



# **Examination Standard for Automatic Water Control Valves**

**Class Number 1020**

**December 2020**

---

# Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of a this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

---

## TABLE OF CONTENTS

|                                                   |           |
|---------------------------------------------------|-----------|
| <b>1 INTRODUCTION.....</b>                        | <b>1</b>  |
| 1.1 Purpose.....                                  | 1         |
| 1.2 Scope.....                                    | 1         |
| 1.3 Basis for Requirements .....                  | 1         |
| 1.4 Basis for Certification .....                 | 1         |
| 1.5 Basis for Continued Certification .....       | 2         |
| 1.6 Effective Date .....                          | 2         |
| 1.7 System of Units .....                         | 2         |
| 1.8 Normative References.....                     | 2         |
| 1.9 Terms and Definitions.....                    | 3         |
| <b>2 GENERAL INFORMATION .....</b>                | <b>5</b>  |
| 2.1 Product Information .....                     | 5         |
| 2.2 Types.....                                    | 5         |
| 2.3 Certification Application Requirements.....   | 6         |
| 2.4 Requirements for Samples for Examination..... | 6         |
| <b>3 GENERAL REQUIREMENTS .....</b>               | <b>7</b>  |
| 3.1 Review of Documentation.....                  | 7         |
| 3.2 Physical or Structural Features .....         | 7         |
| 3.3 Design Requirements .....                     | 7         |
| 3.4 Operation.....                                | 8         |
| 3.5 Markings .....                                | 8         |
| 3.6 Materials and Construction .....              | 8         |
| 3.7 Environment .....                             | 9         |
| 3.8 Serviceability and Parts Removal .....        | 9         |
| 3.9 Instructions and Trim Equipment .....         | 9         |
| 3.10 Clearances .....                             | 10        |
| 3.11 Calibration.....                             | 10        |
| <b>4 PERFORMANCE REQUIREMENTS.....</b>            | <b>11</b> |
| 4.1 Examination.....                              | 11        |
| 4.2 Operational Tests .....                       | 11        |
| 4.3 Friction Loss.....                            | 12        |
| 4.4 Body Hydrostatic Strength .....               | 12        |
| 4.5 Clapper Strength .....                        | 12        |
| 4.6 Diaphragm Strength.....                       | 13        |
| 4.7 Bonding Adequacy .....                        | 13        |
| 4.8 Water Absorption.....                         | 13        |
| 4.9 Aging.....                                    | 14        |
| 4.10 Additional Tests.....                        | 14        |
| <b>5 OPERATIONS REQUIREMENTS.....</b>             | <b>15</b> |
| 5.1 Demonstrated Quality Control Program.....     | 15        |
| 5.2 Surveillance Audit .....                      | 16        |
| 5.3 Manufacturer's Responsibilities.....          | 16        |
| 5.4 Manufacturing and Production Tests .....      | 16        |
| <b>Appendix A is intentionally blank.....</b>     | <b>17</b> |
| <b>Appendix B is intentionally blank.....</b>     | <b>17</b> |
| <b>APPENDIX C: Figures .....</b>                  | <b>18</b> |

# 1 INTRODUCTION

## 1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for automatic water control valves.
- 1.1.2 Testing and certification criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

## 1.2 Scope

- 1.2.1 Automatic water control valves are most commonly used to control the flow of water to various fire protection sprinkler systems. They are used in sprinkler systems such as deluge, preaction, refrigerated area, and on-off multicycle sprinkler systems. Therefore, valves used for these applications must meet the requirements of this standard, as well as, at minimum, one of the following Examination Standards:

| <i>Sprinkler System</i> | <i>Examination Standard</i> |
|-------------------------|-----------------------------|
|                         | <b>Class</b>                |
| Deluge                  | 1011                        |
| Preaction               | 1012                        |
| Refrigerated Area       | 1013                        |
| On-Off Multicycle       | 1016                        |

- 1.2.2 Although not addressed in this standard, automatic water control valves may be configured to control the flow to water spray systems, open and closed head foam water sprinkler systems and other special purpose systems. Certain designs of automatic water control valves are also utilized on the discharge of fire pumps for pressure relief, pressure reducing, and pump suction pressure regulating purposes.

## 1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine the design of automatic water control valves for the purpose of obtaining Certification. Transformer fluids having characteristics not anticipated by this standard may be certified if performance equal, or superior, to that required by this standard is demonstrated.

## 1.4 Basis for Certification

Certification is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

- 1.4.1 Examination and tests on production samples shall be performed to evaluate
- the suitability of the product;
  - the performance of the product as specified by the manufacturer and required for certification; and as far as practical,
  - the durability and reliability of the product.

- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures may be made to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

## 1.5 Basis for Continued Certification

The basis for continual certification may include, but is not limited to, the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agencies product surveillance program.

## 1.6 Effective Date

The effective date of this certification standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this Standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

## 1.7 System of Units

Units of measurement used in this Standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

## 1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies.

ASME B16.5 - 2003, Pipe Flanges and Flanged Fittings: NPS 1/2 through 24

ASTM D 471 - 2006, Standard Test Method for Rubber Property - Effect of Liquids

ASTM D 572 - 2004, Standard Test Method for Rubber - Deterioration by Heat and Oxygen

AWWA C606-06, AWWA Standard for Grooved and Shouldered Joints

FM Global Property Loss Prevention Data Sheets

IEEE/ASTM SI 10 - 2002, American National Standard for Use of the International System of Units (SI): The Modern Metric System

IEC 17025 - 2005, General Requirements for the Competence of Testing and Calibration Laboratories

NFPA 13 - 2007, Standard for the Installation of Sprinkler Systems

NFPA 15 - 2001, Standard for Water Spray Fixed Systems for Fire Protection

NFPA 16 - 2007, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems

## 1.9 Terms and Definitions

For purposes of this standard, the following terms apply:

### ***Accepted***

This term refers to installations acceptable to the authority enforcing the applicable installation rules. Acceptance is based upon an overall evaluation of the installation.. Acceptance is not a characteristic of a product. A product accepted for one installation may not be acceptable elsewhere.

### ***Deluge System***

A deluge system is a sprinkler system employing open sprinklers installed in the piping system. The system is connected to a water supply through an automatic water control valve that is opened by the operation of a detection system installed in the same areas as the sprinklers. When this valve opens, water flows into the piping system and discharges from all sprinklers attached thereto.

Deluge sprinkler systems have open sprinklers and are used where it is desirable to discharge water through all of the system's sprinklers simultaneously. Prior to discharge there is no water in the sprinkler piping. The water supply is held back by an automatic water control valve which is operated manually or automatically by the actuation of a fire detection system. The fire detection system is required to be one of the following types: wet pilot sprinkler line, dry pilot sprinkler line, hydraulic rate-of-rise, pneumatic rate- of-rise or electric.

### ***Precision System***

A sprinkler system employing automatic sprinklers attached to a piping system containing air that may or may not be under pressure, with a supplemental detection system installed in the same areas as the sprinklers. Actuation of the detection system opens an automatic water control valve that permits water to flow into the sprinkler piping system and to be discharged from any sprinklers that open.

Precision systems are equipped with automatic sprinklers and are used where it is important to prevent the accidental discharge of water. These systems may also be used where an alarm is desired in advance of sprinkler operation or where it is desired to minimize the water delivery delay inherent in a standard dry- pipe system.

### ***Rated Working Pressure***

The maximum sustained pressure at or below which the valve shall operate trouble free. This pressure also sets the basis for the testing described in Section 4, Performance Requirements.

### ***Refrigerated Area System***

A hybrid precision system that requires both a sprinkler and a heat-actuated device to operate before the water control valve opens and admits water into the sprinkler piping. It is intended for use in freezers with extremely low temperatures.

A refrigerated area sprinkler system affords fire protection in refrigerated rooms or buildings and includes special safeguards against accidental filling with water and subsequent freezing of the system. A fire detection system must actuate and one or more automatic sprinklers in the piping must operate before water will enter the sprinkler system. An alarm sounds if the detection system only is actuated while pneumatic pressure is maintained in the sprinkler piping. An alarm also sounds if the pneumatic pressure in the sprinkler piping is not properly maintained. In either case, water does not enter the system piping.

### ***On-Off Multicycle Sprinkler Systems***

Multicycle sprinkler systems are certified automatic sprinklers and hydraulic controls capable of repeated on-off cycles appropriate to control the possible redevelopment of fire in the protected area. The cycling occurs as the result of fire detector operation which, acting as an electrical interlock, causes the main automatic water control valve to open and close. Fire detector actuation precedes sprinkler operation so water is discharged as from a conventional water system. Should the fire rekindle after its initial control, water again flows from the opened sprinklers. Manual control valve operation, in the event of detector impairment, is a required system capability. Sprinkler replacement after a fire does not cause impairment of protection

## 2 GENERAL INFORMATION

### 2.1 Product Information

- 2.1.1 Nominal sizes of automatic water control valves for fire protection service addressed in this standard are: nominal pipe sizes (NPS) 1-1/2, 2, 2½, 3, 4, 6 and 8 inches with a minimum rated working pressure of 175 psig (1215 kPa). Other pressure ratings and sizes, including metric sizes, shall be evaluated on a case-by-case basis.
- 2.1.2 In order to meet the intent of this standard, automatic water control valves must be examined on a model-by-model, type-by-type, manufacturer-by-manufacturer, and plant-by-plant basis. This is required because identical designs, fabricated using identical materials by different manufacturers, or even by different plants of the same manufacturer, have been shown to perform differently in testing. Sample automatic water control valves selected in conformance to this criterion shall satisfy all of the requirements of this standard.

### 2.2 Types

Current automatic water control valves are of two general designs:

#### 2.2.1 Clapper Type

The clapper type valve utilizes a swing type clapper that is held closed on its seat by a mechanical latch which is held in the closed position by the force from a piston. The clapper type valve is illustrated in Figure C-1. Figure C-1 shows the valve in its ready or set position. Also illustrated are the sequence and the mechanisms for valve trip: the piston chamber water pressure is reduced by operation of a releasing device (a solenoid valve is shown in Figure C-1), the piston retracts, the clapper is unlatched and opens, and water flows to the sprinklers. The piston retracts because of a reduction in water pressure in the piston chamber. This pressure reduction results from the action of heat detectors and/or activated sprinklers opening trim release devices in the piston charge line. Figure C-1 shows an energized open solenoid valve (normally closed) which vents the pressure in the piston charge line. This solenoid valve release shown is one of many automatic control valve release mechanisms. A complete description of all the various release systems is detailed in the Examination Standards listed in Section 1.2.1 of this Standard. Figure C-1 shows a restrictor orifice between the water supply and the piston chamber. This is a common feature which ensures that the piston chamber pressure is fully vented by the release device(s), because the orifice limits the flow into the chamber to be less than the flow out of it.

#### 2.2.2 Diaphragm Type

The diaphragm type utilizes an elastomeric flat or cylindrical (sleeve type) diaphragm that is held closed on the valve seat by the water supply pressure acting on the top of the flat diaphragm or on the outside of the sleeve type diaphragm. The flat diaphragm is illustrated in Figure C-2. The sleeve type diaphragm type is illustrated in Figure C-3. Figures C-2 and C-3 shows the valves in their ready or set position. Also illustrated are the sequence and the mechanisms for valve trip: diaphragm chamber water pressure is reduced by operation of a releasing device (a solenoid valve is shown in Figures C-2 and C-3), the diaphragm retracts, and water flows to the sprinklers. The diaphragm retracts because of a reduction in water pressure in the diaphragm chamber. This pressure reduction results from the action of heat detectors and/or activated sprinklers, which open trim components in the diaphragm charge line. Figures C-2 and C-3 show an energized open solenoid valve (normally closed) which vents the pressure in the diaphragm charge line. This solenoid valve release shown is one of many automatic control valve release systems. A complete description of all the various release systems is detailed in the Examination Standards listed in Section 1.2.1 of this Standard. Figures C-2 and C-3 also show a restrictor orifice between the water supply and the diaphragm chamber. This ensures that the diaphragm chamber pressure is fully vented because the orifice limits the flow into the chamber to be less than the flow out