcing mesh. The maximum wet weight and water~~

~~holding capacity of an engineered soil medium shall be determined in accordance with ASTM E2399.~~

- ~~3. Where access to the *building* facades is provided from locations on the perimeter of the roof, non-vegetated buffers adequate to support associated equipment and to protect the roof shall be provided.~~
4. Plantings shall be managed to maintain the function of the vegetative roof.

SECTION 407 PROJECT ELECTIVES

PART IV – CHAPTER 5

Delete definition as follows:

~~**[B] VAPOR RETARDER.** A vapor-resistant material, membrane or covering such as foil, plastic sheeting or insulation facing having a permeance rating of 1 perm or less, when tested in accordance with the desiccant method using Procedure A of ASTM E96. Vapor retarders limit the amount of moisture vapor that passes through a material or wall assembly.~~

Revise as follows:

SECTION 502 MATERIAL AND WASTE MANAGEMENT

502.1 Construction material and waste management plan. Not less than 50 percent of non-hazardous construction waste shall be diverted from landfills, except where other percentages are indicated in Table 302.1. A Construction Material and Waste Management Plan shall be developed and implemented to recycle or salvage construction materials and waste. The Construction Material and Waste Management Plan shall comply with all of the following:

1. The location where the collection, separation and storage of recyclable construction waste materials such as wood, paper, plastic, aluminum, steel, iron, gypsum board, carpet, mineral fiber, acoustical ceiling tile, glass and concrete, shall be indicated.
2. Materials to be diverted from disposal by ~~efficient usage~~, recycling, reuse on the project, or salvage for future use or sale shall be specified.
3. The amount of materials to be diverted shall be specified and shall be calculated by weight or volume, but not both.

For the purpose of this section, construction and waste materials shall not include land clearing debris, excavated soils and fill and base materials such as, but not limited to, *topsoil*, sand and gravel. Land-clearing debris shall include trees, stumps, rocks, and vegetation. Excavated soil, fill material and land-clearing debris shall be managed in accordance with Section 402.3.6.

~~**502.2 Recycling areas for waste generated post certificate of occupancy.** Waste recycling areas for use by *building* occupants shall be provided in accordance with one of the following:~~

- ~~1. Waste recycling areas shall be designed and constructed in accordance with the *jurisdiction's* laws or regulations;~~
- ~~2. Where laws or regulations do not exist or where limited recycling services are available, waste recycling areas shall be designed and constructed to accommodate recyclable materials based on the availability of recycling services;~~
- ~~3. Where recycling services are not available, waste recycling areas shall be designed and nstructured to accommodate the future recycling of materials in accordance with an *approved* design. The *approved* design shall meet one of the following:~~
 - ~~3.1 The approved waste recycling area design shall be based on analysis of other regional recycling services, laws or regulations.~~

~~3.2 The approved waste recycling area shall be designed to meet the needs of the occupancy, facilitate efficient pick-up, and shall be available to occupants and haulers.~~

~~**502.3 Storage of lamps, batteries and electronics.** Storage space shall be provided for fluorescent lamps, HID lamps, batteries, electronics, and other discarded items requiring special disposal by the jurisdiction.~~

SECTION 503 MATERIAL SELECTION

503.2 Material selection. Not less than 55 percent of the total *building* materials used in the project, based on mass or cost, shall comply with Section 503.2.1, 503.2.2, 503.2.3, 503.2.4 or 503.2.5. Compliance shall be demonstrated in accordance with those sections singularly or in combination. ~~Materials regulated by Sections 503.2.2, 503.2.3, 503.2.4 and 503.2.5 shall have a *design life* that is equal to or greater than that indicated in the *building service life* plan in accordance with Section 505.1.~~ Materials meeting the requirements of sections 503.2.2, 503.2.3, and 503.2.4 shall have a manufacturers designation as complying the requirements of that section(s).

503.2.2 Recycled content building materials. *Recycled content building* materials shall comply with one of the following:

1. Contain not less than 25 percent combined *post-consumer* and *pre-consumer* recovered material, and shall comply with Section 503.2.3.
2. Contain not less than 50 percent combined *post-consumer* and *pre-consumer* recovered material.

~~The *pre-consumer* recycled content shall be counted as one-half of its actual content in the material.~~

~~**503.2.5 Indigenous materials.** Indigenous materials or components shall be composed of resources that are recovered, harvested, extracted and manufactured within a 500 mile (800 km) radius of the *building site*. Where only a portion of a material or product is recovered, harvested, extracted and manufactured within 500 miles (800km), only that portion shall be included. Where resources are transported by water or rail, the distance to the *building site* shall be determined by multiplying the distance that the resources are transported by water or rail by 0.25, and adding that number to the distance transported by means other than water or rail.~~

SECTION 504 LAMPS

504.1 ~~Low-mercury lamps~~ Lamp mercury content. Lamps with a mercury content greater than 1 mg per lamp shall have a manufacturer's designation of the amount of mercury per lamp.

504.2 Fluorescent lamps. The mercury content in fluorescent lamps shall comply with Section 504.2 or 504.3.

Exceptions: Appliance, black light, bug, colored, germicidal, plant, shatter-resistant/shatter-proof/shatter-protected, showcase, sultan, T-8 and T-12 lamps with a color rendering index of 87 or higher, lamps with RDC bases, and lamps used for special-needs lighting ~~for individuals with exceptional needs.~~

504.2 ~~504.2.1~~ Straight fluorescent lamps. Straight, double-ended fluorescent lamps less than 6 feet in nominal length and with bi-pin bases shall contain not more than 5 milligrams of mercury per lamp.

Exception: Lamps with a rated lifetime greater than 22,000 hours at 3 hours per start operated on an ANSI reference ballast shall not exceed 8 milligrams of mercury per lamp.

504.2.2 ~~504.3~~ Compact Fluorescent Lamps. Single-ended pin-base and screw-base compact fluorescent lamps shall contain not more than ~~5~~ 4 milligrams of mercury per lamp.

Exception: Lamps rated at 25 watts or greater shall contain not more than ~~6~~ 5 milligrams of mercury per lamp.

SECTION 505
DETAILED SITE DEVELOPMENT REQUIREMENTS

SECTION 506
DETAILED SITE DEVELOPMENT REQUIREMENTS

SECTION 507
DETAILED SITE DEVELOPMENT REQUIREMENTS

PART V – CHAPTER 6

Delete definitions as follows:

~~**CO₂e.** Weight of each gas emitted when consuming a specific energy type in the *building* per unit of the specific energy type provided to the *building* at the utility *meter* multiplied by the GWP of the specific gas, and then summed over all three gases emitted.~~

Where:

~~GWP (CO₂) = 1~~

~~GWP (CH₄) = 25~~

~~GWP (N₂O) = 298.~~

~~**INDEPENDENT SYSTEM OPERATOR (ISO).** The electric system's operator.~~

~~**METER.** A water volume measuring device used to collect data and indicate water usage abnormalities. Such devices are provided by the water purveyor or the *building owner*.~~

~~**BUILDING INTEGRATED PHOTOVOLTAIC (BIPV) SYSTEM.** A system that incorporates photovoltaic modules, which covert solar radiation into energy, into the building envelope.~~

~~**PHOTOVOLTAIC PANEL SYSTEM.** A system that incorporates photovoltaic modules, which covert solar radiation into energy, into discrete panels that are installed on a building site or mounted on a building.~~

~~**PROCESS LOADS.** *Building energy loads that are not related to building space conditioning, lighting, service water heating or ventilation for human comfort.*~~

~~Reason: Definition is inconsistent with use of the word in IGCC, as it would include both most plug loads and large single purpose loads such as data centers.~~

~~**PROPOSED DESIGN.** A description of the proposed *building* used to estimate annual energy use for determining compliance based on total *building* performance including improvements in design such as the use of passive solar energy design concepts and technologies, improved *building thermal envelope* strategies, increased equipment and systems efficiency, increased use of daylighting, improved *control* strategies and improved lighting sources that will result in a decrease in annual energy.~~

~~**PRIMARY ENERGY USE.** The total fuel-cycle energy embedded within building materials and all forms of energy required for building operation. Units of energy are reported in total Btu's for building materials and total Btu's per unit of energy (e.g., kWh, therms, gallons, etc.) consumed in the operation of building mechanical systems (HVAC, lighting, etc.) Total fuel-cycle energy includes energy required from the point~~

of initial extraction, through processing and delivery to the final point of consumption into building materials or building operation.

SOLAR REFLECTANCE INDEX (SRI). A value that incorporates both *solar reflectance* and *infrared thermal emittance* in a single measure to represent a material's temperature in the sun. ~~SRI quantifies how hot a surface would get relative to standard black and standard white surfaces. SRI is calculated using equations based on previously measured values of solar reflectance and infrared emittance as laid out in ASTM E1980. SRI is expressed as a fraction, 0.0 to 1.0, or percentage, 0 percent to 100 percent.~~

STANDARD REFERENCE DESIGN. ~~A building design that meets the minimum requirements of the *International Energy Conservation Code* and the additional requirements of Section 603.3.~~

Delete Chapter 6 and substitute as follows:

**CHAPTER 6
ENERGY CONSERVATION, EFFICIENCY AND ATMOSPHERIC
QUALITY**

**CHAPTER 6
ENERGY EFFICIENCY**

**SECTION 601
GENERAL**

601.1 Scope. This chapter regulates the design, construction, and commissioning of buildings and building sites for the effective use of energy.

601.2 Intent. This chapter is intended to ensure the effective use of energy by buildings and building sites. It is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the effective use of energy.

601.3 Energy saving calculations. Energy calculations for the IGCC shall be in accordance with Section 507 of the IECC. The energy savings from daylighting with automated controls shall be permitted to be included. The energy savings from renewable, waste, and recovered energy shall be permitted to be included as a reduction in energy use.

601.4. Implied energy end uses. Unless specifically stated otherwise, references to the building energy use in this chapter shall be taken to mean the energy used by heating systems, cooling systems, ventilation/fans, service water heating and lighting. Other end uses shall be included only when specifically named.

601.5. Climate zones. References to climate zones in this Chapter shall be taken to mean the climate zones as specified in Section 301 of the *International Energy Conservation Code*.

**SECTION 602
COMPLIANCE ALTERNATIVES**

602.1 Compliance options. Buildings in compliance with Sections 602.2, 602.3, or 602.4 shall be considered to be in compliance with this Chapter.

602.2 Compliance based on prescriptive list. Buildings in compliance with at least 4 items in Table 602.2 shall be considered to be in compliance with this Chapter provided that they also comply with the minimum metering requirements in Section 604.

TABLE 602.2 PRESCRIPTIVE OPTION LIST

<u>Measure</u>	<u>Description</u>
<u>Heating and cooling equipment efficiency</u>	<u>Meet increased equipment efficiency requirements in Section 506.2 of IECC. For heating or cooling equipment lacking increased efficiency requirements in Section 506.2, the requirement shall be for both heating and cooling equipment to be 10% above Federal standards.</u> <u>Any ground source heat pump complying with Table 605.3 is deemed to meet this requirement.</u>
<u>Lighting efficiency</u>	<u>Meet LPD (lighting power density) requirements in IECC Section 506.3</u>
<u>Renewable energy</u>	<u>Meet renewables specification in IECC Section 506.4.</u>
<u>UA reduction</u>	<u>Reduce the overall building UA (sum of U-factor times area for each component) by 10% from that specified in the IECC tables for Opaque Thermal Envelope (Table 502.1.2) and Fenestration (Table 502.3).</u> <u>The areas of the envelope components, including windows, shall be as in the building constructed.</u>
<u>Increased daylighting</u>	<u>Provide daylighting with automated controls for an area equal to 70% of the regularly occupied space.</u>
<u>Increased water efficiency</u>	<u>Water heating efficiency complies with one or more of the options listed in Section 607.1.</u>
<u>Expanded metering</u>	<u>In addition to meeting the requirements for metering in Section 604, the metering and associated software shall meet the following requirements:</u> <u>Provide averaged values for hour of the day, day of the week and month.</u> <u>Be capable of comparing user selected like periods, such as comparing yesterday's energy use to the average for the same day of the week last year, or comparing the same month over several years.</u> <u>Provide peak, energy, and estimated energy cost for the periods defined by the utility's billing periods.</u> <u>Where the end uses are provided by separate equipment-- heating, cooling, fans, and service water heating shall be metered separately if projected to account for > 5% of the energy costs.</u>

602.3 Compliance based on 10% energy savings calculation. Buildings shown to save at least 10% of the energy allowed for a building that meets the requirements of the IECC shall be in compliance with this chapter. The calculation of energy savings shall be in accordance with Section 507 of the IECC. Buildings approved under this section shall also comply with the minimum metering requirements in Section 604.

602.4 Compliance based on an approved program. The code official or other authority having jurisdiction shall be permitted to approve a national, state or local program that exceed the energy saving requirements of the IECC by a minimum of 10%. Approval in writing by such a program shall be deemed to be compliance with this Chapter provided such a program includes compliance with the minimum metering requirements in Section 604. Compliance shall be permitted to be determined in accordance with the approved program's methodology.

**SECTION 603
BUILDING ENVELOPE**

603.1 Air barriers. The air barrier requirements in IECC section 502.4.1 shall apply to climate zones 2 through 8.

603.2 Roof solar reflectance and thermal emittance. In climate zones 1, 2, and 3 roof coverings above cooled *conditioned spaces* shall comply with this section. Low-sloped roofs, with a slope less than 2 units vertical in 12 horizontal shall comply with IECC Section 502.2.1.1. Roofs with other slopes shall comply with Table 603.2.

TABLE 603.2
MINIMUM REFLECTANCE AND EMITTANCE
FOR OTHER THAN LOW-SLOPED ROOFS^a

Three-year aged solar reflectance ^b of 0.35 and three-year aged thermal emittance ^b of 0.75
Initial solar reflectance ^b of 0.40 and initial thermal emittance ^b of 0.75
Three-year-aged solar reflectance index ^c of 32
Initial solar reflectance index ^c of 39

- a. The use of area-weighted averages to meet these requirements shall be permitted. Materials lacking initial tested values for either solar reflectance or thermal emittance, shall be assigned both an initial solar reflectance of 0.10 and an initial thermal emittance of 0.90. Materials lacking three-year aged tested values for either solar reflectance or thermal emittance shall be assigned both a three-year aged solar reflectance of 0.10 and a three-year aged thermal emittance of 0.90.
- b. Tested solar reflectance and thermal emittance shall be in accordance with CRRC-1 Standard.
- c. Solar reflectance index (SRI) shall be determined in accordance with ASTM E1980 using a convection coefficient of 2.1 BTU/h-ft²-F (12W/m².K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance. Calculation of initial SRI shall be based on initial tested values of solar reflectance and thermal emittance.

SECTION 604
ENERGY METERING

604.1 Scope. This section requires capabilities to meter and report energy use in new buildings. These include requirements for separating energy end uses for reporting, a data acquisition system, and the aggregation of collected data.

604.2 Buildings with tenants. In buildings with tenants, the energy use shall be metered separately for each tenant.

604.3 Energy distribution design requirements. The end use served by each distribution system shall be clearly designated on the energy distribution system. Adequate space shall be provided for installation of metering equipment to measure energy use. Where a distribution panel or pipe serves multiple end uses, the end uses shall be clearly designated at a point where the energy supply is subdivided into end uses.

604.4 End use distribution documentation. The energy distribution by end use shall be marked on the plans or other document(s) to be provided prior to occupancy.

604.5 Multiple building metering. Where there are multiple buildings on a building site, total energy use by each building > 2000 ft² shall also be metered and reported separately.

604.3 Minimum energy end use disaggregation. Each energy use that accounts for > 5% of the building energy use shall be metered and reported separately.

Exception: The following shall not require end use disaggregation:

- Buildings < 10,000 ft² of conditioned space.
- End uses projected to require < 5% of the building energy use.
- Buildings for which one end use is 90% or more of the building energy use.
- Warehouses.
- Spaces that are projected to use an average of < 2 watts/ft² in total energy use.

The following energy uses shall be metered by any method that will disaggregate the end uses, archive the data, and allow the building owner or operator to access electronic reporting. Data shall be taken at minimum hourly. Metering systems shall be connected to a data acquisition and management system capable of storing not less than 36 months worth of the end use data.

HVAC and service hot water heating includes, but is not limited to, fans, pumps, boiler energy, chiller energy, and service hot water.

Lighting includes both interior and exterior lighting.

Building operations includes vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains and *fireplaces*, swimming pools, snow-melt systems, and other *building operations*.

Plug loads includes energy use by devices, appliances, and equipment connected to convenience receptacle outlets.

Process loads. Energy used by any single load associated with activities within the building such as, but not limited to, data centers, manufacturing equipment, and commercial kitchens that exceeds 5% of the energy use of the whole building.

Total building energy use, separated by purchased fuel type.

Utility energy meters shall be permitted to be used to collect data for any end use and time period for which they are appropriate, provided the metered data can automatically be integrated with the other building energy end use reporting.

SECTION 605 **BUILDING MECHANICAL SYSTEMS**

605.1 Prescriptive compliance. Mechanical systems shall meet the applicable provisions of this section.

605.2 HVAC equipment efficiency. Where not prohibited by law, equipment shall meet the requirements of this section as applicable. Heating and cooling equipment shall comply with the requirement in IECC Section 506.2.

605.3 Ground source heat pumps. The efficiency of ground source heat pumps shall in accordance with Table 605.3.

TABLE 605.3
EFFICIENCY CRITERIA FOR GROUND SOURCE HEAT PUMPS

<u>Product Type</u>	<u>Minimum EER</u>	<u>Minimum COP</u>	<u>Test Procedure</u>
Water-to-Air Closed loop	<u>14.1</u>	<u>3.3</u>	<u>ISO 13256-1</u>
Water-to-Air Open loop	<u>16.2</u>	<u>3.6</u>	<u>ISO 13256-1</u>
Water-to-Water Closed loop	<u>15.1</u>	<u>3.0</u>	<u>ISO 13256-2</u>
Water-to-Water Open loop	<u>19.1</u>	<u>3.4</u>	<u>ISO 13256-2</u>
Direct Expansion (DX) or Direct GeoExchange (DGX)	<u>15.0</u>	<u>3.5</u>	<u>AHRI 870</u>

605.4 Ventilating fans. Ventilating fans shall comply with the requirements in Table 605.4.

**TABLE 605.4
MECHANICAL VENTILATION FAN EFFICACY**

<u>FAN LOCATION</u>	<u>AIR FLOW RATE Min / Max (CFM)</u>	<u>MINIMUM EFFICACY (CFM/WATT)</u>
Range hoods	any	2.8 cfm/watt
In-line fan	any	2.8 cfm/watt
Bathroom, utility room	10 to <90	1.4 cfm/watt
Bathroom, utility room	90 and above	2.8 cfm/watt

**SECTION 606
ROUGH-INS**

606.5.1 Rough-ins for future renewable energy generation. For buildings of 1,000 sq ft or more, rough-ins shall be provided for the connection of renewable energy sources attached to the building including solar photovoltaic and solar thermal. Rough ins shall be air-sealed in accordance with the IECC. Rough ins for different systems shall be permitted to be combined, provided the rough-in has the capacity for the combined systems.

Exception: Where shaded as specified by Section 502.2.2.1.1 of the IECC.

606.5.1.1 Rough-ins for future solar photovoltaic systems. Rough-ins shall be provided for the future installation of solar photovoltaic system(s) that will be capable of conveying at least 0.05 kW/m² of roof area. The conduit(s), sleeve(s), or other pathway(s) shall:

1. Have internal dimensions large enough to allow transferring power to the electrical room(s) or the electric service panel(s). Conduit for this purpose shall be at least ¾ inches in size.
2. Be accessible to allow the wiring to be easily installed, removed and replaced.
3. Provide for the electrically separated passage of electrical power and control wiring to the electrical room or other designated control room. Conduit for this purpose shall be at least ¾ inches in size.
4. Terminate near the solar photovoltaic system site(s) and shall be accessible.

606.5.1.2 Rough-ins for future solar hot water. Rough-ins shall provide for the future installation of a solar water heating system that will be capable of conveying at least 0.05 kW/m² of roof area for the energy needed for heating water in the following occupancies as defined in the *International Building Code*:

1. Group A-2, Restaurants and Banquet halls;
2. Group F, Laundries;
3. Group R-1, Boarding houses (transient), Hotels (transient), Motels (transient);
4. Group R-2 buildings; and
5. Group A-3, Health Clubs and Spas
6. Group I-2, Hospitals, Mental hospitals and Nursing homes.
7. Building sites that have a pool, spa or hot tub

The conduit(s), sleeve(s), or other pathway(s) shall

1. Have internal dimensions large enough to allow the solar thermal energy to be transferred to the location(s) of the service water heating equipment. Conduit for this purpose shall be at least ¾ inches in size.
2. Provide for not less than two runs of piping. The minimum diameter of the piping shall be ¾ inch nominal and the tubing shall be certified to handle sustained temperatures above 180F. Insulation shall be sized in accordance with Section 607.5.
3. Be accessible to allow the piping and insulation to be easily installed, removed, and replaced.
4. Terminate near the solar thermal site(s).
5. Provide space for the control wiring.

606.5.1.3 Space for future storage tank(s). Space for future storage tank(s) shall be identified and reserved. This space shall be located in or near the room that houses the service water heating equipment and shall be large enough to accommodate the storage for a solar thermal system sized in accordance with this Section. The area shall be at least 10 sq. ft.

Exception: Rough-ins are not required in Climate Zones Marine 4, and zones 4a, 5a and 6-8 or when 50% of the roof or other solar collection locations are shaded by a permanent structure(s).

SECTION 607 **BUILDING SERVICE WATER HEATING SYSTEMS**

607.1 Service water heating equipment efficiency. Where not prohibited by law, service water heating equipment shall be provided by any combination of the following:

1. Natural gas, propane, or oil water heater with an energy factor of 0.80 or more or with a thermal efficiency of 0.90 or more;
2. Electric water heater with an energy factor of 2.0 or more;
3. Ground source heat pump;
4. Desuperheater on a vapor compression air conditioner, heat pump, or ground source heat pump projected to supply a minimum of 30% of the energy required for service hot water.
5. Solar water heating system having a minimum Solar Fraction of 0.30 when tested in accordance with OG-300.
6. Tankless coil with a boiler with a minimum of 85 AFUE.
7. Waste heat recovery projected to provide more than 30% of the energy required by water heating.

607.2 Waste water energy recovery system. The following building types shall be provided with a waste water heat recovery system that will preheat the incoming water used for service hot water functions an average of not less than 10 °F (5.6 C):

1. Group A-2, Restaurants and Banquet halls;
2. Group F, Laundries;
3. Group R-1, Boarding houses (transient), Hotels (transient), Motels (transient);
4. Group R-2 buildings; and
5. Group A-3, Health Clubs and Spas
6. Group I-2, Hospitals, Mental hospitals and Nursing homes.

Exception: Single-story, slab-on grade and single-story, on crawl-space buildings.

607.3 Pipe insulation. This section shall apply to piping conveying heated or cooled fluids as part of a heating or cooling system, within an HVAC system, or within a hot water supply system. Piping with a nominal diameter ¼ inch and larger shall be insulated in accordance with Table 607.3. For piping larger than 2 inches, the minimum wall thickness shall be 2 inches for hot and chilled water, and 4 inches for steam.

Exceptions:

1. Factory-installed piping within HVAC or water heating equipment tested and rated in accordance with Federal standards or Section 607.3.
2. Piping conveying fluids having a design operating temperature range between 60°F and 105°F.
3. Piping conveying fluids not heated or cooled such as roof and condensate drains, cold water supply, and natural gas piping.
4. Where heat gain or heat loss will not increase energy usage such as liquid refrigerant piping.

5. Piping having an outside diameter or 1 inch or less, associated with strainers, control valves, and balancing valves.
6. Supply piping exposed under sinks, lavatories and similar fixtures.
7. Piping within blown-in or sprayed insulation. The pipe shall be continuously surrounded with at least 1 inch of insulation or the amount required in Table 607.3, whichever is greater.

**TABLE 607.3
PIPE INSULATION THICKNESS^a**

Fluid	Minimum Pipe Insulation^{b,c}
Steam (212°F and above)	Double the Pipe Diameter
Hot Water (At least 105°F to < 212°F)	Pipe Diameter
Chilled Water (60°F or less)	Pipe Diameter

a. All pipe diameters are nominal diameters. Insulation thickness is thickness outside pipe wall; for example, 1" hot water pipe would have insulation such that the overall diameter of pipe plus insulation is 3".

b. For insulation with conductivity above 0.34 (Btu-in./(h-ft²-F), the adjusted minimum thickness shall be determined as follows: $T = r[(1 + t/r)K/0.34 - 1]$

Where:

T = adjusted minimum insulation thickness (inches)

r = actual outside radius of pipe (inches)

t = applicable insulation thickness from table (inches)

K = conductivity of alternate material (Btu-in./h-ft²-°F)

607.4 Piping within building assemblies. Where the piping is installed in ceilings, floors or wall cavities in the thermal envelope, the minimum insulation between the pipe and the exterior shall be 4 times the amount required in Table 607.3.

607.5 Buried piping. Piping installed within a slab or below grade shall be placed within a physically protective, waterproof channel, sleeve or conduit having internal dimensions large enough such that the piping and insulation can be removed and replaced, and maintain its dimensional integrity during and after construction.

Exception: Where the insulation manufacturer stipulates that the pipe insulation will maintain its insulating value in underground applications in damp soil when installed according to the manufacturer's instructions. This exception does not apply to piping that runs through or under *building* slabs.

SECTION 608 BUILDING ELECTRICAL POWER AND LIGHTING SYSTEMS

608.1 General. Building electrical power and lighting systems shall meet the provisions of the *International Energy Conservation Code* for such systems and the provisions of this Sections 608.2 through.

608.2 Captive key control in hotels / motel. Captive key controls shall be used to energize hotel and motel rooms.

608.3 Automatic daylight controls. Automatic daylight controls shall be provided in daylit areas with minimum fenestration as specified in Table 808.1 and Figures 808.1 to 808.4. General lighting in a sidelighting daylit area that is within one window head height shall be separately controlled by automatic daylighting controls.

Exceptions: Automatic daylight controls are not required for the following spaces and equipment:

1. Toplight daylight zones where the skylight is located in an obstructed roof.
2. Sidelight daylight zones where the vertical fenestration is located in an obstructed exterior wall.
3. Daylit areas served by less than 90 watts of lighting.
4. Spaces where medical care is directly provided.
5. Spaces within dwelling units or sleeping units.
6. Lighting required to comply with IECC Section 505.2.3.

608.4 Plug load controls. Receptacles and electrical outlets in the following spaces shall be controlled by an occupant sensor or time switch as follows:

1. Group B office spaces shall incorporate wired receptacles, with at least one switched receptacle shall be provided for each 100 square feet. Switch receptacles in furniture systems, shall be permitted to be counted towards this requirement.
2. In classrooms in Group B and Group E occupancies, not less than four switched receptacles shall be provided in each classroom.
3. In copy rooms, print shops, and computer labs, not less than one switched receptacle shall be provided for each data jack.

608.4.1 Distribution and marking. Controlled receptacles and electrical outlets shall be distributed in a reasonably uniform pattern throughout each space. Controlled receptacles shall be marked to differentiate them from uncontrolled receptacles.

608.5 Continuously burning pilot lights. Fixtures that generate illumination by combustion of fuel gas shall not contain continuously burning pilot lights.

608.6 Verification of lamps and ballasts. A field inspector shall confirm the installation of luminaires, type and quantity; lamps, type, wattage and quantity, and ballasts, type and performance for not less than one representative luminaire of each type and for consistency with the approved construction documents. Where a discrepancy is found, energy calculations shall be corrected accordingly and resubmitted.

SECTION 609 **BUILDING RENEWABLE ENERGY SYSTEMS**

609.1 Renewable / recovered energy systems requirements. The energy required by this section can be provided by any combination and type of renewable or recovered energy including building integrated photovoltaic system, photovoltaic panel system, solar water heating system, wind energy system, waste heater recovery, power generated from waste, or other renewable systems. Energy from renewable systems, recovered from water beyond that required in Section 607.1 or energy generated from waste shall meet or exceed the energy specified in Section 506.4 of the IECC.

Exception: Buildings which comply with one additional item from Table 602.2.

609.2 Roof-mounted systems. The building structure shall be constructed to support the loads imposed by renewable systems installed on roofs. Support systems shall be constructed of noncombustible materials or fire-retardant-treated wood equivalent to that required for the roof construction. Not less than four feet of clearance shall be provided between any portion of the roof mounted renewable system and roof mounted equipment, skylights, access hatches and similar building components that could hinder access to the renewable system.

PART VI – CHAPTER 7

Revise as follows:

SECTION 701 GENERAL

701.1 Scope. The provisions of this chapter shall ~~establish~~ govern the means of conserving water used indoors, ~~and~~ outdoors. This chapter also regulates water distribution systems, the use of non-potable water, and ~~in~~ methods for wastewater conveyance.

701.2 Simple compliance option. Buildings which meet the following requirements shall be considered to be in compliance with this chapter.

1. Potable and municipal reclaimed water are not used for irrigation or other outdoor uses.
2. Fixtures and fittings of the types covered by Table 702.1 have a manufacturer's designation for flow rate and are in compliance with the maximum flow rates in Table 702.1.
3. Clothes washers, ice machines, dishwashers, dipper wells, and pre-rinse spray valves are in compliance with Sections 702.3 and 702.6.
4. Gray water, rainwater and municipal reclaimed water uses are in accordance with this chapter.
5. Hot water distribution systems are in accordance with Section 702.8.
6. Potable water use of over 500 g/ day is metered in accordance with Section 705.
7. Vehicle washing facilities are in accordance with Section 702.14.

SECTION 702 FIXTURES, FITTINGS, EQUIPMENT AND APPLIANCES

702.1 Fitting and fixture consumption. ~~A schedule of p Plumbing fixtures and fixture fittings shall have a manufacturer's designation indicating compliance be provided that demonstrates compliance with all of the following:~~ with the maximum flow rates specified in Table 702.1.

- ~~1. The maximum water consumption of fixtures and fittings shall comply with the flow rates specified in Table 702.1 for the fixtures and fittings listed therein.~~
- ~~2. The aggregate *potable* water consumption of fixtures and fittings shall be at least 20 percent less than the reference value calculated in accordance with Section 702.1.1.~~

Exceptions: The following fixtures and devices shall not be required to comply with the reduced flow rates of this section.

1. Blowout design water closets having a maximum water consumption of ~~2-8~~ 1.6 gallons (40.4 L) per flush.
2. Clinical sinks having a maximum water consumption of 4.5 gallons (17 L) per flush.
3. Service sinks, bath valves, pot fillers, laboratory faucets, utility faucets, and other fittings designed primarily for filling operations.

702.1.1 Aggregate fixture and fitting water consumption calculation. ~~The aggregate consumption of all fixtures and fittings shall be calculated in accordance with Tables 702.1.1(1) and 702.1.1(2) for the purpose of demonstrating compliance with the aggregate consumption requirement in Sections 702.1 and 702.1.2. Table 702.1.1(1) is to be used first to calculate the reference water use and Table 702.1.1(2) is then to be used to calculate the required reduction in that reference water use. The percentage of reduction of the total water use shall be calculated in accordance with equation 7-1.~~

~~Consumption for each fixture or fitting type = (flow rate) x (duration) x (daily uses per occupant) x (number of occupants). The aggregate fixture and fitting consumption is equal to the sum of the consumption values for each fixture and fitting located in the occupancy.~~

Percent reduction = $[(R-D)/R] \times 100$
(Equation 7-1)

Where:

- R = Total reference water use determined from Table 702.1.1(1)
- D = Total design water use determined from Table 702.1.1(2)

**TABLE 702.1
 MAXIMUM FIXTURE AND FITTING FLOW RATES
 FOR REDUCED WATER CONSUMPTION**

FIXTURE OR FIXTURE FITTING TYPE	MAXIMUM FLOW RATE
Showerhead ^e	2.0 gpm ^b and WaterSense labeled
Lavatory faucet and bar sink -private	1.25-1.5 gpm ^e and WaterSense labeled
Lavatory faucet-public (metered metering)	0.25 gpc ^d
Lavatory faucet-public (non- metered metering)	0.5 gpm ^e
Kitchen faucet-private	2.2 gpm ^e
Kitchen and bar sink faucets in other than dwelling units and guest rooms	2.2 gpm ^e
Urinal	0.5 gpf and WaterSense labeled or nonwater urinal
Water closet	1.6 gallons per flush ^a
Water closet-private	1.28 gpf and WaterSense labeled
Prerinse Spray Valves	1.3 gpm ^e
Drinking Fountains (manual)	0.7 gpm ^e
Drinking Fountains (metered)	0.25 gpc ^d

- a. The effective flush volume of a dual-flush water closet is defined as the composite, average flush volume of two reduced flushes and one full flush.
- b. Flow rate at a pressure of 45 and 80 psi.
- c. Flow rate at a pressure of 60 psi.
- d. Gallons per cycle
- e. Includes hand showers, body sprays, rainfall panels and jets. Showerhead(s) shall be supplied by *automatic* compensating valves that comply with ASSE 1016 or ASME A112.18.1/CSA B125.1 and that are specifically designed to function at the flow rate of the showerheads being used.

**TABLE 702.1.1(1)
 REFERENCE FIXTURE AND SUPPLY FITTING WATER CONSUMPTION
 To Calculate Baseline Water Use Projections**

Plumbing Fixture or Supply Fitting	Flow Rate or Volume ^b	Duration	Daily Uses Per Occupant	Occupants ^h	Daily Volume Gallon per day
Shower head ^a in dwelling units and guest rooms	2.5 gpm ^e	8.5 min.	4	-Note c	
Lavatory faucet, private and in dwelling units and guest rooms	2.2 gpm ^d	0.25 min.	3		
Lavatory, public (metered)	0.25 gpc ^f	1 cycle	3		
Lavatory, public (nonmetered)	0.5 gpm ^d	0.25 min.	3		
Kitchen and bar sink faucets	2.2 gpm ^d	4 min.	4		
Urinal	1.0 gpc ^f	1 cycle	2/male		
Water closet in other than dwelling units and guest	1.6 gpc ^f	1 cycle	1/male ^g	Males	
			3/female	Females	

Plumbing Fixture or Supply Fitting	Flow Rate or Volume ^b	Duration	Daily Uses Per Occupant	Occupants ^h	Daily Volume Gallon per day
rooms					
Water closet in dwelling units and guest rooms ⁱ	1.6 gpc ^f	1 cycle	6/male	Males	
			6/female	Females	
				Total Reference Water Use (R) (gal/day)	
For SI: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.					

- a. A hand-held shower spray is considered to be a showerhead.
- b. Consumption tolerances shall be determined from referenced standards.
- c. For shower heads, the number of occupants shall be based upon the anticipated number of shower users. Residential and hotels shall presume 1 shower per occupant per day. Residential occupancy as regulated by the code in accordance with Section 101.2.
- d. Flow at 60 psi
- e. Flow at 80 psi
- f. Gallons per cycle (gpc)
- g. The daily use per male occupant shall be 3 where urinals are not installed
- h. The number of occupants shall be that number used to determine the required number of plumbing fixtures in accordance with the International Plumbing Code.
- i. Residential occupancies as regulated by this code in accordance with Section 101.2

TABLE 702.1.1(2)
DESIGN FIXTURE AND SUPPLY FITTING WATER CONSUMPTION
To Calculate Water Use Reduction Compared to Baseline Projections

Plumbing Fixture or Supply Fitting	Flow Rate or Volume ^b	Duration	Daily Uses Per Occupant	Occupants ^f	Daily Volume Gallon per day
Shower head or shower spa ^a		8.5 min.	1	-Note c	
Lavatory faucet, private in dwelling units and guest rooms ^g		0.25 min.	3		
Lavatory, public (metered)		1 cycle	3		
Lavatory, public (nonmetered)		0.25 min.	3		
Kitchen and bar sink faucets		4 min.	1		
Urinal		1 cycle	2/male		
Water closet ^d In other than dwelling units and guest rooms ^g	1.6 gpc	1 cycle	1/male ^e	males	
			3/female	females	
Water closet ^d In dwelling units and guest rooms ^g	1.28 gpc	1 cycle	6/male	males	
			6/female	females	
				Total Design Water Use (D) (gal/day)	

- For SI: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.
- a. Includes hand showers, body sprays, rainfall panels and jets. Showerhead(s) shall be supplied by automatic compensating valves that comply with ASSE 1016 or ASME A112.18.1/CSA B125.1 and that are specifically designed to function at the flow rate of the showerheads being used.
 - b. Consumption tolerances shall be determined from referenced standards.
 - c. For shower heads, the number of occupants shall be based upon the anticipated number of shower users.
 - d. Tank type and pressure assist High-Efficiency Water Closets (HETs) shall be certified to the current WaterSense High-Efficiency Toilet Specification.
 - e. The daily use per male occupant shall be 3 where urinals are not installed.

- f. The number of occupants shall be that number used to determine the required number of plumbing fixtures in accordance with the *International Plumbing Code*.
- g. Residential occupancies as regulated by this code in accordance with Section 101.2.

702.1.2 Additional reductions. The provisions for Tier 1 and Tier 2 maximum fixture flow rates shall be applicable where indicated in Table 302.1. The specific requirements for Tier 1 and Tier 2 fixture and fitting consumption shall be as follows:

Tier 1. A schedule of plumbing fixtures and fixture fittings shall be provided that demonstrates that fixture and fitting consumption meets the applicable reduced flow rates specified in Table 702.1 and that demonstrates a 30 percent reduction in the reference aggregate fixture and fitting *potable* water consumption calculated in accordance with Section 702.1.1.

Tier 2. A schedule of plumbing fixtures and fixture fittings shall be provided that demonstrates that fixture and fitting consumption meets the applicable reduced flow rates specified in Table 702.1 and that demonstrates a 40 percent reduction in the reference aggregate fixture and fitting *potable* water consumption calculated in accordance with Section 702.1.1.

702.1.4 Showerhead performance. Showerheads shall have a manufacturers designation as complying with EPA 8**R100**.

702.1.5 Water closet performance. Water closets shall have a manufacturers designation as complying with EPA 800R07010.

702.3 Food establishment pre-rinse spray heads. Food establishment pre-rinse spray heads shall have a manufacturers designation of flow rate, shall comply with the maximum flow rate in accordance with Table 702.1, and shall shut off *automatically* when released.

702.4 Drinking fountain controls. Drinking fountains equipped with *manually* controlled valves shall shutoff *automatically* upon the release of the valve. *Metered* drinking fountains shall comply with the flow volume specified in Table 702.1.

702.6 Appliances and other equipment. Sections 702.6.1 through 702.6.4 shall regulate appliances that are not related to space conditioning. Appliances and equipment specified in this section and present at the time of final inspection for issuance of the certificate of occupancy shall be in compliance with the requirements of this section.

702.6.1 Clothes washers. Clothes washers shall have a manufacturers designation of Modified Energy Factor (MEF) and Water Factor (WF), ~~be Energy Star labeled,~~ and shall have an MEF of 2.0 or greater, and a WF of 6.0 or lower.

702.6.2 Commercial ice machines makers. Ice machines makers shall not be water cooled. Ice makers machines shall have a manufacturers designation as complying with the requirements of Table 702.6.2.

**Table 702.6.2
Commercial Ice Machines^a**

Equipment Type	Harvest Rate, H (lbs ice/day)	Energy Use Limit (kWh/100 lbs ice)	Potable Water Use (gal/100 lbs ice)
Ice Making Head	< 450	9.23 – 0.0077H	<= 25
	>= 450	6.20 – 0.0010H	<= 25
Remote Condensing Unit (without remote compressor)	< 1000	8.05 – 0.0035H	<= 25
	>= 1000	4.64	<= 25
Remote Condensing	< 934	8.05 – 0.0035H	<= 25

<u>Equipment Type</u>	<u>Harvest Rate, H (lbs ice/day)</u>	<u>Energy Use Limit (kWh/100 lbs ice)</u>	<u>Potable Water Use (gal/100 lbs ice)</u>
<u>Unit (with remote compressor)</u>	<u>>= 934</u>	<u>4.82</u>	<u><= 25</u>
<u>Self-Contained Unit</u>	<u>< 175</u>	<u>16.7 – 0.0436H</u>	<u><= 35</u>
	<u>>= 175</u>	<u>9.11</u>	<u><= 35</u>

a. When tested shall in accordance with ARI Standard 810-2006.

702.6.3 Food steamers. Food steamers shall consume not more than 2.0 gal (7.5 L) per hour in the full operational mode.

702.6.4 Dishwashers. Dishwashers shall have a manufacturer's designation indicating that energy consumption does not exceed ~~be Energy Star labeled or 307 kWh/year~~ and water consumption does not exceed 5.0 gallons/cycle; or that energy and water consumption is in accordance with ~~dishwashers shall be in accordance with~~ Table 702.6.4. Machines that are interchangeable between high temperature and low temperature operation, shall meet both requirements.

**TABLE 702.6.4
MAXIMUM WATER AND IDLE ENERGY FOR DISHWASHERS**

<u>Machine Type^a</u>	<u>High Temperature</u>		<u>Low Temperature</u>	
	<u>Idle Energy^b</u>	<u>Water Consumption^c</u>	<u>Idle Energy^b</u>	<u>Water Consumption^c</u>
<u>Under Counter</u>	<u><= 0.90 kW</u>	<u><= 1.00 gal/rack</u>	<u><= 0.5 kW</u>	<u><= 1.70 gal/rack</u>
<u>Stationary Single Tank Door</u>	<u><= 1.0 kW</u>	<u><= 0.950 gal/rack</u>	<u><= 0.6 kW</u>	<u><= 1.18 gal/rack</u>
<u>Single Tank Conveyor</u>	<u><= 2.0 kW</u>	<u><= 0.700 gal/rack</u>	<u><= 1.6 kW</u>	<u><= 0.790 gal/rack</u>
<u>Multiple Tank Conveyor</u>	<u><= 2.6 kW</u>	<u><= 0.540 gal/rack</u>	<u><= 2.0 kW</u>	<u><= 0.540 gal/rack</u>

- a. "Under Counter" is a machine with a height of 38 inches or less with a stationary rack of dishes.
"Stationary, single tank, door" is a machine with a stationary or revolving rack of dishes.
"Single Tank Conveyor" is a machine that carries dishes through wash and rinse sprays within the machine. It has a tank for wash water followed by a final sanitizing rinse, but does not have a pumped rinse tank.
"Multiple Tank Conveyor" is a machine that carries dishes through a series of wash and rinse sprays. It has tank(s) for wash water, tank(s) for pumped rinse water, and a final sanitizing rinse.
"High Temperature" is a machine that applies potable hot water to achieve sanitization.
"Low Temperature" is a machine that applies potable water and a chemical sanitizing solution to achieve sanitization.
- b. Water Consumption shall be measured in accordance with NSF/ANSI 3-2007.
- c. "Idle Energy" is measured with the door closed and the tank heater only in operation. Idle Energy shall be measured in accordance with ASTM Standard F1696, or ASTM Standard F1920, as applicable.

702.6.5 702.13 Dipper wells. The water supply to a dipper well shall have a shutoff valve and flow control valve. The flow control valve shall ~~Water flow into a dipper well shall~~ have a manufacturer's designation that the maximum flow does not exceeding 1 gpm (3.78 lpm) at a supply pressure of 60 psi (413.7 kPa).

702.6.6 702.20 Food water waste disposal disposers. The water flow into a commercial food waste disposer in a food establishment shall be controlled by a load sensing device such that the water flow does not exceed 1 gpm under no-load operating conditions and 8 gpm under full-load operating conditions. ~~The disposal of food wastes that are collected as part of preparing ware for washing shall be accomplished by one or more of the following:~~

1. Through the use of a food strainer (scraper) basket that is emptied into a trash can,
2. Processed by garbage grinder where the water flow into a commercial food waste disposer in a food establishment shall be controlled by a load sensing device such that the water flow does not exceed 1 gpm under no-load operating conditions and 8 gpm under full-load operating conditions
3. Through the use of a pulper or mechanical strainer that uses not more than 2 gpm of potable water.

702.6.7 702.22 Autoclaves and sterilizers. Autoclaves and sterilizers requiring condensate tempering systems shall be of the type that does not require potable water to be blended with the discharge water to reduce the temperature of discharge.

702.6.7.1 702.22.4 Vacuum autoclaves and sterilizers. Vacuum sterilizers shall be prohibited from utilizing venturi-type vacuum mechanisms using water.

702.6.8 702.23 Liquid ring vacuum pumps. Except where the discharge is contaminated with hazardous materials or pathogens, the discharge water from liquid ring vacuum pumps shall be recovered for reuse within the pump or for other onsite applications. The use of liquid ring or venturi vacuum systems that consume water shall be prohibited.

702.6.9 Heat exchangers for appliances and equipment. Once-through cooling is prohibited for appliances and equipment with heat exchangers.

702.21 Combination ovens. Combination ovens shall consume not more than 10 gallons per hour (38 Lph) in any operational mode. Water consumption shall be tested in accordance with the requirements of ASTM F1639

Exception: Where health or safety considerations require a liquid ring pump be used.

702.7 Municipal reclaimed water. Where required by Table 302.1 and where *municipal reclaimed water* is accessible and allowed for such use by the laws, rules and ordinances applicable in the *jurisdiction*, it shall be supplied to water closets, water-supplied urinals, water-supplied trap primers and applicable industrial uses.

702.8 Efficient hot water distribution. Hot water shall be delivered to the outlets of individual showers, combination tub-showers, sinks, lavatories, dishwashers, washing machines and hot water hose bibbs in accordance with Section 702.8.1 or Section 702.8.2. For purposes of this section, the source of hot water is a water heater, boiler, hot water circulation loop piping or electrically heat-traced hot water piping.

702.8.1 Maximum allowable pipe length method. The maximum allowable pipe length from the source of hot water to the termination of the fixture supply pipe shall be in accordance with Table 702.8.2. Where the length contains more than one size of pipe, the largest size of pipe shall be used for determining the maximum allowable length of the pipe in Table 702.8.2.

702.8.2 Maximum allowable pipe volume method. The water volume in the piping shall be calculated in accordance with Section 702.8.2.1. The maximum volume of hot water in the piping to public lavatory faucets, metering or non-metering, shall be 2 ounces (0.06 L). For fixtures other than public lavatory faucets the maximum volume shall be 64 ounces (1.89 L) for hot water from a water heater or boiler; and 24 ounces (0.7 L) for hot water from a hot water circulation loop pipe or an electrically heat-traced hot water pipe.

702.8.2.1 Water volume determination. The volume shall be determined by adding the internal volume of pipe, fittings, valves, meters and manifolds between the source of hot water and the termination of the fixture supply pipe. The volume shall be determined from the liquid ounces per foot column of Table 702.8.2. The volume contained within fixture shut off valves, flexible water supply connectors to a fixture fitting or within a fixture fitting shall not be included in the water volume determination. Where hot water is supplied by a hot water circulation loop pipe or an electrically heat-traced pipe, the volume shall include the portion of the fitting on the source pipe that supplies the pipe to the fixture.

**TABLE 702.8.2
MAXIMUM LENGTH OF PIPE OR TUBE**

Nominal Pipe or Tube Size (inch)	Liquid Ounces per Foot of Length	Maximum Pipe or Tube Length		
		System without a Circulation Loop or Heat Traced Line (feet)	System with a Circulation Loop or Heat Traced Line (feet)	Lavatory Faucets – Public (metering and non-metering) (feet)
<u>1/4^a</u>	<u>0.33</u>	<u>50</u>	<u>16</u>	<u>6</u>
<u>5/16^a</u>	<u>0.5</u>	<u>50</u>	<u>16</u>	<u>4</u>
<u>3/8^a</u>	<u>0.75</u>	<u>50</u>	<u>16</u>	<u>3</u>
<u>1/2</u>	<u>1.5</u>	<u>43</u>	<u>16</u>	<u>2</u>
<u>5/8</u>	<u>2</u>	<u>32</u>	<u>12</u>	<u>1</u>
<u>3/4</u>	<u>3</u>	<u>21</u>	<u>8</u>	<u>0.5</u>
<u>7/8</u>	<u>4</u>	<u>16</u>	<u>6</u>	<u>0.5</u>
<u>1</u>	<u>5</u>	<u>13</u>	<u>5</u>	<u>0.5</u>
<u>1 1/4</u>	<u>8</u>	<u>8</u>	<u>3</u>	<u>0.5</u>
<u>1 1/2</u>	<u>11</u>	<u>6</u>	<u>2</u>	<u>0.5</u>
<u>2 or larger</u>	<u>18</u>	<u>4</u>	<u>1</u>	<u>0.5</u>

a. The flow rate for 1/4 inch size is limited to 0.5 gpm; for 5/16 inch size is limited to 1 gpm; for 3/8 inch size is limited to 1.5 gpm.

702.9 Trap priming water. ~~Potable water shall not be used for trap priming purposes where a municipal reclaimed water distribution system or a graywater distribution system is provided.~~ Continuously running trap primers are prohibited. Trap primers shall be of the type that uses no more than 30 gallons per year per trap.

702.9.1 Trap primer filtration required. ~~Non-potable water~~ utilized by pressurized trap primer devices shall be filtered by a 100 micron or finer filter.

702.9.2 Labeling and signage. ~~Each trap primer device utilizing non-potable water shall be provided with signage in accordance with Section 706.2.~~

702.10 Makeup water supply. ~~Onsite non-potable water supply systems, such as on-site non-potable sources or reclaimed water, graywater and rain water harvest systems, shall be supplied with municipal-reclaimed makeup water except that potable water shall be supplied where municipal reclaimed water is not accessible or is not allowed for such use by the laws, rules and ordinances applicable in the jurisdiction.~~

702.11 Water powered pumps. ~~Water-powered pumps are prohibited for use as a primary means of eliminating ground water from sumps. Water powered pump may be used as an emergency or backup sump pump. only in sumps equipped with an electric powered primary pump, and if equipped with a battery powered alarm to warn when the water powered pump activates. The alarm shall have a minimum rating of 85 dB at ten feet.~~

702.14 Vehicle wash facilities. Vehicle wash facilities shall comply with the applicable requirements of this section.

702.14.1 Automated vehicle wash facilities. Not less than 50 percent of the water used for the rinsing phase of the wash cycle at automated vehicle wash facilities shall be collected to be re-used in for the washing phase. Towel and chamois washing machines shall have high-level water cut-offs. Maximum potable water use for automobile washing shall not exceed 55 gallons per vehicle for in-bay automatic and 35 gallons for conveyor and express type car washes.

Exception: This does not apply to bus and large commercial vehicle washing facilities.

~~702.15~~ **14.2 Self-service vehicle wash facilities.** Spray wand nozzles used at self-service vehicle wash facilities shall discharge not more than 3 gpm (11.4 lpm). Faucets for chamois wringer sinks shall be of the self-closing type.

~~702.16~~ **14.3 Vehicle washing facilities.** Wastewater from reverse osmosis water treatment systems installed in vehicle washing facilities shall be used in discharge to the washing phase water holding tank.

~~702.17 Covers.~~ Spas shall be provided with vapor-retardant covers. ~~Installed covers shall be in continuous contact with the rim surface of the spa.~~

~~702.18 Splash troughs.~~ Swimming pool splash troughs shall discharge to the pool water system.

~~702.19 Covers.~~ Swimming pools shall be provided with vapor-retardant covers.

~~702.24 Film processors.~~ The cooling water discharge from water-cooled film processors shall be recovered and reused within the processor or for other onsite applications.

SECTION 703 HVAC SYSTEMS AND EQUIPMENT

~~703.1 Hydronic closed systems.~~ Closed loop hydronic heating and cooling systems, and ground-source heat pump systems shall not be connected to a ~~potable~~ makeup water supply.

~~703.3 Condensate coolers and tempering.~~ ~~Potable~~ water shall not be used to reduce the temperature of waste water such as steam condensate and boiler blow-down water. Water tempering devices that control water used for tempering hot water and steam condensate and blowdown shall be designed to flow cool water only when temperatures in the discharge exceed 140 degrees F. The use of continuously flowing tempering water is prohibited.

~~703.4 Air-conditioning system condensate drainage recovery.~~ When the air-conditioning equipment will create condensate greater than 100 gallons per day averaged over the cooling season, the condensate shall be collected and used as an alternate source of non-potable water. Where a non-potable water source, such as a graywater or rain water collection system, is installed on site, or water features or fountains are installed within the building, cooling system condensate shall be collected and discharged to such collection system, water feature or fountain.

~~703.5 Heat exchangers.~~ ~~Potable~~ water shall not be used as a coolant in any heat exchanger except where the ~~potable~~ water is recirculated. Once-through cooling is prohibited. Heat exchangers shall be connected to a recirculating water system such as a chilled water loop, cooling tower loop, or similar recirculating system.

~~703.6 Humidifier discharge.~~ Water discharge from flow-through type humidifiers and from the draining and flushing operations of other types of humidifiers shall be collected for reuse where a collection and reuse system exists.

~~704.1.3 Waste connections.~~ Waste water from water softener regeneration shall not discharge to ~~reclaimed graywater or rainwater~~ collection systems and shall discharge in accordance with the *International Plumbing Code*.

~~704.2 Reverse osmosis water treatment systems.~~ Point-of-use reverse osmosis treatment systems shall comply with NSF 58. ~~The discharge pipe from a reverse osmosis drinking water treatment unit shall connect to the building drainage system in accordance with Section 611.2 of the International Plumbing Code.~~ Point-of-use reverse osmosis systems shall be equipped with an automatic shutoff valve that prevents the production of reject water when there is no demand for treated water.

SECTION 705
SPECIFIC WATER CONSERVATION MEASURES METERING

705.1 Indoor ornamental fountains and water features. Where indoor ornamental fountains, indoor water features or permanent indoor irrigation systems are supplied by *potable water*, the *building* that contains them shall comply with one additional *project elective* from Section 710. This shall be in addition to the requirements of Table 302.1.

705.1 Metering. Water *meters* shall be required for *building water consumed from any source*. Each *potable* and reclaimed source, and each onsite water system, shall be *metered* separately. ~~Meters shall be installed in accordance with the requirements of the International Plumbing Code.~~ Each *meter* shall be required to be capable of communicating water consumption data remotely.

Exception: Buildings whose total water use is projected to be less than 500 g/day.

705.1.1 Metering end uses. ~~All *Potable* and non-*potable* water supplied to the applications listed in Table 705.2.1 shall be individually metered in accordance with the requirements indicated in Table 705.2.1.~~ Similar appliances and equipment shall be permitted to be grouped and supplied from piping connected to a single *meter*. Meters shall be capable of measuring flow rates at least as low as 1/8 gpm. Utility meters shall be permitted as a source of data for the metering system.

705.1.2 Minimum water end use disaggregation. The water uses in Table 705.1.1 shall be metered by a method that will disaggregate the end uses, archive the data, and allow the building owner or operator to access electronic reporting. Metering systems shall be connected to a data acquisition and management system capable of storing not less than 36 months of end use data collected and capable of transferring such data electronically.

Exception: The following shall not require end use disaggregation:

1. Buildings having less than 10,000 ft² of conditioned space
2. End uses projected to require less than 5 percent of the building water use.
3. Buildings for which one end use is 90 percent or more of the building water use.
4. Warehouses.
5. Buildings that are projected to use less than 500 g/day in total.

TABLE 705.1.1
METERING REQUIREMENTS

APPLICATION	REQUIREMENTS
Irrigation	Irrigation systems that are automatically controlled shall be <i>metered</i> .
Tenant Spaces	Tenant spaces that consume water shall be <i>metered</i> individually.
Onsite Water Collection Systems	The makeup water lines supplying onsite water collection systems shall be <i>metered</i> .
Ornamental Water Features	Ornamental water features with a permanently installed water supply shall be required to utilize a <i>meter</i> on makeup water supply lines.
Pools and Spas	Indoor and outdoor pools and spas shall be required to utilize a <i>meter</i> on makeup water supply lines.
Cooling Towers	Cooling towers or groups of towers shall be required to utilize a <i>meter</i> on makeup water and blow-down water supply lines.
Steam Boilers	The makeup water supply line to steam boilers having a rating of 1,000,000 BTU/h or greater shall be metered.
Industrial Processes	Industrial processes consuming more than 1,000 gallons per day on average shall be <i>metered</i> individually.
Evaporative Coolers	Evaporative coolers supplying in excess of 0.6 gpm, on average, makeup water shall be measured.

APPLICATION	REQUIREMENTS
Fluid Coolers and Chillers	Water-cooled fluid coolers and chillers that do not utilize closed-loop recirculation shall be metered.
Roof Spray Systems	Roof spray systems for irrigating vegetated roofs or thermal conditioning shall be metered.
Make up Water	The make-up water for closed loop systems such as chilled water and hydronic systems shall be metered.

705.1.3 Metering system capability. The metering system and associated software shall be capable of the following:

1. Collecting and reporting data at least at an hourly level.
2. Providing water use by chronological hour, day and month.
3. Providing averaged values for hour of the day, day, day of the week and month.
4. Comparing user selected like periods, such as comparing yesterday's water use to the average for the same day of the week over the last year, or comparing the same month over several years.
5. Identifying leaks and failures of valves in the open position.
6. Providing the time periods and averages by either total building or end use.
7. Providing an estimated water cost for the periods defined by the utility's billing periods.
8. Maintaining metering and average period data for at least 36 months in electronic form.

SECTION 706 NON-POTABLE WATER REQUIREMENTS

706.1 Scope. The provisions of this section shall govern the use of *non-potable* water and the materials, design, construction, installation, and alteration design of systems utilizing *non-potable* water. The use and application of non-potable water shall comply with laws, rules and ordinances applicable in the *jurisdiction*.

706.2 Signage-required Identification of non-potable water. The source of each type of non-potable water shall be marked on each of the components that system. Non-potable water shall be identified as specified in Section 608.8 of the *International Plumbing Code*. Where *non-potable* water is used for a water use application, signage shall be provided that reads as follows: "Non-potable water is utilized for [application name]. Caution: non-potable water. DO NOT DRINK." The words shall be legibly and indelibly printed on a sign constructed of corrosion-resistant waterproof material. The letters of the words shall be not less than 0.5 inches in height and of a color in contrast to the background on which they are applied. In addition to the required wordage, the pictograph shown in Figure 706.2 shall appear on the signage required by this section. The required location of the signage and pictograph shall be in accordance with the applicable section of this code that requires the use of *non-potable* water.



Figure 706.2 Pictograph – DO NOT DRINK

706.4 System Components. Non-potable water systems shall consist of on-site collection, storage, treatment and distribution, as applicable. Some or all of each system may be pressurized.

706.5 ~~708.2~~ Permits. Permits shall be required for the construction, installation, ~~and alteration,~~ and repair of ~~graywater~~ non-potable water systems. ~~Construction documents, engineering calculations, diagrams, and other such data pertaining to the graywater system shall be submitted with each application for permit in accordance with the laws, rules and ordinances applicable in the jurisdiction.~~

706.6 ~~708.3~~ Potable water connections. Where a potable water system is connected to a ~~graywater~~ non-potable water system, the potable water supply shall be protected against backflow and cross-connection. ~~in accordance with Section 608 of the International Plumbing Code.~~

706.7 ~~708.4~~ Non-potable water connections. Where non-potable water from different sources is combined in a system, the system shall comply with the most stringent of the requirements of this code that are applicable to such sources. The highest quality water shall be protected from back flow and cross connection.

706.8 ~~708.5~~ Installation. Except as provided for in this section, all systems shall be installed in compliance with the provisions of the *International Plumbing Code* and manufacturer's instructions, as applicable.

706.9 ~~708.7~~ Approved components and materials. The piping, plumbing components, and materials used in ~~graywater~~ non-potable water systems shall be manufactured of material *approved* for the intended application and compatible with any disinfection and treatment systems used.

706.10 ~~708.8~~ Insect and vermin control. The inlets and vents to the system shall be protected to prevent insects and vermin from entering *storage tanks* and piping systems. Screens installed on vent pipes and overflow pipes shall have ~~an aperture not greater than 1/16 inch~~ not less than 16 mesh per inch (16 mesh per 25 mm) and shall be close-fitting. Screen materials shall be compatible with contacting system components and shall not accelerate corrosion of system components.

706.11 708.9 Freeze protection. Where sustained freezing temperatures occur, provisions shall be made to keep *storage tanks* and the related piping from freezing.

706.12 707.44 Trenching requirements. Non-potable water sources shall follow the provisions of Section 603.2 of the *International Plumbing Code* for the separation from building sewers and Section 603.3 of the *International Plumbing Code* for protection from sources of pollution.

When potable and non-potable water sources share the same trench or cross, higher quality water sources shall be located above lower quality water sources. Pressurized piping shall be above non-pressurized piping. The separation distance shall be a minimum of 12 inches (305 mm) above the top of the pipe below it.

Exceptions:

1. Where rainwater, graywater or municipally reclaimed water is used for outdoor irrigation, the irrigation piping located outside of a *building* and downstream of the backflow preventer is not required to meet the trenching requirements ~~where rainwater is used for outdoor applications.~~
2. Water service pipe is permitted to be located in the same trench with a *building sewer*, provided such sewer is constructed of materials that comply with the *International Plumbing Code* for such installations.
3. The required separation distance shall not apply where a *potable* or *non-potable* water service pipe crosses a sewer pipe provided the water service pipe is sleeved to at least 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing with pipe materials that comply with the *International Plumbing Code* for such applications.
4. Irrigation piping located outside of a *building* and downstream of the backflow preventer is not required to meet the trenching requirements where *rainwater* is used for outdoor applications.

706.13 707.42.5 Filtration. ~~Collected rainwater~~ Non-potable water shall be filtered to the level required for the intended end use. Filters shall be accessible for inspection and maintenance. Filters shall utilize a pressure gage or other *approved* method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves installed immediately upstream and downstream to allow for isolation during maintenance.

706.14 707.42.6 Disinfection. Where the intended application and initial quality of the ~~collected rainwater~~ non-potable water requires disinfection or other treatment or both, the ~~collected rainwater~~ non-potable water shall be treated as needed to ensure that the required water quality is delivered at the point of use.

706.15 707.42.7 Storage tank. ~~The design of the *storage tank* shall be in accordance with Sections 707.12.7.1 through 707.12.7.11.~~

706.15.1 707.42.7.4 Location. *Storage tanks* shall be installed either above or below grade. Above grade *storage tanks* shall be protected from direct sunlight and shall be constructed using opaque, UV resistant materials including, but not limited to, heavily tinted plastic, lined metal, concrete, wood, or painted to prevent algae growth, or shall have specially constructed sun barriers including but not limited to installation in garages, crawlspaces, or sheds. *Storage tanks* and their manholes shall not be located directly under any soil or waste piping or any source of contamination. *Rainwater and graywater storage tanks* shall be located with a minimum horizontal distance between various elements in accordance with the provisions in IPC Appendix C – Gray Water Recycling Systems Table C103.8 and at least 2 feet from the critical root zone of protected trees. ~~707.12.7.4.~~

**TABLE 707.12.7.1
LOCATION OF RAINWATER STORAGE TANKS**

Element	Minimum Horizontal Distance from Storage Tank (feet)
Critical root zone (CRZ) of protected trees	2
Lot line adjoining private lots	5
Seepage pits	5
Septic tanks	5

706.15.2 707.12.7.2 Materials. Where water is collected onsite, it shall be collected in an *approved* tank constructed of durable, nonabsorbent and corrosion-resistant materials. Where collected water is to be treated to *potable* water standards, tanks shall not be constructed of recycled materials and shall be constructed of materials in accordance with the *International Plumbing Code*. *Storage tanks* shall be constructed of *approved* materials compatible with the water quality of the desired end use and with the type of disinfection system used to treat water upstream of the tank and used to maintain water quality within the tank.

706.15.2.1 707.12.7.2.1 Wooden tanks. *Wooden storage tanks* shall not be required to have a liner. Where a tank is lined and used for potable water, the liner shall be NSF approved. Where unlined tanks are used, the species of wood shall be decay resistant and untreated.

706.15.3 707.12.7.3 Foundation and supports. *Storage tanks* shall be supported on a firm base capable of withstanding the storage tank's weight when filled to capacity. Where earthquake loads are applicable in accordance with the *International Building Code*, above-ground collection tank supports shall be designed and installed for the seismic forces in accordance with the *International Building Code*. Tank foundations and supports shall be designed and installed to accommodate the seismic forces.

706.15.3.1 707.12.7.3.1 Ballast. Where the soil can become saturated, an underground *storage tank* shall be ballasted, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down ballast shall meet or exceed the buoyancy force of the tank. Where the installation requires a foundation, the foundation shall be flat and shall be designed to support the *storage tank* weight when full, consistent with bearing capability of adjacent soil.

706.15.3.2 707.12.7.3.2 Structural support. When installed below grade, *storage tank* installations shall be designed to withstand earth and surface structural loads without damage and with minimal deformation when filled with water or empty.

706.15.4 707.12.7.4 Makeup water. Where an uninterrupted supply is required for the intended application, *potable* or municipally supplied reclaimed or recycled water, as applicable, shall be provided as a source of makeup water for to the *storage tank*. The *potable* or reclaimed or recycled *makeup* water supply shall be protected against backflow by means of an air gap not less than 4 inches (102 mm) above the overflow or an *approved* backflow device in accordance with the *International Plumbing Code*. There shall be a full-open valve located on the makeup water supply line to the *storage tank*. Inlets to *storage tank* shall be controlled by fill valves or other automatic supply valves installed so as to prevent the tank from overflowing and to prevent the water from dropping below a predetermined level.

706.15.5 707.12.7.5 Overflow. The *storage tank* shall be equipped with an overflow pipe having the same or larger area as the sum of the areas of all tank inlet pipes. The overflow pipe shall be trapped and shall be discharged in a manner consistent with storm water runoff requirements of the *jurisdiction* and at a sufficient distance from the tank to avoid damaging the tank foundation. The overflow drain shall not be equipped with a shutoff valve. A minimum of one cleanout shall be provided on each overflow pipe in accordance with Section 708 of the *International Plumbing Code*.

706.15.6 707.12.7.6 Access. A minimum of one access opening shall be provided to allow inspection and cleaning of the tank interior. All access openings to *storage tanks* and other vessels shall have an *approved* locking device or shall otherwise be protected from unauthorized access. Below grade *storage*

tanks, located outside of the *building*, shall be provided with either a manhole not less than 24 inches (610 mm) square or a manhole with an inside diameter of not less than 24 inches (610 mm). Manholes shall extend not less than 4 inches above ground or shall be gasketed and bolted to prevent water infiltration. Finish grade shall be sloped away from the manhole to divert surface water from the manhole. Each manhole cover shall have an effective locking device. Service ports in manhole covers shall be not less than 8 inches (203 mm) in diameter and shall be a minimum of 4 inches (102 mm) above the finished grade level. The service port shall have an effective locking cover or a brass cleanout plug.

Exception: *Storage tanks* having a volume of less than 800 gallons and installed below grade shall not be required to be equipped with a manhole where provided with a service port that is not less than 8 inches (203 mm) in diameter.

706.15.7 707.12.7.7 Venting. Tanks shall be provided with a vent sized ~~in accordance with the *International Plumbing Code*~~ and based on the aggregate diameter of the tank influent pipe(s). Tank vents shall not be connected to sanitary drainage system vents. Vents shall be protected from contamination by means of a U-bend installed with the opening directed downward or an *approved cap*. Vent outlets shall extend a minimum of 4" above grade, or as necessary to prevent surface water from entering the *storage tank*.

706.15.8 707.12.7.8 Inlets. *Storage tank* inlets shall be designed to introduce water into the tank with minimum turbulence, and shall be located and designed to avoid agitating the contents of the *storage tank*.

706.15.9 707.12.7.9 Outlets. Outlets shall be located at least 4 inches (102 mm) above the bottom of the *storage tanks* and shall not skim water from the surface.

706.15.10 707.12.7.10 Drain. A drain shall be located at the lowest point of aboveground storage tanks and shall discharge in a manner consistent with the storm water runoff requirements of the *jurisdiction* and at a sufficient distance from the tank to avoid damaging the tank foundation. A minimum of one cleanout shall be provided on each drain pipe in accordance with Section 708 of the *International Plumbing Code*.

706.15.11 707.12.7.11 Labeling and signage. *Storage tanks* shall be labeled in accordance with Section 706.2. ~~E~~ each *Storage tanks* shall be *labeled* with its rated capacity of the tank and the location of the upstream bypass valve. ~~*Storage tanks* shall bear signage that reads as follows: "CAUTION: NON-POTABLE WATER – DO NOT DRINK."~~ Where an opening is provided that could allow the entry of personnel, the opening shall bear signage that reads as follows: "DANGER – CONFINED SPACE." Markings shall be indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material mounted on the tank or shall be indelibly printed on the tank. The letters of words shall be not less than 0.5 inches in height and shall be of a color that contrasts with the background on which they are applied.

706.16 707.12.11 Pumping and control system. Mechanical equipment including pumps, valves and filters shall be easily accessible and removable in order to perform *repair*, maintenance and cleaning. Where collected *rainwater* is to be treated to *potable* water standards, the pump and all other pump components shall be *listed* and *approved* for use with *potable* water systems. Pressurized water shall be supplied at a pressure appropriate for the application and within the range specified by the *International Plumbing Code*. Where water could be supplied at an excessive pressure, a pressure-reducing valve shall be installed in accordance with the requirements of the *International Plumbing Code*.

706.16.1 707.12.11.1 Standby power. Where required for the intended application, automatically activated standby power, capable of powering all essential treatment and pumping systems under design conditions shall be provided.

706.16.2 707.12.11.2 Inlet control valve alarm. Make-up water systems shall be fitted with a warning mechanism that alerts the user to a failure of the inlet control valve to close correctly. The alarm shall activate before the water within the *storage tank* begins to discharge into the overflow system.

706.16.3 707.12.11.3 Water-pressure reducing valve or regulator. Where the *rainwater* pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the *rainwater* distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8 of the *International Plumbing Code*.

706.17 707.12.12 Distribution pipe. ~~Distribution piping shall comply with Sections 707.12.12.1 through 707.12.12.4, 706.17.1 and 706.17.2.~~

~~**707.12.12.1 Materials.** Distribution piping conveying rainwater shall conform to the standards and requirements specified by the *International Plumbing Code* for non-potable or potable water, as applicable.~~

~~**706.17.1 707.12.12.2 Joints.** Distribution piping conveying rainwater shall utilize joints approved for use with the distribution piping and appropriate for the intended applications as specified in the *International Plumbing Code*.~~

~~**706.17.2 707.12.12.3 Size.** Distribution piping conveying rainwater shall be sized in accordance with the *International Plumbing Code* for the intended application or.~~

~~**707.12.12.4 Labeling and marking.** Non-potable rainwater distribution piping shall be of the color purple and shall be embossed or integrally stamped or marked with the words: "CAUTION: NONPOTABLE WATER — DO NOT DRINK" or shall be installed with a purple identification tape or wrap. Identification tape shall be at least 3 inches wide and have white or black lettering on purple field stating "CAUTION: NON-POTABLE WATER — DO NOT DRINK". Identification tape shall be installed on top of non-potable rainwater distribution pipes, fastened at least every 10 feet to each pipe length and run continuously the entire length of the pipe. Lettering shall be readily observable within the room or space where the piping is located.~~

~~**Exception:** Piping located outside of the building and downstream of the backflow preventer is not required to be purple where rainwater is used for outdoor applications.~~

~~**706.18 707.13 Tests and inspections.** Tests and inspection shall be performed in accordance with Sections 707.13.1 through 707.13.10.~~

~~**706.18.1 707.13.1 Drainage and vent tests.** The testing of rainwater collection piping, overflow piping, vent piping and storage tank drains shall be conducted in accordance with Section 312 of the *International Plumbing Code*.~~

~~**706.18.2 707.13.2 Drainage and vent final test.** A final test shall be applied to the rainwater collection piping, overflow piping, storage tank, and tank vent piping in accordance with Section 312.4 of the *International Plumbing Code*.~~

~~**706.18.3 707.13.3 Water supply system test.** The testing of makeup water supply piping and rainwater distribution piping shall be conducted in accordance with Section 312.5 of the *International Plumbing Code*.~~

~~**706.18.4 707.13.4 Inspection and testing of backflow prevention assemblies.** The testing of backflow preventers and backwater valves shall be conducted in accordance with Section 312.10 of the *International Plumbing Code*.~~

707.13.5 Inspection vermin and insect protection. ~~All inlets and vents to the system shall be inspected to ensure that each is protected to prevent the entrance of insects or vermin into storage tank and piping systems in accordance with Section 707.8.~~

706.18.5 707.13.6 Roof gutter inspection and test. Roof gutters shall be inspected to verify that the installation and slope is in accordance with Section 707.12.3. Gutters shall be tested by pouring a minimum of one gallon of water into the end of the gutter opposite the collection point. The gutter being tested shall not leak and shall not retain standing water.

706.18.6 707.13.7 Roofwasher test. Roofwashers shall be tested by introducing water into the gutters. Proper diversion of the first quantity of water in accordance with the requirements of Section 707.12.9 shall be verified.

706.18.7 707.13.8 Storage tank tests. *Storage tanks* shall be tested in accordance with the following:

1. *Storage tanks* shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed and the tank shall remain water tight without leakage for a period of 24 hours.
2. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and verify that there are no leaks.
3. Following a successful test of the overflow, the water level in the tank shall be reduced to a level that is at 2 inches below the makeup water trigger point by using the tank drain. The tank drain shall be observed for proper operation. The makeup water system shall be observed for proper operation, and successful automatic shutoff of the system at the refill threshold shall be verified. Water shall not be drained from the overflow at any time during the refill test.

706.18.8 707.13.9 Supply pressure test. The static water pressure at the point of use furthest from the supply shall be verified to be within the range required for the application, in accordance with Section 707.12.11.

706.18.9 707.13.10 Water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the *jurisdiction*.

706.19 707.14 Operation and maintenance manuals. Operations and maintenance materials shall be supplied in accordance with this section. ~~707.14.1 through 707.14.4.~~

706.19.1 707.14.1 Manual. ~~An~~ detailed operations and maintenance manual shall be supplied in hardcopy form with all non-potable water ~~rainwater collection~~ systems.

706.19.2 707.14.2 Schematics. The manual shall include a ~~detailed~~ system schematic, the locations of all system components, and a list of all system components including manufacturer and model number.

706.19.3 707.14.3 Maintenance procedures. The manual shall provide a maintenance schedule and procedures for all system components requiring periodic maintenance. Consumable parts including filters shall be noted along with part numbers.

706.19.4 707.14.4 Operations procedures. The manual shall include system startup and shutdown procedures. The manual shall include ~~detailed~~ operating procedures for the system.

706.20 707.15 System abandonment. ~~If the owner of a rainwater collection and conveyance system elects to cease use of, or fails to properly maintain such system, the system shall be~~ When a non-potable water system is abandoned: ~~and shall comply with the following:~~

706.20.1 All system piping connecting to a utility provided water system shall be removed or disabled. The *collection piping* shall be connected to the building's sewer system or storm water management system as applicable.

706.20.2 The ~~rainwater distribution piping system~~ shall be replaced with an *approved potable* water supply piping system. Where an existing *potable* pipe system is already in place, the fixtures shall be connected to the existing system.

706.20.3 The storage tank shall be secured from accidental access by sealing or locking tank inlets and access points, or filling with sand or equivalent.

SECTION 707 RAINWATER COLLECTION, STORAGE, TREATMENT AND DISTRIBUTION SYSTEMS.

707.1 Scope. The provisions of this section shall govern ~~the materials, design, construction, installation, and alteration, and repair of rainwater collection and conveyance systems.~~

707.2 Permits. ~~Permits shall be required for the construction, installation, alteration, and repair of rainwater collection and conveyance systems. Construction documents, engineering calculations, diagrams, and other such data pertaining to the rainwater collection and conveyance system shall be submitted with each application for permit.~~

707.3 Potable water connections. ~~Where a potable system is connected to a rainwater collection and conveyance system, the potable water supply shall be protected against backflow in accordance with Section 608 of the International Plumbing Code.~~

707.4 Non-Potable water connections. ~~Where non-potable water from different sources is combined in a system, the system shall comply with the most stringent of the requirements of this code that are applicable to such sources.~~

707.5 Installation. ~~Except as provided for in this section, all systems shall be installed in compliance with the provisions of the International Plumbing Code and manufacturer's instructions.~~

707.6 Applications. ~~Untreated rainwater shall be utilized in accordance with Section 702 and local codes. Treated rainwater shall be utilized in accordance with Section 706 or potable water provisions of the International Plumbing Code, as applicable, and as permitted by local codes.~~

707.7 Approved components and materials. ~~Piping, plumbing components, and materials used in the collection and conveyance systems shall be manufactured of material approved for the intended application and compatible with any disinfection and treatment systems used.~~

707.8 Insect and vermin control. ~~Inlets and vents to the system shall be protected to prevent the entrance of insects and vermin into storage tanks and piping systems. Screens installed on vent pipes, inlets, and overflow pipes shall have an aperture of not greater than 1/16 inch and shall be close fitting. Screen materials shall be compatible with contacting system components and shall not accelerate corrosion of system components.~~

707.10 Freeze protection. ~~Where sustained freezing temperatures occur, provisions shall be made to keep storage tanks and the related piping from freezing.~~

707.11 Trenching requirements. ~~All water service piping, including piping containing rainwater, shall be separated from the building sewer by 5 feet (1524 m) of undisturbed or compacted earth. Water service pipes, potable and non-potable, shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Buried rainwater collection and distribution piping shall comply with the requirements of Section 306 of the International Plumbing Code for support, trenching, bedding, backfilling, and tunneling.~~

Exceptions:

1. The required separation distance shall not apply where the bottom of the water service pipe within 5 feet (1524 mm) of the sewer is a minimum of 12 inches (305 mm) above the top of the highest point of the sewer and the pipe materials shall comply with the *International Plumbing Code* for such applications.
2. Water service pipe is permitted to be located in the same trench with a *building sewer*, provided such sewer is constructed of materials that comply with the *International Plumbing Code* for such installations.
3. The required separation distance shall not apply where a *potable or non-potable water service pipe* crosses a sewer pipe provided the water service pipe is sleeved to at least 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing with pipe materials that comply with the *International Plumbing Code* for such applications.
4. Irrigation piping located outside of a building and downstream of the backflow preventer is not required to meet the trenching requirements where rainwater is used for outdoor applications.

707.12 Rainwater catchment and collection systems. The design and installation of *rainwater collection and conveyance systems* shall conform to accepted engineering practice.

707.12.1.1 Potable water applications. Where collected water is to be treated to *potable water* standards, wood or cedar shake roofing materials, roofing materials treated with biocides, and lead flashing is prohibited on collection surfaces. Painted surfaces are acceptable only where paint has been certified to ensure that the toxicity level of the paint is acceptable for drinking water contact. Lead, chromium or zinc based paints are not permitted on *rainwater* collection surfaces. Flat roofing products shall be certified to NSF P151. *Rainwater* shall not be collected from vegetated roof systems.

707.12.3 Roof gutters and downspouts. Gutters and downspouts shall be constructed of approved materials that are compatible with the water collection surface and the *rainwater* quality for of the desired end use. Joints shall be made water-tight. Where the collected *rainwater* is to be used for *potable* applications, gutters and downspouts shall be constructed of materials *approved* for drinking water applications and flashing and joints shall not be made of lead.

707.12.3.2 Size. Gutters and downspouts shall be installed and sized in accordance with Section 1106.6 of the *International Plumbing Code* and local rainfall rates.

707.12.4 Collection pPipe materials. In *buildings where rainwater collection and conveyance systems* are installed, drainage piping *approved* for use within plumbing drainage systems shall be utilized to collect *rainwater* and convey it to the *storage tank*. Vent piping *approved* for use within plumbing venting systems shall be utilized for all vents within the *rainwater* system. Drains to a storm water discharge shall use *approved* waste piping.

707.12.4.1 Joints. Collection piping conveying *rainwater* shall utilize joints *approved* for use with the applicable material and application *distribution piping* and appropriate for the intended applications as specified in the *International Plumbing Code*.

707.12.4.2 Size. Collection piping conveying *rainwater* from collection surfaces shall be sized in accordance with local Chapter 11 of the *International Plumbing Code* and local rainfall rates. The piping in each portion of the rainwater system shall be sized to handle the water it must convey.

707.12.4.3 Labeling and marking. Additional marking of *rainwater* collection piping shall not be required beyond that required for sanitary drainage, waste, and vent piping by the *International Plumbing Code*.

707.12.5 Filtration. Collected *rainwater* shall be filtered to the level required for the intended end use. Filters shall be accessible for inspection and maintenance.

707.12.6 Disinfection. Where the intended application and initial quality of the collected *rainwater* requires disinfection or other treatment or both, the collected *rainwater* shall be treated as needed to ensure that the required water quality is delivered at the point of use.

707.12.7 Storage tank. The design of the *storage tank* shall be in accordance with Sections 707.12.7.4 through 707.12.7.11.

707.12.7.1 Location. *Storage tanks* shall be installed either above or below grade. Above grade *storage tanks* shall be protected from direct sunlight and shall be constructed using opaque, UV resistant materials including, but not limited to, heavily tinted plastic, lined metal, concrete, wood, or painted to prevent algae growth, or shall have specially constructed sun barriers including but not limited to installation in garages, crawlspaces, or sheds. *Storage tanks* and their manholes shall not be located directly under any soil or waste piping or any source of contamination. *Rainwater storage tanks* shall be located with a minimum horizontal distance between various elements as indicated in Table 707.12.7.1.

**TABLE 707.12.7.1
LOCATION OF RAINWATER STORAGE TANKS**

Element	Minimum Horizontal Distance from Storage Tank (feet)
Critical root zone (CRZ) of protected trees	2
Lot line adjoining private lots	5
Seepage pits	5
Septic tanks	5

707.12.7.2 Materials. Where water is collected onsite, it shall be collected in an *approved tank* constructed of durable, nonabsorbent and corrosion-resistant materials. Where collected water is to be treated to *potable* water standards, tanks shall not be constructed of recycled materials and shall be constructed of materials in accordance with the *International Plumbing Code*. *Storage tanks* shall be constructed of approved materials compatible with the water quality of the desired end use and with the type of disinfection system used to treat water upstream of the tank and used to maintain water quality within the tank.

707.12.7.2.1 Wooden tanks. *Wooden storage tanks* shall not be required to have a liner. Where a tank is lined and used for potable water, the liner shall be NSF approved. Where unlined tanks are used, the species of wood shall be decay resistant and untreated.

707.12.7.3 Foundation and supports. *Storage tanks* shall be supported on a firm base capable of withstanding the storage tank's weight when filled to capacity. Where earthquake loads are applicable in accordance with the *International Building Code*, above-ground collection tank supports shall be designed and installed for the seismic forces in accordance with the *International Building Code*. Where applicable, tank foundations and supports shall be designed and installed to accommodate the seismic forces.

707.12.7.3.1 Ballast. Where the soil can become saturated, an underground *storage tank* shall be ballasted, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down ballast shall meet or exceed the buoyancy force of the tank. Where the installation requires a foundation, the foundation shall be flat and shall be designed to support the *storage tank* weight when full, consistent with bearing capability of adjacent soil.

707.12.7.3.2 Structural support. When installed below grade, *storage tank* installations shall be designed to withstand earth and surface structural loads without damage and with minimal deformation when filled with water or empty.

707.12.7.4 Makeup water. Where an uninterrupted supply is required for the intended application, *potable* or municipally supplied reclaimed or recycled water shall be provided as a source of makeup water for the *storage tank*. The *potable* or reclaimed or recycled water supply shall be protected against backflow by means of an air gap not less than 4 inches (102 mm) above the overflow or an *approved*

~~backflow device in accordance with the *International Plumbing Code*. There shall be a full-open valve located on the makeup water supply line to the *storage tank*. Inlets to *storage tank* shall be controlled by fill valves or other automatic supply valves installed so as to prevent the tank from overflowing and to prevent the water from dropping below a predetermined level.~~

~~**707.12.7.5 Overflow.** The *storage tank* shall be equipped with an overflow pipe having the same or larger area as the sum of the areas of all tank inlet pipes. The overflow pipe shall be trapped and shall be discharged in a manner consistent with storm water runoff requirements of the *jurisdiction* and at a sufficient distance from the tank to avoid damaging the tank foundation. The overflow drain shall not be equipped with a shutoff valve. A minimum of one cleanout shall be provided on each overflow pipe in accordance with Section 708 of the *International Plumbing Code*.~~

~~**707.12.7.6 Access.** A minimum of one access opening shall be provided to allow inspection and cleaning of the tank interior. All access openings to *storage tanks* and other vessels shall have an *approved* locking device or shall otherwise be protected from unauthorized access. Below grade *storage tanks*, located outside of the *building*, shall be provided with either a manhole not less than 24 inches (610 mm) square or a manhole with an inside diameter of not less than 24 inches (610 mm). Manholes shall extend not less than 4 inches above ground or shall be gasketed and bolted to prevent water infiltration. Finish grade shall be sloped away from the manhole to divert surface water from the manhole. Each manhole cover shall have an effective locking device. Service ports in manhole covers shall be not less than 8 inches (203 mm) in diameter and shall be a minimum of 4 inches (102 mm) above the finished grade level. The service port shall have an effective locking cover or a brass cleanout plug.~~

~~**Exception:** *Storage tanks* having a volume of less than 800 gallons and installed below grade shall not be required to be equipped with a manhole where provided with a service port that is not less than 8 inches (203 mm) in diameter.~~

~~**707.12.7.7 Venting.** Tanks shall be provided with a vent sized in accordance with the *International Plumbing Code* and based on the diameter of the tank influent pipe. Tank vents shall not be connected to sanitary drainage system vents.~~

~~**707.12.7.8 Inlets.** *Storage tank* inlets shall be designed to introduce water into the tank with minimum turbulence, and shall be located and designed to avoid agitating the contents of the *storage tank*.~~

~~**707.12.7.9 Outlets.** Outlets shall be located at least 4 inches (102 mm) above the bottom of the *storage tanks* and shall not skim water from the surface.~~

~~**707.12.7.10 Drain.** A drain shall be located at the lowest point of aboveground *storage tanks* and shall discharge in a manner consistent with the storm water runoff requirements of the *jurisdiction* and at a sufficient distance from the tank to avoid damaging the tank foundation. A minimum of one cleanout shall be provided on each drain pipe in accordance with Section 708 of the *International Plumbing Code*.~~

~~**707.12.7.11 Labeling and signage.** Each *storage tank* shall be *labeled* with its rated capacity and the location of the upstream bypass valve. *Storage tanks* shall bear signage that reads as follows: "CAUTION: NON-POTABLE WATER — DO NOT DRINK." Where an opening is provided that could allow the entry of personnel, the opening shall bear signage that reads as follows: "DANGER — CONFINED SPACE." Markings shall be indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material mounted on the tank or shall be indelibly printed on the tank. The letters or words shall be not less than 0.5 inches in height and shall be of a color that contrasts with the background on which they are applied.~~

~~**707.12.8 Valves.** Valves shall be supplied in accordance with Sections 707.12.8.1 and 707.12.8.2.~~

~~**707.12.10 Vent piping.** *Storage tanks* shall be provided with a vent in accordance with the requirements of Section 707.12.7.7. Vents shall be sized in accordance with the *International Plumbing Code*, based on the aggregate diameter of *storage tank* influent pipe(s). Vents shall be protected from contamination~~

by means of a U-bend installed with the opening directed downward or an *approved* cap. Vent outlets shall extend a minimum of 4" above grade, or as necessary to prevent surface water from entering the *storage tank*. Vent openings shall be protected against the entrance of vermin and insects in accordance with the requirements of Section 707.8.

707.12.11 Pumping and control system. Mechanical equipment including pumps, valves and filters shall be easily accessible and removable in order to perform *repair*, maintenance and cleaning. Where collected *rainwater* is to be treated to *potable* water standards, the pump and all other pump components shall be *listed* and *approved* for use with *potable* water systems. Pressurized water shall be supplied at a pressure appropriate for the application and within the range specified by the *International Plumbing Code*. Where water could be supplied at an excessive pressure, a pressure-reducing valve shall be installed in accordance with the requirements of the *International Plumbing Code*.

707.12.11.1 Standby power. Where required for the intended application, automatically activated standby power, capable of powering all essential treatment and pumping systems under design conditions shall be provided.

707.12.11.2 Inlet control valve alarm. Make-up water systems shall be fitted with a warning mechanism that alerts the user to a failure of the inlet control valve to close correctly. The alarm shall activate before the water within the *storage tank* begins to discharge into the overflow system.

707.12.11.3 Water pressure reducing valve or regulator. Where the *rainwater* pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the *rainwater* distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8 of the *International Plumbing Code*.

707.12.12 Distribution pipe. *Distribution piping* shall comply with Sections 707.12.12.1 through 707.12.12.4.

707.12.12.1 Materials. *Distribution piping* conveying *rainwater* shall conform to the standards and requirements specified by the *International Plumbing Code* for *non-potable* or *potable* water, as applicable.

707.12.12.2 Joints. *Distribution piping* conveying *rainwater* shall utilize joints *approved* for use with the *distribution piping* and appropriate for the intended applications as specified in the *International Plumbing Code*.

707.12.12.3 Size. *Distribution piping* conveying *rainwater* water shall be sized in accordance with the *International Plumbing Code* for the intended application or.

707.12.12.4 Labeling and marking. *Non-potable rainwater distribution piping* shall be of the color purple and shall be embossed or integrally stamped or marked with the words: "CAUTION: NONPOTABLE WATER — DO NOT DRINK" or shall be installed with a purple identification tape or wrap. Identification tape shall be at least 3 inches wide and have white or black lettering on purple field stating "CAUTION: NON-POTABLE WATER — DO NOT DRINK". Identification tape shall be installed on top of *non-potable rainwater distribution pipes*, fastened at least every 10 feet to each pipe length and run continuously the entire length of the pipe. Lettering shall be readily observable within the room or space where the piping is located.

Exception: Piping located outside of the *building* and downstream of the backflow preventer is not required to be purple where *rainwater* is used for outdoor applications.

707.13 Tests and inspections. Tests and inspection shall be performed in accordance with Sections 707.13.1 through 707.13.10.

~~**707.13.1 Drainage and vent tests.** The testing of *rainwater* collection piping, overflow piping, vent piping and *storage tank* drains shall be conducted in accordance with Section 312 of the *International Plumbing Code*.~~

~~**707.13.2 Drainage and vent final test.** A final test shall be applied to the *rainwater* collection piping, overflow piping, *storage tank*, and tank vent piping in accordance with Section 312.4 of the *International Plumbing Code*.~~

~~**707.13.3 Water supply system test.** The testing of makeup water supply piping and *rainwater distribution piping* shall be conducted in accordance with Section 312.5 of the *International Plumbing Code*.~~

~~**707.13.4 Inspection and testing of backflow prevention assemblies.** The testing of backflow preventers and *backwater valves* shall be conducted in accordance with Section 312.10 of the *International Plumbing Code*.~~

~~**707.13.5 Inspection vermin and insect protection.** All inlets and vents to the system shall be inspected to ensure that each is protected to prevent the entrance of insects or vermin into *storage tank* and piping systems in accordance with Section 707.8.~~

~~**707.13.6 Roof gutter inspection and test.** Roof gutters shall be inspected to verify that the installation and slope is in accordance with Section 707.12.3. Gutters shall be tested by pouring a minimum of one gallon of water into the end of the gutter opposite the collection point. The gutter being tested shall not leak and shall not retain standing water.~~

~~**707.13.7 Roofwasher test.** Roofwashers shall be tested by introducing water into the gutters. Proper diversion of the first quantity of water in accordance with the requirements of Section 707.12.9 shall be verified.~~

~~**707.13.8 Storage tank tests.** *Storage tanks* shall be tested in accordance with the following:~~

- ~~1. *Storage tanks* shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed and the tank shall remain water tight without leakage for a period of 24 hours.~~
- ~~2. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and verify that there are no leaks.~~
- ~~3. Following a successful test of the overflow, the water level in the tank shall be reduced to a level that is at 2 inches below the makeup water trigger point by using the tank drain. The tank drain shall be observed for proper operation. The makeup water system shall be observed for proper operation, and successful automatic shutoff of the system at the refill threshold shall be verified. Water shall not be drained from the overflow at any time during the refill test.~~

~~**707.13.9 Supply pressure test.** The static water pressure at the point of use furthest from the supply shall be verified to be within the range required for the application, in accordance with Section 707.12.11.~~

~~**707.13.10 Water quality test.** The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the *jurisdiction*.~~

~~**707.14 Operation and maintenance manuals.** Operations and maintenance materials shall be supplied in accordance with 707.14.1 through 707.14.4.~~

~~**707.14.1 Manual.** A detailed operations and maintenance manual shall be supplied in hardcopy form with all *rainwater* collection systems.~~

707.14.2 Schematics. The manual shall include a detailed system schematic, the locations of all system components, and a list of all system components including manufacturer and model number.

707.14.3 Maintenance procedures. The manual shall provide a maintenance schedule and procedures for all system components requiring periodic maintenance. Consumable parts including filters shall be noted along with part numbers.

707.14.4 Operations procedures. The manual shall include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

707.15 System abandonment. If the owner of a *rainwater collection and conveyance system* elects to cease use of, or fails to properly maintain such system, the system shall be abandoned and shall comply with the following:

1. All system piping connecting to a utility-provided water system shall be removed or disabled.
2. The *rainwater distribution piping system* shall be replaced with an *approved potable* water supply piping system. Where an existing *potable* pipe system is already in place, the fixtures shall be connected to the existing system.
3. The storage tank shall be secured from accidental access by sealing or locking tank inlets and access points, or filling with sand or equivalent.

SECTION 708 GRAYWATER SYSTEMS

708.1 Scope. The provisions of this section shall govern the materials, design, construction, installation, and alteration, and repair of graywater reuse systems.

708.2 Permits. *Permits* shall be required for the construction, installation, and alteration, and repair of graywater systems. *Construction documents*, engineering calculations, diagrams, and other such data pertaining to the *graywater system* shall be submitted with each application for *permit* in accordance with the laws, rules and ordinances applicable in the *jurisdiction*.

708.3 Potable water connections. Where a *potable* water system is connected to a *graywater system*, the *potable* water supply shall be protected against backflow in accordance with Section 608 of the *International Plumbing Code*.

708.4 Non-potable water connections. Where *non-potable* water from different sources is combined in a system, the system shall comply with the most stringent of the requirements of this code that are applicable to such sources.

708.5 Installation. Except as provided for in this section, all systems shall be installed in compliance with the provisions of the *International Plumbing Code* and manufacturer's instructions, as applicable.

708.6 Applications. Untreated *graywater* shall be utilized in accordance with Section 702 and local codes. Treated *graywater* shall be utilized in accordance with Section 706 and as permitted by local codes.

708.7 Approved components and materials. The piping, plumbing components, and materials used in *graywater systems* shall be manufactured of material *approved* for the intended application and compatible with any disinfection and treatment systems used.

708.8 Insect and vermin control. The inlets and vents to the system shall be protected to prevent insects and vermin from entering *storage tanks* and piping systems. Screens installed on vent pipes and overflow pipes shall have an aperture not greater than 1/16 inch and shall be close-fitting. Screen materials shall be compatible with contacting system components and shall not accelerate corrosion of system components.

708.9 Freeze protection. ~~Where sustained freezing temperatures occur, provisions shall be made to keep storage tanks and the related piping from freezing.~~

708.10 Trenching requirements. ~~Water service piping, including piping containing graywater, shall be separated from the building sewer by 5 feet (1524 mm) of undisturbed or compacted earth. Graywater piping shall be separated from potable water piping underground by 5 feet (1524 mm) of undisturbed or compacted earth. Non-potable water service pipes shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Buried graywater piping shall comply with the requirements of Section 306 of the International Plumbing Code for support, trenching, bedding, backfilling, and tunneling.~~

Exceptions:

1. ~~The required separation distance shall not apply where the bottom of the graywater service pipe within 5 feet (1524 mm) of the sewer is a minimum of 12 inches (305 mm) above the top of the highest point of the sewer and the pipe materials comply with the requirements of the International Plumbing Code for such applications.~~
2. ~~The required separation distance shall not apply where the bottom of the potable water service pipe within 5 feet (1524 mm) of the graywater pipe is a minimum of 12 inches (305 mm) above the top of the highest point of the graywater pipe and the pipe materials comply with the requirements of the International Plumbing Code for such applications.~~
3. ~~Water service pipe is permitted to be located in the same trench with a building sewer, provided that such sewer is constructed of materials that comply with the requirements of the International Plumbing Code for such applications.~~
4. ~~The required separation distance shall not apply where a potable or non-potable water service pipe crosses a sewer pipe provided that the water service pipe is sleeved to at least 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing with pipe materials that comply with the requirements of the International Plumbing Code for such applications.~~
5. ~~The required separation distance shall not apply where a potable water service pipe crosses a graywater pipe provided that the potable water service pipe is sleeved for a distance of at least 5 feet (1524 mm) horizontally from the centerline of the graywater pipe on both sides of such crossing with pipe materials that comply with the requirements of the International Plumbing Code for such applications.~~
6. ~~Irrigation piping located outside of a building and downstream of the backflow preventer is not required to meet the trenching requirements where graywater is used for outdoor applications.~~

708.11 System abandonment. ~~If the owner of a graywater system elects to cease use of, or fails to properly maintain such system, the system shall be abandoned and shall comply with the following:~~

1. ~~All system piping connecting to a utility-provided water system shall be removed or disabled.~~
2. ~~Storage tanks shall be secured against accidental access by sealing or locking tank inlets and access points, or filling with sand or equivalent.~~

708.12 Graywater systems. ~~The design of the Graywater systems shall conform to accepted engineering practice and be installed in accordance with the provisions in International Plumbing Code Appendix C – Gray Water Recycling Systems.~~

708.12.3.2 Size. ~~Collection piping conveying untreated graywater rainwater from collection surfaces shall be sized in accordance with storm-drainage sizing requirements specified in the International Plumbing Code.~~

708.12.3.3 Labeling and marking. ~~Additional marking of untreated graywater collection piping shall not be required beyond that required for sanitary drainage, waste, and vent piping by the International Plumbing Code.~~

708.12.4 Filtration. Collected *graywater* shall be filtered as required for the intended end use. Filters shall be accessible for inspection and maintenance. Filters shall utilize a pressure gage or other approved method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves installed immediately upstream and downstream to allow for isolation during maintenance.

708.12.5 Disinfection. Where the intended application for collected *graywater* requires disinfection or other treatment or both, collected *graywater* shall be disinfected as needed to ensure that the required water quality is delivered at the point of use. Untreated *graywater* shall be retained in collection reservoirs for a maximum of 24 hours in accordance with Section 708.12.6.1.

708.12.6 Storage tank. The design of the *storage tank* shall be in accordance with Sections 708.12.6.1 through 708.12.6.12.

708.12.6.1 Sizing. The holding capacity of the *storage tank* shall be sized for in accordance with the anticipated demand in accordance with the provisions in IPC Appendix C – Gray Water Recycling Systems. Separate storage shall be provided for indoor and outdoor uses of *graywater*, where there are different retention times. Where *graywater* is to be used in untreated form for groundwater recharge or subsurface irrigation, the *storage tank* shall be sized to limit the retention time of *graywater* to a maximum of 24 hours.

708.12.6.2 Location. *Storage tanks* shall be installed above or below grade. Above grade *storage tanks* shall be protected from direct sunlight and shall be constructed using opaque, UV resistant, materials such as, but not limited to, heavily tinted plastic, lined metal, concrete, wood, or painted to prevent algae growth, or shall have specially constructed sun barriers including but not limited to installation in garages, crawlspaces, or sheds. *Storage tanks* and their manholes shall not be located directly under any soil or waste piping or any source of contamination. *Graywater storage tanks* shall be located with a minimum horizontal distance between various elements as indicated in Table 708.12.6.2. *Storage tanks* containing untreated *graywater* shall be located a minimum horizontal distance of 5 feet from *buildings*, in addition to the requirements in Table 708.12.6.2.

**TABLE 708.12.6.2
LOCATION OF GRAYWATER STORAGE TANKS**

Element	Minimum Horizontal Distance from Storage Tank (feet)
Critical root zone (CRZ) of protected trees	2
Lot line adjoining private lots	5
Seepage pits	5
Septic tanks	5
Water wells	50
Streams and lakes	50
Water service	5
Public water main	10

708.12.6.3 Materials. Where collected onsite, water shall be collected in an approved tank constructed of durable, nonabsorbent and corrosion-resistant materials. The *storage tank* shall be constructed of materials compatible with any disinfection systems used to treat water upstream of the tank and with any systems used to maintain water quality within the tank.

708.12.6.3.1 Wood tanks. Wooden *storage tanks* that are not equipped with a makeup water source shall be provided with a flexible liner.

708.12.6.4 Foundation and supports. *Storage tanks* shall be supported on a firm base capable of withstanding the *storage tank's* weight when filled to capacity. Where earthquake loads are applicable in

accordance with the *International Building Code*, above-ground collection reservoir supports shall be designed and installed for the seismic forces in accordance with the *International Building Code*.

708.12.6.4.1 Ballast. Where the soil can become saturated, an underground *storage tank* shall be ballasted, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down ballast shall meet or exceed the buoyancy force of the tank. Where the installation requires a foundation, the foundation shall be flat and shall be designed to support the *storage tank* weight when full, consistent with the bearing capability of adjacent soil.

708.12.6.4.2 Structural support. Where installed below grade, *storage tank* installations shall be designed to withstand earth and surface structural loads without damage and with minimal deformation when filled with water or empty.

708.12.6.5 Makeup water. Where an uninterrupted supply is required for the intended application, *potable* or municipally supplied reclaimed/recycled water shall be provided as a source of makeup water for the *storage tank*. The *potable* or reclaimed/recycled water supply shall be protected against backflow by means of an air gap not less than 4 inches (102 mm) above the overflow or an *approved* backflow device in accordance with the *International Plumbing Code*. There shall be a full-open valve located on the makeup water supply line to the *storage tank*. Inlets to *storage tank* shall be controlled by fill valves or other automatic supply valves installed so as 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 *graywater* inlet or the intake of any attached pump.

708.12.6.6 Overflow. The *storage tank* shall be equipped with an overflow pipe having the same or larger area as the sum of the areas of all reservoir inlet pipes. The overflow pipe shall be trapped and shall be indirectly connected to the sanitary drainage system. The overflow drain shall not be equipped with a shutoff valve. A minimum of one cleanout shall be provided on each overflow pipe in accordance with Section 708 of the *International Plumbing Code*.

708.12.6.7 Access. A minimum of one access opening shall be provided to allow inspection and cleaning of the tank interior. Access openings shall have an *approved* locking device or other *approved* method of securing access. Below grade *storage tanks*, located outside of the *building*, shall be provided with either a manhole not less than 24 inches (610 mm) square or a manhole with an inside diameter not less than 24 inches (610 mm) and extending not less than 4 inches above ground. Finished grade shall be sloped away from the manhole to divert surface water from the manhole. Each manhole cover shall have an effective locking device. Service ports in manhole covers shall be not less than 8 inches (203 mm) in diameter and shall be a minimum of 4 inches (102 mm) above the finished grade level. The service port shall have an effective locking cover or a brass cleanout plug.

Exception: *Storage tanks* under 800 gallons in volume installed below grade shall not be required to be equipped with a manhole, but shall have a service port not less than 8 inches (203 mm) in diameter.

708.12.6.8 Venting. The tank shall be provided with a vent sized in accordance with the *International Plumbing Code* and based on the diameter of the tank influent pipe. The reservoir vent shall not be connected to sanitary drainage system vents.

708.12.6.9 Inlets. *Storage tank* inlets shall be designed to introduce water into the tank with minimum turbulence, and shall be located and designed to avoid agitating the contents of the *storage tank*.

708.12.6.10 Outlets. Outlets shall be located at least 4 inches (102 mm) above the bottom of the *storage tank*, and shall not skim water from the surface.

708.12.6.11 Drain. A drain shall be located at the lowest point of the *storage tank* and shall be indirectly connected to the sanitary drainage system. The total area of all drains shall not be smaller than the total

area of all overflow pipes. A minimum of one cleanout shall be provided on each drain pipe in accordance with Section 708 of the *International Plumbing Code*.

708.12.6.12 Labeling and signage. Each *storage tank* shall be *labeled* with its rated capacity and the location of the upstream bypass valve. The contents of *storage tanks* shall be identified with the words "CAUTION: NON-POTABLE WATER — DO NOT DRINK." Where an opening is provided that could allow the entry of personnel, the opening shall be marked with the words, "DANGER — CONFINED SPACE." Markings shall be indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material mounted on the tank or shall be indelibly printed on the tank. The letters of the words shall be not less than 0.5 inches in height and shall be of a color in contrast with the background on which they are applied.

708.12.7 Valves. Valves shall be supplied in accordance with Sections 708.12.7.1 and 708.12.7.2.

708.12.8 Vent piping. *Storage tanks* shall be provided with a vent in accordance with the requirements of Section 708.12.6.8. Vents shall be sized in accordance with the *International Plumbing Code*, based on the aggregate diameter of *storage tank* influent pipes. Open vents shall be protected from contamination by means of a U-bend installed with the opening directed downward or an *approved cap*. Vent outlets shall extend a minimum of 4 inches above grade, or as necessary to prevent surface water from entering the *storage tank*. Vent openings shall be protected against the entrance of vermin and insects in accordance with the requirements of Section 708.8.

708.12.9 Pumping and control system. *Mechanical equipment* including pumps, valves and filters shall be accessible and removable in order to perform *repair*, maintenance and cleaning. Pressurized water shall be supplied at a pressure appropriate for the application and within the range specified by the *International Plumbing Code*. Where water could be supplied at an excessive pressure, a pressure-reducing valve shall be installed in accordance with the requirements of the *International Plumbing Code*.

708.12.9.1 Standby power. Where required for the intended application, automatically activated standby power, capable of powering all essential treatment and pumping systems under design conditions shall be provided.

708.12.9.2 Inlet control valve alarm. Make-up water systems shall be provided with a warning mechanism that alerts the user to a failure of the inlet control valve to close correctly. The alarm shall activate before the water within the collection reservoir *storage tank* begins to discharge into the overflow system.

708.12.9.3 Water-pressure reducing valve or regulator. Where the *graywater* pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the *graywater* distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8 of the *International Plumbing Code*.

708.12.10 Distribution pipe. *Distribution piping* shall comply with Sections 708.12.10.1 through 708.12.10.4.

708.12.10.1 Materials. *Distribution piping* conveying *graywater* shall conform to standards and requirements specified by the *International Plumbing Code* for *non-potable water*.

708.12.10.2 Joints. *Distribution piping* conveying *graywater* shall utilize joints *approved* for use with the *distribution piping* and appropriate for the intended applications as specified in the *International Plumbing Code*.

708.12.10.3 Size. *Distribution piping* conveying *graywater* shall be sized in accordance with the *International Plumbing Code* for the intended application or applications.

708.12.10.4 Labeling and marking. All *graywater distribution piping* shall be either the color purple and embossed or integrally stamped or marked "CAUTION: NONPOTABLE WATER — DO NOT DRINK" or shall be installed with a purple identification tape or wrap. Identification tape shall be at least 3 inches wide and have white or black lettering on purple field stating "CAUTION: NON-POTABLE WATER — DO NOT DRINK". Identification tape shall be installed on top of *graywater distribution pipes*, fastened at least every 10 feet to each pipe length and run continuously the entire length of the pipe. Lettering shall be readily observable within the room or space where the piping is located.

Exception: Outside of the *building*, purple piping is not required downstream of the backflow preventer where *graywater* is used for outdoor applications.

708.13 Tests and inspections. Tests and inspections shall be performed in accordance with Sections 708.13.1 through 708.13.9.

708.13.1 Drainage and vent test. A pressure test shall be applied to the *graywater* collection piping, overflow piping, *storage tank*, *storage tank* drainage piping and tank vent piping in accordance with Section 312 of the *International Plumbing Code*.

708.13.2 Drainage and vent final test. A final test shall be applied to the *graywater* collection piping, overflow piping, *storage tank*, and tank vent piping in accordance with Section 312.4 of the *International Plumbing Code*.

708.13.3 Water supply system test. The testing of makeup water supply piping and *rainwater distribution piping* shall be conducted in accordance with Section 312.5 of the *International Plumbing Code*.

708.13.4 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers and *backwater valves* shall be conducted in accordance with Section 312.10 of the *International Plumbing Code*.

708.13.5 Inspection vermin and insect protection. Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the *storage tank* and piping systems in accordance with Section 708.8.

708.13.6 Storage tank tests. *Storage tanks* shall be tested in accordance with all of the following:

1. *Storage tanks* shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed and the tank shall remain water tight without leakage for a period of 24 hours.
2. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and verify that there are no leaks.
3. Following the successful test of the overflow, the water level in the tank shall be reduced to a point 2 inches below the makeup water trigger point using the tank drain. The tank drain shall be observed for proper operation. The makeup water system shall be observed to verify proper operation, and successful automatic shutoff of the system at the refill threshold. Water shall not be drained from the overflow at any time during the refill test.

708.13.7 Supply pressure test. The static water pressure at the point of use furthest from the supply shall be verified to be within the range required for the application, in accordance with Section 707.12.11.

708.13.8 Water quality test. The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the *jurisdiction*.

708.14 Operation and maintenance manuals. Operations and maintenance materials shall be supplied with *graywater* systems in accordance with Sections 708.14.1 through 708.14.4.

~~708.14.1 Manual.~~ A detailed operations and maintenance manual shall be supplied in hardcopy form with all *graywater* systems.

~~708.14.2 Schematics.~~ The manual shall include a detailed system schematic, locations of all system components, and a list of all system components including manufacturer and model number.

~~708.14.3 Maintenance procedures.~~ The manual shall provide a maintenance schedule and procedures for all system components requiring periodic maintenance. Consumable parts including filters shall be noted along with part numbers.

~~708.14.4 Operations procedures.~~ The manual shall include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

SECTION 709 **MUNICIPAL RECLAIMED WATER SYSTEMS**

~~709.1 Scope.~~ The provisions of this section shall govern the construction, installation, *alteration*, and *repair* of systems supplying *non-potable municipal reclaimed water*.

~~709.2 Permits.~~ *Permits* shall be required for the construction, installation, *alteration*, and *repair* of *reclaimed water* systems. *Construction documents*, engineering calculations, diagrams, and other such data pertaining to the reclaimed system shall be submitted with each application for *permit*.

~~709.3 Potable water connections.~~ Connections between a *reclaimed water* system and a *potable water* system shall be protected against backflow in accordance with Section 608 of the *International Plumbing Code*.

~~709.4 Installation.~~ Except as provided for in this section, systems shall be installed in compliance with the provisions of the *International Plumbing Code* and manufacturer's instructions, as applicable.

~~709.5 Applications.~~ *Reclaimed water* shall be utilized in accordance with Section 706 and local codes.

~~709.6 Approved components and materials.~~ Piping, plumbing components, and material used in the *reclaimed water* systems shall be manufactured of material *approved* for the intended application.

~~709.7 Water pressure reducing valve or regulator.~~ Where the *reclaimed water* pressure supplied to the *building* exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the *reclaimed water* distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8 of the *International Plumbing Code*.

~~709.8 Trenching requirements.~~ Water service piping, including piping containing *reclaimed water*, shall be separated from the *building sewer* by 5 feet (1524 m) of undisturbed or compacted earth. *Reclaimed water* piping shall be separated from *potable water* piping underground by 5 feet (1524 m) of undisturbed or compacted earth. *Reclaimed water* service pipes shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Buried *reclaimed water* piping shall comply with the requirements of Section 306 of the *International Plumbing Code* for support, trenching, bedding, backfilling, and tunneling.

Exceptions:

1. The required separation distance shall not apply where the bottom of the *reclaimed water* service pipe within 5 feet (1524 mm) of the sewer is a minimum of 12 inches (305 mm) above the top of the highest point of the sewer and the pipe materials comply with the requirements of the *International Plumbing Code* for the application.

2. The required separation distance shall not apply where the bottom of the *potable* water service pipe within 5 feet (1524 mm) of the *reclaimed water* pipe is a minimum of 12 inches (305 mm) above the top of the highest point of the *reclaimed water* pipe and the pipe materials comply with the requirements of the *International Plumbing Code* for the application.
3. Water service pipe is permitted to be located in the same trench with a *building sewer*, provided such sewer is constructed of materials that comply with the requirements of the *International Plumbing Code* for the application.
4. The required separation distance shall not apply where a *potable* or *non-potable* water service pipe crosses a sewer pipe provided the water service pipe is sleeved to at least 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing with pipe materials that comply with the requirements of the *International Plumbing Code* for the application.
5. The required separation distance shall not apply where a *potable* water service pipe crosses a *reclaimed water* pipe provided the *potable* water service pipe is sleeved to at least 5 feet (1524 mm) horizontally from the *reclaimed water* pipe centerline on both sides of such crossing with pipe materials that comply with the requirements of the *International Plumbing Code* for the application.

709.9 Reclaimed water systems. The design and installation of the *municipal reclaimed water* systems on the site shall conform to *accepted engineering practice*.

709.9.1 Distribution pipe. ~~Distribution piping shall comply with Sections 709.9.1.1 through 709.9.1.4.~~

709.9.1.1 Materials. ~~Distribution piping conveying reclaimed water shall conform to standards and requirements specified by the *International Plumbing Code*.~~

709.9.1.2 Joints. ~~Distribution piping conveying reclaimed water shall utilize joints approved for use with the *distribution piping* and appropriate for the intended applications as specified in the *International Plumbing Code*.~~

709.9.1.3 Size. ~~Distribution piping conveying reclaimed water shall be sized in accordance with the *International Plumbing Code* for the intended application.~~

709.9.1.4 Labeling and marking. ~~Reclaimed water distribution piping shall be either the color purple and embossed or integrally stamped or marked "CAUTION: NONPOTABLE WATER — DO NOT DRINK" or be installed with a purple identification tape or wrap. Identification tape shall be at least 3 inches wide and have white or black lettering on purple field stating "CAUTION: NON-POTABLE WATER — DO NOT DRINK". Identification tape shall be installed on top of *reclaimed water distribution pipes*, fastened at least every 10 feet to each pipe length and run continuously the entire length of the pipe. Lettering shall be readily observable within the room or space where the piping is located.~~

Exception: Outside of the *building*, purple piping is not required downstream of the backflow preventer where *reclaimed water* is used for outdoor applications.

709.10 Tests and inspections. Tests and inspections shall be performed in accordance with Sections 709.10.1 and 709.10.2.

709.10.1 Water supply system test. The testing of makeup water supply piping and *reclaimed water distribution piping* shall be conducted in accordance with Section 312.5 of the *International Plumbing Code*.

709.10.2 Inspection and testing of backflow prevention assemblies. The testing of backflow preventers shall be conducted in accordance with Section 312.10 of the *International Plumbing Code*.

SECTION 710 PROJECT ELECTIVES

710.1 General. Section 710 contains *project electives* related to water conservation and efficiency. *Project electives* shall not be mandatory unless selected by the owner or registered design professional and indicated in the Project Elective Checklist required by Section 303.1.

710.2 Indoor water use. This section contains *project electives* related to indoor water use.

710.2.1 Water conservation tier project electives. Each water conservation tier above that mandated in Table 302.1 shall be recognized as an individual *project elective*.

710.3 On-site wastewater treatment project elective. Where projects are intended to qualify for an on-site wastewater treatment *project elective* in accordance with Section 303.4, all wastewater from the building shall be treated on-site to *tertiary standards* and reused on-site.

710.4 Non-potable outdoor water supply project elective. Where projects are intended to qualify for a *non-potable* outdoor water supply *project elective* in accordance with Section 303.4, sillcocks, hose bibs, wall hydrants, yard hydrants, and other outdoor outlets shall be supplied by *non-potable* water. Such outlets shall be located in a locked vault or shall be operable only by means of a removable key.

710.4.1 Labeling and signage. Each outlet shall be provided with signage in accordance with Section 706.2.

710.5 Non-potable water for plumbing fixture flushing water project elective. Where projects are intended to qualify for a *non-potable* water for plumbing fixture flushing *project elective* in accordance with Section 303.4, *non-potable* water shall be used for flushing water closets and urinals.

710.5.1 Water quality. *Non-potable* water for water closet and urinal flushing shall meet minimum water quality requirements as established for indoor flushing applications by local codes and regulations. Where chlorine is used for disinfection, the *non-potable* water shall contain not more than 4 mg/L of chloramines or free chlorine. Where ozone is used for disinfection, the *non-potable* water shall not contain gas bubbles having elevated levels of ozone at the point of use.

710.5.2 Filtration required. *Non-potable* water utilized for water closet and urinal flushing applications shall be filtered by a 100-micron or finer filter.

710.5.3 Labeling and signage. The entries to rooms having water closets or urinals that are supplied with *non-potable* water shall be provided with signage in accordance with Section 706.2.

710.6 Automatic fire sprinkler system project elective. Where projects are intended to qualify for an automatic fire sprinklers system *project elective* in accordance with Section 303.4, automatic fire sprinkler systems shall be supplied with *non-potable* water from an on-site *rainwater* collection system. Such *rainwater* collection system shall comply with Section 707. The requirements of Sections 710.6.1 and 710.6.2 shall apply to the fire sprinkler system and the on-site *rainwater* collection system.

710.6.1 Emergency power. An emergency power system complying with Chapter 27 of the *International Building Code* shall be provided for powering the pump and controls for the on-site *rainwater* collection system.

710.6.2 Source volume indication. The fire command center for the *building* shall be equipped with a device that indicates the volume of *non-potable* water contained in the collection reservoir. The indicator shall be *approved* and shall be in compliance with NFPA 72.

710.7 Non-potable water supply to fire pumps project elective. Where projects are intended to qualify for a *non-potable* water supply to fire pumps *project elective* in accordance with Section 303.4, one or

more fire pumps shall be located within 200 feet of a source of reclaimed or recycled water of sufficient quality, pressure, and capacity for fire pump applications and the fire pumps shall be connected to such source of reclaimed or recycled water. The connections shall be in accordance with Section 403.3.2 of the *International Building Code*.

710.7.1 Labeling and signage. Fire pumps connected to a *non-potable* water supply shall have signage in accordance with Section 706.2 provided at the *building's* fire command center and at each fire pump.

710.8 Non-potable water for industrial process makeup water project elective. Where projects are intended to qualify for a *non-potable* water for industrial process makeup water *project elective* in accordance with Section 303.4, industrial processes requiring makeup water shall utilize *non-potable* water except where the process requires *potable* water for proper functioning.

710.8.1 Labeling and signage. All rooms containing process equipment supplied with *non-potable* water shall be provided with signage in accordance with Section 706.2.

710.9 Efficient hot water distribution system project elective. Where projects are intended to qualify for an efficient hot water distribution *project elective* in accordance with Section 303.4, the volume of water in the piping between the source of hot water and the hot water outlets of shower, sink and lavatory fixture fittings shall not exceed 64 ounces (1.89 L). The volume of water contained in fixture branch piping that connects to a hot water circulation loop or electrically heat-traced pipe shall not exceed 24 ounces (0.47 L). The volume shall be calculated in accordance with Section 710.9.1.

710.9.1 Volume calculation. The volume of water between the source of hot water and a given outlet shall be calculated by adding the internal volume of all piping, fittings, valves, *motors*, and manifolds between the source and the outlet. Piping volumes shall be calculated using Table 702.8.2. Where water is supplied by a circulating hot water system or an electrically heat-traced pipe, the hot water source shall be considered to be the loop or the heat-traced pipe, and the volume shall include the fitting on the loop that supplies the fixture branch.

710.10 Non-potable water for cooling tower makeup water project elective. Where projects are intended to qualify for a *non-potable* water for cooling tower makeup water *project elective* in accordance with Section 303.4, *non-potable* water shall be utilized for cooling tower makeup water in accordance with the requirements of Section 706.3.

710.11 Graywater collection project elective. Where projects are intended to qualify for a *graywater* collection *project elective* in accordance with Section 303.4, wastewater from lavatories, showers, bathtubs, clotheswashers, and laundry trays shall be collected for reuse onsite in accordance with Section 708.

Add new standards as follows:

ARI

Air-Conditioning and Refrigeration Institute (ARI),
Standard 810-2006, Performance Rating of Automatic Commercial Ice-Makers

ASTM

Standard F1696, Standard Test Method for Energy Performance of Single-Rack Hot Water Sanitizing, Door-Type Commercial Dishwashing Machines
Standard F1920, Standard Test Method for Energy Performance of Rack Conveyor, Hot Water Sanitizing, Commercial Dishwashing Machines

EPA

EPA- 800R07010 Water Sense March 2010 Tank-Type High-Efficiency Toilet Specification, Appendix A: HET Fixture Performance Testing Protocol, Section 4.0 Flush Performance Criteria. Version 1, January 24, 2007.

PART VII – CHAPTER 8

Delete definitions and figures without substitution:

~~**DAYLIGHT ZONE, SIDELIGHTING.** The floor area illuminated by vertical fenestration. Where fenestration is located on a roof, this area extends back from the fenestration to the nearest 56 inch high partition, or up to 0.7 times the height from the floor to the top of the fenestration and laterally from the edge of the fenestration to the nearest 56 inch high partition, or up to 0.5 times the height from the floor to the top of the fenestration, as indicated in Figures 202.2, 202.3, and 202.4 whichever is less. Otherwise, this area extends back from the fenestration to the nearest 56 inch high partition, or up to 1.75 times the height from the floor to the top of north facing fenestration, up to 1.5 times the height from the floor to the top of south facing fenestration, and up to 1.0 times the height from the floor to the top of all other fenestration, and laterally to the nearest 56 inch high partition, or up to 0.5 times the height from the floor to the top of the fenestration, as indicated in Figure 202.1 whichever is less.~~

~~**EXTERIOR WALL, OBSTRUCTED.** That portion of an exterior wall that does not face a public way or a yard or court complying with Section 1206 of the *International Building Code* or where the distance to any buildings, structures, or geological formations in front of the wall is less than two times the height of the buildings, structures, or geological formations. For the purposes of this determination, the maximum allowed heights of buildings or structures on adjacent property under existing zoning regulations is permitted to be considered. Determination is made on a floor by floor basis.~~

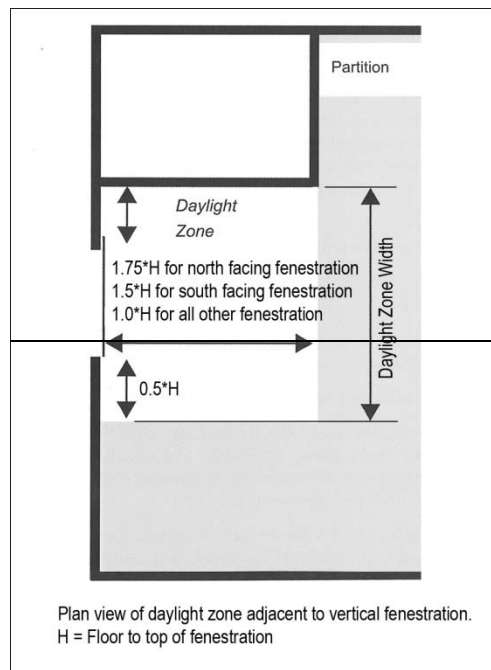


Figure 202.1
Daylight Zone Adjacent to Vertical Fenestration in a Wall

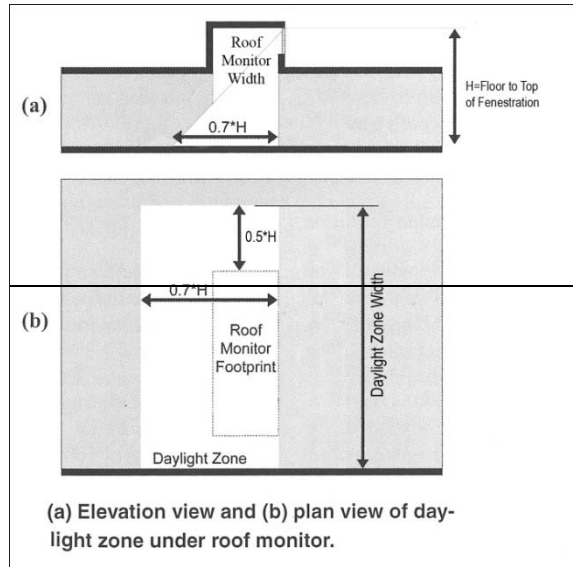


Figure 202.2

Daylight Zone Adjacent to Vertical Fenestration Above a Roof (Clerestory)

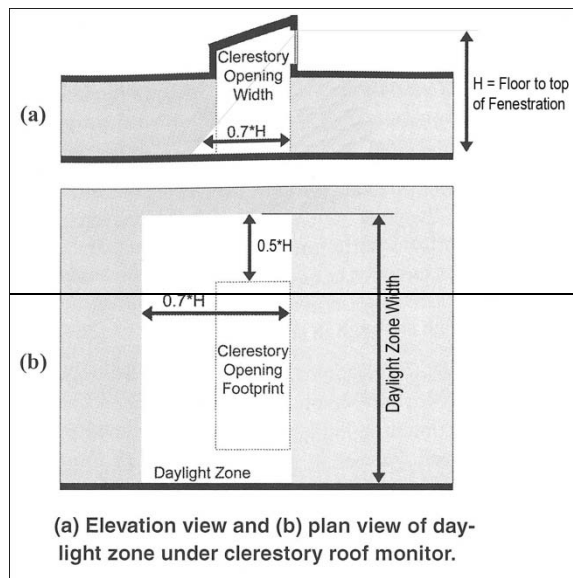


Figure 202.3

Daylight Zone Adjacent to Vertical Fenestration Above a Roof (Sawtooth)

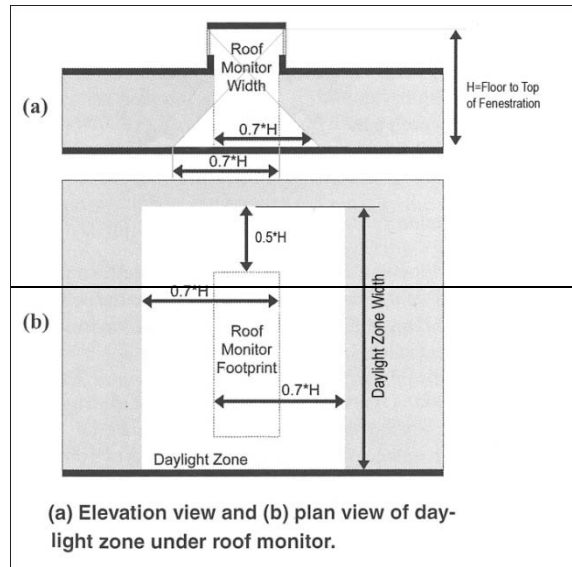


Figure 202.4

Daylight Zone Adjacent to Vertical Fenestration Above a Roof (Monitor)

DAYLIGHT ZONE, TOPLIGHTING. The floor area beneath a *skylight*. This area extends laterally and longitudinally beyond the rough opening of the *skylight* to the nearest 56 inch high partition, or up to 0.7 times the height from the floor to the ceiling, as indicated in Figure 202.5 whichever is less.

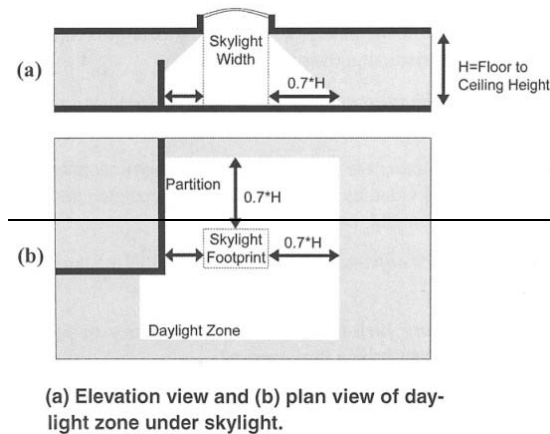


Figure 202.5

Daylight Zone Under a Skylight

ROOF, OBSTRUCTED. That portion of the roof that is shaded by any *building, structure, or geological formation* at the peak solar altitude on the spring equinox, and three hours before and after the peak solar altitude on the spring equinox. For the purposes of this determination, the maximum allowed heights of *buildings or structures* on adjacent property under existing zoning regulations are permitted to be considered.

Revise as follows:

SECTION 801 GENERAL

801.1 Scope and intent. ~~The provisions of this chapter shall govern and are intended to provide an the impact of the interior environment on human that is conducive to the health and well-being of, building occupants, neighbors and construction personnel.~~

801.2 Indoor air quality management plan required. ~~An indoor air quality management plan shall be developed. Such plan shall address the methods and procedures to be used during design and construction to obtain compliance with Sections 802 through 805.~~

SECTION 802 BUILDING CONSTRUCTION FEATURES, OPERATIONS AND MAINTENANCE FACILITATION AIR CIRCULATION SYSTEM

802.1 Scope Air circulation requirements. ~~To facilitate the operation and maintenance of the completed building, the building and its systems shall comply with the requirements of Sections 802.2 through 802.5. Air circulation systems shall meet the requirements of this section.~~

802.2 Duct Sealing. Ducts, air handlers, and filter boxes shall be sealed. Joints and seams in ducts shall comply with Section 603.9 of the International Mechanical Code.

802.3 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of not more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193, as applicable.

802.24 Air handling system access. ~~The arrangement and location of air handling system components including, but not limited to, ducts, Air handlers, air filters, units, fans, coils and condensate pans shall allow access be provided with access for purposes of cleaning, and repair, and replacement, of the air handling surfaces of such components. Access ports shall be installed in the air handling system to permit such cleaning and repairs. Piping, conduits, and other building components shall not be located so as to obstruct the required access ports.~~

802.5 Duct Air Leakage Testing. Ductwork designed to operate at static pressures exceeding 3 inches water column and ductwork located outdoors shall be leak-tested in accordance with the SMACNA *HVAC Air Duct Leakage Test Manual*. Representative sections totaling not less than 25% of the total installed duct area for the designated pressure class shall be tested. Positive pressure testing is acceptable for negative pressure ductwork. Duct systems with pressure ratings in excess of 3 inches water column shall be identified on the construction documents. The maximum permitted duct leakage shall be in accordance with Equation 8-1.

$$F = C P^{0.65} \quad , \quad \text{(Equation 8-1)}$$

Where

F = maximum permitted leakage in cfm/100 ft² duct surface area;

C = 4, duct leakage class, cfm/100 ft² at 1 inch water column.

P = test pressure, which shall be equal to the design duct pressure class rating inches of water column.

802.3 Durability of air handling surfaces. ~~Surfaces exposed to airflow within air handling systems shall be constructed of materials that are resistant to deterioration and will not break away, crack, peel, flake off, or show evidence of delaminating or continued erosion when tested in accordance with the erosion test in UL 181.~~

~~**802.4 Air handling system filters.** Filter racks shall be designed to prevent airflow from bypassing filters. Access doors and panels provided for filter replacement shall be fitted with flexible seals to provide an effective seal between the doors and panels and the mating filter rack surfaces. Special tools shall not be required for opening access doors and panels. Filter access panels and doors shall not be obstructed.~~

~~**802.5 Airstream surfaces.** Materials exposed to airflow within ducts, within air plenums, or on top of suspended ceilings, shall not break away, crack, peel, flake off, or show evidence of delamination or continued erosion when tested in accordance with the erosion test in UL 181.~~

SECTION 803 HVAC SYSTEMS

~~**803.1 Construction phase requirements.** The *ventilation of buildings* during the construction phase shall be in accordance with sections 803.1.1 through 803.1.3.~~

~~**803.1.1 802.5 Duct openings.** Duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or shall be closed by an *approved* method to reduce the amount of dust and debris that collects in the system from the time of rough-in installation and until startup of the heating and cooling equipment. Dust and debris shall be cleaned from duct openings prior to system flush out and *building* occupancy.~~

~~**803.1.2 Indoor air quality during construction.** Temporary *ventilation* during construction shall be provided in accordance with Sections 803.1.2.1 through 803.1.2.3.~~

~~**803.1.2.1 Ventilation.** *Ventilation* during construction shall be achieved through openings in the *building* envelope using natural *ventilation* in accordance with the provisions of the *International Building Code* or the *International Mechanical Code*, or fans that produce a minimum of three air changes per hour.~~

~~**803.1.2.2 Protection of HVAC system openings.** HVAC supply and return duct and equipment openings shall be protected during dust-producing operations.~~

~~**803.1.2.3 Return air filters.** Where a forced air HVAC system is used during construction, new return air filters shall be installed prior to system flush out and *building* occupancy.~~

~~**803.1.3 Construction phase ductless system or filter.** Where spaces are conditioned during the construction phase, space conditioning systems shall be of the ductless variety, or filters for ducted systems shall be rated at MERV 8 or higher and system equipment shall be designed to be compatible. Duct system design shall account for pressure drop across the filter.~~

~~**803.2 Thermal environmental conditions for human occupancy.** Buildings shall be designed in compliance with ASHRAE 55-04, Sections 6.1, "Design," and 6.2, "Documentation."~~

~~**Exception:** Spaces with special requirements for processes, activities, or contents that require a thermal environment outside of that which humans find thermally acceptable, such as food storage, natatoriums, shower rooms, saunas, and drying rooms.~~

~~**803.3 Environmental tobacco smoke control.** Smoking shall not be allowed inside of buildings. Signage stating such shall be posted within 10 ft (3 m) of each building entrance. Any exterior designated smoking areas shall be located not less than 25 ft (7.5 m) away from building entrances, outdoor air intakes, and operable windows.~~

~~**803.4.1 Print, copy and janitorial rooms and garages.** Enclosed rooms or spaces that are greater than 200 square feet in area and that are used as a print or copy facility, janitorial room, repair garage or aircraft hangar where the use of chemicals occurs shall comply with all of the following:~~

- ~~1. The enclosing walls shall extend from the floor surface to the underside of the floor, roof deck or solid ceiling above and shall be constructed to resist the passage of airborne chemical pollutants.~~

2. Doors in the enclosing walls shall be automatic or self-closing.
3. An HVAC system Such rooms and spaces shall be provided that: provides separate with exhaust airflow to the outdoors at a rate of not less than 0.50 cfm per square foot; that maintains or shall be maintained at a negative pressure of not less than 7pa within relative to the adjacent rooms. The recirculation of unfiltered air from the room to other portions of the *building* shall be prohibited..

**SECTION 804
SPECIFIC INDOOR AIR QUALITY & POLLUTANT CONTROL MEASURES**

Delete Section 804.2 without substitution.

804.3 Building flush out. ~~After all interior finishes are installed, the *building* shall be flushed-out by supplying continuous *ventilation* with all air handling units at their maximum outdoor air rate for at least 14 days while maintaining an internal temperature of at least 60°F, and relative humidity not higher than 60 percent. Occupancy shall be permitted to start 7 days after start of the flush-out, provided that flush-out continues for the full 14 days. The *building* shall not be “baked-out” by increasing the temperature of the space. Where continuous *ventilation* is not possible, the aggregate of flush-out periods shall be equivalent to 14 days of continuous *ventilation*.~~

Exceptions:

- 1- ~~Group S, F, H and U occupancies shall not be required to comply with this section.~~
- 2- ~~A building shall not be required to be flushed-out where it is tested for indoor air quality and the testing results indicate that the levels of VOC's are acceptable.~~

804.4 Building Entrances. ~~All building entrances shall employ an entry mat system that shall have a scraper surface, an absorption surface, and a finishing surface in accordance with Sections 804.4.1 through 804.4.3. Each surface shall be not less than the width of the entry opening, and the minimum length is measured in the primary direction of travel.~~

Exceptions:

- 1- ~~Entrances to individual dwelling units.~~
- 2- ~~The length of entry mat surfaces is allowed to be reduced because of a barrier, such as a counter, partition or wall, or where local regulations prohibit the use of scraper surfaces outside of the entry. In such cases, the entry mat surfaces shall have a minimum length of 3 ft (914mm) of indoor surface, with a minimum combined length of 6 ft (1829 mm).~~

804.4.1 Scraper Surface. ~~The scraper surface shall comply with all of the following:~~

- 1- ~~It shall be the first surface stepped on when entering the building.~~
- 2- ~~It shall be either immediately outside of or inside of the entry.~~
- 3- ~~It shall be not less than 3 feet (914mm) in length.~~
- 4- ~~It shall consist of permanently mounted grates or removable mats with knobby or squeegee like projections.~~

804.4.2 Absorption Surface. ~~The absorption surface shall comply with all of the following:~~

- 1- ~~It shall be the second surface stepped on when entering the building.~~
- 2- ~~It shall be not less than 3 feet (914mm) in length and made from materials that can perform both a scraping action and a moisture wicking action.~~

804.4.3 Finishing Surface. ~~The finishing surface shall comply with all of the following:~~

- 1- ~~It shall be the third surface stepped on when entering the building.~~

2. It shall be not less than 4 feet (1219mm) in length and made from materials that will both capture and hold any remaining particles or moisture.

**SECTION 805
ASBESTOS USE PREVENTION**

805.1 Scope. The use of materials containing asbestos in *building* construction shall be prohibited.

**SECTION 806
MATERIAL EMISSIONS & POLLUTANT CONTROL**

**SECTION 807
ACOUSTICS**

Delete Section 808 and substitute as follows:

**SECTION 808
DAYLIGHTING**

808.1 Daylighting requirement. Daylighting shall be required for the following occupancies or portions of occupancies:

1. A Group A3 occupancy where the specific use of the room or space is for reading areas in libraries, waiting areas in transportation terminals, exhibition halls, gymnasiums, and indoor athletic areas.
2. A Group B occupancy where the specific use of the room or space is for educational facilities for students above the 12th grade, laboratories for testing and research, post offices, print shops, offices, and training and skill development not within a school or academic program.
3. All group E and F occupancies.
4. Those portions of Group M or S occupancies located directly underneath a roof.

Exception: Daylighting is not required in the following rooms and spaces:

1. Building spaces where darkness is required for the primary use of the space, including, but not limited to, light sensitive material handling and darkrooms.
2. Building spaces that are required to be cooled below 50 degrees F.
3. Unconditioned buildings that are equipped with exterior doors that when opened, provides equivalent daylighting.
4. Alteration, repair, movement, or change of occupancy of existing buildings.

808.2 Daylighting of building spaces. For buildings one or two stories above grade, at least 50 percent of the total floor area in regularly occupied spaces with an unobstructed wall or unobstructed roof shall be located within a daylit area. For buildings three stories or more above grade, at least 25 percent of the total floor area in regularly occupied spaces with an unobstructed wall or unobstructed roof shall be located within a daylit area. The required effective aperture shall be determine by Table 808.1 and Equation 8-1.

**TABLE 808.1
MINIMUM EFFECTIVE APERTURE**

Sky Type ^a	(percentage)		
	Sidelighting from Fenestration in a Wall	Sidelighting from Rooftop Monitor	Toplighting
A	10.0	5.0	1.0
B	12.0	6.0	1.2
C	16.0	8.0	2.2

^a US shall be Sky Type B, except: Alaska shall be Sky Type C. Arizona and Hawaii shall be Sky type A. Sky type A counties shall be: Nevada- Churchill, Lincoln, Nye, Washoe, and counties south. New Mexico- Lincoln, Otero, Sandoval, San Juan, Santa Fe, Torrance and counties south. Texas- Hudspeth, El Paso, and Jeff Davis. Utah- Iron, Kane, and Washington. California- all counties except Del Norte, Siskiyou, Modoc, Humboldt, Trinity, and Mendocino.

$EA = (AF \times VT)/DA$ **(Equation 8-2)**

EA = Effective aperture
 AF = area of fenestration
 VT = visible transmittance of the fenestration
 DA = daylight area

808.2.1 Wall and roof obstruction. An unobstructed roof is a roof that is not shaded by any building, structure, or geological formation at the peak solar altitude on the spring equinox, and three hours before and after the peak solar altitude on the spring equinox.

An unobstructed exterior wall for each floor is a wall that faces a public way or a yard or court complying with Section 1206 of the International Building Code, or has the distance to any buildings, structures, or geological formations in front of the wall of at least two times the height of the buildings, structures, or geological formations.

For the purposes of determining obstruction, the maximum allowed heights of buildings or structures on adjacent property under existing zoning regulations is permitted to be considered.

For determining the total daylight area, any overlapping daylight areas shall be counted only once.

808.2.2. Sidelighting. The daylight area shall be illuminated by fenestration that complies with Table 808.1 and Figure 808.1.

808.2.2.1 Sidelighting daylight area. Where fenestration is located in a wall, the daylight area shall extend laterally to the nearest 56 inch high partition, or up to 1.0 times the height from the floor to the top of fenestration facing within 45 degrees of east or west or up to 1.5 times the height from the floor to the top of all other fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest 56 inch high partition, or up to 2 feet, whichever is less, as indicated in Figure 808.1. Where fenestration is located in a rooftop monitor, the daylight area shall extend laterally to the nearest 56 inch high partition, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest 56 inch high partition, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures 808.2 and 808.3.

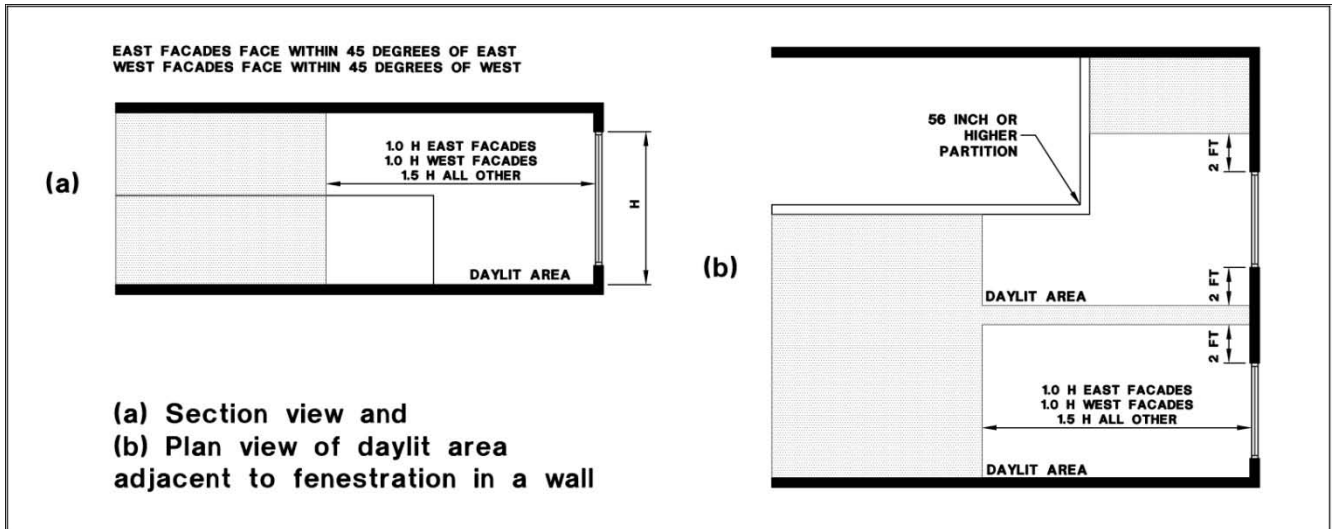


Figure 808.1
Daylit Area Adjacent to Fenestration in a Wall

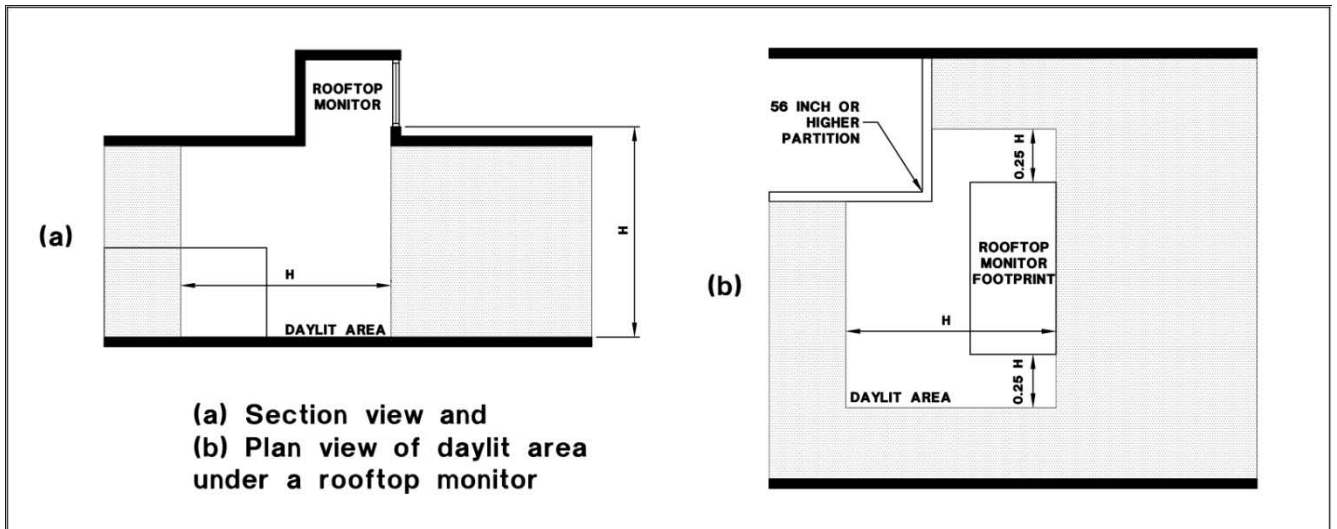


Figure 808.2
Daylit Area Adjacent Under a Rooftop Monitor

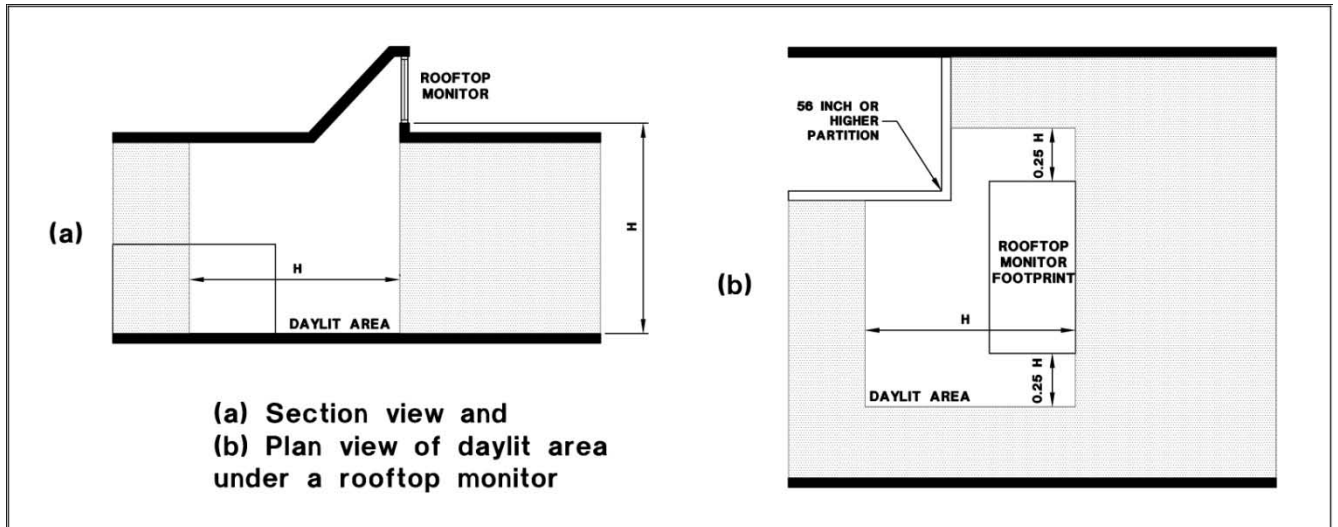


Figure 808.3
Daylit Area Adjacent Under a Rooftop Monitor

808.2.3 Toplighting. The *daylit area* shall be illuminated by a *skylight* that complies with Table 808.1 and Figures 808.2 to 808.4.

808.2.3.1 Toplighting daylit area. The *daylit area* extends laterally and longitudinally beyond the rough opening of the *skylight* to the nearest 56 inch high partition, or up to 0.7 times the height from the floor to the bottom of the rough opening of the *skylight* well, whichever is less, as indicated in Figure 808.4.

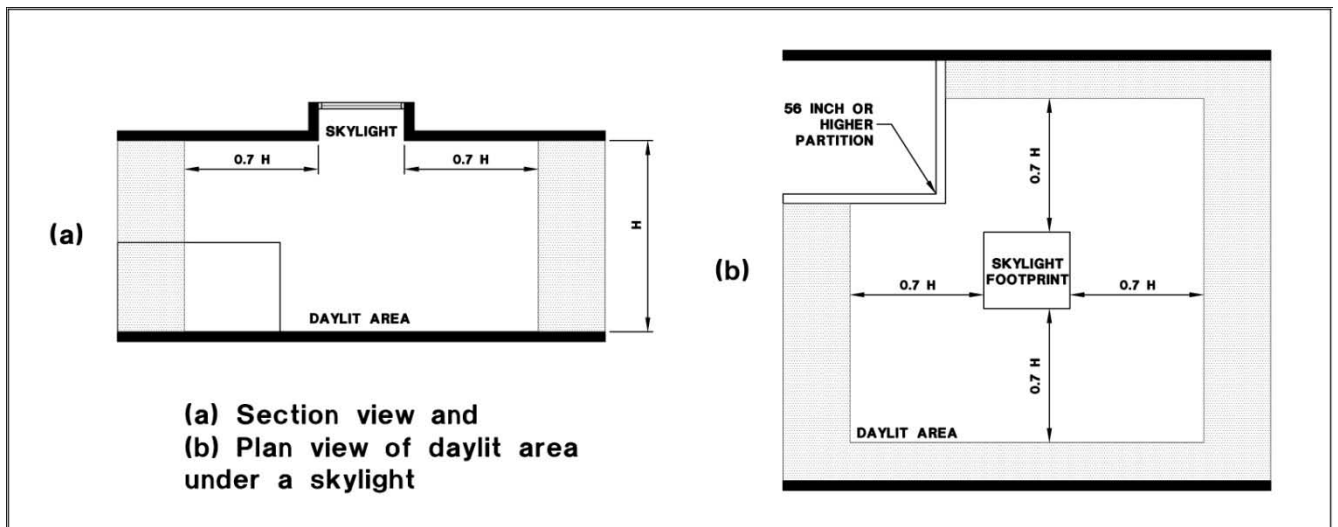


Figure 808.4
Daylit Area Under a Skylight

Delete Section 809 without substitution.

Add new standard as follows:

ASHRAE 193 Method of Test for Determining the Air Leakage Rate for HVAC Equipment

PART VIII – CHAPTER 9

CHAPTER 9
COMMISSIONING, OPERATIONS AND MAINTENANCE

PART IX – CHAPTER 10

Revise Chapter 10 as follows. Move Chapter 10 to an Appendix and renumber accordingly.

~~CHAPTER 10~~ APPENDIX E
EXISTING BUILDINGS

SECTION 1001
GENERAL

1001.1 Scope. The provisions of this ~~chapter~~ appendix shall control the *alteration, repair, addition, maintenance and operation and change of occupancy* of existing *buildings and structures*. ~~Existing building sites shall comply with Chapter 11.~~

~~**1001.2 Building operation and maintenance.** Existing *buildings* and parts thereof, shall be operated and maintained in conformance with the code edition and zoning or other adopted site development regulations applicable at the time of construction, and as required by Section 102.6. The owner or the owner's designated agent shall be responsible for the operation and maintenance of existing *buildings*. The requirements of this chapter shall not provide the basis for removal or abrogation of fire protection and safety systems and devices in *existing structures*.~~

1001.3 Compliance. *Alterations, repairs, additions* and changes of occupancy to *existing structures* shall comply with the provisions of this chapter.

1001.4 Building materials, assemblies and systems. *Building materials* shall comply with the requirements of this section.

1001.4.1 Existing materials, assemblies, configurations and systems. Materials, assemblies, configurations and systems already in use in a *building* in conformance with requirements or approvals in effect at the time of their erection or installation shall be permitted to remain in use unless determined by the *code official* to be dangerous to life, health or safety. Where such conditions are determined to be dangerous to the environment, life, health or safety, they shall be mitigated or made safe.

1001.4.2 New and replacement materials, assemblies, configurations and systems. Except as otherwise required or permitted by this code, materials, assemblies, configurations and systems permitted by the applicable code for new construction shall be used. Like materials shall be permitted for *repairs* and *alterations* provided that a hazard to life, health or property is not created. Hazardous materials shall not be used where the code for new construction would not *permit* their use in *buildings* of similar occupancy, purpose and location.

SECTION 1002
ADDITIONS

1002.1 General. *Additions* to any *building or structure* shall comply with the requirements of this code for new construction. Unaltered portions of the *building or structure* shall be in accordance with the provisions of the code in force at the time of their construction and shall comply with Section 1003.2.

Additions to existing portions or components of the *building structure* shall be in accordance with the provisions of this code for those portions or components being altered.

1. *Additions* to an existing *building* or *structure* shall be made such that the existing *building* or *structure* together with the *addition* are not less conforming with the provisions of this code than the existing *building* and or *structure* was prior to the *addition*.
2. *Additions* shall not be permitted to *buildings* and *structures* that are located in *flood hazard areas*.

Exception: Where an existing *building* or *structure* is located such that all habitable space is located not less than 1 foot above the flood elevation, ~~additions complying with Section 402.2.1(1)~~ shall be permitted.

SECTION 1003 ALTERATIONS TO EXISTING BUILDINGS

1003.1 General. *Alterations* to existing *buildings* and *building* systems shall be in accordance with the provisions of this code for those areas, assemblies, systems and components being altered. Unaltered portions and components, areas and systems of the *building* or *structure* shall be in accordance with the provisions of the code in force at the time of their construction and shall comply with Section 1003.2. *Alterations* shall be such that the existing *building* or *structure* is not less conforming to the provisions of this code upon the completion of work than the existing *building* or *structure* was prior to the *alteration*. ~~Energy compliance for this purpose shall be evaluated in accordance with Section 602.4.~~ Areas, assemblies, systems and components that are altered shall be in accordance with this section and Sections 1003.2 and 1003.3.

Exception: Where, in the opinion of the *code official*, there is no significant compromise of the intent of this code, the *code official* shall have the authority to approve materials and assemblies that perform in a manner that is at least the equivalent of those being replaced.

1003.2 Minimum energy, HVAC and water requirements. Compliance with Sections 1003.2.1 through 1003.2.3 shall be required.

Exceptions:

1. Materials, assemblies and components regulated by Sections 1003.2.1, 1003.2.2 or 1003.2.3 that are dependent upon properties of other concealed materials, assemblies or system components to function properly and where the properties of the concealed materials, assemblies or components are unknown or insufficient and will not be revealed during construction.
2. Where the application of the requirements of Sections 1003.2.1, 1003.2.2 or 1003.2.3 are determined by the *code official* to be technically infeasible based upon the existing configuration of spaces, unless the intent of the *permit* applicant is to reconfigure those spaces or portions thereof.
3. Where a tenant in a multi-tenant *building* does not have control within that tenant space of a complete system or item, compliance for that complete system or item shall not be required.

1003.2.1 Heating, ventilation and air conditioning. Heating, *ventilation* and air conditioning systems and equipment shall be in accordance with the following:

1. Non-functioning thermostats shall be repaired or replaced.
2. Leaking accessible supply air and return ducts shall be sealed with *approved* sealants. Although the presence of existing duct tape shall not be deemed to indicate noncompliance where a duct is not leaking, duct tape shall not be acceptable for repair of such a leak.
3. Outside air dampers, damper controls and linkages controlled by HVAC units shall be in good repair and adjustment.
4. Hot water and steam leaks, defective steam traps and radiator control, relief, and vent valves shall not be permitted in any accessible piping.
5. Leaking accessible chilled water lines and equipment shall be repaired or replaced.

1003.2.2 Service water systems. Defective hot and cold water piping and equipment within service water systems shall be repaired or replaced.

1003.2.3 Motor-driven equipment. There shall not be leaks in compressed air or pumped water systems.

1003.3 Additional requirements. *Alterations* of portions and components of *buildings* shall comply with Sections 1003.3.1 through 1003.3.9.

Exceptions:

1. The total cost of improvements required by Sections 1003.3.1 through 1003.3.9 shall not be required to exceed 10 percent of the costs of the *alterations* exclusive of land and *building site* improvements. The costs of *alterations* shall include costs related to Section 1003.2, but shall not limit its application.
2. This section shall not require compliance that exceeds that required for systems regulated by Chapters 6 through 8 of this code.
3. Materials, assemblies and components regulated by Sections 1003.3.1 through 1003.3.9 that are dependent upon properties of other concealed materials, assemblies or system components to function properly and where the properties of the concealed materials, assemblies or components are unknown or insufficient and will not be revealed during construction.
4. Where the application of the requirements of Sections 1003.3.1 through 1003.3.9 are determined by the *code official* to be technically infeasible based upon the existing configuration of spaces, unless the intent of the *permit* applicant is to reconfigure those spaces or portions thereof.
5. Where a tenant in a multi-tenant *building* does not have control within that tenant space of a complete system or item, compliance for that complete system or item shall not be required.

1003.3.1 Energy audit and report. The *building* owner shall commission a *building* energy audit and provide copies of the audit report to the local *jurisdiction*. The audit shall be conducted by persons qualified to perform such audits, as determined by the *code official*. The energy audit report shall indicate the improvements listed in Sections 1003.3.2 through 1003.3.9 that the auditor recommends for scoping and prioritizing the modification, replacement or the addition of equipment or systems to improve the energy performance of the *building*.

Exception: An energy audit and report shall not be required where a *building* is vacant and has been vacant for a minimum of six months prior to the sale date of the property.

1003.3.2 Metering devices. Dedicated individual utility or private *metering* devices to facilitate the measurement and verification of energy and water use within the *building* or space shall be provided for at least one of the following:

1. Electrical energy consumption for individual tenant spaces
2. Water consumption for individual tenant spaces
3. Natural gas or fuel oil consumption for individual tenant spaces
4. Lighting loads
5. Motor and drive loads
6. Chiller part-load efficiency
7. Cooling loads
8. Economizer and heat recovery loads
9. Boiler efficiencies
10. *Building* process systems and equipment loads
11. Water consumption for landscape irrigation

1003.3.3 Heating, ventilation and air conditioning. Heating, *ventilation* and air conditioning systems and equipment shall be in accordance with the following:

1. Time clock and *time switch controls* that can turn systems off and on according to *building* occupancy requirements shall be provided and connected to the following HVAC equipment: chillers and other space cooling equipment, chilled water pumps, boilers and other space heating devices, hot water pumps, heat exchanger circulation pumps, supply fans, return fans, and exhaust fans. Where occupant override is provided, it shall be designed with a timer to automatically revert to time clock and *time switch controls* in not longer than twelve hours.

Exception: A time clock and *time switch controls* shall not be required for spaces with twenty-four-hour occupancy or containing materials with special atmospheric requirements dependent on twenty-four-hour space conditioning, or where a majority of areas of the *building* served by the system are under set-back thermostat control, or where manufacturer's specifications stipulate that the system must not be shut off.

2. Functional outside air economizers shall be provided on all cooling systems of more than 6 1/4 tons total cooling capability, 75K *Btu/hr.*, or more than two thousand five hundred cubic feet per minute air flow, provided manufacturer's guidelines are available for adding the economizer to the existing system.

Exceptions: An outside air economizer shall not be required for *buildings* or special uses requiring one hundred percent outside air for *ventilation*, where the existing system has a water based economizer, where the existing system does not have an outside air intake, where special economizer operations such as, but not limited to, carefully controlled humidity would require more energy use than is conserved, where there is insufficient space to install necessary equipment, where installation of an economizer would require major modifications to the *building's* life-safety system, or where the existing system is a multi-zone system where the same intake air may be used at the same time for either heating or cooling in different parts of the *building*.

3. HVAC piping and ducts, including those located above suspended ceilings, shall be insulated to *R-values* in accordance with this code.

Exception: Additional insulation shall not be required for piping within HVAC equipment, within conditioned space that conveys fluids between sixty degrees Fahrenheit and one hundred five degrees Fahrenheit, piping that is already insulated and the insulation is in good condition, or where the insulation cannot be installed without structural *alteration*.

4. Furnace combustion units shall have been cleaned and tuned within one year prior to the alteration. Filters shall be replaced in accordance with the furnace manufacturer's recommendations. Where central heat is intended to be replaced with individual electric space heaters, the application for the electrical *permit* shall include documentation demonstrating that the new electric heaters will not consume more energy than the existing nonelectric heater(s).
5. Boiler systems shall have been cleaned and tuned within one year prior to the alteration.
6. Boilers shall be equipped with an outdoor air lock-out thermostat or a temperature reset control.
7. Chiller systems shall have been cleaned and tuned within one year prior to the *alteration*.
8. Chillers shall be equipped with an outdoor air lockout thermostat and chilled water reset control.
9. A maximum 5 year phase out plan shall be provided for *buildings* with existing systems that use CFC-based refrigerants.
10. ~~Where mechanical and electrical systems and equipment are joined with microprocessors that communicate with each other or to a computer, a properly integrated *building* automation system shall be installed to optimize energy, operations, and indoor comfort. The *building* automation system shall allow the owner to set up schedules of operation for the equipment and provide equipment optimal start with adaptive learning; provide trim and respond capabilities based on zone demand; ability to monitor energy usage, including the ability to *meter* electric, gas, water,~~

~~steam, hot water, chilled water, and fuel oil services; offer economizing based on enthalpy calculation and/or CO2 set point control; offer load shedding when power companies are at peak demand and need; and offer the ability to send alarms to alert building owner, manager, or operator when problems occur due to system failures.~~

1003.3.4 Service water systems. Service water systems and equipment shall be in accordance with the following:

1. Water heater and hot water *storage tanks* shall have a combined minimum total of external and internal insulation value of R-16, or shall comply with the minimum efficiency in Section 607.1.
2. Accessible hot ~~and cold water~~ supply and *distribution pipes* shall be insulated to *R-values* as specified in this code.
3. In Seismic Design Categories D, E and F, as established in accordance with the *International Building Code*, water heater and water *storage tanks* with a tank capacity of thirty gallons or greater shall be strapped or otherwise secured to a wall, floor, ceiling, or other object that itself is adequately secured to a wall, floor, or ceiling. Water, gas and overflow pipes connected to water tanks shall be similarly secured.
4. Gas water heaters shall have a flexible gas line entering the appliance.
5. Circulating pump systems for hot water supply purposes other than comfort heating shall be controlled as specified in Section 504.6 of the IECC.
6. Showerhead, toilet, urinal and faucet flow rates shall be in accordance with Table 702.1 of this code.

1003.3.5 Lighting. Lighting systems and equipment shall be in accordance with sections 505.2.2.3 and 505.2.4 of the *International Energy Conservation Code*.

1003.3.6 Commercial refrigeration equipment. Commercial refrigeration equipment shall be cleaned and tuned for efficiency, including, but not limited to, cleaning of condenser coils and evaporators, and replacement of defective or worn door gaskets and seals.

1003.3.7 Motor-driven equipment. Motor-driven systems and equipment shall be in accordance with the following:

1. Filters shall be cleaned or replaced.
2. Belts and other coupling systems shall be in good repair.

1003.3.8 Swimming pools and spas. Swimming pools and spas and their equipment shall be in accordance with the following:

1. Heated swimming pools and spas shall be equipped with a cover for unoccupied hours.

Exception: A cover shall not be required for indoor pools or spas in which water temperature is less than eighty degrees Fahrenheit during time of non-use.

2. Pool and spa recirculation pumps shall be under timeclock control.
3. Heaters shall be cleaned and tuned for efficiency within one year prior to the *change of occupancy*.

1003.3.9 Unconditioned attic insulation. In *buildings* with three or fewer stories above grade plane, ceiling insulation with a minimum *R-value* as required by this code shall be installed in accessible attic spaces that are directly above conditioned spaces. For the purposes of this section, accessible attic space shall be the space between a ceiling joists and roof rafters where the vertical clear height from the top of a ceiling joist or the bottom chord of a truss, to the underside of the roof sheathing at the roof ridge, is greater than twenty-four inches. Where the required *R-value* insulation cannot fit in the attic space, the maximum amount of insulation compatible with available space and existing uses shall be installed.

1003.3.10 Asbestos-containing products. Identification and removal of *asbestos-containing products* shall be in accordance with ASTM E2356 and ASTM E1368.

SECTION 1004 CHANGE OF OCCUPANCY

1004.1 Change of occupancy. Where a change in occupancy of a *building* or tenant space places it in a different division of the same group of occupancy or in a different group of occupancies, as determined in accordance with the provisions of the *International Building Code*, compliance with Section 1003.2 shall be required. Altered portions of, and *additions* to, existing *buildings* that are not a result of *change of occupancy* requirements, shall comply with other sections of this chapter, as applicable.

Exception: *Historic buildings* in accordance with Section 1005 shall not be required to comply with Section 1004.

SECTION 1005 HISTORIC BUILDINGS

1005.1 Historic buildings. The provisions of this code relating to the construction, *repair*, *alteration*, *addition*, restoration and movement of *structures*, and *change of occupancy*, where each individual provision is evaluated separately on its own merit, shall not be mandatory for *historic buildings* for any of the following conditions:

1. Where implementation of that provision would change the visible configuration of *building* components in a manner that is not in keeping with the *buildings* historic nature, as determined by the *code official*, or
2. Where compliance with that provision would produce a conflict with a *building* function that is fundamental to the historic nature of the *building*.

SECTION 1006 JURISDICTIONAL REQUIREMENTS DEMOLITION

~~**1006.1 General.** Sections 1006.2 and 1006.3 shall be mandatory and Section 1006.4 shall be enforced only where specifically indicated by the *jurisdiction* in Table 302.1.~~

1006.2 Demolition. Where *buildings*, *structures* or portions thereof are *deconstructed* or demolished, a minimum of 50 percent of materials shall be diverted from landfills and incineration. Documentation of the total materials in *buildings*, *structures* and portions thereof to be *deconstructed* or demolished and materials to be diverted, and evidence of diversion, shall be provided. Material quantities shall be indicated and calculated by weight or volume, but not by both.

~~**1006.3 Sale of existing buildings and portions of buildings.** *Buildings* and portions of buildings that are sold shall comply with Sections 1003.2 and 1003.3 within 1 year of sale.~~

~~**1006.4 Evaluation and certification of existing buildings and building sites.** Where a *permit* application is accepted by a *jurisdiction* for the evaluation of an existing *building* and *building site* in accordance with the requirements of this code as applicable to a new project, and this code does not otherwise require conformance, evaluation shall be in accordance with the requirements of this section. *Project electives* in accordance with Table 303.1 shall be included in the evaluation of the existing *building*.~~

~~**1006.4.1 Certificate of conformance.** Where conformance with the requirements of this code as applicable to a new *building* is verified by the *code official* for an existing *building* and *building site*, a certificate shall be issued indicating conformance with this code, as modified by the limitations contained in Sections 1006.4.2 through 1006.4.3.2.~~

~~**1006.4.2 Specific exclusions.** Where evidence of compliance is not available, *existing buildings* evaluated under Section 1006.4 shall not be subject to the requirements of Section 806. Provisions of this code related to the projects construction phase, including Sections 402.3.1, 402.3.5, 402.3.6, 502.1, 506 and 803.1, and other sections as approved by the *code official*, shall not be required for *buildings* evaluated under Section 1006.4. Where buildings do not comply with the aforementioned sections, the certification shall specifically list the sections for which compliance has not been required or verified.~~

~~**1006.4.3 Existing concealed construction.** Existing concealed construction in *buildings* regulated by Section 1006.4 shall be in accordance with Sections 1006.4.3.1 and 1006.4.3.2.~~

~~**1006.4.3.1 Previously approved documents.** Previously *approved construction documents* for the initial construction of an *existing building* and, where possible, description of changing uses and major upgrades over the *building's* lifetime for which a certificate of occupancy was previously issued shall be deemed an acceptable indication of materials, assemblies and equipment in concealed spaces, except where field inspection reveals sufficient evidence suggesting noncompliance, subject to the evaluation of the *code official*.~~

~~**1006.4.3.2 Previously approved documents not available.** Where previously *approved construction documents* for the initial construction of an existing project are not available, materials, assemblies and equipment in spaces in *existing buildings* and existing portions thereof that are concealed, including, but not limited to, materials in spaces within walls and floor/ceiling assemblies, shall be exposed and spot checked in limited areas as determined by the *code official*.~~

PART X:

Delete without substitution:

**CHAPTER 11
EXISTING BUILDING SITE DEVELOPMENT**

PART XI:

Delete without substitution:

**APPENDIX A
OPTIONAL ORDINANCE**

PART XII:

Delete without substitution:

**APPENDIX B
GREENHOUSE GAS REDUCTION IN EXISTING BUILDINGS**

PART XIII:

Delete without substitution.

**APPENDIX C
SUSTAINABILITY MEASURES**

Reason: The price of complexity and ambiguity in the code world is a lack of compliance.

The purpose of this proposal is to reduce complexity and ambiguity, and thereby produce a usable code. The changes below are separated into Parts that represent Chapters. Presenting the changes as Chapters was more understandable than presenting them as several hundred separate changes with many overlaps. Taken as a whole, the changes consolidate and focus the IGCC.

Many changes make demonstrating compliance and code enforcement simpler. Overall the IGCC's size is reduced by half. More importantly a usable IGCC will have more impact.

Version 2 of IGCC resembles a long list of good ideas. Good ideas, even with good intentions, have less impact than a concise and clear set of enforceable requirements focused on the core goals of "green". Our challenge is to write a usable green code.

The IGCC should be a minimum green code. It should be appropriate to all buildings and jurisdictions, including small buildings and small jurisdictions lacking green experts. A minimum green code should not be overly expensive, complicated, or hard for the non-expert to understand.

The IGCC is not a codified LEED. Ratings, complexity, and new and initially untested requirements belong in rating systems, not codes. LEED and the IGCC have different roles and are not mutually exclusive.

This comprehensive change is intended in part to promote informal discussions on all parts of the IGCC. Informal discussions prior to the ICC hearings often help interested parties converge to support specific code changes. Informal discussions can resolve code issues outside the somewhat adversarial process of the hearings.

An informal meeting to discuss IGCC proposed changes will occur in Denver on April 20th. This informal meeting will be hosted by the Colorado code officials as a way of encouraging the interested parties to look for common ground. (The Colorado code officials are not endorsing this particular change, rather they are promoting discussion of all changes.) More information about the informal Denver meeting and discussions can be found at <http://www.codesynergy.org/igcc/> Follow on phone conversations may also occur on specific topics.

Several themes underscore most of the IGCC changes proposed here:

I-code consistency. The IGCC is an "overlay" code, an extension of the I-codes. As such the IGCC needs to be consistent with the I-code family. At this point in the code development process we don't have the option to change the 2012 I-codes to match the IGCC, but only to change the IGCC to match the other 2012 I-codes as needed.

A number of changes to correct inconsistencies in format, language and requirements are proposed below. Where the IGCC is repeating other I-code requirements, those are usually eliminated or made into a reference to the other I-code. The IGCC presumes the other I-codes are adopted. Where a provision from another I-code is really needed in the IGCC, that provision should be identified as originating in another code (for example [B] means originated in IBC) and maintained by another committee, as many of the definitions in the IGCC are already. This will help keep the I-code family aligned.

Remove items outside scope of the codes. Regulating how the building is used is beyond the code. Regulating behavior in the building is beyond the code. Things occurring after the certificate of occupancy is issued are beyond the code. These are removed.

Keep it simple. Keep it enforceable. Many parts of the IGCC are simplified. Calculations are replaced with simple prescriptions. Items that are unenforceable are removed. Complexity does not equal impact. Some of the most impactful requirements are simple.

Not really part of green. Most would call energy and water the core green issues. Materials, site development, impact on the ecosystem are also legitimate green topics. A variety of other topics, such as acoustics, are deleted as they add enforcement burden without compensating impact.

Electives don't work, remove them. The electives add complexity, but little value to the IGCC. The jurisdiction picks any combination of 20 plus options for jurisdictional electives; encouraging differences between jurisdictions and moving away from the I-code principal of "one code". The combined jurisdictional and project electives, over 70 total electives, significantly expand the volume of code that must be learned and potentially enforced but does not add much impact. As written the jurisdiction must make decisions on over 70 electives before adoption, making adoption more difficult, particularly for jurisdictions lacking significant "green" expertise. Many of the electives don't apply well to most buildings or jurisdictions. Worst of all, many of the electives are flawed (see Chapter 3 discussion below.) Both the jurisdictional and project electives are removed from the IGCC in this proposed change. Like all the I-codes, the IGCC is a minimum code, in this case a minimum green code.

"Simplicity is the ultimate sophistication." -- Leonardo da Vinci

PART I: Most of Chapter 1 is left unchanged. Many jurisdictions amend or rewrite the administrative chapter.

Section 101.2 #3. Adds an exemption for temporary buildings based on the IBC section on temporary buildings. The compliance and enforcement costs associated with a green code are not justified for temporary buildings.

Section 102.1. Since the IGCC is designed only to be used with other I-codes, this deletes the sentence suggesting IGCC might be adopted outside I-codes. Also, "advised" is an odd word in an applicability section.

Section 102.4. The IGCC does not need to describe the other codes. This section's purpose is to be clear that the IGCC presumes the other I-codes are adopted prior to, or with, the IGCC. Furthermore, the short summaries of the other I-codes' scope, intent, and/or applicability are not entirely consistent with those same sections in the I-codes named.

The requirement to adopt the IZC was deleted. The IZC was not used in the IGCC. Many jurisdictions do not adopt the IZC. Furthermore, for many jurisdictions the IZC may conflict with local zoning regulations.

Section 104.1. The principal point of this section is that construction documents shall have detail sufficient to demonstrate compliance. Specially naming some items that must be on construction documents, for example the electives, is unproductive as it brings up the question of whether items not specifically listed need to be on the construction documents. Additionally, the requirement for listing the "applicable commissioning requirements in accordance with Section 903" would require a long list of requirements that did not change much from building to building (see Table 903.1). Better to keep this section a statement of the principal that construction documents be sufficient to demonstrate compliance.

Section 105.6. A new section specifically allows code officials to approve programs or compliance materials, sometimes for a specific or narrow use. Tools that deal with a specific construction method or category of materials are common example. Approved tools simplify compliance. This is taken from language already in Sections 102.1.1, 405.6.2, and 507.6.1 of the IECC.

PART II: Most of Chapter 3 is deleted.

Sections 301.2, 302, 303. Deletes references to all electives. The electives provided limited impact but add complexity to the code and code enforcement. Although the specific electives are counted as equal, their impact is far from equal. Electives are more like a point system in a voluntary program, not a code. Many electives are flawed.

Examples of flawed electives:

Elective in 304.1 Whole Building Life Cycle Assessment. Very complex. Vaguely defined. Lacks any minimum or base case to compare to. Does not have any requirements or consequences, beyond preparing a complex report.

Elective in 302.1 (2) Optional compliance path – ASHRAE 189.1. This should be the code users' choice to select or not to select ASHRAE 189.1, as the user has the option of using ASHRAE 90.1 in the IECC. This section is made into an option for code user.

302.1 (3) Project Electives – Jurisdiction picks a number between 1 and 14. This encourages differences between jurisdictions. Project electives belong more in a rating system than a code. Increases complexity of code without corresponding impact as code staff needs to learn all electives.

Electives in 402.2.5 Agricultural land, 402.2.3 Conservation area, 402.2.6 Greenfields, 407.2.1 Flood hazard avoidance, 407.2.2 Agricultural land, 407.2.3 Wildlife corridor. These topics seem more appropriate as part of a zoning ordinance, or land use regulation. Some might be appropriate as a set of model zoning or land use recommendations or regulations, but not as part of the code.

Electives in 403.4.1 High occupancy vehicle parking, 407.3.3 Preferred parking. Not practical. HOV (high occupancy vehicle) freeway lanes are based on how many people are in the car at the time the lane is used. For a parked car, how can one tell how many people were in it? Per the definition, 25% of time car could have only one occupant, but is still "high occupancy". How is the car that currently has one occupant, but usually has two, to be identified?

Electives in 403.4.2 Low emission, hybrid and electric vehicle parking, 407.3.3 Preferred parking. No standard is referenced for low emission vehicles outside California. "EPA Tier 2" has many levels. EPA says "EPA's newest standards, called 'Tier 2,' provide auto manufacturers with an array of emissions standards they can choose for any particular vehicle model, as long as all the new vehicles they sell in a given model year fall below a required average." See <http://www.epa.gov/greenvehicles/Faq.do#important>. "A minimum of LEV standards" does not seem to describe anything specific, rather "LEV" seems to be a broad category called "Low Emissions Vehicles". See <http://www.epa.gov/greenvehicles/summarychart.pdf>

Electives in 405.1 Light pollution control, 407.5 Light pollution. Uplight ratings, glare, lighting zones in national parks, etc. is outside the scope of the code and/or confusing.

Elective in 407.4.4 Roof covering. It is not clear "cool roofs" are of value in very cold climates.

Electives in 508.4.1 Service life–100 year design life category, 508.4.1 Service life– 200 year design life category. The service life concept is impractical. Who has experience with how materials will perform after 100 or 200 years? What manufacturer in their right mind would guarantee performance for 100 or 200 years?

Elective in 508.4.2 Interior adaptability. What is the code definition of "interior adaptability"?

Electives having to do with zEPI related items (several in Chapter 6). Energy requirements in IGCC should be calculated based on the IECC energy calculation, not a new method. zEPI is vague and lacks tools to calculate it. Version 1 had TANUE, Version 2 has zEPI. Neither seems to work well. The IGCC should not create a new energy metric without first testing it, creating the tools to apply it, and aligning it with the IECC.

Elective in 602.3.2.3 Total annual CO₂e emissions limits and reporting. This is complicated and probably will have little effect. The big impact on CO₂e will come from reducing the energy use, which is already the focus of Chapter 6.

Elective in 613.2 Post Certificate of Occupancy zEPI, energy demand, and CO₂e emissions reporting. Post occupancy requirements do not belong in the code. Jurisdictions wanting to regulate these should set up a separate regulatory mechanism.

Elective in 613.7 Passive design. Elements of passive design are poorly defined and could not be enforced. Is any concrete part of the thermal mass of a building? When is a window not an element of passive design?

Electives in 702.1.2 Enhanced plumbing fixture and fitting flow rate tier, 710.2.1 Fixture flow rates. Calculating the flow rate for devices is too complicated. Changes from the plans could require repeated recalculation. Better to just require water efficient devices.

Elective in 809.4 Interior plant density. Does not belong in a building code. Plants will often be added after occupancy. The lifetime of some plants is much shorter than the building.

Elective in 904.1.1.1 Periodic reporting. Ongoing reporting after certificate of occupancy is not practical, or at least should not be part of the code.

Elective in Appendix B Greenhouse gas reduction in existing buildings. This is not practical. It is simpler to reduce energy use and let greenhouse gas reductions come as a result of reduced energy use. The referenced "Greenhouse Gas Protocol" is not appropriate as a part of code. We need to reduce greenhouse gases, but don't need a complicated and questionable calculation of how much.

Two electives are modified and retained:

Section 302 (new). This makes the ASHRAE 189.1 standard an option, similar to the way that the energy requirements of ASHRAE 90.1 are an option within the IECC. The code users want to be able to choose.

Section 402.3.2. Storm water management in Chapter 4 is simplified and made a requirement rather than an elective. Storm water management is a key part of limiting a new building's impact and potentially enhancing the environmental quality of the site.

PART III: Several themes emerge in changes to Chapter 4. Chapter 4 overlaps zoning regulations in many jurisdictions. Zoning regulations should be outside the scope of a model code, as they are almost always governed at the local level. A model green zoning ordinance is a good idea, but not in the scope of the IGCC. Several requirements are overly complex. Some parts of Chapter 4 are moved to other chapters, including water and energy, mirroring their assignments in the I-codes.

Specific changes, in order. Definitions first:

"High Occupancy Vehicle" definition. This is not practical. HOV (high occupancy vehicle) freeway lanes are based on how many people are in the car at the time the lane is used. For a parked car, how does one tell how many people were in it before it was parked? Even worse, the definition says up to 25% of time an HOV car could have only one occupant, but is still "high occupancy". How is the car that currently has one occupant, but usually has two, to be identified? This is deleted.

"Low Emission, Hybrid and Electric Vehicle" definition. No standard is referenced. No values are listed. "EPA Tier 2" has many levels. EPA says "EPA's newest standards, called 'Tier 2,' provide auto manufacturers with an array of emissions standards they can choose for any particular vehicle model, as long as all the new vehicles they sell in a given model year fall below a required average." See <http://www.epa.gov/greenvehicles/Faq.do#important>. "A minimum of LEV standards" does not describe anything specific, rather "LEV" is a the broad category "Low Emissions Vehicles". See <http://www.epa.gov/greenvehicles/summarychart.pdf> Since LEV levels are not defined, so this should be deleted.

"Vegetative Roof" definition. This is removed in favor of "roof gardens" and "landscape roofs", which are the terms used in the I-codes (IECC Section 502.2.1.1, IBC Sections 1507.16, 1607.11.2.2, 1607.11.3).

Section 402.2. "Protection by area" is more of a zoning requirement than a building code requirement and is deleted.

Section 402.3.2. Storm water management is simplified and made a requirement rather than an elective. Storm water management is a key aspect of limiting damage and potentially enhancing the environmental quality of the site.

Section 402.3.3. Rules on the use of water in landscape irrigation were simplified.

Section 402.3.5.6. As modified, the list of "invasive species" is to be provided by the jurisdiction, or the requirement is moot. It is not practical or enforceable if each code use defines their own list of plants. Likewise the jurisdiction can define its own "preferred plants". The list of preferred plants will usually be more inclusive than just "native" and will likely include plants are not "native" but are well adapted to the climate.

Section 403.3. A simpler version of the bicycle parking requirements is inserted. The requirements are based on occupant load, as defined in the IBC, rather than the ambiguous "employees". The difference between short- and long-term parking is eliminated.

Section 404.2.1. Pavement covers huge areas, therefore a "cool pavement" is important. This section specifies the wrong measure and probably the wrong test standard. ASTM E1980 specifies how to compute an SRI from solar reflectance and thermal emittance, but not how to measure solar reflectance or thermal emittance.

Setting a minimum SRI is the wrong way to specify moderately reflective pavement. SRI is a relative temperature scale based on the energy balance of a well-insulated surface with low thermal mass. A pavement is a thermally massive structure that conducts heat directly into the ground. Hence, SRI is not as meaningful for hardscape materials.

Since all pavements have a high thermal emittance (until someone comes out with a metal road), the solar reflection is the important characteristic for cool pavements. The solar reflectance is best measured using CRRC-1. CRRC-1 was recently approved by ANSI and is required here.

Section 404.3. Reflective roof requirements for low-slope roofs were approved in the 2012 IECC based on an updated version of what is in Version 2 of the IGCC. Medium and high-sloped roofs, which are not in the IECC, were added to the IGCC. The topic of reflective roofs was moved to the IGCC's energy chapter (Chapter 6) to match the I-codes energy code (IECC).

Section 405. This elective for lighting is deleted. Upright ratings, glare, lighting zones in national parks, etc. is outside the scope of the code and/or confusing.

Sections 406 to 406.3.6. Are almost a duplicate of IPC Section C103.6 to C103.10. Such a duplication is both confusing and redundant. Sections replaced with a reference to the IPC Appendix C on gray water and moved to IGCC water chapter (Chapter 7).

Section 406.7. Terms used in the I-codes, "roof gardens" and "landscape roofs" used in IBC and IECC, are substituted for "vegetative roofs". IGCC never uses "extensive" and "intensive" to distinguish between vegetative roof requirements. Section is simplified. Judging items like "micro climate conditions of the building site including ... wind, precipitation and temperature", and "foliage coverage ... in two years" are beyond what can be expected of a code official.

PART IV: Changes to Chapter 5 encompass several major themes. Some of the specifications are modified to be usable and enforceable. A number of unusable requirements are deleted. Requirements that are inconsistent or lack specifics are eliminated.

Specific changes, in order:

"Vapor Retarder" definition. Incorrect definition, not as defined in IBC. Term was replaced by "Vapor Retarder Class" in IBC and IECC. Term is used several times in IGCC but only in section 507 on straw bales, which is proposed for deletion. Delete definition.

Sections 502.2 and 502.3. Storage areas for "recycled materials" and "special materials" are perhaps a good idea, but this lacks any specific requirement. In other words, would any storage do regardless of size or composition? Both are deleted.

Section 503. The choice of construction materials is a key part of the IGCC. The materials selection criteria section was made more usable in this proposal. "Efficient usage" is undefined and unenforceable, and therefore was eliminated. "Building service life" "design life", and "reference service-life data", are poorly defined and were eliminated.

Section 503.2.5 on indigenous materials, would be difficult to comply with, at best. Furthermore, it is internally inconsistent as it uses both radius (measured in a straight line, "as the crow flies") and distance traveled, (measured as the distance as the distance on the road). Traveled distance can easily be twice the "radius" distance between the same two points. Moreover, using the water/rail multiplier, one could import materials from Mexico into Portland and call them "indigenous materials" as materials could travel 2000 miles by water. This section is deleted.

Section 505 on Service Life is impractical. Many materials used in construction have not been in use as long as some values in the table would require them to last (up to 60 years). This was deleted.

Section 506. Moisture control and material handling is in part vague and in part covered by other parts of the I-codes. It is deleted.

Section 507. Strawbale construction does not belong in the IGCC. Very few commercial buildings are made of strawbales. Other alternative materials are not covered in the IGCC. The strawbale code text might be a standalone standard/code for strawbale, or perhaps a part of another building standard. The 10+ pages of this section are deleted.

Section 508. The electives are deleted as part of making the IGCC usable. The service life concept is impractical, can anyone show where this has been implemented and is in use on a large scale? How does one know when "interior adaptability" has been achieved? Long service life promotes things that last a long time without much change, but "interior adaptability" promotes things that are easily changed. These will sometimes be at cross-purposes.

PART V: Chapter 6 is almost entirely rewritten.

The energy chapter of the IGCC needs a great deal of work in order to become usable and integrate with the rest of the I-code family. The new 2012 IECC is already a substantial increase in energy efficiency over the 2009 IECC. Since the energy efficiency of the IECC was markedly increased for 2012 IECC, the code-based target which the IGCC must exceed also became much more stringent. An energy savings of 10% over the 2012 IECC seem an achievable target.

Several themes underlie most changes to Chapter 6:

Be consistent with the IECC energy calculation. The IGCC is an overlay code. As an overlay code the IGCC should use the IECC specified method to calculate energy savings. If changes are made to the calculation method, these changes should be done first or concurrently in the IECC as well. There are a variety of different energy measurements and measurements of energy impact

described in the IGCC. None of the measures of energy in version 2 of the IGCC are consistent with the IECC specified calculation of energy expenditures (IECC Section 507.3); therefore none are appropriate in a code that is an overlay to the IGCC.

Remove items outside the scope of the I-codes. Items outside the scope of the I-codes or generally accepted procedures and methods of code enforcement should be removed. For example, elements of the buildings installed after the Certificate of Occupancy (C of O) is issued, appliances that are plugged in or that are portable, behavior of the occupants, and building use patterns should not be regulated by the code.

Keep it usable. Difficult, unclear, or overly complex requirements should be removed. Requirements that implement a complicated method that has not been proven, or is outside of generally accepted construction practice should be removed. The IGCC needs options for simple compliance, small buildings, and small jurisdictions. The IGCC needs to provide optional paths for simple compliance, especially for small buildings. It needs to be usable by all jurisdictions, regardless of the expertise of the code official. For that reason a simple compliance section is added (new Section 602).

Be part of the I-code family. The IGCC should not duplicate the contents of the 2012 IECC. As an overlay code the IGCC presumes that a number of I-codes, including the latest IECC, will apply in the jurisdiction. Where the IECC has the same or better language, the duplicate should be removed from the IGCC. Many of the topics in Chapter 6 were successfully inserted into the 2012 IECC. Due to the code development schedules, the IGCC developers could not know the final 2012 IECC result and included early drafts of material that is now part in the 2012 IECC. Most of the drafts were modified as approved for the IECC. Early drafts, redundant and overlapping items are suggested for removal. Where the IGCC extends or strengthens the IECC, overlap sufficient to show the expanded part(s) in the IGCC is maintained.

Metering is important. Metering is a key addition for energy in the IGCC. It may be the most important energy addition of the IGCC. Metering allows the building occupant to track actual savings, which research has repeatedly shown as valuable. The IGCC should specify an efficient design and include metering as a tool that will be available to the building owner/operator. Metering is simplified and made less ambiguous in this proposal. The key element of tracking energy by end use is maintained. This code change proposes expanding metering to apply to buildings >10,000 sq. ft. in floor area.

Code can't regulate how the building is used or actual energy use (outcome-based codes). Tracking energy use after occupancy is not in the scope of the code or within the code official's duties. Monitoring and limiting energy use, including explaining why expected costs and actual costs differ is, and should be, a strong interest of the building owner/operator based on paying the energy bills. However, predicting exact actual energy use and explaining differences from the predictions is highly complex. The effect of the occupants' behaviors, changes in occupants and business environments, changes in operating schedules, and even the weather make it nearly impossible to regulate actual energy use. Large scale demonstrations of how predicted and actual energy costs could be reconciled should occur prior to any regulatory effort, much less the code.

What enforcement action would the code official take if actual energy use exceeds predictions? Shut down the building, post-occupancy? What if the reason was that business was good and more people used the building? What if the business was sold, then the new owners must assume the obligation for the new building? This is very impractical.

Specific changes, in order. Definitions first:

Definitions:

"CO₂e" definition. Definition for "CO₂e" is inappropriate for the use of the term in the IGCC. Definition confuses the global warming potential (GWP) of a gas released directly into the atmosphere with the GWP of the gas used as fuel. Natural gas is mainly methane. The products of burning methane are primarily carbon dioxide and water, and have a much smaller GWP than if released unburned as assumed by the value in this definition. Definition is not needed and is deleted.

"Independent System Operator (ISO)" definition. Code should not redefine ISO, which is used in I-codes to mean "International Organization for Standardization" as part of the name for ISO standards.

"Infrared Emittance" definition. Term used in the IECC is "thermal emittance", which is also the term used in the new CRRC-1 standard.

"Meter" definition. "Meter" is also used to apply to electric, gas and other meters. Term is not just for water meters. "Meter" is in common use and does not need to be defined so it is deleted.

"Primary Energy Use" definition. Term is defined incorrectly. Should not include "energy embedded within the building materials", which would be correctly called "embodied energy". Primary energy is energy consumed to extract, generate, transmit, and distribute the energy delivered at point of use. Similar term "Primary Energy" is defined differently in appendix B, but is closer to correct. Term is not needed and is deleted.

"Process Loads" definition. Definition is inconsistent with use of the word in IGCC, as it would include both most plug loads and large single purpose loads such as data centers.

"Proposed Design" definition. Should not redefine a term already defined in the IECC. Definition is deleted.

"Standard Reference Design" definition. Same term is defined differently in the IECC. Definition is deleted.

"Solar Reflectance Index (SRI)" definition. This term is revised to be consistent with use of the new CRRC-1 standard.

Reasons by section or :

Section 602 (new) adds several options that might work in various situations. All still require metering larger buildings.

Section 602.2 allows compliance based on choosing several options from a table, including making use of several new options that are now defined in the 2012 IECC.

Section 602.3 allows compliance by showing a 10% reduction in energy use based on the 2012 IECC calculation.

Section 602.4 allows the code official to approve compliance with a local or national program as compliance with this chapter.

Measures of energy use and impact.

Sections 602 and 603 in the existing Chapter 6 are focused on calculating energy use and the impact of energy use. This code change specifies two rules that were perhaps implicit, but need to be made explicit as they dictate part of the core energy calculations. Section 601.3 (new) specifies that the energy calculation must be consistent with the IECC defined calculation and with the code-defined building in the 2012 IECC. The "standard reference design" is specified by Section 506 of the IECC as the base case for all performance based comparisons. The requirement for consistency with the IECC is a direct result of the IGCC being an overlay code and the IECC being the energy code within the I-code family.

Section 601.4 (new) specifies that the IECC end uses are those covered by the IGCC calculation. This requirement is a direct result of the IGCC being an overlay code.

The requirement to calculate based on the IECC method eliminates the EUI (existing [Section 602.2.4](#)), as the EUI is not consistent with the IECC calculations; it includes end uses not regulated by the IECC, such as plug loads; and is not based on the code minimum building ("standard reference design") specified in the 2012 IECC.

The requirement to calculate based on the IECC method also probably eliminates the zEPI (several places in existing [Sections 602 and 603](#)) as inconsistent with the IECC specified calculation for this overlay code. The specification of zEPI is vague, so it remains to be seen if it can be clarified by the zEPI proponents. This proponent will argue that any new calculation or measure of energy, including the zEPI, should first or concurrently be made part of the IECC; and that any new metric like the zEPI should first be demonstrated in use before it becomes code.

The other "measure" of energy use being proposed is an "outcome-based code". Simply put "outcome-based code" means predicting energy use, metering energy use, and comparing actual energy use over time to the predicted energy use. The first two steps, predicting energy use and installing meters, are legitimate topics for the I-codes and especially the IGCC. Although comparing actual energy use after the certificate of occupancy to predicted energy use is very important, it is not within the scope of the IECC or the I-codes. Previous attempts have shown predicting actual energy use to be very difficult even in the best of situations. Simply put, buildings have people in them, people's behavior is not regulated by the code, and the behavior of the people is by itself sufficient to greatly modify the energy use. Business cycles, weather, and energy prices also affect actual energy use.

[Section 602.2.2](#) (existing). Peak energy is vague and is deleted. Is the peak requirement referring to the building's own peak, or the use during the utility peak period? Is it the monthly peak, annual peak, or some other time period? Is it for all fuels individually or combined? A utility price structure that includes time-of-use pricing is a better surrogate for the impact on the local utility and is already specifically recognized by [Section 507.3](#) of the IECC. Furthermore, the local utility pricing is something a building owner is clearly interested in, so "energy expenditures" as specified by the IECC are very appropriate. The IGCC should not define a different peak.

[Section 602 and 603](#) (existing). The CO₂e (CO₂ equivalent emissions) is overly complex, has limited impact at best, and is eliminated. The CO₂e will often have a very limited or no effect, for example in an all electric building the emissions multiplier can be the same for both the code's "standard reference design" and the "proposed building", so the CO₂e has no effect. It is not clear if the IGCC drafting committee intended to encourage fuel switching to lower the CO₂e, if so it will be a source of conflict in the IGCC between the gas and electric interests. A better way to reduce green house emissions is to reduce energy use, which is already the major goal of the IGCC.

[Section 603.1](#) (new). This change deletes the air barrier requirements (existing [Section 606.1](#)) as a new and better version of the air barrier requirements was approved for the 2012 IECC. [Section 603.1](#) expands on the air barrier requirements in the IECC to also apply to climate zones 2 and 3, as well as the existing zones 4 through 8 already in the IECC.

[Section 603.2](#) (new). Requirements for solar reflectance and thermal emittance for low-sloped roofs ("cool roofs") were added to the 2012 IECC. This change removes an older version of cool roofs from the IGCC [Section 404.3.1](#). The cool roof requirements are placed in the IGCC energy chapter to be consistent with the IECC. This change expands the cool roof requirements to cover medium and high-sloped roofs. The new ANSI approved cool roof rating standard (CRRC-1 Standard) is added, as it better defines the appropriate cool roof testing procedures. The tests standards are consistent with the 2012 IECC test standards.

[Section 604](#) (new) clarifies the metering requirements and the end use disaggregation that is required. The existing IGCC text on metering is confusing. Because metering will provide such strong potential benefits in terms of understanding how energy is actually used and detecting problems, the threshold for the more detailed metering is lowered from 25,000 to 10,000 ft² of conditioned space. End uses projected to use < 5% are exempted from being metered separately.

[Section 605.2](#) revises the mechanical requirements. Where Federal law allows it, the optional equipment efficiency requirements now in [Section 506.2](#) of the 2012 IECC are required in the IGCC by [Section 605.2](#). [Section 607.1](#) has a similar function for water heating.

Federal law preempts jurisdictions from requiring higher equipment efficiency as a part of state or local codes in most cases. However the same law allows requirements for high efficiency in specified cases. For example a state could require high efficiency equipment for state owned buildings and for state incentivized programs. These represent likely early uses for the IGCC. Specifying higher levels of equipment efficiency when allowed makes sense in a code where one of the major goals is increased energy efficiency.

It is conceivable that federal rules for equipment efficiency in energy codes will change, such that this section would become applicable to all who adopted the IGCC. Last year such a rule change passed the US Senate. It is not hard to conceive of a similar law passing say next year, thereby making equipment requirements viable for jurisdictions that had already adopted the IGCC.

The energy savings available in increased equipment efficiency is considerable. With the addition of the water heating requirements, the equipment efficiency section would be one of the largest increases in energy efficiency in IGCC significantly, making this one of the biggest energy efficiency gains of the IGCC.

Because the equipment efficiency tables are already in the IECC the specified levels of equipment efficiency for heating and cooling are already "blessed" by the IECC process and the work went into establishing those levels (Consortium for Energy Efficiency and New Buildings Institute's Core Performance Guide).

[Section 605.3](#) retains the ground source heat pump requirement now in the IGCC.

[Section 605.4](#) adds efficiency requirements for ventilation fans. These same requirements were approved in the residential section of the IECC for whole-house ventilation fans. These fans are broadly available.

[Section 606](#) adds requirements for PV and solar hot water rough-ins. Providing the rough-ins is inexpensive in new buildings. Rough-ins preserve the option of adding PV and/or solar water heating at a later date because less costly electrical and plumbing changes are required to add PV or solar hot water.

[Section 607.1](#) increases the minimum water heater efficiency requirement. See reason under [Section 605.2](#) above.

[Section 607.2](#) retains the IGCC requirement to recover waste heat from selected occupancies.

[Section 607.3](#) on pipe insulation further modifies the IGCC pipe insulation requirements to be more usable. Commercially available pipe insulation will meet the insulation conductivity requirement, and therefore will not require the calculation. The requirements for heating and cooling system pipe insulation are the same as those for hot water supply systems, so the sections are combined. It will be easy to recall the simple rule that pipe insulation thickness is at least the pipe diameter (or double for steam).

[Section 607.4](#) (new) requires buried piping in or under slabs to be protected and available for repair. Piping under slabs is very expensive to repair if simply encased in concrete.

[Section 608](#) updates and simplifies the daylighting requirements to be consistent with requirements proposed for Chapter 8. The sky type and effective aperture now refer to those requirements in Chapter 8. The sunshine map has been eliminated in favor of sky types defined based on the more enforceable list of counties in Chapter 8.

Section 608.6 simplifies the IGCC requirements for providing receptacles and outlets that can be controlled by a sensor to time switch. This change makes them more practical.

Sections 609.6.2 to 609.6.6, and Section 610 (existing) requirements for portable and "plug in" devices are eliminated. These requirements are outside the code and would be nearly impossible to enforce.

Section 609.8.1 (existing) requirements for transformers are now required in the 2012 IECC and are therefore eliminated from the IGCC as redundant. The voltage drop limits were eliminated as impractical to enforce.

Sections 610.2.1 and 610.2.2 (existing) requirements for elevators and escalators were removed as too complex and untested as code requirements.

Section 610.2.3 (existing) requirements for food service equipment were removed due to reference to the Energy Star program. The specific equipment performance requirements could be extracted from Energy Star and reinserted.

Section 609.2 (existing) requirements for lighting controlled by occupancy sensors are eliminated as a possible safety hazard.

Section 610.2.4 (existing) on conveyors was removed, as these are usually part of a process not regulated by the I-codes.

Section 611 (existing) on renewables is overly complex with large parts of the code text lacking the substance of a requirement. This is simplified as Section 609 (new). The new section is primarily a reference to the Section 506.4 of the 2012 IECC.

Requirements for roof-mounted systems are maintained and generalized to any renewable system on the roof.

Section 612 on commissioning was removed since an updated version of the commissioning requirements is part of the 2012 IECC.

Section 613 is electives. Section is deleted as part of simplifying the IGCC and removing impractical electives.

PART VI: Water is chapter 7. Water and energy are at the core of green and sustainable design. In many areas water is becoming the constraint on construction. In terms of "bang for the buck" in new buildings water offers a major opportunity for a positive impact.

Water has an important connection to energy. Efficient use of hot water obviously saves energy. Less obviously, water transport and treatment are major municipal uses of energy. Treatment and transport of water often represent a jurisdiction's largest single use of energy. Therefore saving water, even cold water, also saves energy.

Chapter 7 is extensively rewritten in this code change proposal. As with the other chapters, clarity, brevity, impact, and enforceability are an intended result.

The majority of changes address one or more of the following:

- Efficient use of water, already a focus of the IGCC, is further defined.
- Water use for landscaping, a major end use for water, is modified.
- Efficient hot water distribution impacts both water and energy, and is clarified here.
- Calculations are removed or simplified when possible.
- Requirements already in, or very similar to, the IPC are removed from the IGCC. The IPC gray water appendix is made a requirement for gray water. Areas of overlap with the IPC are made more consistent with the IPC.
- Requirements outside the code's scope are removed.
- Some items that expand the scope of the code by including appliances or equipment are exempted if not present at time of inspection.
- Some requirements that specify non-potable water should instead limit water use, and therefore are changed.
- Overlaps on water (storm water and landscaping) in Chapter 4 and Chapter 7 are addressed.
- A "simple compliance" option is added.
- Common elements of gray water, rainwater, and municipally reclaimed water are integrated into single section.
- Requirements for rainwater are expanded and clarified.
- Several sections add the requirement for a manufacturers designation of something required by code in order to make enforcement simpler.

As with energy, metering water use can show actual water use and identify potential problems. The IGCC metering requirements are modified to focus on the biggest uses, or uses where potential leaks may be identified. The capability to archive, aggregate, and compare periods of water measurements is added.

Specific sections or groups of sections:

Section 701.2 (new) Adds a simple option meant to allow quick compliance in simpler cases.

Section 702 (existing). In this section and all parts of the IGCC the words "WaterSense" and "Energy Star" are removed. WaterSense and Energy Star programs are proprietary, change over time, and include many program specific requirements beyond the characteristics desired by this code. This change inserts the specific applicable requirement or "figure of merit" as a replacement. In practice, looking for WaterSense and Energy Star labels would be one way of verifying many of the IGCC requirements, but participation in those programs should not be a requirement.

Section 702.1 (existing). This change deletes a complicated calculation of the total faucet and fixture flow rate for the whole building. Verifying compliance with the total building flow rate would require inventorying the faucets and fixtures in the building, then summing flow rates. This is impractical and tedious. Any deviation from plans could change the building flow rate. Specifying high efficiency fixtures is sufficient and simple to enforce with the manufacturers designation on the product verifying it meets the requirement.

Section 702.8 (existing). Simplified to remove most calculations concerning efficient water supply.

Section 702.1.4 and 702.1.5 (new). These require performance from water efficient devices. Consumer complaints concerning the poor performance of some low-water products have shown that showerheads and water closets (toilets) benefit from the performance requirements in Sections 702.1.4 and 702.1.5. These tests are currently used by EPA and many manufacturers.

Substitute requirements for Water Sense and Energy Star. Where WaterSense and Energy Star were specified, the specific measure of the requirement of interest was substituted for a reference to the program. This happened in the fixture / faucet table (Section 702), shower head performance (Sections 702 and 702.1.4), water closet performance (Sections 702 and 702.1.5), ice machines (Section 702.6.2), and dishwashers (Section 720.6.4).

Equipment and appliances inside or outside the IGCC scope. Equipment and appliances are put into one of 3 groups- 1) In the IGCC scope and kept in the IGCC, 2) Outside the IGCC scope and deleted from the IGCC, or 3) In the IGCC scope if present during inspection. The third category is established to allow the IGCC to have requirements for water using devices that have a substantial impact, but avoid having code requirements for things that occur after the C of O is granted. To a degree it is a judgment call; where the emphasis should be is on IGCC items with a big impact on water.

The phrase “if present prior to issuing the certificate of occupancy” in Section 702.6 means a requirement only applies to items present at inspection, but does apply to the same thing if added later to the building. This phrase is unusual in the code, but is added to address important water using appliances and equipment. This is used to include clothes washers (Section 702.6.1), ice machines (Section 702.6.2), dishwashers (Section 720.6.4), and dipper wells (was Section 702.13).

Some equipment and appliances are removed as being outside the scope of the code. These include food steamers (Section 702.6.3) and combination ovens (Section 702.21).

Requirements in other I-codes. Some requirements are removed because they are covered elsewhere in the IPC or other I-codes. These include circulating hot water systems (IGCC Section 702.8.1, already in IECC section 504.6), and spa and swimming pool covers (IGCC Section 702.17, already in IECC section 504.7.3).

Marking for non-potable water is already in the IPC Section 608.8. Duplicate or similar requirements were deleted in trap priming water (Section 702.9.2), signage required (Section 706.2) and labeling and marking (Section 709.9.1.4).

Limit water use rather than requiring non-potable water. Existing requirements for the use of non-potable water often should be changed to requirements to limit water use no matter what the source. The change is proposed in trap priming water (Section 702.9), make up water supply (Section 702.1), food waste disposal (Section 702.20), and condensate cooling and tempering (Section 703.3). A closed hydronic loop system (Section 703.1) that uses significant water could have a leak, but starting out with the cleanest water available helps maintain the system. Once through cooling it is prohibited for heat exchangers (Section 703.5).

Section 702.14. A limit on potable water use was added in automated vehicle wash facilities.

Section 702.20. Options were added for food waste disposal.

Section 703.4. A requirement to collect air conditioning condensate is added for large systems in air conditioning systems.

Section 703.6. Humidifier discharge is deleted because flushing operations may not produce suitable water and because the section doesn't really require anything due to the qualifier “where a collection and reuse system exists”.

Section 705 on water metering. Requirements for the water metering system and its ability to summarize and report water use were expanded significantly. Metering is an important part of determining how water is used and in detecting problems like leaks.

Section 706.10. The wording for mesh now matches that used in Section 304.14 of the 2009 IPMC, since insects are the problem, not larger vermin.

Merged lengthy sections on alternative water supply in Sections 706, 706, and 708. A lengthy set of changes to these sections primarily integrates gray water and rainwater requirements. Requirements already in the IPC are deleted from the IGCC.

Section 709.2. No permits are required solely because municipal reclaimed water is used.

Section 710. All electives are removed.

PART VII: Chapter 8 includes a variety of requirements related to indoor health and comfort.

Several themes underlie the changes to this chapter. A number of requirements were simplified. Requirements related to the air movement system were clarified. Requirements occurring after C of O were removed. Sound requirements included excessive inspections and were removed. Requirements that seemed impractical during construction were eliminated. The radon requirement is almost an exact copy of the IRC appendix, which could be referenced instead; however this is a radon requirement made for residential construction, should be a separate jurisdictional decision, and was deleted. The VOC requirements are too complex and were deleted. The daylight section was greatly clarified and most calculations were removed to produce an important and usable requirement that also has a big impact on energy.

Specific sections and topics:

Section 801.2 requires an unnecessary management plan covering requirements that are already narrow and specific. It is deleted.

Section 802 is condensed down to its core requirement, which is making the air handling system accessible. Accessible is a code term that includes much of what this section is trying to say. The Standard UL 181 referenced in the section is already required in IMC Section 603 on duct construction and installation. The requirement to seal the air handler, including ducts, air handlers, and filter boxes is already in the IECC Section 503.2.7 and in various parts of IMC Section 603, and is referenced here. The requirement to test some ducts is moved from Chapter 6 (Section 607.4.1) to this Chapter to locate all the duct requirements in one place. These duct requirements could be placed either in Chapter 6 (energy) or this Chapter, but it is best to group them together.

Section 803 (new). Both commercial and residential air handlers are required to be sealed by the 2009 IECC. The residential 2012 IECC added a specific test and maximum leakage rate, based on the new ASHRAE 193 standard on air handler air tightness. Commercial air handlers are already required to be sealed by Section 503.2.7 of the 2009 IECC. Therefore the same test and leakage rate based on air flow is added to the IGCC.

Sections 803.1.2 and 803.1.3 (existing) on duct operation during construction seem impractical. They are deleted.

Section 803.2 concerning thermal comfort should stay with the thermal conditions in the IBC. The section is deleted.

Section 803.3 concerning smoking is a matter of behavior after the C of O. It is appropriate for local regulation, but not the building code. It is deleted.

Section 804.1.4 on fireplaces duplicates the same requirement in Section 606.1.2.4 of Chapter 6. It was deleted in Chapter 6.

Section 804.2 on radon is very nearly an exact duplicate of IRC Appendix AF. If such a chapter was included it would be better to reference Appendix AF where it is in existing code. Better yet would be to delete the IGCC radon requirement, as the decision to invoke the radon requirements is better left to the jurisdiction. It is also worth noting that the IRC Appendix AF, which was the source of Section 804.2, was written for residences, not commercial structures.

Section 804.3 on “building flush out” seems excessive for many buildings, would waste energy, and would impede the start up use of the building. It is deleted.

Section 804.4 on building entrance scrapers does not seem workable on some entrances. It is deleted.

Section 804.5 on asbestos sets no lower-end threshold for tiny levels of asbestos and seems unworkable. It is deleted.

Section 806 on emissions seems overly complex and is deleted. It is possible that some subset should be maintained. How much of it is already codified by Federal law? What is codified should not be in the code.

Section 807 on acoustics is not a core part of “green”, requires difficult inspections, and is deleted.

Section 808 was rewritten and reorganized to simplify the daylighting requirements. Energy savings from daylighting are a major improvement in the IGCC, so it is important that the daylighting requirements be useable.

The existing sunshine percentage map (Table 609.5) makes it hard to determine exact boundaries to the sky type zones. The map is deleted. The sunshine percentage rules that generated the map are applied to define sky types by counties and added as

footnote to the Minimum Fenestration table. The associated equations (6-8 and 6-9) are simplified. The table and equations are brought into Section 808.

The definitions for obstructed roof, obstructed exterior wall, toplighting daylight zone, and sidelighting daylight zone are too much like requirements. They are made into code text. The figures showing the daylit areas are improved and put into the code text instead of the definitions.

The daylight simulation (existing Section 808.3.2.1) is too complex and does not seem to be needed to meet the sections requirements, so the simulation is deleted.

PART VIII: Chapter 9 introduces a large number of post certificate of occupancy requirements, which are outside the scope of the code. Requirements for how the building is operated are also outside the code. Chapter 9 is deleted.

PART IX: Chapter 10 should be moved into an appendix. Creating a green code for new construction is hard enough. Until the IGCC is established and used, adding existing buildings will make it harder, since many jurisdictions do not adopt an existing building code. However Chapter 10 includes a number of useful and specific requirements that some jurisdictions may choose to adopt for existing buildings.

Section 1001.1 Scope. Existing *building sites* removed.

Section 1001.2 Building operation and maintenance. Operation and maintenance is beyond the scope of the I-codes. Section is deleted.

1002.1 General, 1003.1 General. References to Section 402.2.1 and 602.4 are removed as the referenced sections are proposed for deletion.

1003.3.3 Heating, ventilation and air conditioning. Item #10 dealing with building automation systems is too complex and is deleted.

Section 1006 Jurisdictional requirements. Is changed to just Demolition and retained. Demolition is a major source of waste and belongs in the IGCC.

1006.3 Sale of existing buildings and portions of buildings. This section would complicate building sales and is likely to cause significant opposition. Section is deleted.

1006.4 Evaluation and certification of existing buildings and building sites, 1006.4.1 Certificate of conformance, 1006.4.2 Specific exclusions, 1006.4.3 Existing concealed construction. These sections seem too complicated and/or include deleted electives. These sections are deleted.

PART X: Chapter 11 creating requirements for existing sites will make the IGCC even harder to get put into use. Regulating the existing site is well beyond most jurisdictions. Delete Chapter 11

APPENDICES A-C: The IGCC does not need a second adopting ordinance (Appendix A). Greenhouse gas reduction analysis in existing buildings is beyond the capability most jurisdictions, code users and code enforcers (Appendix B). The sustainably measures is another list of options that further complicates what is supposed to be a minimum green code. Lets get the minimum code working first. Delete Appendices A, B and C.

Cost Impact: The IGCC increases the cost of construction. Overall the changes proposed here reduce the cost of the IGCC by making it more usable and removing a large number of difficult or impractical items.

PART I – CHAPTER 1

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

PART II – CHAPTER 3

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

PART III – CHAPTER 4

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

PART IV – CHAPTER 5

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

PART V – CHAPTER 6

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

PART VI – CHAPTER 7

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

PART VII – CHAPTER 8

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

PART VIII – CHAPTER 9

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

PART IX – CHAPTER 10

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

PART X – CHAPTER 11

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

PART XI – APPENDIX A

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

PART XII – APPENDIX B

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

PART XIII – APPENDIX C

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF

ALL CHAPTERS-CONNER

GG113-11

202

Proponent: Robert Dewey, representing U.S. Department of Energy (robert.dewey@ee.doe.gov)

Revise as follows:

SOLAR PHOTOVOLTAIC EQUIPMENT. Devices such as ~~solar cells~~ photovoltaic (PV) modules inverters that are used to transform solar radiation into energy.

SOLAR THERMAL EQUIPMENT. A device that uses solar radiation to heat water or air for use within the facility for service water heating, process heat, space heating or space cooling.

Reason: Clarification. The correct term is PV modules. Solar thermal energy can also be used to support process heat needs so addition of "process heat" is appropriate.

Cost Impact: This change will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

SOLAR PHOTOVOLTAIC EQUIPMENT-DEWEY.doc

GG284-11

404.2.2, 404.3

Proponent: Robert A. Zabcik, P.E., LEED AP, NCI Building Systems, representing himself

Revise as follows:

404.2.2 Shading structures. Where shading is provided by a building or structure or an element or component thereof, such building, structure, component or element shall comply with all of the following:

1. Where open trellis-type free standing structures such as, but not limited to, covered walkways, and trellises or pergolas, are covered with native plantings, the plantings shall be designed to achieve mature coverage within five years;
2. ~~Parking shading structures shall comply with Section 404.3.~~ Where roofed structures are used to shade parking, those roofs shall comply with Section 404.3 in climate zones 1 through 6.
3. Shade provided onto the hardscape by an adjacent building or structure located on the same lot shall be calculated and credited toward compliance with this section based on the projected peak sun angle on the summer solstice.

404.3 Roof coverings. Not less than 75 percent of the roof surfaces of *buildings* located in climate zones 1 through 3, as established in the *International Energy Conservation Code*, shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods. The provisions of this section shall apply to roofs of structures providing shade to parking in accordance with Section 404.2.2 where located in climate zones 1 through 6.

Exception: Portions of roof surfaces where *solar thermal* collectors, *solar photovoltaic* systems, roof penetrations and associated equipment, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, or vegetative roofing systems are provided shall be permitted to be deducted from the roof surface required to comply with this section.

Reason: Section 404.2.2 is under 404.2, which specifically references hardscape requirements for climate zones 1-6. Item 2 of 404.2.2 references Section 404.3 for its SRI requirements. However, Section 404.3 itself specifically references climate zone 1-3, NOT 1-6 as is intended by Section 404.2.2. This creates a situation where a user could interpret the IgCC in such a way to bypass the requirements of 404.2.2 in climate zones 4 through 6. This revision makes it clear that Section 404.3 applies to the same climate zones to which 404.2.2 applies.

Cost Impact: The code change proposal will not increase the cost of construction. This proposal does not impact the cost of construction beyond that originally proposed.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

404.2.2-ZABCIK.doc

GG286-11

404.2.3

Proponent: Bob Eugene, Underwriters Laboratories Inc., representing Underwriters Laboratories Inc. and UL Environment Inc. (Robert.Eugene@us.ul.com)

Revise as follows:

404.2.3 Shade by trees. Where shading is provided by trees, such trees shall be selected and placed in accordance with all of the following:

1. Trees selected shall be those that are native to, or non-invasive and adaptive to, the region and climate zone in which the project site is located. Plantings shall be selected and sited to produce a hardy and drought resistant vegetated area;.
2. *Construction documents* shall be submitted that show the planting location and anticipated ten year canopy growth of all trees and that show the contributions of existing tree canopies; and;.
3. The anticipated 25-year canopy growth of all trees shall not result in the shading of solar photovoltaic arrays or solar thermal systems.
- 3.4. Shading calculations shall be shown on the *construction documents* demonstrating compliance with this section and shall include only those *hardscape* areas directly beneath the trees based on a ten year growth canopy. Duplicate shading credit shall not be granted for those areas where multiple trees shade the same *hardscape*.

Reason: Shading adversely affects the performance of the solar photovoltaic system and solar thermal system. Shading can also increase the operating temperatures of the systems. Solar photovoltaic and solar thermal systems are assumed to have a 25-year useful life.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

404.2.3-EUGENE.doc

GG291-11

404.3

Proponent: Maureen Traxler, representing City of Seattle Dept of Planning & Development
(maureen.traxler@seattle.gov)

Revise as follows:

404.3 Roof coverings. Not less than 75 percent of the roof surfaces of *buildings* located in climate zones 1 through 3, as established in the *International Energy Conservation Code*, shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods.

Exception: Portions of roof surfaces ~~where~~ occupied by the following shall be permitted to be deducted from the roof surface area required to comply with this section:

1. Solar thermal collectors.
2. Solar photovoltaic systems.
3. Roof penetrations and associated equipment.
4. Portions of the roof used to capture heat for building energy technologies.
5. Rooftop decks ~~or~~ and rooftop walkways.

~~, or vegetative roofing systems are provided shall be permitted to be deducted from the roof surface required to comply with this section.~~

Reason: This proposal serves two purposes. First, it clarifies a complicated sentence by creating a numbered list. Second, it removes vegetative roofing from the list of things that are allowed to be deducted from the area required to comply with Section 404.3. Section 404.3 requires roofs to be covered with either certain types of roof coverings or with vegetative roofs. Listing vegetative roofing as an exception to a requirement to install vegetative roofing is circular and illogical.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee:	AS	AM	D
Assembly:	ASF	AMF	DF

404.3-TRAXLER

GG292-11

404.3

Proponent: Mark S. Graham, representing National Roofing Contractors Association
(mgraham@nrca.net)

Revise as follows:

404.3 Roof coverings. Not less than 75 percent of the roof surfaces of *buildings* located in climate zones 1 through 3, as established in the *International Energy Conservation Code*, shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods.

Exception: The following portions of roof surfaces ~~where solar thermal collectors, solar photovoltaic systems, roof penetrations and associated equipment, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, or vegetative roofing systems are provided~~ shall be permitted to be deducted from the roof surface required to comply with this section:

1. Roof penetrations and associated equipment.
2. Areas for capturing heat for building energy technologies.
3. Rooftop decks and walkways.
4. Vegetative roofing systems.
5. Solar thermal collectors and solar photovoltaic systems and the necessary space between rows of collectors or panels.

Reason: This proposed change is intended to clarify the intent of the code by clearly indicating the necessary space(s) between collectors or panels are to be included in the permitted surface area deduction covered by this exception. This is shown in the #5 of the listed items.

The balance of the change (Items 1 through 4) are simply a reformatting of the elements listed as exempt in the existing exception. The existing exception was becoming too complicated to follow and creating a list provides clarity.

The inclusion of language "...including necessary space between rows of collectors or panels..." is consistent with the requirements of ASHRAE 1891. Section 5.3.2.3.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

404.3 #3-GRAHAM.doc

GG293-11

404.3

Proponent: Anthony C. Floyd, AIA, representing City of Scottsdale (afloyd@scottsdaleaz.gov)

Revise as follows:

404.3 Roof coverings. Not less than 75 percent of the roof surfaces of *buildings* located in climate zones 1 through 3, as established in the *International Energy Conservation Code*, shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods.

Exception: Portions of roof surfaces ~~where occupied by solar thermal collectors, solar photovoltaic systems, roof penetrations and associated equipment, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, or vegetative roofing systems are provided~~ shall be permitted to be deducted from the roof surface required to comply with this section.

Reason: Vegetative roofing systems is proposed to be deleted since it is already permitted as one of the acceptable heat island mitigation methods specified in Section 404.3.2. It is not necessary as an exception and would contradict the language in Section 404.3.

The language exempting portions of the roof used to capture heat for building energy technologies is also unneeded as it is redundant with the listed solar equipment.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee:	AS	AM	D
Assembly:	ASF	AMF	DF

404.3-FLOYD.doc

GG294-11

404.3

Proponent: Mark S. Graham, representing National Roofing Contractors Association
(mgraham@nrca.net)

Revise as follows:

404.3 Roof coverings. Not less than 75 percent of the roof surfaces of *buildings and covered parking* located in climate zones 1 through 3, as established in the *International Energy Conservation Code*, shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods.

Exception: Portions of roof surfaces where *solar thermal* collectors, *solar photovoltaic systems*, roof penetrations and associated equipment, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, or vegetative roofing systems are provided shall be permitted to be deducted from the roof surface required to comply with this section.

Reason: This proposed change is intended to clarify the intent of the current requirement by clearly indicating any covered parking is to be included in determination of the minimum 75 percent requirement.

The inclusion of covered parking here makes this requirement consistent with that of ASHRAE 189.1 Sec. 5.3.2.3.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

404.3 #2-GRAHAM.doc

GG295-11

404.3, 404.3.2

Proponent: Robert Dewey, representing U.S. Department of Energy (robert.dewey@ee.doe.gov)

Revise as follows:

404.3 Roof coverings. Not less than 75 percent of the roof surfaces of *buildings* located in climate zones 1 through 3, as established in the *International Energy Conservation Code*, shall ~~be in compliance with Section 404.3.1 or 404.3.2 or a combination of both methods~~ comply with one of the following requirements:

1. The roof shall be covered with either an extensive or intensive vegetative roof complying with Section 406.6;
2. The roof shall comply with Section 404.3.1; or
3. The roof shall comply with a combination of Items 1 and 2.

Exception: Portions of roof surfaces where *solar thermal* collectors, *solar photovoltaic* systems, roof penetrations and associated equipment, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, ~~or vegetative roofing systems~~ are provided shall be permitted to be deducted from the roof surface required to comply with this section.

Delete without substitution:

~~**404.3.2 Vegetative roofs.** Roofs shall be covered with either an *extensive* or *intensive vegetative roof*. *Vegetative roofs* shall comply with Section 406.6.~~

Reason: The current text in 404.3 clearly indicates that roof coverings must meet 404.3.1 and/or 404.3.2. It does not mention vegetative roofs other than in the exception to 404.3 and even there does not reference 404.3.2. Essentially 404.3.2 does not have a parent section requiring its use. The intent of 404.3.2 is to refer the user to the provisions of 406.6 when they have chosen to comply with 404.3 using vegetative roofing. The proposed text implements that by bringing vegetative roofs up into the parent section and making the reference to 406.6 and eliminating the need to cover such roofs in the exception.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

404.3-DEWEY.doc

GG296-11

404.3

Proponent: Mark S. Graham, representing National Roofing Contractors Association
(mgraham@nrca.net)

Revise as follows:

404.3 Roof coverings. Not less than 75 percent of the roof surfaces of *buildings* located in climate zones 1 through 3, as established in the *International Energy Conservation Code*, shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods.

Exception: The following roofs, roof surfaces and portions of roof surfaces shall be permitted to be deducted from the roof surface area required to comply with this section.

1. Portions of roof surfaces ~~where occupied by solar thermal collectors, solar photovoltaic systems, roof penetrations and associated equipment, rooftop decks, or rooftop walkways,~~ or portions of the roof used to capture heat for building energy technologies. ~~vegetative roofing systems are provided shall be permitted to be deducted from the roof surface required to comply with this section.~~
2. Stone ballasted roofs where the stone ballast has a weight of 17 pounds per square foot or more.
3. Paver ballasted roofs where the pavers have a weight of 23 pounds per square foot or more.
4. Vegetative roofs that provide a growing media that is not less than 2.5 inches in thickness and cover 75 percent or more of the roof area with durable plantings.
5. Metal building roofs having a slope of 2 units vertical in 12 units horizontal or less as established in the *International Energy Conservation Code*.
6. Roofs over ventilated attics, semi-heated spaces or conditioned spaces that are not cooled spaces.
7. Asphaltic membranes in climate zone 2 or 3 as established in the *International Energy Conservation Code*.

Reason: This proposed code change is intended to provide for exceptions to Public Version 2.0's current requirement for roof solar reflectance and thermal emittance. The added exceptions are based upon newly-added exceptions in AHSRAE 90.1-2010 Section 5.5.3.1.1.

The exception for shading that is included in ASHRAE 90.1-2010 Section 5.5.3.1.1 Exception c is not being proposed to be added here because Public Version 2.0 already addresses shading in Sec. 404.2.2 and Sec. 404.2.3.

The exception for steep slope roofs that is included in ASHRAE 90.1-2010 Section 5.5.3.1.1 Exception d is not being proposed to be added here because Public Version 2.0 requires minimum reflectance and thermal emittance values for these roofs in Table 404.3.1.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing:	Committee:	AS	AM	D
	Assembly:	ASF	AMF	DF

404.3 #4-GRAHAM.doc

GG297-11

202, 404.3. 1003.3, 1003.3.11(New)

Proponent: Bill McHugh, representing Chicago Roofing Contractors Association (bill@crca.org)

Revise as follows:

404.3 Roof coverings. Not less than 75 percent of the roof surfaces of *buildings* located in climate zones 1 through 3, as established in the *International Energy Conservation Code*, shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods.

Exceptions:

1. Portions of roof surfaces ~~where occupied by solar thermal collectors, solar photovoltaic systems, roof penetrations and associated equipment, rooftop decks, or rooftop walkways, or extensive, semi-intensive, or semi-intensive vegetative green roofing systems are provided, or~~ portions of the roof used to capture heat for building energy technologies shall be permitted to be deducted from the roof surface required to comply with this section.
2. Aggregate or ballasted green roofs need not comply with this section provided that:
 - 2.1. The weight of the roof assembly including aggregate or weight of the ballast for the roof assembly is 15 pounds per square foot or more over the entire roof surface.
 - 2.2. The aggregate or ballast provides a solar reflectance value of not less than 0.30.
 - 2.3. The aggregate or exposed top layer of aggregate covers the roof area to the extent that the exposure of the underlying adhesive water-repellent layer is not more than 5 percent of the total area of the roof.

Revise as follows:

1003.3 Additional requirements. Alterations of portions and components of buildings shall comply with Sections 1003.3.1 through ~~4003.3.9~~ 1003.3.11.

Add new text as follows:

1003.3.11 Roof systems. Where an existing roof, with a slope not exceeding 1 unit vertical in 4 units horizontal, is repaired to mend, fix, patch, cure, refurbish or otherwise salvage a portion of an existing roof in order to maintain or extend the lifespan of such roof, the portion of the roof that is repaired shall meet or exceed the reflectance value for aggregate, ballast, smooth, vegetative or mineral surfaced green roofs in effect when the existing roof was installed.

Revise as follows:

~~VEGETATIVE ROOF GREEN ROOF.~~ ~~An assembly of interacting roof assembly components installed designed to waterproof and normally insulate a building's top surface above grade that includes, by design, vegetation and related landscaping~~ roof covering system elements.

Extensive vegetative green roof. ~~A low-profile roof covering system with a growing medium greater than 2 inches and less than 6 inches in depth, composed of plants that can thrive in a rooftop environment with limited water, shallow roots and sparse nutrients.~~

Semi-Intensive vegetative green roof. ~~A high-profile roof covering system with a growing medium 6-10 inches or more in depth.~~

Intensive vegetative green roof. ~~A high-profile roof covering system with a growing medium 8-10 inches or more in depth that can support a wide range of vegetables, shrubs and small trees.~~

Reason: While we appreciate efforts to lighten the color of roof surfaces and minimize the Urban Heat Island Effect, the science has not yet proven that there is benefit from highly reflective roof covering systems and coatings over other systems that provide value to the building owner and manager, and environment such as aggregate and ballast. Although the high reflectivity and solar reflectance means a light initial color, the aging of the system may darken the surface, changing those characteristics. Although it's great to expect that roofs will be cleaned, it may be unrealistic, and may technically not be beneficial to the long term service life of the roof assembly. Plus, when tested at Oak Ridge National Laboratory, it was found that the performance of 15-24 lbs. of mass approaches the performance of lighter colored roof membranes.

Most important, there are significant costs to the building owner and manager for keeping these highly reflective roof surfaces light colored, when the mass effect of a heavy roof aggregate or ballast may approach the performance of light colored surfaces, without the constant cleaning required.

Limiting the building owner and managers' roofing systems options through high reflectivity levels eliminates a sustainable roof option for building owners and managers.

Secondly, we are suggesting that the term 'vegetative roof' be changed to 'vegetative green roof' wherever it occurs in the code. And, since the vegetative roof is not the only green roof available, this would also apply to the aggregate, ballasted and smooth surfaced green roofs.

Regarding the definition of Vegetative roof. In this part of the code change proposal, we have changed the definition of Vegetative Roof to Vegetative Green Roof, and added one subsection to reflect the NRCA Green Roof Systems Manual description of these roofs. This is a derivative of the definition from the National Roofing Contractors Association Green Roof Systems Manual and the existing IgCC definition.

Additionally, we removed wording that is not addressing factual elements, such as 'high profile' and 'low profile'. High profile could be confused for many other concepts, from visible and 'high profile' to raised higher than normal, or 'high profile'. The same possibility exists for low profile.

This proposal makes the language in the IgCC consistent with industry documents that have existed for several years, while incorporating important concepts from Chapter 15 of the International Building Code.

While it is useful to have explanatory language to help users with understanding the definitions, it is much better suited for an appendix. And, the code should reflect language that already exists in the roofing industry.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee:	AS	AM	D
Assembly:	ASF	AMF	DF

404.3 #2-MCHUGH.doc

GG306-11

404.3, 404.3.1, Table 404.3.1, 404.3.1.1, 404.3.1.2, 606.1.3(New), 606.1.3.1(New)

Proponent: Michael D. Fischer, Kellen Company, representing the Asphalt Roofing Manufacturers Association (MFischer@kellencompany.com)

Revise as follows:

~~404.3 606.1.3 Roof coverings.~~ Roof coverings shall comply with the solar reflectance and thermal emittance requirements of ~~Not less than 75 percent of the roof surfaces of buildings located in climate zones 1 through 3, as established in the International Energy Conservation Code,~~ shall be in compliance with Section 404.3.1 or 404.3.2, or a combination of both methods.

~~**Exception:** Portions of roof surfaces where solar thermal collectors, solar photovoltaic systems, roof penetrations and associated equipment, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, or vegetative roofing systems are provided shall be permitted to be deducted from the roof surface required to comply with this section.~~

~~404.3.1 Roof solar reflectance and thermal emittance.~~ Where ~~roof coverings~~ are used for compliance with Section 404.3, ~~roof coverings~~ shall comply with Section 404.3.1.1 or 404.3.1.2. The values for ~~solar reflectance~~ and thermal emittance shall be determined by an independent laboratory accredited by a nationally recognized accreditation program. Roof products shall be ~~labeled~~ and certified by the manufacturer demonstrating compliance.

~~404.3.1.1 Roof products testing.~~ Roof products shall be tested for a minimum three-year aged ~~solar reflectance~~ in accordance with ASTM E1918, ASTM C1549 or Test Method One of CRRC-1 Standard and thermal emittance in accordance with ASTM C1371 or ASTM E408, and shall comply with the minimum values in Table 404.3.1.

~~404.3.1.2 Solar reflectance index.~~ Roof products shall be permitted to use a ~~Solar Reflectance Index (SRI)~~ where the calculated value is in compliance with Table 404.3.1 values for Minimum Aged SRI. The SRI value shall be determined using ASTM E1980 with a convection coefficient of 2.1 Btu/h-ft² (12 W/m² x k) based on three-year aged roof samples tested in accordance with the test methods in Section 404.3.1.1.

**TABLE 404.3.1
REFLECTANCE AND EMITTANCE**

Roof Slope	Minimum Aged Solar Reflectance	Minimum Aged Thermal Emittance	Minimum Aged SRI
Less than 2:12	0.55	0.75	60
2:12 or greater	0.30	0.75	25

~~404.3.2 606.1.3.1 Vegetative roofs.~~ Roofs shall be covered with either an ~~extensive or intensive vegetative roof.~~ ~~Vegetative roofs~~ shall comply with Section 406.6.

Reason: This proposal moves the roof covering reflectivity requirements to Chapter 6 in order to facilitate a whole building energy design that allows for consideration of all thermal envelope elements. Many leading jurisdictions, including California, consider the role that roof and/or ceiling insulation plays in energy use as part of roofing reflectance requirements. This proposal will also allow for the use of initial values as manufacturers bring new high performance products to market.

Cost Impact: The code change proposal will not increase the cost of construction.

Public Hearing: Committee: AS AM D
Assembly: ASF AMF DF