



Examination Standard for Early Warning Flood Sensor Systems

Class Number 2505

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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 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.

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for early warning flood sensor systems that automatically sense and transmit data on programmed intervals.
- 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 This standard applies to systems that measure water elevations (i.e. static and rate of change types), rainfall, water flow, presence of water, soil moisture, etc. The equipment in this standard may include multiple sensors..
- 1.2.2 Communication between the equipment and the network infrastructure may be accomplished using industry protocols (i.e. ALERT, ALERT2, IoT, IIoT.) and/or proprietary software.
- 1.2.3 Early warning flood sensor systems used in this standard support the bidirectional transmission of sensor data via network topographies such as direct communication, node to node, mesh, star, etc. Systems may incorporate one or multiple technologies to ensure ability to transmit and receive data.
- 1.2.4 The equipment included in this standard may be powered by one or more means such as: electrical service, secondary (rechargeable) battery with solar panel, or by primary (non-rechargeable) battery.
- 1.2.5 The equipment included in this standard may be stand alone or housed within one or multiple enclosures to protect the components from the environment.
- 1.2.6 The equipment included within this standard may be mounted directly to a structure or a pole. Installations may result in all components being installed in close proximity or separated as needed to provide for easier access for maintenance and protection from the natural or human environment.
- 1.2.7 The requirements of this standard shall be used to measure and describe the performance, security and reliability of early warning flood sensor systems in a controlled test environment.

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 best practices used to examine performance characteristics for early warning flood sensor systems for the purpose of obtaining certification. Systems having characteristics not anticipated by this standard may be certified if performance is 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.

ANSI/IEC 60529, *Degrees of Protection Provided by Enclosures (IP Code)*.

ANSI/IEEE/ASTM SI 10, *American National Standard for Metric Practice*

ANSI/UL 157, *Standard for Gaskets and Seals*

ANSI/UL 61010-1, *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements*

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*.

ANSI/UL 50E, *Enclosures for Electrical Equipment, Environmental Considerations*

1.9 Terms and Definitions

For purposes of this standard, the following terms apply:

Brute Force Password Attack

A method of accessing an obstructed device by attempting multiple combinations of numeric/alphanumeric passwords.

Contact Sensor

This term refers to a sensor that is positioned in the fluid being measured. For example, pressure transducer, float, mechanical switch, etc.

Elevation

This term refers to the height of the water surface relative to a reference height. For the purposes of this standard other common terms such as “Stage” or “Gage Height” may be considered interchangeable with “Elevation” defined here.

Gateway

This term refers to a device that allows communication between two networks or translates data from one communication protocol to another. This allows a node to communicate using one protocol and have the data passed forward using another.

IoT Device

This term refers to a device that supports bidirectional communication with other internet connected devices.

Node

This term refers to an individual location designating the combination of telemetry system and sensor(s).

Non-Contact Sensor

This term refers to a sensor that is positioned near, but not in the fluid being measured. For example, optical, acoustic, radar, etc.

Presence of Water

This term refers to a sensor that is looking to see if water is there or not. This information can be helpful in flood scenarios to determine if a body or channel of water is near overtopping it’s boundaries or in areas prone to flash floods.

Rate of Rise

This term refers to the change of surface water elevation over a period of time. These measurements are particularly useful in hydraulic modeling and creation of hydrographs that can be used to estimate the time when a body of water will overtop its boundaries, or discharge levels will reach peak for an event.

Telemetry Systems

This term refers to the assembly of components used to transmit measurements from the sensor to another node(s), central gateway or IoT device. The assembly may utilize one or multiple communication technologies for this purpose.

2 GENERAL INFORMATION

2.1 Product Information

2.1.1 Systems defined by this standard are categorized by the type of measurement, and by the method in which the measurement is taken.

2.1.2 Third party electronic modules and/or Printed Circuit Boards (PCBs) which are not designed or manufactured by the listing company can be used for approval with the following requirements.

1. All documentation for schematics and Bill of Materials (BOM) for the third party electronic modules and/or PCBs will be required for review and controlled by the certification agency. When the listing company purchases the electronic modules and/or PCBs from the Original Equipment Manufacturer (OEM) a declaration of conformance will be required to be supplied with the equipment designating the design documentation with revision number and date used for the manufacture. Requires a Non-Disclosure Agreement (NDA).

2. Alternatively, drawing numbers and revisions of design documents without the review of the documents by the certification agency is acceptable. When the listing company purchases the electronic modules and/or PCBs from the OEM a declaration of conformance will be required to be supplied with the equipment designating the design documentation with revision number and date used for the manufacture. (Would not require a NDA but would need validation from OEM).

3. No information for design documentation is provided for the electronic modules and/or PCBs. When the listing company purchases the electronic modules and/or PCBs from the OEM, 100% visual inspection will be required. (No NDA and no validation from the OEM).

Documentation to support the process for incoming inspection and compliance to the above requirements will be filed in the Controlled Drawing List (CDL).

- All proprietary drawings (schematics, BOMs, assembly...) will be filed in the Project Data Report (PDR).
- Incoming inspection documents will be required and will be filed in the CDL.

2.2 Certification Application Requirements

The manufacturer shall provide the following preliminary information with an application request for certification:

- A complete list of all models, types, sizes, and options for the products or services being submitted for certification;
- General assembly drawings, electrical schematics, description of product (i.e. sales literature or product brochure)
- Materials list including manufactured and purchased components including manufacturer's model numbers, size, ratings, etc.
- Installation, Operation and Maintenance manuals
- Anticipated marking format including product nameplate and electrical ratings
- The number and location of manufacturing facilities.
- All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.