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**JULIUS A. BALLANCO, P.E.**  
President

May 14, 2021

**Report No. 21M051421E1**

**- Engineering Report -  
Analysis of McGuire Defender Valves**

**Prepared For:** McGuire Manufacturing Co., Inc.  
60 Grandview Court  
Cheshire, CT 06410

**Scope:** McGuire Manufacturing Co., Inc., developed a new product line identified as the ICV Defender Integral Check Valve. The new product line incorporates a spring loaded check valve into McGuire's heavy duty stop valves. Julius Ballanco, P.E., CPD, FASPE, President, JB Engineering and Code Consulting, P.C., was requested to analyze the product line regarding acceptance, listings, and applications.

**Background**

**Information:** McGuire Manufacturing Co., Inc., is a manufacturer of high quality plumbing products including stop valves for plumbing fixtures. The heavy duty brass stop valves manufactured by McGuire provide long-term performance for commercial plumbing fixtures.

The ICV Defender Integral Check Valve was developed to provide protection from both crossflow and backflow. The integral check valve is a spring loaded check valve that has been evaluated for providing backflow protection. McGuire provides the following description of their ICV Defender Integral Check Valve:

*ICV Defender Integral Check Valve*

*McGuire's mechanical integral check valve was designed to protect the building's water supply.*

*Ideal for jobs such as:*

*Healthcare*

*Education*

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*Hospitality*

*High-use public facilities*

*Designed to be an effective solution as a last line of defense against reverse flow and cross-connection contamination that results in harmful bacteria known to contaminate water systems.*

*The ICV Defender valve is a spring actuated integral check valve manufactured to McGuire's heavy pattern angle stop specification. It is completely serviceable and requires no third-party components. Available in IPS, sweat and compression connections both wheel handle and loose key. Backed by a 3-year warranty and IAPMO and NSF/ANSI 61 & 372 certified. Patent pending.*

The ICV Defender Integral Check Valve models available from McGuire are, as follows:

LFCK01: 3/8" IPS X 3/8" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem wheel handle.

LFCK01LK: 3/8" IPS X 3/8" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem loose key.

LFCK02: 1/2" IPS X 3/8" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem wheel handle.

LFCK02LK: 1/2" IPS X 3/8" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem loose key.

LFCK03: 3/8" IPS X 1/2" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem wheel handle.

LFCK04LK: 1/2" IPS X 1/2" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem loose key.

LFCK07: 1/2" Sweat X 3/8" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem wheel handle.

LFCK07LK: 1/2" Sweat X 3/8" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem loose key.

LFCK082: 1/2" Sweat X 3/8" OD w/ 5" Ext Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem wheel handle.

LFCK082LK: 1/2" Sweat X 3/8" OD w/ 5" Ext Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem loose key.

LFCK09: 1/2" OD X 3/8" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem wheel handle.

LFCK09LK: 1/2" OD X 3/8" OD Chrome plated brass supply stop valve with spring actuated integral check valve and full turn brass stem loose key.

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## **Certifications and**

**Listings:** There are multiple test reports, certifications, and listings for the ICV Defender Integral Check Valve.

IAPMO R&T Lab issued Report Number 2681-19003-002 on August 30, 2019. Models LFCK01, LFCK01LK, LFCK02, LFCK02LK, LFCK04, LFCK04LK, LFCK07, LFCK07LK, LFCK09, LFCK09LK, LFCK082 and LFCK082LK were tested for conformance to ASME A112.18.1-2018/CSA B125.1-18. The report indicates that the valves comply with the standard other than NSF/ANSI 61 and NSF/ANSI 372. Separate reports were issued for testing to both NSF/ANSI 61 and NSF/ANSI 372.

IAPMO R&T Lab issued Report Number 2681-18001-002 on December 19, 2018. Models LFCK09, LFCK082 and LFCK04, LFCK02, LFCK07, LFCK02LK, LFCK04 LK, LFCK07 LK, LFCK09 LK, and LFCK082 LK were tested for conformance to NSF 61. The report indicates that the valves comply with Section 9 of NSF/ANSI 61. Section 9 regulates end point devices including fixture fittings, faucets, and fixture stops.

Stevens Institute of Technology, Center for Environmental Systems, issued Report No. MMC070920R, dated November 12, 2020. McGuire's Check Valve, Model LFCK01 was tested in accordance with ASME A112.18.3-2002\_R2017. The report indicated that the check valve complied with ASME A112.18.3-2002\_R2017. The check valve tested was considered equivalent to the check valve used in Models LFCK01, LFCK01LK, LFCK02, LFCK02LK, LFCK04, LFCK07, LFCK07LK, LFCK09, LFCK09LK, LFCK082 and LFCK082LK.

IAPMO R&T issued a product listing, File No. 4136, dated 5/25/2020, for Models LFCK01, LFCK01LK, LFCK02, LFCK02LK, LFCK04, LFCK04LK, LFCK07, LFCK07LK, LFCK09, LFCK09LK, LFCK082 and LFCK082LK. The listing indicates that the models comply with ASME A112.18.1-2012/CSA B125.1-12, as well as, the IAPMO Uniform Plumbing Code, The ICC International Plumbing Code, and the National Plumbing Code of Canada.

IAPMO R&T issued a product listing, File No. 6284, dated 5/25/2020, for Models LFCK01, LFCK01LK, LFCK02, LFCK02LK, LFCK04, LFCK04LK, LFCK07, LFCK07LK, LFCK09, LFCK09LK, LFCK082 and LFCK082LK. The listing indicates that the models comply with NSF/ANSI 372-2016 as being lead free (low lead content) in accordance with Section 1417(d) of the Safe Drinking Water Act and Section 116875 of the California Health & Safety Code.

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IAPMO R&T issued a product listing, File No. N-4551, dated 5/25/2020, for Models LFCK01, LFCK01LK, LFCK02, LFCK02LK, LFCK04, LFCK04LK, LFCK07, LFCK07LK, LFCK09, LFCK09LK, LFCK082 and LFCK082LK. The listing indicates that the models comply with NSF/ANSI/CAN 61-2018.

### **Plumbing Codes and**

**Standards:** The two primary standards that regulate angle stops used in plumbing systems are ASME A112.18.1/CSA B125.1 and NSF/ANSI/CAN 61. ASME A112.18.1/CSA B125.1 specifies the performance and material requirements of angle stops. NSF/ANSI/CAN 61 is a health effects standard testing the suitability for use in a potable water system supplying water for drinking or cooking. Angle stops are evaluated as end point devices similar to faucets and fixture fittings.

In addition to NSF/ANSI/CAN 61, another standard, NSF 372, determines that materials used in drinking water systems comply with the low lead requirement stipulated in U.S. Federal Law. While NSF/ANSI/CAN 61 requires compliance to NSF 372, it is common practice for products to be separately listed as complying with NSF 372.

ASME A112.18.3 is a standard that specifies performance requirements for backflow protection devices used in plumbing fixture fittings. The standard lists aggressive age testing to determine the performance of a backflow device after years of service. The standard requires backflow protection to be accomplished by a minimum of two backflow devices, one of which must be a check valve.

The ICC International Plumbing Code regulates valves in Section 605.7. Valves must comply with one of the standards listed in Table 605.7. Included in the list of standards is ASME A112.18.1/CSA B125.1. Section 605.7 also requires valves to comply with NSF 61. Section 605.2.1 requires valves supplying water for drinking or cooking to comply with NSF 372. Section 303.4 requires all plumbing products, including valves, to be third party listed as complying with the applicable referenced standard(s).

Both Section 412.2 and 412.6 reference as a means of complying with the backflow requirements of the International Plumbing Code for handheld showers and hose connected outlets, such as pull out spray faucets.

The IAPMO Uniform Plumbing Code references ASME A112.18.1/CSA B125.1 for faucets and fixture fittings in Section 417.1. NSF 61 is also listed in the same section.

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Section 301.2 requires all plumbing products, including valves, to be listed by a third party agency.

Both Sections 417.3 and 417.4 reference ASME A112.18.3 as a means of complying with the backflow requirements in the code. The specific sections regulate handheld showers and faucets with hose connected outlets.

## **Engineering**

### **Analysis:**

The ICV Defender Integral Check Valves are a series of patent pending angle stop valves having an integral check valve that is rated for protection against backflow. The ICV Defender Integral Check Valves are listed by IAPMO R&T as complying with ASME A112.18.1/CSA B125.1, NSF 61, and NSF 372.

The ICV Defender Integral Check Valves comply with the ICC International Plumbing Code and IAPMO Uniform Plumbing Code as a fixture stop valve. The ICV Defender Integral Check Valves also comply with the ICC International Plumbing Code and IAPMO Uniform Plumbing Code as backflow protection devices complying with ASME A112.18.3.

ASME A112.18.1/CSA B125.1 is a bi-national standard developed in the United States and Canada. The standard is referenced in the National Plumbing Code of Canada. The ICV Defender Integral Check Valves also comply with the National Plumbing Code of Canada.

The integral check valve in the Defender valves was subjected to the difficult testing requirements of ASME A112.18.3. The testing protocol evaluates the long-term performance of backflow protection devices after years of service. For a check valve, the device must continue to prevent the reversal of flow after being subjected to the harsh tests. Having passed the test and being rated as a backflow check valve, the ICV Defender Integral Check Valves can be used as one of the means of backflow protection for hose connected outlets and handheld showers.

Being rated as a backflow check valve also means that the ICV Defender Integral Check Valves will prevent crossflow when supplying the hot or cold water to a faucet. Crossflow in a faucet or fixture fitting can occur whenever there is a flow restrictor or shut off downstream of the faucet or mixing valve. For example, if a service sink has a wye connection with shut off valve, crossflow can result in hot water flowing into the cold water piping, or cold water flowing into the hot water

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pipings. The ICV Defender Integral Check Valves will prevent crossflow from occurring for installations similar to the service sink example.

**Application of Valve:** The ICV Defender Integral Check Valves are installed at the connection to plumbing fixtures. These are the stop valves typically associated with providing a means of isolating the water supply to service a fixture, faucet, or mixing valve. However, in addition to providing a means of shutting off the flow of water for servicing, the ICV Defender Integral Check Valves also provide a level of defense from backflow and crossflow.

The ICV Defender Integral Check Valves can provide a level of backflow protection in high risk areas where a fixture air gap or vacuum breaker may not be enough protection. This is especially important in health care facilities, food handling establishments, hospitality facilities, and educational buildings.

Many buildings have plumbing fixtures that are used on a limited basis. The water supply to the fixture is stagnant for long periods of time, resulting in water aging. The ICV Defender Integral Check Valves prevents that aged water from flowing back into the potable water supply. The aged water is simply flushed through the fixture the next time the fixture is used.

The recent pandemic identified the need to control the water supply when there is a major shut down of a building. As the building sits unoccupied, the water ages. Even under the best flushing protocol, some water may remain in rarely used fixtures. If the ICV Defender Integral Check Valves are installed as the supply stops to all fixtures, the water from a rarely used fixture that is not properly flushed will not contaminate the potable water supply by reversal of flow. The aged water will only remain in the section of piping between the angle stop and the faucet, fixture fitting, or mixing valve. When the faucet, fixture fitting, or mixing valve is used, the aged water will be flushed. The use of the ICV Defender Integral Check Valve protects the potable water supply from contamination.

In health care and medical buildings, certain medical devices rely on the connection to hot or cold water for proper operation. If the temperature of the water fluctuated during a medical procedure, the results can be disastrous for the patient. The fluctuation of water temperature is often associated with crossflow in a mixing valve or faucet. The installation of ICV Defender Integral Check Valves as the angle stop to mixing valves and faucets prevents crossflow and hazardous conditions that can result from the crossflow.

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Another use of the ICV Defender Integral Check Valves is on the supply to thermostatic mixing valves. Thermostatic mixing valves are known to allow crossflow when there is no flow in the tempered water supply. The hot water can cross over to the cold water supply when there is a change in pressure, such as the activation of a water closet flush valve. The ICV Defender Integral Check Valves prevents crossflow through the thermostatic mixing valve.

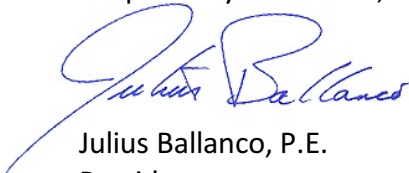
While specifically designed to address high risk areas, the ICV Defender Integral Check Valves can be installed as the angle stop for any plumbing fixture in any building.

**Summary:** The following summary is my professional engineering opinion, based upon my education, training, and experience in the fields of plumbing engineering:

1. The ICV Defender Integral Check Valves are listed by IAPMO R&T to ASME A112.18.1/CSA B125.1, NSF 61, and NSF 372. The valves comply with the ICC International Plumbing Code, IAPMO Uniform Plumbing Code, and National Plumbing Code of Canada.
2. The ICV Defender Integral Check Valves comply with ASME A112.18.3 as a backflow preventer check valve device.
3. The ICV Defender Integral Check Valves prevent backflow and crossflow from a faucet, fixture fitting, and mixing valve.
4. The ICV Defender Integral Check Valves are ideal for high risk buildings, such as medical facilities, health care facilities, food handling establishments, hospitality buildings, and educational buildings. The valves provide an additional level of protection from backflow and crossflow.
5. The ICV Defender Integral Check Valves can be installed in any building as the supply stop to faucets and fixture fittings.

**Certification:** This engineering report was written by Julius Ballanco, P.E., President, JB Engineering and Code Consulting, P.C., registered as a Professional Engineer in the State of Indiana, License #60900631. JB Engineering and Code Consulting, P.C. is a Registered Engineering Professional Corporation in the State of Indiana.

Respectfully submitted,

A handwritten signature in blue ink that reads "Julius Ballanco". The signature is stylized and cursive.

Julius Ballanco, P.E.  
President