International Code Council and Canadian Standards Association

BSR/CSA/ICC 805-201x Standard for Rainwater Harvesting Systems

MEETING #8 AGENDA: JOINT CONSENSUS COMMITTEE ON RAINWATER COLLECTION SYSTEM DESIGN AND INSTALLATION (IS-RCSDI)

Date
May 10-12, 2016, 8:30 AM - 5:00 PM PDT

Location
ICC Western Regional Office
3060 Saturn Street, Suite 100
Brea, CA USA

Teleconference
1-866-946-0852 (toll free) /1-646-216-4900 (toll) (click here for other global numbers), PIN: 464 122 29#

Webex: Password (all days): "**water**"
Day 1: https://csagroup.webex.com/csagroup/j.php?MTID=mecb242b0b305ddc8dabf84b3a3562089
Day 2: https://csagroup.webex.com/csagroup/j.php?MTID=m9cacc0e23e29ae8ecb6568fc337b6d1d
Day 3: https://csagroup.webex.com/csagroup/j.php?MTID=mb0df350b7669d465883ba63f16966ce6

Secretariats: Shawn Martin, ICC; Paul Gulletson, CSA

AGENDA

1. Meeting Opening
    a. Opening Remarks, objective of the meeting, and housekeeping (Chairs, Shawn/Paul)
    b. Quorum (Shawn/Paul)
    c. Review and adoption of agenda (Chairs)
    d. Review and adoption of minutes from Meeting #7(Chairs)
    e. Membership review (Shawn/Paul)
    f. Schedule review (Shawn/Paul)
2. Report on Outstanding Action Items (Shawn/Paul)
3. Overview of Process for Addressing Public Comments (Shawn/Paul)
    a. Review/Discussion of Comments Received on First Public Review Draft (See Comments Matrix Attached)
4. Scheduling of Next Meeting
5. Adjourn

Public Review Comments – First Public Review

CSA/ICC B805 Rainwater Harvesting Systems

CSA/ICC Joint Technical Committee on Rainwater Harvesting Systems - IS-RCSDI

First Public Review Closed on November 24, 2015

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
1	General	Staff	When the size of the table makes it possible, move all tables so that they appear on one page to improve readability.	Move tables to appropriate locations to ensure they are all on one page of the standard.	
2	General	General	I am concerned that the draft rainwater harvesting system standards are very complicated and will require someone with expertise to go through them to meet the requirements. Furthermore I think that the complexity required by these standards may discourage and reduce the potential implementation of this technology.	Consider develop a separate set of requirements for system designs and uses that do not require complex and expensive control, alarm and alert systems. Based on the potential application(s) one or more additional categories could be developed for systems that can operate relatively passively or that can fail and still not affect the public health and well-being. There are numerous examples of systems that if they fail, the irrigation benefits of the system will not be realized and someone will usually figure this out eventually and get the system back online. Where potable water supplies (volume and quality) are dependent on the continuing uninterrupted functioning of the system, such controls are necessary. Identify potential uses that do not require the Cadillac version of this technology to provide most of the required benefit and	

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				develop those standards accordingly.	
3	Table of Contents	Staff	Section 7 of the TOC, should Buoyancy be listed in the Table Section 7; assume buoyancy is discussed in this section.		
4	0	WQ		Recognizing that public health risk increases with an increase in surfaces exposed to rising pollutant types and the number of persons using a treated water system, this standard provides different methods for protecting water quality based on the type of influent water quality, the system and the application.	
5	0	WQ	"For single family dwelling systems, the Standard does not require sampling and testing of the output rainwater quality to substantiate performance. It recognizes the lower risk to the public and relies on sound treatment system design and verification of the treatment system operation." **Comment**: who will verify? Only verify once at installation? No annual verification?		
6	0	WQ	In order to ensure the consideration of the wide range of variables associated with each site, location, design, and application, this standard requires a water safety plan be developed for each system. The water safety plan considers the specific challenges and risks presented by the site impact on source water quality, operation of system components and the risk associated with the use. The water safety plan requires the development of a sound method of verifying treatment processes are operating effectively		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			and as intended, including water quality monitoring for systems serving more than 25 people. **COMMENT**: So for 25 and less, what is the monitoring requirement? You only state a requirement for 26 or more, or is it 25 and more? For Single family, no monitoring? Duplex, triplex, no monitoring?		
7	0	Staff		Based on the expected source water quality, This ~~s~~Standard establishes suitable water quality parameters ~~based on the expected source water quality~~ that are used to substantiate that the treatment process is operating as intended to produce safe water for the specified use.	
8	0	SW	Stormwater is spelled "storm water" and "stormwater" in various locations in the draft. The correct spelling is "stormwater". This is consistent with CSA B184-SERIES 11, US EPA (http://water.epa.gov/polwaste/npdes/stormwater/), NPDES Permits (http://water.epa.gov/polwaste/npdes/)and most other authorities spell stormwater. The introduction notes that water sampling is not required for single family dwellings and then indicates that water quality monitoring is only for "systems serving more than 25 people". The document doesn't provide a reference to substantiate the rationale for 25 people being an appropriate cutoff for monitoring. Is this an arbitrary cutoff? What is the health risk rationale? The document mentions "potential risk of ingestion, inhalation, and skin contact", but the standard provides no supporting reference to substantiate a level of risk for these exposure routes. There is no specific public health risk associated with inhalation or "skin contact" for rainwater. Presumably ingestion is with respect to	Change "storm water" to "stormwater" throughout the document. Provide a rationale to support monitoring requirement for more than 25 people and eliminate the reference to single family dwellings if 25 people is the cutoff (i.e. no need to single out single family dwellings). Eliminate reference to skin contact as a potential risk of using rainwater, and consider simplifying the approach to noting that rainwater may come into contact with microbial and other contaminants during collection that could adversely affect water quality for its intended use. The best management practice is to minimize the potential for contamination during collection and provide an appropriate level of treatment for the intended use.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			microbial or other contaminants that may make the water unfit for potable use unless treated. If the rainwater is appropriately treated, there is no potential risk. Stormwater as defined in this standard is water from precipitation events that comes into contact with impervious and saturated pervious surfaces, resulting in a surface flow that can be collected and stored. This description also matches runoff within a catchment that flows into a stream that could be used as a potable water source (following treatment); yet, this standard calls for stormwater to be prohibited as a potential source of potable water. If stormwater is of concern as a sub-group of rainwater harvesting, then it should be eliminated from the standard, and the standard should focus solely on rainwater harvesting - the collection of rainwater from controlled impervious surfaces (i.e. surfaces specifically selected to minimize the potential for contaminating the collected rainwater) and the storage and treatment of harvested rainwater for potable and non-potable uses.	Eliminate all references in the document to stormwater as a sub-group of rainwater harvesting, and have the focus solely on rainwater harvesting - the collection of rainwater from controlled impervious surfaces (i.e. surfaces specifically selected to minimize the potential for contaminating the collected rainwater) and the storage and treatment of harvested rainwater for potable and non-potable uses.	
9	0	WQ, SW	Curious why Stormwater does not address chemical contamination. This should be explained - specifically, pesticides, metals, hydrocarbons and microcyctin toxins. Australia provides discussion of these risk factors.	Additional information on risks of stormwater should be addressed.	
10	0	SW	For the term stormwater- does it include surface flow coming off of a parcel during a rain event, aren't there already existing water quality regs for runoff?	Specify specific stormwater definition	
11	0	WQ	Water Safety Plan- Excellent idea, this may not be a user friendly term.	Site Water Plan would be a better term, or something related to looking at water holistically on each site	
12	0	General	How will treatment processes be verified for effective operation?	Tie into enforcement	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
13	0	General	What does this standard hope to achieve and when does it apply.	Please add specific examples of when this code would be used	
14	1.1	General	Very helpful.	Define rainwater	
15	1.1.1	SW	Contrary to the statement made in Section 1.1.1, this standard does not cover "stormwater management", which is a very broad subject. Further, the rainwater harvesting systems described in the standard go beyond "onsite use" and include cluster applications for population groups in excess of 25 people.	Eliminate the sentence "Rainwater harvesting systems covered by this Standard include systems used as a source of water for onsite use or stormwater management."	
16	1.1.1	General	This is a broad standard, and that could be made more clear by including residential and non-residential - if that is the intent.	The provisions of this Standard apply to the design, materials, installation, and operation of residential and non-residential rainwater harvesting systems for potable and non-potable applications. Rainwater harvesting systems covered by this Standard include systems used as a source of water for onsite use or stormwater management.	
17	1.1.2	General	**"1.1.2** ***Note:*** *Rainwater includes all forms of water from natural precipitation including but not limited to rain, snowmelt, etc."* Comment: this definition applies to stormwater also, no difference. Difference should be where the precipitation flows, whether on a property or in the right of way.		
18	1.2	Staff	**1.2 Exclusions ;** rain barrels may not be defined by authority having jurisdiction.		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			Why do you include local here? Local is not included in other places where authority having jurisdiction is used.		
19	1.2	General	Add groundwater recharge to the list under 1.2(a)	**1.2 Exclusions** This Standard does not apply to (a) rainwater harvesting systems that provide water for the following applications: Groundwater recharge	
20	1.2		Item (iii) Does this include private vegetable and fruit gardens, residential, small businesses (restaurants that grow their own)?		
21	1.2	General	Item (b): I have seen no code that defines “rain barrels”, which logically would be the purpose of this standard. The 360 gallon limit used on the ARCSA Standard is based on (4) 90 gallon rain barrels on four corners of a house is a contrivance that at least serves to not overregulate .		
22	1.2	General, Irrig.	One of the most commonly accepted uses of harvested rainwater is the irrigation of home vegetable gardens. While exclusion of industrial, manufacturing and commercial agricultural uses may be appropriate, the exclusion of irrigation of food crops makes no sense. Taking the most conservative approach, the standard includes provision for treatment of rainwater to achieve a potable standard - and there is absolutely no reason potable water can't be used to irrigate food crops. It is not necessary to exclude rain barrels that are not connected to the plumbing system, as they are already not subject to plumbing code provisions.	Eliminate the sentence: "(iii) irrigation of food crops;" Eliminate sub-section " b) rain barrels, as defined by the local authority having jurisdiction, not connected to the plumbing system .. "	
23	1.2	General, Irrig.	1.2.(a)(iii) irrigation of food crops.	1.2.(a)(iii) irrigation of *commercial* food crops.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				Without definition provided for the term 'food crops', this can be understood to include/preclude common irrigation practices for non-commercial food crops, such as those found in residential, rooftop or community gardens, where rainwater harvesting systems are commonly implemented and used for such a purpose. if the intent is a ban of RWH water use for all food crops, including non-commercial, it should be explicit.	
24	1.2	General, Irrig.	It is not clear if irrigation of food crops is for commercial growing or includes community and backyard gardens. As lead roofing material can leach lead which can then be absorbed by plants this should be clarified.	irrigation of food crops, including backyard and community gardens. Exemption - roofing material certified to P-151.	
25	2	Staff	**NSF International** Perhaps to avoid confusion, in the initial reference, spell out National Sanitation Foundation (NSF) to avoid confusion with National Science Foundation.		No change. Not spelling out the abbreviation “NSF” is in line with other CSA standards that reference NSF standards. Note that the company name was changed officially to “NSF International” in 1990 as NSF expanded services beyond sanitation and into new international markets.
26	2	General	You need to add the ASPE-ARCSA-ANSI Rainwater Harvesting Standard 63, and Stormwater Harvesting Standard 78 OR add under the ANSI entry of references. This is the only standard vetted by rainwater design professionals and endorsed by the American Rainwater Catchment Systems Association and the American		

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			Society of Plumbing Engineers.		
27	2	Staff	The list of standards is not comprehensive with respect to stormwater, but it also lists many standards that are not relevant of referenced in the document. Only standards directly related to the subject of rainwater harvesting, collection, storage and treatment should be included in the list. Unnecessarily listing irrelevant standards diminishes the value of this section and indicates the committee hasn't spent the time to review and consider existing standards.	Eliminate any standards that are not directly related to the subject of rainwater harvesting, collection, storage and treatment and/or referenced in the document..	
28	2	General	Per comment on Third-party definitions	International Organization for Standardization (ISO) ISO 17065-2012 Conformity assessment -- Requirements for bodies certifying products, processes and services	
29	2	Staff	Please confirm the dates for NSF 53 and NSF 60	NSF 53-2014 and NSF 60-2014a (subject to verification by CSA/ICC)	
30	2	Staff	**2 Reference Publications** This Standard refers to the following publications	**2 Reference Standards and Publications** This Standard refers to the following standards and publications .... The reason for this is that the majority of the listed documents are standards, and elsewhere in the text reference is only made to referenced standards (or codes).	

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31	2	Staff	How do these guidelines differ from existing IAPMO guidelines	Please clarify.	
32	3.1	Staff	The wording here is very confusing.	Clarify when would this code be used and where it overlaps with the organizations listed here.	
33	3.2	General	The requirement that "where conflicts occur between provisions of this standard and the referenced standards, the provisions of this standard shall apply" seems inappropriate and pretentious. For example, this standard describes potable water treatment requirements and it is likely it is not be as considered as a standard developed specifically for water treatment. Consequently, it is inappropriate to state that the provisions of this standard take precedence over any other standard that covers similar ground.	Eliminate the sentence "Where conflicts occur between provisions of this standard and the referenced standards, the provisions of this standard shall apply", or replace it with a more rational conflict resolution statement.	
34	3.2	General	Where this proposed standard is in conflict with an already adopted code (IPC) and is less stringent to say this standard will apply will possibly be a danger to public health and safety.	Where conflicts occur between provisions of this standard and the referenced standards, the more stringent shall apply.	
35	3.2	General	Why does this standard have jurisdiction over IPC and NFPA (to name a few other standards)?	Perhaps include a flow chart of when this code would take precedence.	
36	3.3	Staff	Is this standard to be used in situations where there is a gap in regulation on one-or all- of these levels?	Please clarify.	
37	4	General	The limit of liability seems to only address equipment "life expectancy, durability, operating performance, or workmanship of the equipment, materials, or undertaking". Liability considerations should go	Consider modifying liability limits to include other aspects of direction given by the standard, particularly with respect aspects with	

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			beyond equipment performance.	the directive"shall".	
38	4	General	... the equipment, materials or **undertaking.** The meaning or implication of the word **undertaking** is not clear. If it means the company that is undertaking the installation, why not say so. If it means just the installation, again say so. Better yet, speak to the rain water harvesting system as completed.	... the equipment, materials or ~~undertaking~~ the water harvesting system as completed.	
39	5	SC&D	"distribution" is defined (from point of treated storage to point of end use) and "water distribution system" is defined (from source to point of use) however "distribution system" is not defined and this appears to be the wording that is used in the document the majority of the time (see Section 6.1.3, Section 7.2.5). Please confirm the intent - do Sections 6.1.3 and 7.2.5 cover from treated storage to tap or from source to tap?	For discussion at committee regarding the intent of "disitrbution system" wording and "water distribution system" wording.	
40	5	SC&D, Irrig.	**Irrigation system:** A system of pipes, fittings, and valves to distribute irrigation water. Definition needs to include a reference to sprinklers and drip emitters which are essential in order to distribute the water in desired locations.	**Irrigation system:** A system of pipes, fittings, ~~and~~ valves and emission devices to distribute irrigation water.	
41	5.1	SC&D	**Bypass water.** Secondary water supplied to a rainwater harvesting system downstream of the storage tank for the purpose of recharging a rainwater system as an emergency backup provision. **Potable water**: Water that meets the federal human consumption quality standards and any additional quality standards, as established by the authority having jurisdiction.		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			Suggest adding a definition for Rain Chains Suggest adding a definition for authority having jurisdiction Suggest adding a definition for rain barrel		
42	5.1	SC&D	Add: **Canal**	**Canal:** A scupper or drainage structure from a flat or low-sloped roof that allows rainwater to free fall to a catch basin below	
43	5.1	SC&D	Add: Rain Barrel: mentioned this term earlier in document, so need definition. There is no definition of Rain Barrel in Definitions. Better term is Storage Tank; people can have 500 gallon cisterns using gravity. This is related to 1.2(b) as well.	Add: Rain Barrel, Also called Storage Tank.	
44	5.1	General	Would it not be a good idea to include a definition for rain gardens? Also known as a bioretention or biofiltration features using vegetation, and/or ground surfaces to collect and absorb runoff to improve stormwater quality by reducing sedimentation loads		
45	5.1	General	as you have defined, **rainwater** and stormwater the same. Definitions inaccurate, imprecise, inefficient, confusing. Landing where? On roof, at grade or on ground, parking/driving surfaces, ALL of these? Your definition is any rain landing on ground? Elevated or at grade? Below grade when it flows? Is this water that hits ground and stops, flows? It is rain collected in a storage tank? On impermeable and/or permeable surfaces? No mention of moving across surface. This is the definition of Rain, not rainwater.	**Rainwater**: Collected water from natural precipitation. This is more accurate, and on any surface.	
46	5.1	General	Rainwater Collection Surfaces; add a definition since mention this phrase in 7.2.1.1.		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			Reclaimed water Need definition of Wastewater in the Standard. Though the ISO definition is ANY water wasted, which means rainwater, stormwater, sanitary sewer water. The ISO is not an accurate nor appropriate definition for the United States. Wastewater here is sanitary sewer water, black water.		
47	5.1	Tank	Storage tank definition	**Change to** **Storage tank:** a retention tank of different materials and of various sizes from a rain barrel, 40-100 gallons, to larger tanks or cistern, 100s of gallons and more, used with a hose for gravity flow for use, or connected to a pressurized plumbing system or irrigation system. Also known as “Cistern”	
48	5.1	SW	**Rainwater and Stormwater** Confusing terminology: As a convenience to rule making, stormwater and rainwater should have clear and separate definitions		
49	5.1	SW	**Stormwater definition** Stormwater is one word. You have it as 1 word in definition. 1 word is now more common. Be consistent. Why distinguish between rainwater and stormwater? Just say rainwater for onsite collection; rain hitting a roof or at grade is still rain. Not stormwater until it leaves a parcel and enters the public right of way and is regulated by the government. Wherever rain lands on the ground, it is still rain and becomes rainwater when it flows, onsite. Doesn’t matter if on a roof, driveway, landscape. Rain following on the ground is the same rain as falling on a roof so why 2 definitions? And which ground? Impermeable or permeable? And if the answer is a difference of water		

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			quality, that is irrelevant since the treatment system will take this into account.		
50	5.1	Staff	Storm water and stormwater are both used in the document. Which is the preferred style?		
51	5.1	SW	**Stormwater**: Overland *(over what land, permeable or impermeable?)* water flow caused by precipitation or snowmelt events that occur in volumes or rates that exceed the infiltration capacity of the soil or pervious surfaces. *(from roof, at elevation, at grade, in a pipe?)* Why is permeable surfaces included here? What about impermeable, that is where you get the most flow, runoff; permeable the rain infiltrates, bioretention and rain garden. Is this on the property only, or in the public right of way? Overland can be on a private parcel or public right of way. Should follow EPA definition, in the public right of way, NOT private property, that is rainwater.		
52	5.1	SW	**"**Overland" Could be interpreted as piped water	**Stormwater**: ~~Overland~~ Surface water caused by precipitation or snowmelt that occurs in volumes or rates that exceed the infiltration capacity of the soil or pervious surfaces.	
53	5.1	General	**Vegetative roof**: Also called Blue, Green and Bio roofs.	Should the term green roof not be included in this definition?	
54	5.1	General	Add Wastewater definition		
55	5.1	General	Include Definition for Bioretention, Biofiltration and Rain/Rock Gardens, and include in body of Standard. These are important concepts and BMPs. Most landscaped features are rain gardens or bioretention		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			features.		
56	5.1	General	The definitions are not comprehensive, and many of them are not used in the body of the document and are therefore not required. Catch basins are part of a storm (rainwater) drainage system (curbside drain) and not characteristically part of a rainwater harvesting system or a discharge from a canal. It;'s purpose is to capture sediment and other debris that would otherwise be discharged to storm sewers and drainage waterways. Clear water wastes may contain dissolved contaminants that could be harmful for specific water uses. Zinc from galvanized surfaces can be toxic to fish. Other dissolved contaminants can affect potability unless appropriately treated. **Non-potable water**: comment that non-potable water is not destined for human consumption is not necessarily correct. BC, for example, allows utilities to distribute non-potable water and allow for point of entry and point of use treatment systems to achieve potability. The definition for **"Distribution"** only considers piping systems and components that convey rainwater from the point of treated storage to the point of end use; however, non-potable distribution systems generally do not distribute "treated" water and may rely on point of entry and point of use treatment systems. The definition of **Drainage system** groups rainwater with sewage and other liquid wastes. While drainage systems generically are used to transport liquid waste streams, within the context of this document the definition should be limited to the rainwater collection system that transfers rainwater from impervious surfaces to storage. The term "**Effluent"** is generally used to refer to a	Eliminate any definitions that are not used in the document and add additional definitions as noted below. Correct catch basin definition: Correct clear water waste definition to remove the suggestion it contains "no impurities or contaminants that are harmful to a person's health, plant or animal life or that impair the quality of the natural environment". Clear water wastes are waste streams with no visual indication of water quality impairment. Eliminate the following note from **"Non-potable water"** definition: "Note: This means that non-potable water is not destined for human consumption. See Table 6.2.2 and Table 6.2.3." Reword definition "**Distribution:** Piping systems and components that convey rainwater from either untreated or treated storage to the point of end use." Change to "**Drainage system:** Piping within a public or private premise that conveys rainwater to storage." and eliminate the second sentence. Avoid the use of the term effluent in relation to rainwater treatment.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			treated liquid waste stream. Suggest that the term "Treated Water" or "Treated Rainwater" be used instead - as the overall objective is to recognized the beneficial use of rainwater - and avoid any confusion with reclaimed wastewater or reuse water effluent. The term "**Makeup water"** only considers adding potable water to an untreated rainwater cistern; however, if the rainwater is being treated as a potable water supply, then the makeup water is added to the treated water storage tank - as there is no need to burden the treatment system with treating potable makeup water. Further, the need for makeup water does not necessarily mean an "emergency" condition, and can be a routine operations condition. The reference in the **"Non-potable water**:" definition that "non-potable water is not destined for human consumption" is not necessarily true. Rainwater that is harvested from an impervious surface is not considered to be potable until treated accordingly. Consequently, the raw untreated non-potable rainwater may, in fact, be destined to become potable water. The definition of **"Ultra Violet Transmission (UVT)"** is incorrect. The correct term is **"Ultraviolet Transmittance (UVT)"** and, with respect to rainwater disinfection, is a measure of the fraction of incident light at 253.7 nm wavelength remaining after a passage through 1.0 cm of sample water, expressed as a percentage of the transmission through distilled water. The note "Note: This value ... also changes" does not add any clarity to the definition of UVT. Also note that "ultraviolet" is one word. The definition "**UV dose**: UV dose is measured in mJ/cm2" should be changed to reflect that it is defined as the UV intensity multiplied by the time of exposure.	Change to: **"Makeup water.** Typically, potable water either added to the rainwater cistern for non-potable rainwater systems, or added to the treated rainwater storage tank for potable rainwater systems, as a backup provision." Eliminate the second sentence and leave the definition as: **"Non-potable water**: Water not safe for drinking, personal or culinary utilization." Change the definition to: "**Ultraviolet Transmittance (UVT):** the measure of the fraction of incident light at 253.7 nm wavelength remaining after a passage through 1.0 cm of sample water, expressed as a percentage of the transmission through distilled water." Change the definition to: "**UV dose**: is the average UV intensity multiplied by the contact time, measured in mJ/cm2"	

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57	5.1	SC&D	**Collection:** Open areas that come into contact with rainwater precipitation such as, but not limited roofs and paved areas **Conveyance:** That portion of a rainwater harvesting system that conveys collected rainwater from collection to the point of untreated rainwater storage. This includes, but is not limited to gutters, downspouts, leaders and conductors. **Control:** manual or automatic devices and control algorithm designed to regulate the operation of, a mechanical system in a safe and efficient manner. **Day tank:** a temporary holding tank for a limited volume of treated water to be provided for end use. (also known as buffer tank, batch tank) **Drainage system:** Piping within a public or private premise that conveys sewage, rainwater or other liquid waste to a point of disposal. A drainage system does not include the mains of a public sewer system or a private or public sewage treatment or disposal plant. **Rainwater Inlet:** The point of discharge from the conveyance piping into the storage tank. **Rainwater Outlet:** The point of entrance at the storage tank into the distribution system. **Storage:** That portion of a rainwater harvesting system where collected water is stored, including, but not limited to storage tanks or reservoirs containing untreated rainwater, storage tanks containing treated rainwater for	**Collection:** Open areas that come into contact with rainwater ~~precipitation~~ such as, but not limited *to,* roofs and paved areas **Conveyance:** That portion of a rainwater harvesting system that conveys collected rainwater from collection to the point of untreated rainwater storage. This includes, but is not limited to*,* gutters, downspouts, leaders and conductors. **Control:** *M*anual or automatic devices and control algorithm designed to regulate the operation of~~,~~ a mechanical system in a safe and efficient manner. **Day tank:** *A* temporary holding tank for a limited volume of treated water to be provided for end use. (also known as buffer tank~~,~~ *or* batch tank) **Drainage system:** Piping within a ~~public or private~~ premise that conveys sewage, rainwater or other liquid waste to a point of disposal. A drainage system does not include the mains of a public sewer system or a private or public sewage treatment or disposal plant. **Rainwater *i*nlet:** The point of discharge from the conveyance piping into the storage tank.	

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			its intended use, and piping systems and components that convey rainwater from untreated storage to treated storage. **Ultra Violet Transmission (UVT)**: the measure of a UV light's ability to penetrate the water across 1 cm path length. **Note:** This value is a measurement of the water. For example, water from a metal roof after a 350 micron filter might have a UVT of 90%. As water quality changes, the UVT% of said water also changes.	**Rainwater *o*utlet:** The point of entrance at the storage tank into the distribution system. **Storage:** That portion of a rainwater harvesting system where collected water is stored, including, but not limited to, storage tanks or reservoirs containing untreated rainwater, storage tanks containing treated rainwater for its intended use, and piping systems and components that convey rainwater from untreated storage to treated storage. **Ultra*violet* ~~Violet~~ Transmission (UVT)**: the measure of a UV light's ability to penetrate the water across 1 cm path length. **Note:** This value is a measurement of the water. For example, water from a metal roof after a 350 micron filter might have a UVT of 90%. As water quality changes, the UVT% of said water also changes.	
58	5.1	General	The current definition of Third-party certification agency and Third-party certified are fairly vague and opens itself up to a great amount of interpretation. ISO 17065-2012 Conformity assessment -- Requirements for bodies certifying products, processes and services is a standard that is being used by reputable certification and assessment organizations around the world to show that they know how to do the third-party assessments that they say they are doing. Many authorities having jurisdictions	**Third-party certification agency:** An approved agency operating a product or material certification system that incorporates initial product testing, assessment and surveillance of a manufacturer's quality control system. <u>The approved agency should have the applied certification system in their ISO</u>	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			also are utilizing this as a way to find reputable third-party certification organizations.	17065 scope of accreditation. **Third-party certified:** Certification obtained by a manufacturer indicating that the function and performance characteristics of a product or material have been determined by testing and ongoing surveillance by an approved third-party certification agency. Assertion of certification is in the form of identification in accordance with the requirements of the third-party certification agency and the certification program is in the third-party agencies ISO 17065 scope of accreditation.	
59	5.1	WQ	**Clear water wastes:** Wastewater containing **no** impurities or contaminants... Unfortunately several of the examples provided can well be contaminated by legionella, which is definitely harmful to a person's health.	**Clear water wastes:** Wastewater that has been verified as containing **no** impurities or contaminants...	
60	5.1	General, Irrig.	**Irrigation System:** A system of pipes, fittings, and valves to distribute irrigation water. Irrigation water can also mean water used to irrigate wounds, eyes, etc. I believe we should be specific and speak to water used for landscape or crop irrigation.	**Irrigation System:** A system of pipes, fittings, and valves to distribute ~~irrigation~~ water for the purposes of irrigating landscapes or crops.	
61	5.1	SC&D	**Supports:** Devices for supporting and securing pipe,	**Supports:** Devices for supporting and securing pipes, fixtures ~~and~~ related	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			fixtures and equipment. I believe we could add in tanks, as there are sections addressing the stability of tanks.	equipment and storage tanks.	
62	5.1	WQ	Water Safety Plan needs expansion of the definition.	**Water Safety Plan (WSP)**: A plan to ensure the safety of water used for specified purposes through the application of a comprehensive risk and management approach that encompasses all steps from the source water to end use. A Water Safety Plan includes the concepts of a Hazard Analysis Critical Control Point (HACCP) for the management of water systems and the establishment of monitoring provisions and the pre-identification of responses when the system goes out of the boundaries of designed operating parameters.	
63	5.1	SW	the definition of storm water states it is water discharged off soil or a permeable surface. my comment is that storm water arises from impermeable surfaces also.	add runoff from impermeable surfaces to this definition	
64	5.3	Staff	Some of the abbreviations listed in Section 5.3 are not relevant to the subject of rainwater harvesting or used in the document. Examples include: LPM is referenced twice in the list but never in the body of the document ORP is not used in the body of the document COD is not a relevant water quality parameter used in the body of the document BOD5 is not a relevant water quality parameter for	Eliminate definitions not used in the body of the document or are only used in Appendix D and already are defined in Appendix D.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			rainwater quality The majority of the terms are not used in the body of the document, but are only used in Appendix D, where there already is a list of definitions.		
65	5.3	Staff	The List, as presented, seems to be disjointed.	Please arrange List in logical, alphabetical Order with CAPS first then smallcase, when letters are duplicative. i.e. CAPS, then Caps, then caps.	
66	6.1.1	WQ	The term "multi-barrier" is not defined. In the case of water treatment systems to protect public health this often refers to having redundant disinfection systems in sequence. For example, ultraviolet disinfection followed by chlorination. It is not clear how a treatment system design to "reduce accumulation, introduction, and re-introduction of contaminants into the system" equates to a "multi-barrier" approach.	Clarify what is meant by "multi-barrier" and "treatment train design approach to reduce accumulation, introduction, and re-introduction of contaminants into the system". This likely needs to be expanded to explain how to "reduce accumulation", "reduce introduction" and "reduce re-introduction" of contaminants.	
67	6.1.1		The physical treatment of the water may not be necessary in all systems – I would suggest including "maintaining" the quality of the rain or storm water as an option. They actually call for this in section 6.1.7, so it fits. Safe is a difficult term to use - Suitable may be a better option.	6.1.1 Output water quality The system shall be designed to reliably treat or maintain and deliver the source water to a quality that is deemed to be ~~safe~~ suitable for the intended use as set out in Section 6.2. **Note:** Rainwater Harvesting Systems should employ multi-barrier or a treatment train design approach to reduce accumulation, introduction, and re-introduction of contaminants into the	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				system.	
68	6.1.1	WQ	reliably treat and deliver”	Describe how reliability will be enforced and how it will be measured.	
69	6.1.2	Staff	This is a great idea!	Please provide a template or format as well as a completed example	
70	6.1.2	WQ	The idea of a water safety would be extremely helpful standard format for public agencies to understand how human health is being protected on sites where rainwater is harvested.	WSPs will help expand the rainwater harvesting market.	
71	6.1.2.3	WQ	(a) Site assessment and fit for purpose; The use of the term "fit for purpose" is unclear.	(a) Site assessment and confirmation that the site is generally suitable for the intended purpose; "Generally suitable" relates to whether or not the remaining elements of the WSP can confirm the site is actually suitable for the intended purpose.	
72	6.1.2.3			Change to: The elements of a WSP shall include the following: (a) Site assessment, Volume requirements, and feasibility for intended purpose; (b) Hazards identification, risk prioritization, and risk mitigations; (c) System design and identification of control points;	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				(d) Installation procedures, PPE; (e) Operational monitoring, system verification, and response; (f) Supporting programs, measurement procedures, and documentation.	
73	6.1.3	Size, SC&D	**6.1.3 Continuity of supply** Recommend providing a minimum requirement and then adding or with the requirements of the authority having jurisdiction whichever is more stringent.		
74	6.1.3	SC&D	"distribution" is defined but "distribution system" is not defined.	Please define "distribution system" and clarify the difference with "water distribution system".	
75	6.1.4	Size, SC&D	Would the data used take into account climate change? do you have any guidelines on typical water use per person per day? what are some codes related to system sizing? We also suggest adding “and intended use(s)” to c) anticipated demand.	Please clarify.	
76	6.1.6	SC&D	what is the difference between protection and separation?	Please clarify	
77	6.1.6.2	SC&D	6.1.6.2 Backflow prevention Where a potable water system is connected to a rainwater harvesting system, the potable system and supply shall be protected against backflow by means of (a) an air gap; or (b) an approved backflow protection assembly or device for the application, in accordance with the plumbing code.	Potable and rainwater harvest systems shall never be connected (except indirectly) consider: 6.1.6.2 Backflow prevention Where ~~a~~ potable water ~~system~~ is *utilized as a makeup water supply* ~~connected~~ to a rainwater harvesting system, the potable *water* ~~system and~~ supply shall be protected against backflow by means of	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				(a) an air gap; or (b) an approved backflow protection assembly or device for the application, in accordance with the plumbing code.	
78	6.1.6.3	SC&D		Change to: (b) an approved backflow protection assembly or device for the application, in accordance with the site-specific plumbing code.	
79	6.1.6.3	SC&D	Backflow prevention: This warrants clarification. Is the intent that within the RHS itself, the potable side should be separated from the untreated side by a backflow prevention device, or that an RHS should be separated from a public supply by a backflow prevention device? The latter is justifiable, but not the former.		
80	6.1.7	SC&D	No particular requirements other than general specified		
81	6.1.8	SC&D	include specific examples.	Use the term vector to relate health to why to keep critters out of the tank.	
82	6.1.9	SC&D	Seems to be an appropriate place to list buoyancy issues		
83	6.1.9	SC&D	(d) seismic events: is the same as (g) seismic conditions change (d) and delete (g)	(d) seismic ~~events~~ conditions ~~(g) seismic conditions~~	
84	6.1.9	SC&D	I don't know why seismic "events" and seismic "conditions" shouldn't be combined. Sunlight and UV damage can occur, or excessive algae	6.1.9 Local conditions The system design, installation and materials shall be suitable for local	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			growth, also materials should be compatible with any disinfection agents, if used.	conditions which include but are not limited to, (a) freezing conditions; (b) excessive heat; (c) high wind conditions; (d) seismic events or conditions; (e) potential for extreme rainfall events; (f) dust or other airborne contaminants that may adversely affect source water quality; and ~~(g) seismic conditions.~~ (g) Sunlight or UV exposure; (h) Disinfection agents;	
85	6.1.9	SC&D	(f) dust or other airborne contaminants that may adversely affect source water quality; and	(f) unsanitary conditions of stored water quality and its associated piping and enclosures. Conditions that may lead to odor, corrosion, deposition and infestation of bacteria, insects, as well as unwanted biological matters.	
86	6.1.10	SC&D	Limiting access to "prevent" vandalism is a big ask, especially in residential systems where it may be impossible or cost prohibitive. Maybe state "lessen the potential for" or "limit" and for non-residential systems only.	6.1.10 Access Access to non-residential system components shall be restricted to ~~prevent~~ limit contamination, vandalism, and unauthorized access in accordance with this standard and applicable codes.	
87	6.1.11	SC&D	A manual shall be supplied with all systems and include standard operating procedure under normal operating conditions, such as system start-up and shutdown procedures, as well as contingencies and emergency	A manual shall be supplied with all systems and include standard operating procedures under normal operating conditions, such as system start-up and	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			procedures for system failure, loss of treatment, or other emergency conditions. The first use of the word procedure should be pluralized. contingencies and emergency needs to be revised.	shutdown procedures, as well as ~~contingencies and emergency~~ response procedures for system failure, loss of treatment, or other ~~emergency~~ unplanned conditions.	
88	6.1.11	SC&D	commissioning plan?	add language requiring a commissioning plan as required in icc chapter 9	
89	6.1.12	Staff	Include more information here	perhaps add a list of the government agencies who may have permit requirements for rainwater harvesting suystems.	
90	6.1.12.2	SC&D	**6.1.12.2 Construction documents;** wouldn't the authority having jurisdiction set the submittal requirements? Recommend changing to; Provide documents as indicated below and as required by the authority having jurisdiction.		
91	6.1.12.2	SC&D	This appears to be an administrative item best defined by the AHJ. For some systems this level of detail may not be required.	Revise to "The following documents may be required by the AHJ.".	
92	6.1.12.2	General	A list of prohibited uses would also be helpful.	Under item b, add "and prohibited uses".	
93	6.1.12.2	General	(b) List of end uses at this stage the end uses are only intended, not confirmed (until after the permit is issued)!	(b) List of intended end uses	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
94	6.1.13.1	SC&D	Item (e) is inadequate. There is too much opportunity to leave energized wirng buried.	(e) Electrical, power, and control wiring shall be permanently de-energized, disconnected and removed;	
95	6.1.13.1	SC&D	Item a should make it clear that the system must be protected and its integrity maintained.	add to item a "such that system is protected and its integrity is maintained against contamination entry"	
96	6.1.13.2	SC&D	(c) Inlet piping shall be redirected to approved drain systems; differs from the requirements of Abandonment, but should be the same. (c) Inlet piping shall be disconnected and redirected to approved drain systems;	(c) Inlet piping shall be <u>disconnected and</u> redirected to approved drain systems;	
97	6.2.1.1	WQ	(c) Indicative risk for potential for human contact, including ingestion, inhalation, and skin contact the use of the word risk is inappropriate. The standard definition of risk is a probability x consequence, at this stage the only looking at the potential for human contact.	(c) ~~Indicative risk for~~ potential for human contact, including ingestion, inhalation, and skin contact	
98	6.2.1.1	WQ, Irrig.	There are several different methods of applying irrigation water such as: • sub-surface • emitter pipe • surface • emitter pipe	As can be seen from the above list, most irrigation water is delivered above ground. Therefore Blu-Gold suggests that this variety of delivery methods be considered separately concerning the possible need for filtration and possibly treatment. Maybe a set of basic water quality standards for each family of	Review and utilize the categories of emitters contained within ASABE/ICC 802 standard.

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			• point source emitter • above-surface • fixed riser mount micro spray • fixed riser mount spray • pop up spray • pop up stream rotor	delivery methods could be developed based on the possibility of human exposure. Sub-surface irrigation water need only be filtered to a level that will prevent the emitters from becoming blocked. Surface irrigation may need filtration only as well. Emitter pipe may need to be flushed annually with commercially available products designed to remove any algae like growth in the pipes. Above surface irrigation systems may need filtration and some level of treatment. Filtration and treatment levels would be based on the results of water quality testing. In order to keep irrigation systems as simple as possible and still deliver safe water (the term safe meaning the water does not pose a health risk to humans) Blu-Gold suggests using secondary contact as described in the Guidelines for Canadian Recreational Water Quality Third Edition (April 2012) as the basis for developing filtration and treatment guidelines.	
99	6.2.1.1	WQ, Irrig.	Distinguish between sub-surface or drip irrigation (low risk) and spray irrigation (medium risk).	Address possibility of aerosolized components of harvested rainwater causing contamination in spray irrigation.	
100	6.2.1.2	WQ	An expanded discussion of risks and how risks were evaluated and concluded is needed. What factors were considered in developing the risk categories. Was a generalized Quantitative Microbial Risk Assessment process utilized? Supporting documentation would be appreciated.	An explanation of how risks were determined would be appreciated.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
101	6.2.1.2	WQ	There is a similar misuse of the term risk throughout this paragraph and in the title.	6.2.1.2 End uses and ~~indicative risk~~ potential for human contact The ~~level of indicative risk~~ potential for human contact through ingestion, inhalation, or skin contact is characterized as low, medium, or high under normal operation for the intended use. A low level of ~~risk~~ potential contact applies to end uses where humans rarely come in contact with the treated rainwater due to the nature of the installation that limits direct or indirect contact under normal operation. A medium level of ~~risk~~ potential contact applies to end uses where human contact with the treated rainwater is indirect or limited under normal operation. A high level of ~~risk~~ potential contact applies to end uses where human contact with the treated rainwater is direct under normal operation.	
102	6.2.2	WQ	**TABLE 6.2.2;** Recommend moving clothes washing to R3.		
103	6.2.2	WQ, Irrig.	**R1, End Uses:** State spray and drip (low-volume) irrigation under Irrigation Don't understand why you would not include these important uses explicitly		
104	6.2.2	WQ	R2 Indicative Risk for Skin Contact is assessed too low.	Please change the Indicative Risk for Skin Contact on R2 to a MED	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
105	6.2.2	WQ, Irrig.	There should be a split in the Irrigation category for sub-surface and above ground as the hazard could be different.	R1 - Sub-surface Irrigation R3 - Above Ground irrigation	
106	6.2.2	WQ	How would recreational contact ie. running through sprinklers fit into these categorizations? What assumptions are made when risk is determined ie. how much ingestion, skin contact, or inhalation is assumed.	Further discussions of how risks were determined is needed, given these standards appears to be less strict than those of other jurisdictions.	
107	6.2.2	WQ, Irrig.	Clarify if community garden or backyard gardens are excluded from irrigation.	Change irrigation to "landscape irrigation" or require P-151 certified roof collection material for this use.	
108	6.2.2	WQ, Irrig.	Exposure of the public via irrigation, especially spray heads, is potentially one of the highest exposure categories for humans. Spraying water in a public place such as in front of an hotel or hospital or other will potentially expose the public to what ever agents that may be in the water. As long as the water is clean and free of agents that could be injurious to the public- no issue. However water quality conditions in the tank can change over time- maintenance or lack there of. The absence of any disinfection for collected rainwater for this end use could be detrimental to the public at large. Even though golf courses do it all the time this is not the same as in other public spaces as noted above.	need to move irrigation from the R1 category to the R3 category need to sub-divide irrigation into two categories	
109	6.2.2	WQ	Again the word risk should be changed to read potential contact throughout the table.	delete Risk or Indicative Risk where they occur and replace with Potential for Human Contact (in the Table Title) or in the table itself.	
110	6.2.2	WQ	R4, Third Column, 5th bullet, add in hand washing to align	• Bathing/Showering/Hand	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			with Table 6.2.3.	washing	
111	6.2.2	Staff	these tiers are very descriptive. wonderful and technically sound approach.	none	
112	6.2.3	WQ	**TABLE 6.2.3;** Recommend moving clothes washing to 3.		
113	6.2.3	WQ, Irrig.	**TABLE 6.2.3** Need to consider the Legionella pneumophilia. Legionella is a bacteria that can cause two forms of illness; flu-like illness and Legionnaires' Disease (LD). The suspected route of human exposure is via inhalation. This is why it is more of a concern in indoor plumbing systems and especially showers, hot water tanks, cooling towers, hot tubs, HVAC systems, etc. Once the water is aerated the bacteria combines with tiny water droplets in the air. This aerosolization of the bacteria is what can become a health concern. Not all people are susceptible to the bacteria. Obviously people with already weakened immune systems are more susceptible which is why hospitals can become more of a concern. A possible concern for many areas with respect to rainwater harvesting but also **7.2.3.11 Draining of tanks** especially if near an air intake. Okay so now I see where it is mentioned in Chapter 8. Recommend stating this earlier in the document as well.		
114	6.2.3	WQ, Irrig.	**Tier 1**: State spray and drip (low-volume) irrigation under Irrigation Don't understand why you would not include these important uses explicitly		
115	6.2.3	WQ	Risk comment given for Table 6.2.2 also applies to this table.	Make the same changes.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
116	6.2.3	WQ	End us row 3, third column: • commercial vehicle washing implies washing commercial vehicles (i.e., trucks and buses) where as I think it refers to vehicle washing at commercial installations.	• ~~commercial~~ vehicle washing operations	
117	6.2.3	WQ, Irrig.	There are several different methods of applying irrigation water such as: sub-surface • emitter pipe • surface • emitter pipe • point source emitter • above-surface • fixed riser • mount micro spray • fixed riser mount spray • pop up spray • pop up stream rotor	As can be seen from the above list, most irrigation water is delivered above ground. Therefore Blu-Gold suggests that this variety of delivery methods be considered separately concerning the possible need for filtration and possibly treatment. Maybe a set of basic water quality standards for each family of delivery methods could be developed based on the possibility of human exposure. Sub-surface irrigation water need only be filtered to a level that will prevent the emitters from becoming blocked. Surface irrigation may need filtration only as well. Emitter pipe may need to be flushed annually with commercially available products designed to remove any algae like growth in the pipes. Above surface irrigation systems may need filtration and some level of treatment. Filtration and treatment levels would be based on the results of water quality testing. In order to keep irrigation systems as simple as possible and still deliver safe water (the term safe meaning the water does not pose a health risk to humans) Blu-Gold suggests using secondary contact as described in the Guidelines for Canadian Recreational Water Quality Third Edition (April 2012) as the basis for developing filtration and treatment guidelines.	Review and utilize the categories of emitters contained within ASABE/ICC 802 standard.
118	7.1.2	SC&D	Can one "comply" to NSF or does a product need to be certified to NSF? "Components certified to meet Standard 61 have been tested for	Change comply to Certified or Listed for both NSF 61 and NSF372	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			material safety"		
119	7.1.2	SC&D, WQ	If our concern in this section is to ensure that rainwater has the best chance to be used as potable water, then why allow so many exceptions to it? With all of the exceptions we are allow a great deal of exposure to potentially harmful chemicals. The certification to NSF 61 that is stated in the requirement would ensure that this exposure was not happening and the down system extraction of these chemicals would need to be as taxing.	~~Exceptions: (a) Collection surfaces; (b) Conveyance systems (gutters, leaders, downspouts, roof drains); (c) Collection piping, conductors and components;~~	
120	7.1.2	SC&D, WQ	The sentence may be interpreted to mean that all components must have a weighted average lead content of 0.25 percent or less.	Change "materials" to "assemblies".	
121	7.1.2	SC&D	(b) Conveyance systems (gutters, leaders, downspouts, roof drains); (c) Collection piping, conductors and components; are I think addressing the same elements of the system, and should be combined. Collection piping is not understood given the definition of collection.	(b) Conveyance systems (gutters, leaders, downspouts, roof drains, conductors and components); ~~(c) Collection piping, conductors and components;~~	
122	7.1.2	SC&D	This section is very confusing. Lines about lead / solders and fluxes needs to apply in all circumstances, so it needs to be relocated or I can use 100% lead in a potable system. Break up the requirements into two sections and strike b and c so that only the collection surface is unregulated.	**7.1.2 Materials for potable systems** ~~Where collected rainwater is to be used for potable water applications, all materials contacting the water shall comply with NSF 61.~~ 7.1.2.1 All materials contacting the water shall have a weighted average lead content of 0.25 percent or less in accordance with NSF 372. Solders and fluxes used in rainwater harvesting systems supplying potable water shall not have a lead content greater than 0.2 percent.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				7.1.2.2 Where collected rainwater is to be used for potable water applications, all materials contacting the water shall comply with NSF 61. **Exceptions:** (a) Collection surfaces; ~~(b) Conveyance systems (gutters, leaders, downspouts, roof drains);~~ ~~(c) Collection piping, conductors and components;~~	
123	7.1.3	SC&D	Components used in rainwater harvesting systems shall be approved for use at the **operating** water temperature should be modified to address anticipated or planned operating temperatures (plural because we would be dealing with a range of temperatures.	Components used in rainwater harvesting systems shall be approved for use at the expected operating water temperatures	
124	7.1.3	SC&D	Section 7.1.3 indicates that components used in the rainwater harvesting system shall be approved for use at the operating temperature and rated for the maximum pressure anticipated in the system. This statement should exclude the storage tank. Storage tanks maybe rated for ambient temperature only and/or atmospheric pressure only. Tanks must not be pressurized or exposed to vacuum. Tanks must be open to atmosphere with appropriate sized venting.	7.1.3 Pressure and temperature Components used in rainwater harvesting systems shall be approved for use at the maximum and minimum operating water temperatures and rated for the maximum pressure anticipated within the system. Storage tanks rated for atmospheric pressure only shall not be pressurized or exposed to vacuum. Such tanks shall be open to atmosphere with appropriate sized venting.	
125	7.1.5	SC&D	**7.1.5 Below ground piping**; Recommend setting a minimum horizontal offset distance here, say 10 ft. and a minimum vertical clearance separation, say 2 ft, with the nearest joints being 10 ft away in either direction.		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
126	7.1.5	SC&D	I believe there is a need for an immediately previous paragraph addressing ABOVE GROUND PIPING.	7.1.X Above ground piping Above ground collection and distribution piping shall maintain the separation distances from potable water piping set out in the requirements of the authority having jurisdiction. Above ground collection and distribution piping shall be protected from damage and potential sources of contamination in accordance with the plumbing code. **Exception:** Irrigation piping located outside of a building and downstream of the backflow preventer.	
127	7.1.7.1	Controls	unclear as to how to monitor controls for water quality. does this mean to monitor UV intensity, or chlorine residual or ozone levels? requiring this on smaller systems or even larger systems should be at the discretion of the designer. It is not necessary on every system Recommend striking 7.1.7.1 (d) ~~(d) Minimum treated water quality is within design parameters.~~	~~(d) Minimum treated water quality is within design parameters.~~	
128	7.1.7.3	Controls	I am not sure where the concept of RESETTING would come in, for many automated controls, once the problem has been fixed, then a reset button can be applied. If the problem is not fixed, then the reset button will not function.	7.1.7.3 Bypass, ~~and~~ override and reset Safety controls shall not have provision for bypass or override; however reset mechanisms shall function if the cause of the control failure has been repaired.	
129	7.1.7.3	Controls	needs further clarification What constitutes safety controls? High pressure , low pressure etc. Need clarification or strike all together	needs further review by committee to define safety controls	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
130	7.1.7.5.2	Controls	I would suggest that the order of 7.1.7.5.2 and 71.7.5.3 be reversed, i.e., to address Alerts before Alarms.	switch the order	
131	7.1.7.5.2	Controls	Alarms and Alerts Requirements for Alarms and Alerts seems logical and prudent, but the same is not required of other household systems and seem to be excessive relative to those other appliances and systems. Not a reasonable requirement for most basic systems where a seamless transition from RW to utility water is provided, per descriptions in this standard		
132	7.1.7.5.2	Controls	7.1.7.5.2 is written as if all systems must have alarms to alert the operator or owner that the system is operating outside of the design parameters. Depending on the size and complexity of the system and the intended use of the harvested rainwater, alarms may be unnecessary and increase the cost and complexity of the system without adding corresponding value in terms of risk reduction. This requirement may be a disincentive to those seeking a simple cost effective system that will meet the users needs. Some users may not opt to use RWH systems due to the increased costs of realtime control systems, alarms and alerts. They may also not elect to use these systems if they perceive that there is much more inherent risk than there actually is for this technology. For large scale community potable use systems, I can see how alarms would be useful if the disinfection system is not operating properly and there may be risk of consumption without proper disinfection. The same reasoning may also applied to contact uses where the rainwater may be aerosolized, e.g., fountains and contact recreation applications. There are systems around the world that are very simple, less mechanically oriented that have a sediment filter and perhaps a carbon filter that operate fine without alarms and alerts.	Change this requirement to only require alarms for large potable water systems serving a community of users and other uses where the community at large may be impacted by recreational contact, aerosolized irrigation practices or ingestion of improperly disinfected rainwater. The Water Safety Plan should be used to ascertain and reduce potential risk. Alarms and alerts should not be required for simple residential systems and other systems where there is little risk, e.g., landscape irrigation systems where drip emitters are used or other irrigation systems that do not present an aerosol risk, fire suppression, wash waters, etc. Proposed language change: Alarms shall be provide for community potable water systems, systems used for contract recreation and irrigation systems where there is risk of inhalation of aerosolized water to the community and	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				other potential risk scenarios where the disinfection system must operate properly for the public good.	
133	7.1.7.5.2	Controls	As in a previous comment, need to define what these alarms are. Are they related to high pressure signals, water quality issues, or other? Needs more detail to define the scope of the alarms. Conditions requiring alarms is too open ended. recommend striking it unless more detail provided	~~Alarms shall be provided to indicate that the system is operating outside the design parameters potentially causing a hazard to health and safety or by operating in a manner that could damage the system. Conditions requiring alarms shall automatically disable the rainwater harvesting system to allow for corrective action.~~	
134	7.1.7.5.3	Controls	See comments regarding alarms 7.1.7.5.3. The same comment applies to alerts regarding unnecessary expenses, complexity and the potential to discourage adoption of these technologies due to overly complex system requirements.	See proposed language for alarms 7.1.7.5.3. Mirror the language the committee decides to adopt regarding alarms, i.e., they are only required for community systems.	
135	7.1.7.5.3	Controls	same issue as with previous comment too broad too easily to be interpreted to require more than necessary on simpler systems what kind of alerts visual, audible thru BAS ? Need to clarify or strike	~~Alerts shall be provided to indicate that the system is operating outside design parameters, without causing a hazard to health or safety and without causing damage to the system. Automatic system shutdown shall not be required for conditions requiring alerts.~~	
136	7.1.7.5.4	Controls	clarify requirements for the audible alarm. Can it be silented to acknowledge the alarm if a visual alarm continues. Does the audible alarm need to be a continuous noise or can it be intermittent; does it need to continue to operate for the duration of the alarm or alert conditions if there is no visual alarm..	Use standard wording from other documents regarding alarms and alerts.	
137	7.1.7.5.4	Controls	This section is thinking traditionally, that the alarm or alert is and has to be noticeable at the site of the installation. Modern electronic communications (house alarms, monitoring, etc.) are now moving strongly to remote notification through the internet	An <u>onsite</u> alarm or alert shall .... and add in:	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			and mobile phone networks.	A remote alarm or alert system using electronic communication may be used to advise a responsible person that the system has or is about to fail. In which case, the system shall provide a mechanism for shutting down the rainwater harvesting system.	
138	7.1.7.5.4	Controls	I don't know what a "tactile" alarm is, and I doubt it's of much use. Recommend deletion.	7.1.7.5.4 Alarm and alert devices An alarm or alert shall use bell, horn, speaker, light or text display that provides audible, ~~tactile~~ and/or visible outputs, ~~or any combination thereof~~. Visual alarms shall continue to operate for the duration of the alarm or alert condition. Audible and visual alarms and alerts shall be (a) rated at not less than 85dB at a distance of 3m (10 ft); (b) readily visible at a distance of 10 ft. in light conditions of 1000 lx (102 ft-candles); and (c) provided with a reset switch and test switch.	
139	7.2.1	SW	Clearly define roof runoff and stormwater runoff and possibly collection surfaces in definition section for clarity and brevity. another suggestion would be to do a diagram of what water turns into based on where it lands and what each surface is called when it receives water.	Additional material needed for this section.	
140	7.2.1.1	SW	(Comment, is this for rainwater and stormwater, or only rainwater? If latter, where is stormwater standard for this?)		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
141	7.2.1.1	SC&D	You may want to define "pedestrian access". All roof surfaces will have foot traffic for maintenance purposes.	consider "open to public pedestrian traffic"	
142	7.2.1.1	SC&D	Need to strike two provisions: 1.All commercial roofs are intended to be accessed by maintenance personnel unless pedestrian means non maintenance personnel 2. green roofs runoff is not the same as stormwater runoff. see below strikes	~~and not subject to pedestrian access~~ ~~vegetative roofs,~~	
143	7.2.1.2	SC&D	This seems unenforceable. How would the surface be designed?	7.2.1.2 Protection from contamination Collection surfaces shall be designed to minimize the conveyance of contaminants to the storage tank.	
144	7.2.1.2	SC&D	Does not make sense. The roof will convey whatever is on it during rain events depending on the rainfall intensity. Recommend striking.	~~Collection surfaces shall be designed to minimize the conveyance of contaminants to the storage tank.~~	
145	7.2.1.3	SC&D	Comment, what is meaning of “minimized?” Has no parameter, meaningless.	7.2.1.3 Foliage and vegetation Foliage and vegetation overhanging collection surfaces should ~~shall~~ be minimized.	
146	7.2.1.3	SC&D	recommend adding language below	Foliage and vegetation overhanging collection surfaces shall be minimized where possible.	
147	7.2.1.3	SC&D	gutters underneath foliage and vegetation recommded be covered with lead guards.	provide more guidance.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
148	7.2.1.4	WQ, SC&D	Table 7.2.1.4: Should there not be a notation for cedar roofs being unsuitable for potable purposes?		
149	7.2.1.4	WQ, SC&D	Table 7.2.1.4: Landscaped runoff who collects landscape runoff? Into tanks? Underground tanks? Normally collect from impermeable surfaces. Why include this?		
150	7.2.1.4	WQ, SC&D	Table 7.2.1.4: Subsurface collection Bioswales are surface storage and infiltration not subsurface collection; same for rain garden, generally collects at surface and then infiltrate. Subsurface collection means into a storage tank at surface or below ground. Is this what you mean, into a storage tank, or infiltration pit (subsurface)?		
151	7.2.1.4	WQ, SC&D	Remove treated wood. Upsets bio film and makes for water not suited for irrigation, emergency water or other use.	Remove treated wood	
152	7.2.1.4	WQ, SC&D	Table 7.2.1.4: Subsurface collection “etc is an indication the author has run out of examples and wants to sound like they know more but don’t. Use “e.g.,” as in the cell above. Much more accurate and honest.		
153	7.2.1.4	WQ, SC&D	Note to table “a” for subsurface water no definition of Subsurface Water so mention here but what does it mean; what are the parameters? What is contaminated soil? How defined? Is this related to groundwater contamination? Is subsurface water in a concrete lined channel, part of MS4, storm drains below ground?		
154	7.2.1.4	WQ	See comment below	Due to heavy concentrations of hydrocarbons, and other contaminants such as animal or human urine or feces, etc. collection from pedestrian and parking surfaces should be removed. I doubt there are any jurisdictions that would allow collection from any public access surface.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
155	7.2.1.4	WQ	Vegetated (green) roofs should be utilized for collection for use in potable water systems. From a Texas Water Study, "Effect of Roof Material on Water Quality for Rainwater Harvesting Systems": *Although the rainwater harvested after the first flush from the green roof consistently had the lowest values of TSS, turbidity, nitrite, aluminum, iron, copper, and chromium, it also had the highest values of DOC; if disinfected by chlorination, the high DOC concentrations could lead to high concentrations of disinfection by-products.*	The use of vegetated roofs for collection for potable water cannot be used with chlorine as the systems disinfectant. Another means of disinfection, i.e. UV, Ozone, etc. should be utilized.	
156	7.2.1.4	WQ	Through years and years of scientific evidence and many federal and local laws we have done everything we can to try and remove certain chemicals from human consumption/interaction. Lead is one of those chemicals. We recognize that Table 7.2.1.4 does not allow Lead to be used in collection surfaces for a potable water intended system, but this Lead can make its' way down stream to the point of use and the recommended filtration methods may be inadequate for removing the chemical contamination.	~~Lead~~	
157	7.2.1.4	WQ, SC&D	If collection surfaces are exempt from needing NSF 61 and NSF 372 per 7.1.2 and P151 is optional then how is the collection surface going to be assessed as safe? Different formulations of acceptable collection surface materials from this table may contain added UV inhibitors or biocides/fungicides rendering them not appropriate for potable use.	*Roofing products used within rainwater harvesting systems collecting water for use as drinking water ~~can~~ shall be third-party certified to NSF P151-1995 Health Effects from Rainwater Catchment System Components.*	
158	7.2.1.4	WQ, Irrig.	It is not clear if irrigation water (R1 and 1) can be for community or backyard gardens. If Section 1.2 (iii) excludes the irrigation of food crops from this standard, this needs to be clearer and repeated in Table 6.2.2 and this table. If irrigation includes water for backyard and community gardens, then R1 and 1 should be prohibited with lead roofing material (and possibly copper).	Include a note that re-states food crop is not included in R1 and 1 (if it isn't) or prohibit lead roofing material for these uses (and possible copper).	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
159	7.2.1.4	WQ	Reference to "Parking Surfaces" (table line 5 from the bottom) versus "paved parking" (line 3 from the bottom) seem to be the same condition, but show different end use tiers.	If the concern is surface contamination from parked cars (oil, gas, antifreeze drippings, etc.) I would suggest removal of Parking Surfaces from line 5 from the bottom.	
160	7.2.1.4	WQ, SC&D	Isn't it time to get away from copper and lead as roofing materials at least for collection surfaces? They could corrode under some conditions and contaminate the water.	Delete copper and lead.	
161	7.2.1.4	WQ, SC&D	I suggest the committee reconsider the use of lead roofing materials for irrigation purposes. In fact, lead roofing materials, in my opinion, should not be used for any rainwater harvesting system due to the potential to contaminate soils, vegetation or expose humans to Pb. The committee may also want to think about lead solder used in older metal roofs and its potential to contaminate harvested rainwater. I also suggest that the committee create two irrigation categories. One for landscape irrigation and one for vegetable plants where plant uptake may result in human ingestion of heavy metals such as lead or chromium. Use the precautionary principle due to the paucity of studies on plant uptake associated with rooftop runoff and harvesting. I also question how the relative use categories were determined in Table 7.2.1.4. Why is asphalt allowed to be used for all end uses including R4 and 4 in contrast to the use of harvested runoff from vegetated roofs which are only R1,R2, 1 and 2a? Shouldn't it be treated similarly to other materials such as treated wood, bituminous/tar membranes, etc in terms of use categories? Why is asbestos cement restricted from all end uses? I think that it poses little risk from an ingestion perspective and even in aerosolized form due to the short fibers typically used in the past. I further question why vegetated roofs are categorized along	Revisit Table 7.2.1.4 and make the end use designations consistent and based on relative risk where adequate scientific evidence exists to appropriate assign the relative end use designations. Eliminate lead as a collection surface suitable for rainwater harvesting consistent with 7.2.1.5 lead paints and coatings. Eliminate R4 and 3 as end uses for asphalt. Reconcile the inconsistency between pedestrian and parking surfaces and streets, Freeway, shoulder areas and paved parking. Suggest that paved parking be dropped from the streets, Freeway, shoulder area list. Subsurface collection - Make foundation drains a separate category with R1, R2, 1, 2a, and 2b end uses. Take bioswales and raingardens and put them in a new category with vegetated roofs and give them R1, R2, R3, R4, 1, 2a, 2b, 3 and 4 end use designations.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			with ground level surfaces and pedestrian accessible roofs. How was relative risk determined for the entries in Table 7.2.1.4? What data were used to assigned the use tiers? Subsurface collection: What is the rationale to treat raingardens, onsite bioswales and foundations drains equally in terms of their end use tiers. From what I know about raingardens and biorention systems and vegetated roofs, most metals and particulates and hydrocarbons are filtered out by the soil matrix. Only soluble pollutants are generally of concern. Why does public pedestrian access roof have a 2b designation that is inconsistent with the end uses for vegetated roofs? Please also explain why pedestrian and parking surfaces have R1, R2, 1 and 2a end uses in contrast to paved parking with none and surface waters and stormwater detention ponds with none. How was relative risk determined?	Reconsider treated wood designations due to potential for CCA wood to contaminate soils that are irrigated from such collection surfaces. Develop two irrigation categories 1) landscape and 2) vegetables. Prohibit collection of runoff from any surface intended to be discharged to a vegetable garden than may contain lead, chromium, copper or other pollutants that may be taken up by the plants and ultimately ingested by humans from lead and treated wood collection surfaces. Revisit and rewrite the table starting with public pedestrian roof. Combine and eliminate categories based on risk rather than making If certain collection surfaces are not permitted to be used for RWH they should all be put into one category? Provide rationale/footnote explaining why surface waters and stormwater retention ponds are not acceptable collection surfaces.	
162	7.2.1.4	WQ	add to the end of a: Subsurface water shall not be collected from sites which contain contaminated soils... see below	Subsurface water shall not be collected from sites which contain contaminated soils <u>unless water collected is treated to address the constituent contaminants</u>	
163	7.2.1.5	WQ, SC&D	The statement, 'third-party certified for drinking water contact' does not give appropriate direction to manufacturers, AHJs, or third-party certification agencies. Please include the appropriate drinking water standard in this requirement.	Lead, chromium or zinc-based paints and coatings are not permitted on rainwater collection surfaces used for collection of rainwater for potable applications. Paints or coatings applied to collection surfaces used for potable applications shall be third-party certified for drinking water contact <u>per NSF 61</u>, and shall be installed in accordance with	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				manufacturer's installation instructions.	
164	7.2.1.5	WQ, SC&D	Confirm status of backyard and vegetable garden irrigation. If irrigation water includes this use, lead paints and coatings should be excluded for those uses as well.	Make it clearer irrigaton of food crops (including backyard and community gardens) is excluded from this standard in Section 1.2 and Table 6.2.2 and/or indicate that irrigation is restricted to landscape watering	
165	7.2.1.5	WQ, SC&D	Why are lead and chromium paints and coatings only not permitted for potable uses? Should they not be prohibited for all uses. If they are allowed to be used then they can be dispersed through the RWH and use process which is contrary to good pollution prevention.	Do not allow the use of lead or chromium based paints on rainwater collection surfaces.for all uses. Change the wording to: "Lead and chromium based paints and coatings are not permitted on rainwater collection surfaces used for the collection of rainwater. Paints and coatings applied to collections surfaces used for potable applications shall be third-party..." I am not as concerned with Zn except where there are receiving waters that have aquatic life that is sensitive to Zn. In such watersheds, the use of Zn coatings should be discouraged or prohibited unless there is little risk of it reaching receiving waters. The committee also may want to consider including some language regarding the use of other potential contaminants in paints and coatings that may negatively affect the users. For example, endocrine disruptors such as BPA.	
166	7.2.1.4	WQ	Add: Systems that also collect air conditioning condensate shall be properly treated, disinfected to account for legionella and other		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			airborne microbes. Air conditioning condensate concentrates air borne bacteria such as legionella and the like.		
167	7.2.1.6	WQ	clear water waste could potentially be mineral laden therefore language should read see below"	(b) Clear water waste is discharged and the collection surface supplies rainwater harvesting systems utilized exclusively for R1, R2, 1, or 2a applications unless water quality is deemed to be detrimental to equipment being served by rainwater system i.e.cooling towers	
168	7.2.2.3	SW	**7.2.2.3 Stormwater management;** the stormwater requirement may be less stringent then the requirements for rainwater harvesting (i.e., materials). Use the most stringent requirement.		
169	7.2.2.9	SC&D	most commercial metal buildings have gutters that are designed to be run level and exception needs to be made for this type of gutter	Gutters and collection piping using gravity to produce flow shall have a slope along their entire length, and shall not permit the collection or pooling of water at any point. Siphonic roof drain systems shall not be required to be sloped and shall be installed in accordance with Section 7.2.2.12. Commercial metal exterior gutter types are exempt from this requirement.	
170	7.2.2.10.2	SC&D	**7.2.2.10.2 Conveyance inlet sizing**; should comply with the plumbing code or authority having jurisdiction whichever is more stringent.		
171	7.2.2.11	General	... of the jurisdiction... should use the standard phrase of the authority having jurisdiction.	... of the authority having jurisdiction... (It would be worth doing a search and replace to check all uses of the phrase.)	
172	7.2.2.14.2	SC&D	Canales used twice	Should be canals	changed

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
173	7.2.2.14.2	SC&D	correct typo in header and second sentence:	Canales to Canals	changed
174	7.2.2.14.2	SC&D	Canals or Canales?	Both words are used. I am unfamiliar with CANALES so I would consider this a potential miss-spelling.	changed
175	7.2.2.14.2	SC&D	I suspect "Canales" is a repeated typo for canals……	7.2.2.14.2 Canal~~e~~s and catch basins Where canals are used with elevated collection surfaces, they shall be designed to permit the free fall of water to a catch basin without obstructions in the path of travel. Canal~~e~~s and catch basins shall be designed to prevent water from splashing the exterior of the structure. Catch basins used in conjunction with canals shall comply with Section 7.2.2.	changed
176	7.2.2.14.3	SC&D	Add: . . . and shall comply with the appropriate conveyance material requirements . . .		
177	7.2.2.14.3	SC&D	"Rain chains" - should these really be in a standard? Also, some portions of the structure are going to get wet and are constructed to resist rainwater - is this enforceable?	7.2.2.14.3 Rain chains Rain chains used to convey water ~~from elevated collection surfaces~~ shall be designed and sized to convey ~~captured~~ water ~~to a lower receptacle~~ without splashing ~~the exterior of the structure~~ areas suseptable to water damage. Receptacles used in conjunction with rain chains shall comply with Section 7.2.2.	
178	7.2.2.15.1	SC&D	The sentence "Collection materials shall comply with the requirements of the authority having jurisdiction." is out of place in a section on conveyance. Regardless this standard should	Delete the sentence "Collection materials shall comply with the requirements of the authority having jurisdiction.".	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			provide guidance as to what collection materials are acceptable rather than deferring to the AHJ (who may be looking to this standard for guidance).		
179	7.2.2.15.1	SC&D	It's possible to use pressure piping – or need it for potable collection, or for pressurized distribution of rainwater. Most "drainage" piping isn't rated to NSF 14 for potable uses, nor rated for pressure applications. There's a place for pressure piping in rainwater harvesting.	7.2.2.15.1 General Rainwater harvesting systems shall utilize drainage or pressure piping approved for use within plumbing drainage systems to convey captured rainwater. Collection materials shall comply with the requirements of the authority having jurisdiction.	
180	7.2.2.15.2	SC&D	**7.2.2.15.2 Design and installation of conveyance piping;** sized and installed in accordance with the manufactures recommendation or the authority having jurisdiction whichever is more stringent.		
181	7.2.2.15.2	SC&D	Deferring to the AHJ is not particularly helpful. The system should be designed and installed in conformance with good practice, which could then be listed (such as relevant standards or design handbooks).	Collection piping conveying captured rainwater shall be designed, sized and installed in accordance with good practice such as <list relevant documents>. The size of a drainage pipe shall not be reduced in the direction of flow.	
182	7.2.3.1	Tanks	7.2.3.1 “Tanks shall comply with applicable code requirements, including but not limited to fire, wind, seismic and lightning protection. “	Add buoyancy	
183	7.2.3.1	Staff	Table 7.3 Table number not consistent with preceding tables	Table 7.2.3.1	
184	7.2.3.1	Tanks	There is no mention of ASTM standard D1998-15, “Standard Specification for Polyethylene Upright Storage Tanks”. ARM (Association of Rotational Molders)	TABLE 7.3	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			recommends adding the standard to Table 7.3, Rainwater Tanks. The standard scope is, “1.1 This specification covers flat-bottom, upright, cylindrical tanks molded in one-piece seamless construction by rotational molding. The tanks are molded from polyethylene for above ground, vertical installation and are capable of containing aggressive chemicals at atmospheric pressure. Included are requirements for materials, properties, design, construction, dimensions, tolerances, workmanship and appearance. Tank capacities are from 1900 L (500 gal) up.”	Rainwater Tanks Designation Title ASTM D1998 Standard Specification for Polyethylene Upright Storage Tanks *Remainder of table unchanged*	
185	7.2.3.1	Tanks	UL 58, UL 142, UL 1316, ULCS 601, ULCS 603 standards are all referenced in this draft standard under Table 7.3, Rainwater Tanks. These are all standards for tanks for the storage of flammable and combustible liquids. For example, the scope of ULCS 603 is specific to flammable liquids. *Except as described in Clause 1.7, these minimum requirements cover single and double wall cylindrical steel, non-pressure tanks of the horizontal type that are used for the underground storage of flammable liquids and combustible liquids, that are compatible with the material of construction.* These standards do not appear suitable for water storage. We recommend deletion until they are re-scoped for rainwater, which can be aggressively corrosive to metals.	TABLE 7.3 Rainwater Tanks Designation Title ~~UL 58~~ ~~Standard for Steel Underground Tanks for Flammable and Combustible Liquids~~ ~~UL 142~~ ~~Steel Aboveground Tanks for Flammable and Combustible Liquids~~ ~~UL 1316~~ ~~Glass-Fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures~~ ~~ULC S601~~	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				~~Shop Fabricated Steel Aboveground Tanks For Flammable and Combustible Liquids~~ ~~ULC S603~~ ~~Standard for Steel Underground Tanks for Flammable and Combustible Liquids~~ *Remainder of table unchanged*	
186	7.2.3.2	Sizing	**7.2.3.2 Sizing;** recommend providing a minimum requirement and then adding or with the requirements of the authority having jurisdiction whichever is more stringent. The stormwater requirement may be less than the water needed to run the rainwater harvesting system. They should utilize the maximum amount of water available to meet as much of the demand as possible and then be required to provide make-up water to meet the remainder of the demand. At this point meeting or not meeting the stormwater requirement is incidental and needs to be calculated separately.		
187	7.2.3.2	Sizing	Reword: …shall be sized in accordance with the design criteria or where required, by the requirements of the authority…		
188	7.2.3.2	Sizing	Deferring to the AHJ is not helpful. The AHJ may want to refer to this standard for guidance when approving a design and find a sort of circular reference.	The minimum holding capacity of the rainwater storage tank shall be designed in accordance with good practice such as <list relevant documents>, taking into consideration output water demand, dedicated fire reserve storage volume, stormwater management storage or detention volume and storage loss factors.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
189	7.2.3.3.3	Tanks	Revise: …subject to ultraviolet (UV) light shall be opaque and shall be constructed from a material designed to be stable…		
190	7.2.3.3.3	Tanks	The use of the words UV light in this section makes it sound like UV disinfection when I believe it is referring to direct sunlight. The words "direct sunlight" are used in Section 7.2.3.5.2 and should also be used here for clarity.	In line 3, change "subject to ultraviolet (UV) light" to "subject to direct sunlight".	
191	7.2.3.4.1	Tanks	... Support and restraint shall be in accordance with the building code, the manufacturer's installation instructions and any applicable standards related to the end use. There is a need to condition the requirement of conforming to the building code, etc.	... Support and restraint shall otherwise be in accordance with the building code, the manufacturer's installation instructions and any applicable standards related to the end use. Possibly this amendment is needed in other texts where the relationship between this Standard and other codes, etc. is discussed.	
192	7.2.3.4.2	Tanks	I see buoyancy is covered here. It may be appropriate to mention if more prominently in table of contents and lists of environmental factors as suggested earlier.		
193	7.2.3.4.2	Staff	There is some wording missing in this section as it doesn't make sense.	Add missing text.	
194	7.2.3.4.2	Tanks	There is a grammatical problem in the structure of this Section. Tanks shall be ballasted or otherwise secured to prevent the tank from floating or moving and shall be designed to withstand structural stresses caused by hydrostatic pressure and buoyancy. Where: high ground water	Tanks shall be ballasted or otherwise secured to prevent the tank from floating or moving and shall be designed to withstand structural stresses caused by hydrostatic pressure and buoyancy~~. Where:~~ where high ground water conditions or risk of flooding exist at the location ~~and elevation~~ where the tank is to be installed.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			conditions or risk of flooding at the location and elevation where the tank is to be installed.		
195	7.2.3.4.3	Tanks	**7.2.3.4.3 Underground structural support;** you may want to refer to ASCE 7 which may cover a lot of the structural considerations for you. I believe that is what is called out in the IBC.		
196	7.2.3.4.3.2	Tanks	**7.2.3.4.3.2 Surface loads;** what are the applicable codes and standards. Are you referring to the State Highway Standards where the project is located?		
197	7.2.3.5.1	SC&D, Tanks	Would it not be better to say tanks shall not be installed **over** onsite sewage disposal systems?		
198	7.2.3.5.2	Tanks	Section 7.2.3.5.2 indicates that water contained in storage tanks shall be protected from direct sunlight by either opaque, UV resistant materials or installation in locations not subject to direct sunlight. Tanks manufactured today are made with UV resistant materials and pigmented to restrict the growth of algae in the tanks, or could be painted to accomplish the same outcome.	7.2.3.5.2 Protection of water from direct sunlight <u>To limit algae growth,</u> water contained within storage tanks shall be protected from direct sunlight by any of the following: (a) Opaque<u>, painted, or pigmented,</u> UV-resistant materials; or (b) <u>Tank</u> installation in locations not subject to direct sunlight.	
199	7.2.3.6.1	Tanks	Section 7.2.3.6.1 and 2 discusses openings and manholes. It should be noted that many tanks are provided with openings that are not intended for human access and are smaller than 20” diameter. This is perfectly suitable in most applications for access and cleaning. A lot of tank openings have a 15” diameter and people do use it for access. We recommend consider	**7.2.3.6.1 General** Access openings shall be located to facilitate the pumping and cleaning of tanks and the servicing and inspection of inlets and outlets. At least one access opening shall be provided to allow inspection and cleaning of the interior of each tank<u>, and be a minimum</u>	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			changing the minimum diameter down to 15”.	of 15” in diameter. Access openings shall be secured to prevent unauthorized access. All openings shall be constructed to be watertight and weatherproof, prevent vermin and insects, and prevent entry of foreign materials and substances.	
200	7.2.3.6.2	Tanks	There should be a notation that manhole entrances are classified as restricted spaces and require applicable work practices as per local safety regulations		
201	7.2.3.6.2	Staff	First sentence uses imperial measurement only. I've noticed this in other parts of the document. In my opinion, a document should exclusively use SI measurements, or SI with (Imperial in brackets)	Openings intended for human access shall have a minimum dimension of *510 mm (*20 inches*)* and a minimum area of at least 0.20 m^2 (314 in^2). Manholes shall extend a minimum of ~~4 inches~~ *102 mm* (~~102 mm~~ *4 inches*) above ground or shall be designed to prevent water infiltration.	
202	7.2.3.6.2	Tanks	Is the term Manhole considered acceptable?	7.2.3.6.2 ~~Manholes~~ Entries Openings intended for human access shall have a minimum dimension of 20 inches and a minimum area of at least 0.20 m^2 (314 in^2). ~~Manholes~~ Entries shall extend a minimum of 4 inches (102 mm) above ground or shall be designed to prevent water infiltration. Finished grade shall be sloped away from the manhole to divert surface water. ~~Manhole~~ Entry covers shall be secured to prevent unauthorized access.	
203	7.2.3.6.2	Staff	Units: this section currently reads: dimension of 20 inches and a minimum area of at least 0.20 m^2 (314 in^2). Manholes shall extend a minimum of 4 inches (102 mm) above ... Both metric and non metric dimensions should be shown.	Establish the protocol to be followed and do so throughout the document.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			There should be a standard approach (metric followed by non-metric in parentheses) or the reverse. Is the standard going to use hard or soft conversions between them. I have never seen 4 inches being converted to 102 mm!		
204	7.2.3.6.2	Tanks	Section 7.2.3.6.1 and 2 discusses openings and manholes. It should be noted that many tanks are provided with openings that are not intended for human access and are smaller than 20" diameter. This is perfectly suitable in most applications for access and cleaning. A lot of tank openings have a 15" diameter and people do use it for access. We recommend consider changing the minimum diameter down to 15".	Where installed, openings intended for human access shall have a minimum dimension of 20 inches and a minimum area of at least 0.20 m^2 (314 in^2). Manholes shall extend a minimum of 4 inches (102 mm) above ground or shall be designed to prevent water infiltration. Finished grade shall be sloped away from the manhole to divert surface water. Manhole covers shall be secured to prevent unauthorized access.	
205	7.2.3.6.3	Tanks	Issue about the use of the word Manhole. Covers shall be installed over service ports and manholes. Penetrations for wiring or piping shall not be installed on covers.	Covers shall be installed over service ports and ~~manholes~~ access entries. Penetrations for wiring or piping shall not be installed on covers.	
206	7.2.3.7.1	General	the secondary source should be referred to as a secondary back-up source. The back up source should not be used in lieu of correctly sizing the system for the intended use. For example, if the intended use is for supplemental irrigation and it is sized to meet supplemental irrigation only during times of normal rainfall and temperatures, the secondary source isnt considered a back up, its considered, incorrectly, as part of the supply.	Change secondary source to secondary back-up source.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
207	7.2.3.7.1	Staff	cross referencing ... shall comply with Sections 7.2.3.7.1 through 7.2.3.7.6. states compliance with this section, where as it should cross reference the following sections.	... shall comply with Sections 7.2.3.7.~~1~~ 2 through 7.2.3.7.6.	
208	7.2.3.7.5	SC&D, Sizing	For clarity would suggest you change the text to read "Where a secondary supply is utilized to provide makeup water to the rainwater harvesting system, minimum water levels shall be maintained. "	See above wording.	
209	7.2.3.7.5	SC&D, Sizing	Overly prescriptive. The amount of flow into the tank may not necessarily need to be the same as the flow out of the system. This is a decision of the designer. Recommend striking this provision. No alarm necessary unless deemed necessary by the designer.	Where makeup water is utilized, it shall be provided to rainwater harvesting systems to maintain minimum water levels within the storage tank. Makeup water supply systems shall use automatic level control valves to maintain the minimum water level in the tank for uninterrupted operation. The automatic level controls shall limit the makeup water level below the tank overflow. ~~Makeup water shall be supplied at a flow rate no less than the maximum demand of the end use. For tanks using a makeup water system, an alarm shall be activated in accordance with Section 7.1.7.5 in the event that the water level drops below the minimum operating level in the storage tank.~~	
210	7.2.3.7.6	SC&D, Sizing	**7.2.3.7.6 Bypass water systems**; if I understand this correctly, the bypass water would be used to reduce water consumption in a nearby adjacent facility. I don't understand why it would need to be designed to meet the maximum anticipated demand of the end use. Couldn't it provide a portion the maximum anticipated demand of the end use?		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
211	7.2.3.7.6	SC&D, Sizing	Potable and non- potable bypass systems, swing connections or any other interconnections are not allowed in the plumbing code	Reword to clarify	
212	7.2.3.7.6	SC&D, Sizing	Currently in Alberta it is not permissible to have a bypass connection between the potable water supply and the rain/storm water harvesting system. Mechanical backflow devices can fail so Blu-Gold suggests that bypass connections not be allowed.	There already is a storage tank and pump in any harvesting system so Blu-Gold suggests that any kind of makeup system using potable water should feed water into the storage tank via an air gap. The system pump can then deliver the water as needed. This arrangement would remove the mechanical backflow device, a possible point of failure, from the system making the system simpler and removing virtually any possibility of cross connection between the potable and non-potable systems.	
213	7.2.3.8	SC&D, Sizing	Table 7.2.3.8 I don't see the need for Table 7.2.3.8 if the overflow capacity exceeds the inlet capacity.		
214	7.2.3.8.3	SC&D, Sizing	add: …and account for the volume and flow rate capacity of the overflow…		
215	7.2.3.8.3	SC&D	For interior tanks the overflow should discharge to the exterior of a building or to a storm drain to avoid surcharge of a sanitary system.	Interior tank overflows shall discharge to a storm collection system or to a safe location to the building exterior.	
216	7.2.3.8.4	Staff	Make this provision positive and direct. Shutoff valves shall be prohibited to be installed in tank overflow piping.	Shutoff valves shall <u>not</u> be ~~prohibited to be~~ installed in tank overflow piping.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
217	7.2.3.8.5	Staff	Need to pluralize the first word: Cleanout shall be provided on each tank overflow pipe in accordance with the plumbing code.	Cleanouts shall be provided on each tank overflow pipe in accordance with the plumbing code.	
218	7.2.3.8.6	SC&D	Tank overflows should never be directly connected to storm or sanitary	Reword to include air break requirement for overflow drain	
219	7.2.3.9.3	Staff	**7.2.3.9.3 Rainwateroutlets**	**7.2.3.9.3 Rainwater outlets**	Changed
220	7.2.3.9.3	Staff	Rainwater outlets - two words.	7.2.3.9.3 Rainwater outlets	Changed
221	7.2.3.12	Tanks	In the case of potable services some jurisdictions use the term EXCLUDED CONFINED SPACE or RESTRICTED SPACE or non-permitted confined space, rather than confined space. See attachments		
222	7.2.3.12	General	There is a need to address the use of other languages. Will French and Spanish wordings be specified, and if so how and where?	Insert additional language options.	
223	7.2.3.12	Tank	Tank Marking and signage, 7.2.3.12 & 7.3.1.1 should be clarified so that any exposed signage or markings is UV resistant to avoid fading or deterioration. Warnings can fade and become illegible and fail to stop a person from drinking or otherwise incorrectly applying the non-potable water for human consumption.	**7.2.3.12 Tank marking and signage** Each water storage tank shall be labeled with its rated capacity. Where the tank contains non-potable water, the contents 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 the exterior tank wall or on a tag or sign	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				constructed of corrosion- and fade-resistant waterproof material that is mounted on the tank in a visible location. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and shall be of a color in contrast with the background on which they are applied. At each entry point, a warning sign indicating the need for procedures for safe entry into confined spaces shall be posted. Entry points shall be secured against unauthorized entry and vandalism.	
224	7.2.4.1	Staff	There are two Clause 7.2.4.1s	Renumber clauses and sub-clauses as necessary. In conjunction with this, reorganize the clauses under Disinfection Systems.	
225	7.2.4.1	SC&D	revise last sentence of 7.2.4.1 Filtration systems ….Filters shall be installed with shutoff valves installed immediately upstream and downstream to allow for isolation during maintenance as per multi barrier approach.		
226	7.2.4.1	SC&D	Add new clause for Membrane filtration systems	Include topics such as microfiltraion, ultrfiltration, nanofiltration, and reverse osmosis. Also include use of pre- and post-filters (i.e.: 5 micron, and activated carbon filters).	
227	7.2.4.2	WQ	**7.2.4.2 Disinfection systems**; Do these requirements apply to both potable and non-potable uses? Potable uses would need to comply with the Safe Drinking Water Act (SDWA).		
228	7.2.4.2	SC&D, WQ	Ozone Treatment Should be added.	"Ozone systems used for disinfection should comply with requirements of NSF 222. The ozone system should be controlled using an	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				ORP monitor/controller to maintain water ORP in the safe region for the end use application." ORP is relatively easy to apply and is widely used, although not the best method. Values for cooling towers and drinking water have been established and these application mirror some of the applications discussed in the tables.	
229	7.2.4.2.1	SC&D, WQ	In the draft standard that was forwarded to me by Paul Gulletson, there is a section 7.2.4.2.1.1 (UV Disinfection system sizing) that is not included in the public consultation version. It states that "UV disinfection systems shall be sized based upon the design flow and minimum UVT required for disinfection specified for the end uses." This is very important and must be included in the document.	Re-instate the above missing text.	
230	7.2.4.2.1	WQ	Reference should be given to NSF/ANSI 55 Ultraviolet Microbiological Water Treatment Systems at least for potable water end uses.	Where Rainwater harvesting systems utilize UV disinfection systems to treat water for distribution, disinfection shall occur downstream of the storage tank and prior to the point of end use. Where the end use is potable water, then the disinfection system should be certified to NSF/ANSI 55 Ultraviolet Microbiological Water Treatment Systems.	
231	7.2.4.3	SC&D, WQ	Add section 7.2.4.3.4 Ozone Disinfection systems	Add section 7.2.4.3.4 Ozone Disinfection systems	
232	7.2.4.3	Staff	There is no section 7.4... I assume that this is anticipated in the future, but the basic titles of these sections should be included.	Add section 7.4...	
233	7.2.4.3	SC&D, WQ	In the US, ozone is specifically called out for some rainwater applications.	Add a section for ozone similar to the one for Chlorine.	
234	7.2.4.3.3	Staff	I believe the sections referenced in the last sentence are incorrect.	in the last line, change to "Sections 7.2.4.3.1 through 7.2.4.3.3".	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
235	7.2.4.3.4	Staff	Move this section under "7.2.4.1 Filtration systems" and rename to 7.2.4.1.1.	Move this section under "7.2.4.1 Filtration systems" and rename to 7.2.4.1.1.	
236	7.2.4.3.4	Staff	Why is this section included under the Chemical disinfection systems section (7.2.4.3)? Shouldn't it be part of Section 7.2.4.1?	Move text out of chemical disinfection section and make it's own section or put with Section 7.2.4.1.	
237	7.2.4.3.4	SC&D, WQ	Reference could be given here to NSF / ANSI 58 - Reverse Osmosis Drinking Water Treatment Systems, at least for potable water end use.	Where rainwater harvesting systems utilize microfiltration or ultrafiltration to meet the performance criteria set out in Section 8, it shall be installed between the storage tank and the point of end use. Where the end use is for potable water, the devices shall be certified to NSF/ANSI 58 - Reverse Osmosis Drinking Water Treatment Systems. Microfiltration and	
238	7.2.5	SC&D	Does this section apply from treatment to end use (i.e. definition of distribution) or from source to end use (i.e. definition of water distribution)? Also, please confirm that the plumbing code has suitable wording for non-potable markings.	Please make the definition consistent with "distribution system" or make the title of this section "distribution" and add more specific wording for non-potable markings (don't think the plumbing code is specific enough).	
239	7.2.5	SC&D, Irrig.	Grammatical need.	Non-potable piping in rainwater harvesting systems shall be identified and marked in accordance with the plumbing code. **Exception:** Distribution piping serving irrigation systems at the point of irrigation.	
240	7.2.5	SC&D, Irrig.	Irrigation system components such as pipe, valve box lids, control valves and quick coupler valves are available with lavender/purple coloured striping lids etc to signify non-potable is in use.	Blu-Gold suggests that labels and tags be mandatory in all irrigation systems.	
241	7.2.5.1	SC&D, Irrig.	For some irrigation systems that will be using large sprinklers, 80 psi will be in adequate. An exception needs to be made for irrigation systems that the pumping pressure needs to meet manufacturer's requirements.	**Exception:** Irrigation systems shall have sufficient pressure to meet the manufacturer requirements for proper operation.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
242	7.2.5.2	SC&D, Irrig.	Irrigation system components such as pipe, valve box lids, control valves and quick coupler valves are available with lavender/purple coloured striping lids etc to signify non-potable is in use.	Blu-Gold suggests that labels and tags be mandatory in all irrigation systems.	
243	7.2.5.2.2	Staff	There is no section 6.1.5.2.	Change "Section 6.1.5.2" to "Section 7.2.5".	
244	7.3	SW	Table 7.3 Why isn't there a comparable one for Stormwater Storage Tanks?		
245	7.3.1.1	WQ, Irrig	what about signage for irrigation uses. Common for people to be exposed or recreate in sprinklers used for irrigation. Signs are needed for those types of contact as well to ensure children do not drink sprinkler water.	Add signage to address irrigation contact.	
246	7.3.1.1	SC&D	Add wording that signage be tamper-proof (i.e. the only person that should be able to remove it is the owner of the facility).	Add and "shall be tamper-proof".	
247	7.3.1.1	General	Other languages need to be identified.	Insert other languages.	
248	7.3.1.1	General	Tank Marking and signage, 7.2.3.12 & 7.3.1.1 should be clarified so that any exposed signage or markings is UV resistant to avoid fading or deterioration. Warnings can fade and become illegible and fail to stop a person from drinking or otherwise incorrectly applying the non-potable water for human consumption.	**7.3.1.1 Non-potable water outlets** Non-potable water outlets, such as hose bibbs, open ended pipes and faucets shall be identified at the point of use for each outlet in accordance with the requirements of the plumbing code. Where no such requirements exist, they shall be identified with signage that reads as follows: "Non-potable water is utilized for [application name]. CAUTION: NONPOTABLE WATER – DO NOT DRINK." The words shall be legibly and indelibly printed on a tag or sign constructed of corrosion and fade--resistant waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inch (12.7	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				mm) in height and in colors in contrast to the background on which they are applied. In addition to the required wordage, the pictograph shown in Figure 7.3.1.1 shall appear on the required signage.	
249	8	WQ	pH at 7.0 as a minimum performance criteria (pg. 43); water stored between 25 and 55-degrees Celsius should ot be used for tiers 2-4" ([g 42) and "cleaning of collection surfaces, conveyance piping, equipment and storage tanks" (pg. 49).	After operating four rwh systems for more than three years, each for a different use (potable and nonpotable) and all four with a different system component profile we have found no support for any of the standards described above. I'm sure that in some circumstances they would apply but those circumstances and the independent lab test results that supported the need would have to be part of a realistic and useful standard.	
250	8.1.1	WQ	**8.1.1 Minimum performance criteria;** should to include compliance with the SDWA.		
251	8.1.1	General	“Rainwater harvesting system”, wrong term as tables not labelled this way. Or change tables to be consistent with the document language. Not mentioned in the tables.		
252	8.1.1	WQ	It would be helpful either through the format of the tables or in the accompanying text to indicate that both filtration and disinfection are to be applied when UV or Chlorine is chosen.	Edit for clarity.	
253	8.1.2	SC&D	Sections of the proposed code dealing with "public health and safety" of installed and operating rwh systems	Installation of backflow prevention devices at the public water meter or at the pressure tank if a private well should be a requirement to protect public water supplies (PWS) or groundwater aquifers. This is ***the single most significant issue*** on the minds of regulators, legislators and many advocates currently “pushing back"	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				against expanded use and promotion of rwh systems in Texas, in my experience. And from what I have seen "in the field" as a commercial installer of these systems, there is some basis for concern - concern that could be largely overcome with effective requirements (and enforcement) to install backflow prevention devices.	
254	8.1.2	WQ	Makes no sense. What if the two end uses are for say sub surface and cooling tower make up? It is not necessary for the subsurface water to be treated to the same quality as the cooling tower water. Recommend striking the entire provision.	~~Where multiple end uses are supplied from a single treatment system, the most restrictive performance criteria shall be met for each end use.~~	
255	8.1.4	WQ, SC&D, Tanks	**8.1.4 Water storage temperatures** Heated water should require water temperatures to be maintained at or above 140 degrees F. What are the water temperature monitors for? Will they log temperature data? Will they be monitored from a remote location? It would be more conservative to just require the chlorine residual to be maintained. Suggest moving definitions and abbreviations to the back of the document. Maybe in an appendix.		
256	8.1.4	WQ, SC&D, Tanks	the requirement appears to require constant disinfectant above certain temps, but it doesn't say that.	At the end of the first sentence after maintained add "during the entire storage period."	
257	8.1.4	WQ, SC&D, Tanks	need to remove the provision about the temp probe or put in the below language. Underground tanks will not have temps of above 77 degrees. All the more reason to have above ground irrigation taken out of tier 1.	Where water is supplied to multi-residential or commercial facilities for tier 2, 3 or 4 applications, the system shall be equipped with water temperature monitors unless the tanks are located underground	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
258	8.1.4	General	How should water that has been stored outside of the acceptable range be disposed of?	Please clarify.	
259	8.1.5	WQ	Re: multi-barrier approach, should not all potable systems require a multi-barrier approach?		
260	8.1.5	WQ	b. Due to complexity of operation and design ... chlorine based disinfection is not recommended.	I am not sure this statement is accurate? Can we define complex or operation and design? Then what about Ozone? Giardia, Virus, etc? If chlorine is too complete to operate I don't see how UV or Ozone could be considered? Ozone is widely used for stormwater runoff.	
261	8.1.5	WQ	I have no idea what note 2 means.	Make note 2 understandable.	
262	8.1.5	WQ, Irrig.	Blu-Gold is concerned that no post storage treatment is being considered for irrigation system water usage especially if the water is to be distributed using above surface methods. Blu-Gold is not saying that all water should be treated but that water should be tested in the storage vessel to determine if filtration and treatment may be needed.	Water in the storage vessel is to be tested and based on the results of the tests a course of filtration and treatment is to be designed and implemented if the water test results indicate that filtration and treatment are required.	
263	8.1.5	WQ, Irrig.	again above ground irrigation should be moved to tier 3 not tier 1. Potential for human exposure is high with above ground spray type irrigation systems table should state a max chlorine dose as well as a min range of (.5mg/l - 2.5mg/l for example) add language belo	e: Due to potential for growth of opportunistic pathogens in plumbing systems (e.g., Legionella, Pseudomonas aeruginosa, Mycobacterium avian complex), a minimum 0.5 mg/L chlorine residual shall be maintained as well as a max of - 2.5mg/l	
264	8.2.1	WQ	This section should cover single-family residential as well as commercial and multi-family.	Change line to say "specified in Tables 8(1), 8(2), 8(3) or 8(4) (depending on the source and application), ..."	
265	8.2.2	WQ	Single family residential should have some minimal monitoring similar to what is recommended for private wells (i.e. every six	Add microbial monitoring every six months for single family residential.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			months do microbial monitoring).		
266	8(1) and 8(3) tables	Staff	Tables 8(1) and 8(3) should say Rainwater treatment requirements.		
267	8(2) and 8(4) Tables	General, SW	Table 8(2) 8(4) say Stormwater but not in 8.1.1. 8.1 and 8.3 say Roof runoff water, but should say Rainwater. The key terms are Rainwater and Stormwater if properly defined, and to be consistent. Saying Roof runoff and Stormwater is not consistent. Rainwater is no different from Stormwater when it lands on any surface. It is rain hitting the ground. As discussed in previous sections.		
268	8(4) Table	WQ	Table 8(2), 8(4), R4 row, Mini criteria and requirements: Why Not Permitted? This row is filled in for Table 8(1) and 8(3) for potable use. Why not for Stormwater? Stormwater can be treated to potable levels. If someone or some govt agency wants to do this and installs the proper treatment systems to meet the safe drinking water standards, why should they be denied? Your document is or should be all inclusive. Why can't stormwater be used for potable uses if treated to meet the national standards?		
269	8(3) Table	WQ	Table 8(3): tier 2a: these cells seem to be the same as for stormwater 8(4) tier 2a, but the numbers above the percentage different, why? If treating to the same end uses, why are there some slight differences in the criteria? Treating to same end use standards. Same comment for tier 3		
270	8(5) Table	WQ	Tier 4: the statement you have here should be in the previous tables for Potable use. Be consistent.		
271	8(6) Table	WQ	(versus table 8(5)): Why are there different end use standards for the same pollutant and end uses between roof rainwater v. stormwater? If same end use for whichever influent water source, should not matter what the influent water as it will be treated to 1 water quality standard for each pollutant. Seems confusing to have different water quality standards for the same		

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			end use.		
272	8.2.5	WQ	Table 8(5) We are making the assumption that the AHJ has their own standards and guidelines on drinking water. If they do not we should give them some direction of where to look to help ensure that they are receiving guidance on drinking water standards/guidelines.	Refer to drinking water standards and guidelines applicable from the authority having jurisdiction or see current USEPA or Health Canada regulations for safe drinking water criteria.	
273	8.2.5	WQ	These tables infer that they only apply to commercial and multi-family since there is no R1, R2, R3, R4 uses listed. Also, turbidity can interfere with chlorination so the maximu of 5 NTU is probably too high. This needs more analysis. Lastly, in Table 8(6), need to provide an explanation as to why bacteroides are to be monitored.	Tables should also apply to single family residential; they can't be without a water quality standard to apply. re-visit turbidity and include a note as to why bacteroides are included in Table 8(6).	
274	8.2.5	WQ	All references in the document that propose specific water quality standards	Would like to see in the document that it is not recommending that rainwater systems meet water quality standards "higher or more stringent" than existing EPA Water Quality Standards or standards adopted by governing authority. Any standard beyond these needs to be based on research from independent investigators who demonstrated real knowledge of how rwh systems are designed, built and maintained.	
275	8.2.5	Staff	these biological standards are vital to successful implementation of this program. thank you for including reasonable standards	none	
276	8.2.5	WQ	pH levels should be set to protect equipment such as flush valves. A pH range compatible for plumbing fixtures manufacturers should be taken into account. This is important to get the buy in from Manufacturers such as Sloan, Kohler, and Toto.	insert into table pH range suggested 6.5-7.5? need to confirm with manufacturers	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
277	9	General	a commissioning study might be required depending on the use for the water. i believe chapter 9 of the icc code for non-potable water use lists a requirement for a commissioning plan. such a plan would help assure these systems are properly developed.	add some language similar to that in icc chapter 9 on commissioning study or certification.	
278	9.1	SC&D	Edit for clarity. It is not clear if testing is for backflow protection or a successful cross-connection.	Where a potable water system is connected to a rainwater harvesting system, testing in accordance with Section 9.1.1 through 9.1.2 shall be done before commissioning the system to determine that the potable water system is protected from backflow	
279	9.1	SC&D	Testing should also be required for seasonal re-commissioning.	Add "For seasonal facilities, testing shall be done annually as part of seasonal re-commissioning. "	
280	9.2	SC&D	Alternately, if the RHS is isolated by a backflow device approved by local authority, testing of that device as described by the authority having jurisdiction shall be conducted		
281	9.2	SC&D		…shall be verified if installed	
282	9.4		This may not be practical in all instances. For example systems in the desert with vast holding capacities say 250,000 gallons or more may be difficult to manage. An exemption should be made for these scenarios.	9.4 Tank test (e) exceptions can be made for large systems with large flows that are difficult to simulate	
283	9.6	SC&D	Do the applicable codes include a requirement for a qualified tester to inspect backflow prevention assemblies? If not, a minimum requirement should be stated.	Add - "In the absence of a code requirement, backflow preventers and backwater valves shall be tested on an annual basis by a qualified tester."	
284	9.7	Staff	Editorial	Inspection of protection from vermin and insects	
285	9.8	WQ	Again, makes no sense if two end uses are designed. One for underground irrigation and the other for cooling towers. different end uses different treatment requirements	Water supplied to an end use shall be verified to meet the minimum water quality requirements for the intended application as	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				specified in Section 8. ~~If there are multiple end uses supplied by a single treatment system, the water supply shall meet the most stringent requirements for the end use applications as specified in Section 8.~~ The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of this standard and applicable codes.	
286	Annex C	Tanks	In section C.1.1.3, the second sentence should be changed to "Compliance to this requirement includes form release agents used in the production of all molded components installed on tanks to be used in potable applications.	Change to wording noted above.	
287	C.1.1	Tanks	What about fiberglass tanks?	Have a section on fiberglass tanks	
288	C.1.1.3	Tanks	As is stated throughout the standard, we want to ensure that anywhere that the collected water is to be used for potable water the material touching it should not have the opportunity to be adding potentially harmful chemicals. Only requiring the sealants and fittings to comply with NSF 61 is 'missing the forest for the trees' – while requiring the sealants and fittings to be cleared is good, what about the largest part of the holding vessel that will be touching the water…the tank?	Tanks for potable water use shall require sealants, ~~and~~ fittings, and the tank material itself comply~~ing~~ with applicable requirements of NSF 61. Non-toxic form release agents shall be used in the production of all molded components installed on tanks to be used in potable applications.	
289	C.2.1	Tanks	ASTM D1193-99e1 scope is focused on reagent water and should not be allowed as a suitable alternative to NSF 61. These two standards focus on different types of requirements for different types of products, therefore we do not feel this requirement should be 'either/or'.	Potable and non-potable tanks shall be manufactured with recycled or virgin polymers complying with the applicable requirements of NSF 61 ~~or ASTM D1193-99e1~~.	
290	C.2.1	Tanks	In section C.2, Modular plastic tanks, under C.2.1, Materials, the section references ASTM D1193-99e1, an outdated standard for reagent water. It has no relevance to materials used in the manufacture of a plastic or other tank. ARM recommends deletion of the standard. If this is a typo, and another standard was intended, we are unclear. One possibility is ASTM D1998 was intended. D1998 material section states .."This	**C.2.1 Materials** Potable and non-potable tanks shall be manufactured with recycled or virgin polymers complying with the applicable requirements of NSF 61 and ASTM D1998 ~~or ASTM D1193-99e1~~. Injection molded	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			specification is based upon the use of 100 % virgin polyethylene intended for the rotational molding process. Any use of regrind, recycled or reprocessed materials, or combinations of such materials, shall not rely upon the performance data of their original constituents, but must meet the requirements of this specification in its own right." D1998 says to use virgin resin or confirm the recycle meets the requirements of the D1998, so the statement should read"…requirements of NSF 61 and ASTM D 1998".	products shall use polymer material tested in accordance with ASTM D1621.	
291	C.3.1	Tanks	As is stated throughout the standard, we want to ensure that anywhere that the collected water is to be used for potable water the material touching it should not have the opportunity to be adding potentially harmful chemicals. As with many other areas, we have a standard that can help address this issue. NSF 61 should be utilized as a way to ensure that the products touching the water will be acceptable for this use.	Panels shall be tested in accordance with the test methods specified in Table C.3.1 and shall comply with performance criteria set in Table C.3.1 as applicable for the type and minimum total material weight and with the applicable requirements of NSF 61.	
292	Water Safety Plan	WQ	As a Water Safety Plan is a mandatory "shall" component of a rainwater harvesting system, it is unclear why it is referred to as a "non-mandatory" part of the Standard.	If it is non-mandatory, then consideration should be given to eliminating it as a mandatory component within the Standard (i.e. eliminate Section 6.1.2 and its sub-sections).	
293	E.1	WQ	Add a descriptive general statement:	Water safety plans require the assessment of hazards likely to affect the water system, consideration of the probability of the hazard becoming real, evaluation of the risk (i.e., the probability of the hazard occurring times the consequence of the hazard once real), the establishment of parameters for monitoring the system including its hazards, and the establishment of responses to realized hazards to bring the system back into line with the design parameters. A WSP plan also has an element for review and revision based on its implementation.	
294	E.1.1	WQ	The elements in the figure are either not covered or are	A greater level of detail is required to	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			inadequately covered by the sections in this Appendix.	make this an effective support document for preparing a Water Safety Plan.	
295	E.1.2	WQ	I believe the title was intended to be: "Scope of Water Safety Plan" The section states that WSP are intended only for "rainwater harvesting systems using roofs of residential or commercial structures as the catchment area". This contradicts the main body of the Standard which includes the collection of rainwater off of other impermeable surfaces and the collection of stormwater. The sentences "It is important ... Section E.5" need to be reworded. The concept of "Rainwater Harvesting System Information Document" is introduced but not defined. Section E.5 refers to this as a "**Rainwater harvesting system general information document** "	Change title to "Scope of Water Safety Plan" Change scope limitation sentence to: "This WSP only applies to rainwater harvesting systems using roofs of residential or commercial structures, and other impermeable surfaces with low risk of contamination, as the catchment area." This is consistent with the practice of rainwater harvesting and the overall recommendation of these comments to eliminate stormwater considerations from this rainwater harvesting standard. Change to: "A rainwater harvesting system general information document should be prepared that identifies system components, scope of system supply, parties necessary for system maintenance, and operational guidelines for the rainwater harvesting system. Section E.5 provides details on the document contents."	
296	E.1.3	WQ	**E.1.3 Water testing**; if for potable use, need to include testing requirements as required by the EPA under their authority in reference to the SDWA.		
297	E.1.3	WQ	A preliminary water quality test will not be possible for greenfield projects. An assessment of potential contaminants for a rainwater collection system should not rely on water sampling and water quality analysis as the source and characteristics of contaminants can vary with season and age of the surfaces the rainwater comes into contact with from collection through distribution. The	This section should note the following: "A preliminary water quality test will not be possible for greenfield projects. An assessment of potential contaminants for a rainwater collection system should not rely on water sampling and water quality	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			collection of a grab or short term composite sample is unlikely to provide a significant comprehensive assessment of potential contaminants of concern. Even the concept recognized within this standard of "first flush diversion" is based on the accumulation of contaminants over a long dry weather period and the tendency for a significant portion of these contaminants to be contained in the initial portion of the runoff of a storm event following the dry period. The determination of possible contaminants needs to, more importantly, consider potential sources of contaminants within the airshed as well as the surface materials.	analysis, as the source and characteristics of contaminants can vary with season and age of the surfaces the rainwater comes into contact with from collection through distribution. The collection of a grab or short term composite sample is unlikely to provide a significant comprehensive assessment of potential contaminants of concern. If water samples can be collected, the samples should be collected during the initial portion of a storm event that follows a long dry weather period that can result in the accumulation contaminants. It is also important that an assessment be carried out of potential sources of contaminants within the air-shed as well as the solubility characteristics of the surfaces the rainwater will come into contact with during collection, storage and distribution, and changes in the material characteristics and contaminants that may be released as the surfaces age.	
298	E.2	General	**E.2 Site assessment and fit for purpose** All rainwater harvesting systems except those installed on single-family homes using rainwater collected exclusively from a rooftop should be assessed for suitability in accordance with ASTM E2727 or ~~equivalent~~ as required by the authority having jurisdiction whichever is more stringent. You don't address designing for flooding in here anywhere. What about sites that are within a 100 year flood plain whether the area has tidal influences from oceans bays or rivers, to Riverine flooding as would be seen along the Mississippi River or a similar river? Should there be any additional restrictions in these areas?		
299	E.2	WQ	ASTM E2727 is a methodology for assessing rainwater quality, and is likely more suited as a reference to Section	Either transfer the reference to ASTM E2727 to Section E.1.3 or explain what	

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			E.1.3. ASTM E2727 does not establish design requirements as implied in Section E.2 in reference to "rainwater harvesting systems", which are defined in this document as collection, storage, treatment and distribution systems - specifically excluded from ASTM E2727. The proposed standard appears to single out single-family homes or dwellings, yet also considers systems serving less than 25 people as being exempt from water sampling and testing requirements. The title "Site assessment and fit for purpose" does not appear to be consistent with the text. the test needs to be reworded and clarified to better explain the objectives and characteristics of a site assessment and what "fit for purpose" refers to.	aspects of ASTM E2727 are to be considered in carrying out a site assessment and fit for purpose assessment. All rainwater harvesting applications involving potable water use need to take into consideration sources of airborne contaminants and the materials the collected rainwater may come into contact with regardless of whether it is a single family, cluster of less than 25 people, or larger system. The potential for contamination and effects on public health is not a scaled-risk issue (i.e. the risk of contamination does not diminish just because the population base diminishes). The text needs to relate to the title - or at least the concept of "site assessment and fit for purpose" needs to be explained in the text.	
300	E.2	General	The use of the term fit for purpose has already been commented on. The title needs to be changed.	E. 2 Site assessment and suitability for the intended purpose.	
301	E.3	General	The wording below is a beginning to add to the Code:	The preliminary read shows a lot of effort was out into this. Because there are storage tanks and various materials that may or may not be susceptible to biofilm, such as copper or silver versus plastic, electro polished versus rough surfaces, even porousity, dead leg type areas if certain joining techniques are not properly completed, and certain corrosion byproducts, I have Patents in that field, and write maintenance Manuals, I merely offer the consideration for a maintenance section that addresses proper installation per relevant electrical and other codes, cautions if hot work is performed, potential monitoring sensors and redundant	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				systems, possible conditions where pressure and or temperature relief valves would be required, vent inspection to assure deterioration or corrosion is not an issue, especially because of vermin, and proper external and internal cathodic or other protection and recommended current densities. While these are very brief comments, a Standard this well written, may want to consider these thoughts for completeness. I intend to more deeply and carefully go over this extensive body of work because it is historic. Very respectfully, Robert Boiko robertboiko@robertboiko.com R. Boiko Corporation	
302	E.3.1	WQ	Section E.3.1 suggests that a "map" or drawing may be needed - but it doesn't state what elements should be in the "map" or "drawing" or how those elements help identify treatment components at risk or identify a "specific risk". The text then switches from a "map" or "drawing" to reference a WSP - and recommends ("should") performing an evaluation of the entire rainwater harvesting system design - but instead of identifying the elements of a design review, it states a list of potential water quality sources and issues. Appendix E specifically states it applies only to rainwater collected from residential or commercial roofs - which brings into question why would an assessment of fecal contamination from humans be required?	Title Section **E.3.1 Factors affecting harvested rainwater quality**. Change the text to: An evaluation of potential contaminants or water quality changes should be performed to determine treatment requirements for the intended rainwater application(s) including, but not limited to, the following:	
303	E.3.1	WQ	All of the items listed in (a) to (j) are hazards, not risks. The introductory sentences need to be adjusted accordingly.	A rainwater harvesting system design “map” or drawing may be needed in order to identify what component in the rainwater harvesting system is most likely to encounter a specific ~~risk~~ hazard. The WSP should recognize ~~risks~~ hazards that could adversely impact water quality in a rainwater harvesting system. An evaluation of the	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
				entire rainwater harvesting system or system design should be performed to assess which water quality ~~risks~~ hazards are most prevalent. ~~Risks~~ Hazards may include, but not be limited to, the following:	
304	E.3.2	WQ	Appendix E begins with a statement limiting the application to rainwater harvesting from roofs of residential and commercial buildings. This specifically excludes stormwater systems, which by definition is the collection of water that is flowing over saturated permeable surfaces and has a greater potential to become contaminated than for rainwater harvesting. While it is recommended that stormwater be excluded from consideration under the subject of rainwater harvesting, if it is to be considered, it must be recognized that individual dwellings through to large municipalities that obtain their drinking water from surface sources are, in fact, using stormwater as a source of water. If Appendix E is intended for potable water considerations, then the types of contaminants indicated will have particular significance for consideration to protect public health. If that is the case, given the body of the Standard states that stormwater is prohibited from consideration as a source of potable water - Section E3.2 should be deleted as the land use characteristics are not very relevant to non-potable uses.	I recommend deleting all references in the document to stormwater, and keep the standard focused on rainwater harvesting. Section E.3.2 provides limited information on the nature of the contaminants that maybe associated with the various land uses or the relevance of those contaminants (or land uses) with respect to the collection and use of stormwater for either non-potable or potable water source uses. Recommend deleting E.3.2	
305	E.4.1	WQ	This entire section fails to mention that a key aspect of risk assessment is water use. Appendix E fails to discuss applications and water quality considerations affecting potable or non-potable water use applications. Consequently, the questions posed in section E.4.1 have little if any value and represent some general considerations regarding potential sources of contamination within a catchment area and possible mitigative measures if the catchment area is controlled or can be modified. Further, it is not clear how these questions are "incremental improvements". The questions posed are vague and assume that a water collection system is already	Stormwater related sections of Appendix E should be removed, and the focus kept to rainwater harvesting systems as stated in the beginning of this Appendix. Section E.4.1 should be rewritten to address rainwater harvesting issues and factors - and there needs to be a considerably greater level of detail provided to explain how to go about addressing the questions posed and the conditions identified - to reduce risk.	

	Clause/ Sub-clause	Category	Comments	Proposed change	Recommendation
			in place versus being planned. For example: "when is the system inspected?"; "who is responsible?; etc.	Consideration of risk must take into consideration the water use applications, particularly the difference between potable versus non-potable water use considerations and risks.	
306	E.4.1	WQ	First sentence needs expansion: .... each identified risk:	... each identified hazard and the actual rate of occurrence and consequent risk (impact - what was the effect and how did it impact the system or the users):	
307	E.4.1	WQ	The subordinate bullets need adjustment: a) What is the risk? (e.g., fecal contamination on the catchment area); (b) How is the risk identified? (e.g., visual inspection, testing etc.); (c) When is the system inspected for each identified risk? (e.g., weekly, monthly, etc.); (d) What system component does the risk impact? (e.g., catchment surface); (e) Where does the risk occur? (e.g., northern ¼ of catchment area); (f) Who is responsible for inspections and/or monitoring the risk?; and (g) What corrective action is needed? (e.g., clean roof area monthly, implement a first flush system for a portion of the roof, etc.).	a) What is the ~~risk~~ hazard? (e.g., fecal contamination on the catchment area); (b) How is the ~~risk~~ hazard identified? (e.g., visual inspection, testing etc.); (c) When is the system inspected for each identified ~~risk~~ hazard? (e.g., weekly, monthly, etc.); (d) What system component does the ~~risk~~ hazard impact? (e.g., catchment surface); (e) Where does the ~~risk~~ hazard occur? (e.g., northern ¼ of catchment area); (f) Who is responsible for inspections and/or monitoring the ~~risk~~ hazard?; and (g) What corrective action is needed to address the hazard? (e.g., clean roof area monthly, implement a first flush system for a portion of the roof, etc.).	

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308	E.4.2	WQ	Same thing, risk is the wrong word.	Control measures should be taken to minimize the ~~risk~~ hazard of adversely impacting water quality for each identified ~~risk~~ element of the system (see Section E.3). The system owner or person(s) responsible for maintaining the rainwater harvesting system is the party responsible for implementing necessary control or response measures. Once the proper control or response measures are identified and implemented it is essential to then perform periodic operational monitoring checks to ensure the control measures are operational and performing as expected.	
309	E.5.1	WQ	This is all interesting information from a documentation perspective, but where is this to be recorded and stored? Who is it intended for? Aside from "(k) Details of any system design drawings", there is no design or equipment performance specifications stated - nor is there any guidance provided to address the questions posed (e.g. whether seasonal weather patterns can impact water quality). These questions appear to have been created by a committee with limited critical assessment of the overall objectives, the relevance or completeness of the questions, or the manner and detail required to address them. As stated earlier, in order to assess risk, the application(s) need to be identified.	The overall purpose, scope and content of Appendix E needs to be reviewed and reconsidered. The committee has attempted to tackle a complex subject with limited time or technical resources to adequately address the subject. Suggest the committee narrow the scope to address rainwater harvesting from residential and commercial roofs, and to specific number of potential potable and non-potable applications.	
310	E.5.2	WQ	The technical information detailed in this section is very limited. It doesn't consider the level of treatment generally expected for potable or non-potable rainwater applications. For example, there are a wide range of filtration methods and design/performance specifications that could be considered besides "Type of filtration/". On the one hand it appears to be focused on documenting a planned system, but then it also considers the "age of equipment" without being specific as to what treatment component the age refers to (i.e. pump age, filter age, etc.)	This section should either be greatly expanded, detailed and divided into general system components, potable and non-potable treatment components - or it should be reduced to a general statement that the dimensions and performance specifications of the treatment components be documented.	