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Office of the State Fire Marshal - Engineering Division
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Guidance Paper: Lawn Irrigation System Backflow Preventer

Statute: NCGS §130A-330 **Date:** October 19, 2026
Codes: 2018 NC Plumbing Code Section 608.16.5
2018 NC Residential Code Section P2902.5.3

Question:

With the changes to the public water system rules in NCGS §130A-330 does a Double Check Valve Assembly (DC) backflow preventer satisfy the code requirement to isolate a lawn irrigation system from the water service or distribution pipe of a potable water supply system?

Answer:

No. Section 1.1(a) of Senate Bill 166 impacts the authority of the public water systems owned or operated by a local government unit as defined in GS 159G-20(13). These changes to the public water system rules (Figure 1) apply to the authority of the public water system and acknowledge the authority of the Department (NC Department of Environmental Quality), other State law (including NC Plumbing Code), and federal law throughout Article 10 North Carolina Drinking Water Act. The 2018 NC Plumbing and Residential Code lawn irrigation system code provisions continue to be enforced by the plumbing code officials, and the code provides the degree-of-hazard determinations and the minimum backflow preventer types required to isolate a lawn irrigation system cross connection from the potable water supply system (Figures 3, 5, 6 and 7).

- The minimum backflow preventer required to isolate a lawn irrigation system with no chemicals introduced and no valves that put the backflow preventer under continuous pressure is an Atmospheric Vacuum Breaker (AVB). These listed devices must be installed at a minimum of six (6) inches above the highest opening of the downstream piping. See NCPC section 608.13.6[i].
- The minimum backflow preventer to isolate a lawn irrigation system with no chemicals introduced that has valves that put the backflow preventer under continuous pressure is a Pressure Vacuum Breaker (PVB). These listed, inline-testable assemblies must be installed at a minimum of twelve (12) inches above the highest opening of the downstream piping. See NCPC section 608.13.5[ii].
- The minimum backflow preventer to isolate a lawn irrigation system with chemicals introduced is a Reduced Pressure Principal (RP). These listed, inline-testable assemblies must be installed a minimum of twelve (12) inches above surrounding grade that drains the waste away by gravity. See manufacturer's installation instructions and 2018 NCPC 608.13[iii].

Discussion:

Both the 2018 NC Plumbing Code Section 608.16.5 (Figure 5), 2018 NC Residential Code Section P2902.5.3 (Figure 6), and the most recent NCDEQ list of High Hazard Service Connections (Figure 2) describe a lawn irrigation system with chemicals introduced as high hazard. The 2018 NC Plumbing Code also provides the minimum type of backflow preventer to isolate three different levels of high hazard lawn irrigation system installations, each of which creates a mechanical air gap by providing an opening to atmosphere during a backflow (and/or mechanical failure) event. The DC type backflow preventer does not provide an opening to atmosphere and does not provide the same or better level of degree-of-hazard protection as the required types of backflow preventers (Figure 3); therefore, a DC does not satisfy NC Plumbing Code Section 105.2 (Figure 4) as an alternative. A DC is "less than the equivalent of that prescribed in this code" for the purpose of isolating a lawn irrigation system cross connection from the potable water system.

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GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2023

SENATE BILL 166
RATIFIED BILL

AN ACT TO AMEND VARIOUS DEVELOPMENT REGULATIONS; TO AMEND VARIOUS NORTH CAROLINA STATE BUILDING CODES; TO AMEND VARIOUS CONSTRUCTION CONTRACTORS AND DESIGN PROFESSIONALS REGULATIONS; TO AMEND VARIOUS ENVIRONMENT AND ENVIRONMENTAL HEALTH REGULATIONS; AND TO REORGANIZE THE BUILDING CODE COUNCIL.

The General Assembly of North Carolina enacts:

PART I. DEVELOPMENT REGULATIONS

PROHIBIT CERTAIN BACKFLOW PREVENTER REQUIREMENTS BY PUBLIC WATER SYSTEMS

SECTION 1.1.(a) Article 10 of Chapter 130A of the General Statutes is amended by adding a new section to read:

"**§ 130A-330. Local authority to require backflow preventers; testing.**

(a) No public water system owned or operated by a local government unit, as that term is defined in G.S. 159G-20(13), shall require a customer to install a backflow preventer on an existing nonresidential or residential connection, including multifamily dwellings, not otherwise required by State or federal law except where the degree of hazard from the customer's connection is determined to be high by the Department.

Figure 1. NCGS §130A-330 (a)

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High Hazard Service Connections

August 21, 2026

1. Lawn sprinkler systems with chemical injection or booster pumps
2. Connection to an unapproved water system or unapproved auxiliary water supply (e.g., reclaimed water, rainwater collection/distribution systems, well water)
3. Connection to a facility with tanks, pumps, lines, steam boilers or vessels that handle sewage, lethal substances, toxic or radioactive substances
4. Fire sprinkler systems with booster pump facilities, chemical additives, or fire department connections
5. Buildings with five or more stories above ground level
6. Waterfront facilities
7. Swimming pools
8. Commercial Facilities
    a. Medical Facilities (e.g., hospitals, morgues, mortuaries, autopsy facilities, urgent cares, dental offices, veterinary offices, dialysis centers)
    b. Industrial Facilities
        i. wastewater treatment
        ii. metal plating
        iii. dye works
        iv. battery manufacturers
        v. chemical processing
    c. Agricultural/Food Processing Facilities
        i. dairies
        ii. meat processing
        iii. bottling
        iv. canneries
    d. Automotive Facilities
        i. car washes
        ii. automotive maintenance
    e. Other Commercial Facilities
        i. laundry (e.g., commercial laundries, dry cleaning)
        ii. exterminators
        iii. landscaping/lawn care
        iv. film laboratories

* This list is based on a table contained in Appendix B of previously published versions of the *North Carolina Rules Governing Public Water Systems* [15A NCAC 18C] and is subject to change as additional information becomes available.

Figure 2. NCDEQ High Hazard Service Connections - August 21, 2026

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TABLE 608.1
APPLICATION OF BACKFLOW PREVENTERS

DEVICE	DEGREE OF HAZARD[a]	APPLICATION[b]	APPLICABLE STANDARDS
Backflow prevention assemblies:			
Double check backflow prevention assembly and double check fire protection backflow prevention assembly	Low hazard	Backpressure or backsiphonage Sizes $^3/_8$″–16″	ASSE 1015, AWWA C510, CSA B64.5, CSA B64.5.1
Double check detector fire protection backflow prevention assemblies	Low hazard	Backpressure or backsiphonage Sizes 2″–16″	ASSE 1048
Pressure vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes $^1/_2$″–2″	ASSE 1020, CSA B64.1.2
Reduced pressure principle backflow prevention assembly and reduced pressure principle fire protection backflow assembly	High or low hazard	Backpressure or backsiphonage Sizes $^3/_8$″–16″	ASSE 1013, AWWA C511, CSA B64.4, CSA B64.4.1
Reduced pressure detector fire protection backflow prevention assemblies	High or low hazard	Backsiphonage or backpressure (Fire sprinkler systems)	ASSE 1047
Spill-resistant vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes $^1/_4$″–2″	ASSE 1056
Backflow preventer plumbing devices:			
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	ASSE 1002, CSA B125.3
Backflow preventer for carbonated beverage machines	Low hazard	Backpressure or backsiphonage Sizes $^1/_4$″–$^3/_8$″	ASSE 1022
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes $^1/_4$″–$^3/_4$″	ASSE 1012, CSA B64.3
Dual-check-valve-type backflow preventer	Low hazard	Backpressure or backsiphonage Sizes $^1/_4$″–1″	ASSE 1024, CSA B64.6
Hose connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure, backpressure or backsiphonage Sizes $^1/_2$″–1″	ASME A112.21.3, ASSE 1052, CSA B64.2.1.1
Hose connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes $^1/_2$″, $^3/_4$″, 1″	ASME A112.21.3, ASSE 1011, CSA B64.2, CSA B64.2.1
Laboratory faucet backflow preventer	High or low hazard	Low head backpressure and backsiphonage	ASSE 1035, CSA B64.7
Pipe-applied atmospheric-type vacuum breaker	High or low hazard	Backsiphonage ony Sizes $^1/_4$″– 4″	ASSE 1001, CSA B64.1.1
Vacuum breaker wall hydrants, frost-resistant, automatic-draining-type	High or low hazard	Low head backpressure or backsiphonage Sizes $^3/_4$″, 1″	ASME A112.21.3, ASSE 1019, CSA B64.2.2
Other means or methods:			
Air gap	High or low hazard	Backsiphonage or backpressure	ASME A112.1.2
Air gap fittings for use with plumbing fixtures, appliances and appurtenances	High or low hazard	Backsiphonage or backpressure	ASME A112.1.3
Barometric loop	High or low hazard	Backsiphonage only	(See Section 608.13.4)

For SI: 1 inch = 25.4 mm.
a. Low hazard—See Pollution (Section 202).
High hazard—See Contamination (Section 202).
b. See Backpressure, low head (Section 202).
See Backsiphonage (Section 202).

Figure 3. 2018 NC Plumbing Code Table 608.1

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[A] 105.2 Alternative materials, methods and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material or method of construction shall be *approved* where the code official finds that the proposed alternative material, method or equipment complies with the intent of the provisions of this code and is not less than the equivalent of that prescribed in this code. Where the alternative material, design or method of construction is not *approved*, the code official shall respond in writing, stating the reasons why the alternative was not *approved*.

Figure 4. 2018 NC Plumbing Code Section 105.2

608.16.5 Connections to lawn irrigation systems. The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric vacuum breaker, a pressure vacuum breaker assembly or a reduced pressure principle backflow prevention assembly. Valves shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system, the potable water supply shall be protected against backflow by a reduced pressure principle backflow prevention assembly.

Figure 5. 2018 NC Plumbing Code Section 608.16.5

P2902.5.3 Lawn irrigation systems. The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric vacuum breaker, a pressure vacuum breaker assembly or a reduced pressure principle backflow prevention assembly. Valves shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system, the potable water supply shall be protected against backflow by a reduced pressure principle backflow prevention assembly.

Figure 6. 2018 NC Residential Code Section P2902.5.3

WATER PIPE.

Riser. A water supply pipe that extends one full story or more to convey water to *branches* or to a group of fixtures.

Water distribution pipe. A pipe within the structure or on the premises that conveys water from the water service pipe, or from the meter when the meter is at the structure, to the points of utilization.

Water service pipe. The pipe from the water main or other source of potable water supply, or from the meter when the meter is at the public right of way, to the water distribution system of the building served.

Figure 7. 2018 NC Plumbing Code Chapter 2 Definitions

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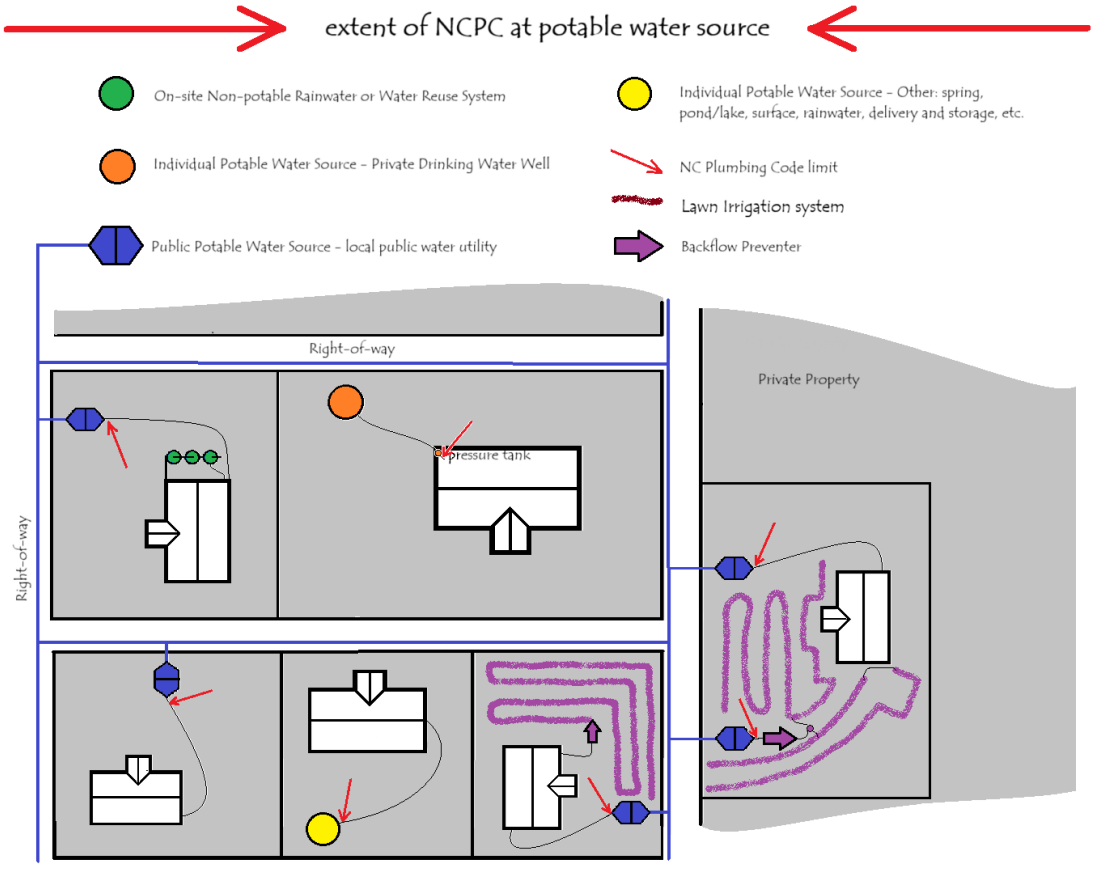

Figure 7. sketch of extent of the scope of the NCSBC plumbing codes

Summary:
The NC Plumbing Code applies to the plumbing system that is connected to the water source, be it an individual or public water supply (Figure 7).

When a lawn irrigation system has no chemicals introduced into the plumbing by injection[iv], and no valves downstream of the backflow preventer, the 2018 NC plumbing code requires an AVB as the minimum isolation from the potable water supply system. The cross connection to an atmospheric vacuum breaker must remain open to atmosphere to remain isolated.

When no chemicals are introduced, but there are valves that put the backflow preventer under continuous pressure, the code requires a PVB to isolate the lawn irrigation system. Closeable nozzles, zone control valves, and system timers include the types of valves that put the backflow preventer under continuous pressure.

Regardless of whether the backflow preventer is under continuous pressure, when chemicals are introduced into the lawn irrigation system it must be isolated from the potable water supply with an RP.

Addendum:
The 2018 NC Plumbing Code does not include the 2015 IPC **Section 312.10 Inspection and testing of backflow prevention assemblies** that requires annual testing of certain backflow preventers. Further, the 2018 NCPC also does not include the 2015 IPC **Section 1304.4.2 Inspection and testing of backflow prevention assemblies** that applies to non-potable water systems. There are no backflow preventer testing requirements within the 2018 NC Plumbing Code.

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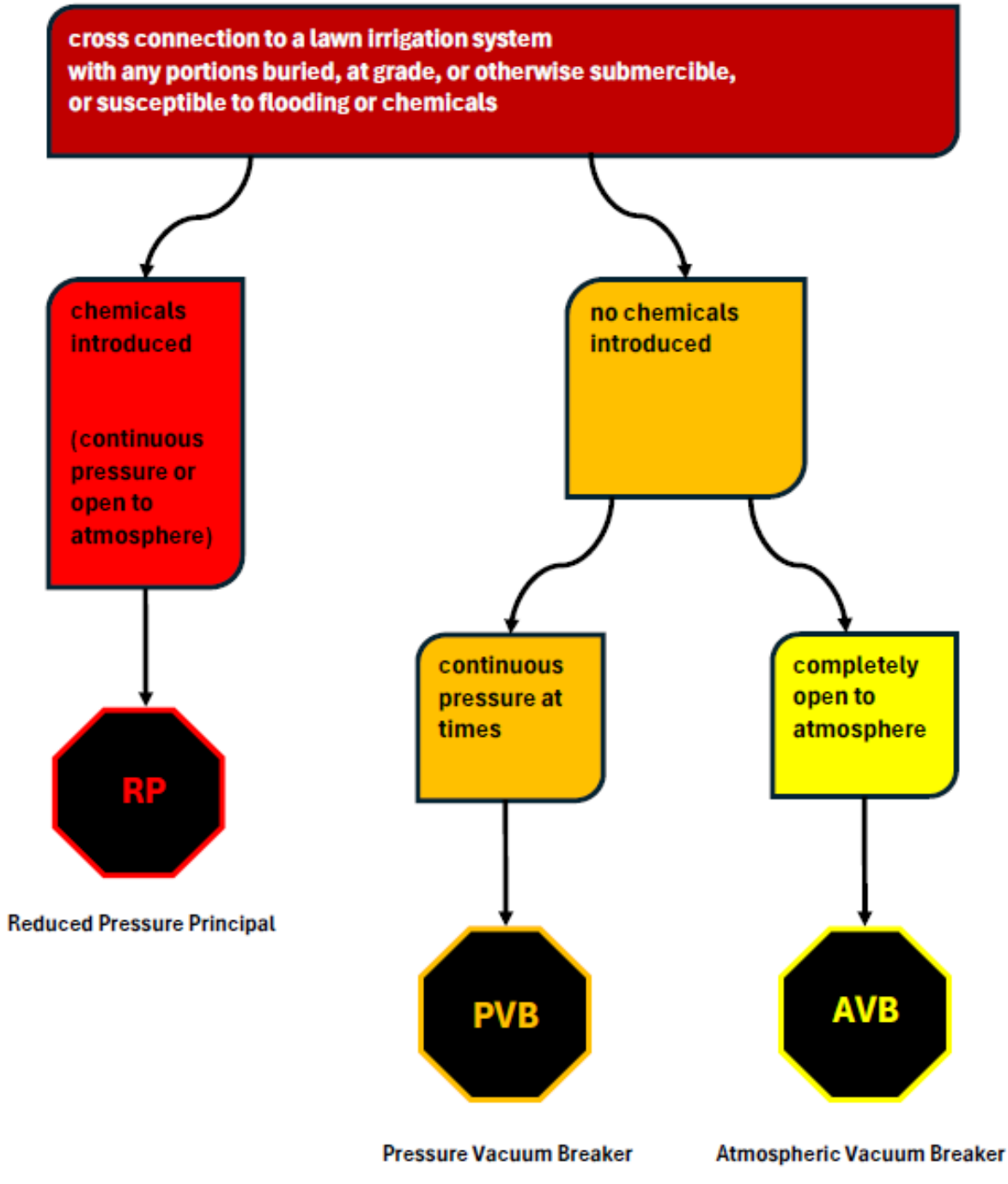
Which backflow preventer is required?



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[i] **608.13.6 Atmospheric-type vacuum breakers.** Pipe-applied atmospheric-type vacuum breakers shall conform to ASSE 1001 or CSA B64.1.1. Hose-connection vacuum breakers shall conform to ASME A112.21.3, ASSE 1011, ASSE 1019, ASSE 1035, ASSE 1052, CSA B64.2, CSA B64.2.1, CSA B64.2.1.1, CSA B64.2.2 or CSA B64.7. Both types of vacuum breakers shall be installed with the outlet continuously open to the atmosphere. The critical level of the atmospheric vacuum breaker shall be set at not less than 6 inches (152 mm) above the highest elevation of downstream piping and the flood level rim of the fixture or device.

[ii] **608.13.5 Pressure vacuum breaker assemblies.** Pressure vacuum breaker assemblies shall conform to ASSE 1020 or CSA B64.1.2. Spill-resistant vacuum breaker assemblies shall comply with ASSE 1056. These assemblies are designed for installation under continuous pressure conditions where the critical level is installed at the required height. The critical level of a pressure vacuum breaker and a spill-resistant vacuum breaker assembly shall be set at not less than 12 inches (304 mm) above the highest elevation of downstream piping and the flood level rim of the fixture or device. Pressure vacuum breaker assemblies shall not be installed in locations where spillage could cause damage to the structure.

[iii] **608.13.2 Reduced pressure principle backflow prevention assemblies.** Reduced pressure principle backflow prevention assemblies shall conform to ASSE 1013, AWWA C511, CSA B64.4 or CSA B64.4.1. Reduced pressure detector assembly backflow preventers shall conform to ASSE 1047. These devices shall be permitted to be installed where subject to continuous pressure conditions. The relief opening shall discharge by *air gap* and shall be prevented from being submerged.

[iv] Equipment currently on the market that introduces chemicals into irrigation systems includes fertilizer, herbicide, and insecticide injectors that are also known as fertigation and chemigation units. Venturi injectors, positive displacement pumps, and proportional hydraulic injectors are utilized in commercial agricultural operations as well as in some residential lawn irrigation installations.

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