



## **SECTION 28 36 00**

### **WATER DETECTION AND ALARM**

#### **FOR DATA CENTERS OR OTHER COMMERCIAL BUILDING APPLICATIONS**

##### **PART 1 GENERAL**

##### **1.1. SUMMARY**

- A. Section Includes
  - 1. Water leak detection system including cable sensors, point sensors, interconnecting cable and controller necessary for a complete installation of an integrated Water Leak Detection & Location System.
- B. Related Requirements (provided by Engineer where applicable)
  - 1. Access Flooring – 09 69 00
  - 2. Common work results for Electrical – Section 26 05 00
  - 3. Low-Voltage electrical power conductors & cables – Section 26 05 19
  - 4. Communication Services – Section 27 05 13
  - 5. Hangers and Supports for Communications Systems – Section 27 05 29
  - 6. Conduits and Back Boxes for Communications Systems – Section 27 05 33
  - 7. Water Detection and Alarm Control, GUI and Logic Systems – Section 28 36 13
  - 8. Water Detection Sensors – Section 28 36 33

##### **1.2. REFERENCES**

- A. Reference Standards
  - 1. NFPA 70 (NEC) – US National Electric Code
  - 2. CSA C22.1 – Canadian Electrical Code
  - 3. NEMA 250 – Enclosures for Electrical Equipment

##### **1.3. SUBMITTALS**

- A. Product Data
  - 1. Application information can be obtained from nVent RAYCHEM TraceTek Leak Detection System Commercial Building Application and Product Selection Guide H53147.
  - 2. Provide nVent RAYCHEM TraceTek installation & operation manuals for controls and communications, electronic monitoring, sensing products, accessories, and installation tools and equipment.
- B. Shop Drawings
  - 1. Provide a water leak detection circuit layout drawing detailing the following information for each circuit:
    - a. Point sensors & location
    - b. Cable sensors & location
    - c. Sensor interface modules & location
    - d. Main control panel & location



2. Shop drawings shall include a floor plan map of the building with sensor location & resistance reading at point sensor and cable sensor.

#### 1.4. QUALITY ASSURANCE

##### A. Qualifications

###### 1. Manufacturers

- a. All manufacturers shall have a minimum of thirty years of experience in the manufacturing of water leak detection sensors, cable, controls & equipment.
- b. The manufacturer shall provide written verification of current ISO 9001 registration.

###### 2. Installers

- a. All installers shall be professionally trained and experienced in the installation of water leak detection systems.

#### 1.5. DELIVERY, STORAGE, AND HANDLING

##### A. Storage And Handling Requirements

1. Sensors, cable and controllers shall be stored in a clean and dry location prior to installation of the water leak detection system.
2. Take precautions necessary to prevent damage from contact with sharp objects to cables & sensors.

#### 1.6. FIELD [OR] SITE CONDITIONS

##### A. Leak Detection Site Conditions

1. Floor area in and around the water leak detection floor sensor shall be cleaned, prepped, sealed and painted prior to the installation of the water sensors.

#### 1.7. WARRANTY

- A. Manufacturer Warranty – Contractor shall provide standard manufacturer’s warranty of 24 months from the date of purchase of the leak detection system.
- B. Extended Warranty – Contractor shall submit all system testing records to manufacturer to qualify for manufacturer extended warranty on the following products:
  1. TT1000 Sensor Cables – 10 years

### PART 2 PRODUCTS

#### 2.1. WATER LEAK DETECTION SYSTEM

##### A. Manufacturers

1. Specification is based on nVent RAYCHEM TraceTek brand water leak detection products.

- B. Contractor to provide a complete water leak detection system including UL approved controls designed for the areas listed below. Contractor to submit system design & system drawings to owner’s agent for approval.

##### C. Water Sensing Cables and Water Point Sensors



1. Engineer in collaboration with Rep shall specify the installation of TraceTek water detection cables and point sensors in the following areas:  
**[Select one or more of the areas listed below]**
  - 1) Computer Room
  - 2) Server Room
  - 3) Under Raised Floors
  - 4) Switch Gear Room
  - 5) Electrical Room
  - 6) Overhead domestic hot water (DHW) or chilled water (CW) pipes
  - 7) Other - Specify
  
2. Engineer in collaboration with Rep shall select from the following TraceTek water sensing cables and water point sensors depending on the application:

(For additional product details refer to Table A and Table 1 in H53147 Design Guide.)

- a. **[Select for TT1000 water sensing cable]** The water sensing cable (TT1000) shall be a four (4) wire design, with two (2) sensing wires, one (1) alarm wire and one (1) continuity wire embedded in a fluoropolymer carrier rod which can sense the presence of water at any point along its length and shall not detect hydrocarbons. The sensing cable design shall have the ability to provide continuous verification of sensing circuit integrity. The sensing wires shall be jacketed with a conductive fluoropolymer and shall be constructed with no metal parts exposed to the environment for corrosion resistance. Sensing cable shall be quick drying and reset within 15 seconds of removal from free water; sensing cable that is braided in construction is not acceptable. No more than one foot of tap water, in contact with a sensing cable at a depth of 1/16 inch, shall be required to cause an alarm at the electronic alarm module. The water sensing cable shall be UL Listed and rated Type CL2P for plenum use. The sensing cable shall have a tensile breaking strength of 160 pounds and an abrasion resistance of >65 cycles per UL719. The sensing cable shall be vibrant yellow for easy identification within floor voids, drip trays and general service areas. Water sensing cable shall be pre-terminated and modular for quick connection to cables and leak detection components. Soldering or the use of wire nut shall not be a permitted method to join leak detection cable. The sensing cable system shall feature modular branching connectors in order to introduce tee splices into the layout.
  
- b. **[Select for TT1100-OHP water sensing cable for suspended pipe]** The water sensing cable for suspended pipe (TT1100-OHP) shall be a four (4) wire design, with two (2) sensing wires, one (1) alarm wire and one (1) continuity wire embedded in a flame retarded polymer carrier rod which can sense the presence of water at any point along its length and shall not detect hydrocarbons. The sensing cable design shall have the ability to provide continuous verification of sensing circuit integrity. The sensing wires shall be jacketed with a conductive fluoropolymer and shall be constructed with no metal parts exposed to the environment for corrosion resistance. Sensing cable shall be supplied with an absorptive synthetic fiber braid that provides extra mechanical protection and designed to wick water along the cable even when the water leak is dripping from a single small pin hole or crack. The sensing cable shall have a tensile breaking strength of >220 pounds. Water sensing cable shall be pre-terminated and modular for quick connection to cables and leak detection components. Soldering or the use of wire nut shall not be a permitted method to join leak detection cable. The sensing cable system shall feature modular branching connectors in order to introduce tee splices



into the layout. The sensing cable shall be fastened to the pipe every 18 inches, and shall be positioned at the lowest point of the pipe or fittings (typically the 6 o'clock position on horizontal pipes) such that any liquid leaking from the pipe or fittings will drip onto the cable surface as it drips off the bottom of the pipe or fitting. For vertical or angled pipe, the sensing cable shall be spiraled around the pipe and secured with straps.

D.

- c. **[Select for TT3000 water sensing cable]** The water sensing cable (TT3000) shall be a four (4) wire design, with two (2) sensing wires, one (1) alarm wire and one (1) continuity wire embedded in a fluoropolymer carrier rod which can sense the presence of water at any point along its length and shall not detect hydrocarbons. The sensing cable design shall have the ability to provide continuous verification of sensing circuit integrity. The sensing wires shall be jacketed with a conductive fluoropolymer and shall be constructed with no metal parts exposed to the environment for corrosion and chemical resistance. The sensing cable shall have a tensile breaking strength of 160 pounds and an abrasion resistance of >65 cycles per UL719 Sensing cable shall be pre-terminated with metal connectors and modular for quick connection to cables and leak detection components. All metal connectors shall be covered with heat shrink tubing to provide corrosion resistance. Soldering or the use of wire nut shall not be a permitted method to join leak detection cable. The sensing cable system shall feature modular branching connectors in order to introduce tee splices into the layout.
- d. **[Select for TT-FLAT-PROBE]** The water detection probe (TT-FLAT-PROBE) shall be provided with pre-installed connectors for connection into the TraceTek system. The probe shall be capable of being floor or wall mounted. The probe shall have an orange epoxy powder coated, low profile guard plate designed for high visibility and to ensure that the probe will not fall over. The water sensing tips shall be of stainless steel for corrosion resistance.
- e. **[Select for TT-MINI-PROBE]** Where there are space constraints, the water detection mini probe (TT-MINI-PROBE) shall be provided as an alternative to the TT-FLAT PROBE. It shall include pre-installed connectors for connection into the TraceTek system. The probe shall have a diameter of 0.70 inches or less to fit easily into drains or low points. The water sensing tips shall be of stainless steel for corrosion resistance.

E. Sensor Interface Modules

- 1. Contractor shall furnish and install for each leak detection circuit a TraceTek Sensor Interface Module model: **[Select from the following]**

- a. TTSIM-1 Sensor Interface Module

LED Indicators for	Power	Leak	Service	Communication
Communications	RS-485 up to 4000 ft			
Protocols	Modbus	OptoMux	Johnson Metasys	
Max Cable Length	5000 feet			
Precision	0.1% of sensor length			
Voltages <b>[select]</b>	24VAC	12VDC	24 VDC	
Mounting	Din rail mounting			



b. TTSIM-1A Sensor Interface Module with integrated Form C Relay

LED Indicators for	Power	Leak	Service	Communication
Communications	RS-485 up to 4000 ft			
Protocols	Modbus	OptoMux	Johnson Metasys	
Max Cable Length	500 feet			
Precision	0.5% of sensor length			
Voltages <b>[select]</b>	24VAC	120VAC	230VAC	12/24 VDC
Relay – Form C	SPDT	NO or NC	2A @ 250VAC	Software selectable
Mounting	Din rail mounting			

c. TTSIM-2 Sensor Interface Module with integrated Form C Relay and Leak Location LCD display

LED Indicators for	Power	Leak	Service	Communication
Display	LCD with leak location			
Communications	RS-485 up to 4000 ft			
Protocols	Modbus	OptoMux	Johnson Metasys	
Max Cable Length	500 feet			
Precision	0.5% of sensor length			
Voltages <b>[select]</b>	24VAC	120VAC	230VAC	12/24 VDC
Relay – Form C	SPDT	NO or NC	2A @ 250VAC	Software selectable
Mounting	Din rail mounting			

d. TTA-SIM-1A Sensor Interface Module with integrated Form C Relay and Audible Alarm

LED Indicators for	Power	Leak	Service	Communication
Communications	RS-485 up to 4000 ft			
Protocols	Modbus	OptoMux	Johnson Metasys	
Max Cable Length	500 feet			
Precision	0.5% of sensor length			
Voltages <b>[select]</b>		120VAC	230VAC	
Relay – Form C	SPDT	NO or NC	2A @ 250VAC	Software selectable
Audible Alarm	60 decibels at 1 ft, with Silence Button			
Enclosure	Rugged polycarbonate, NEMA1/ IP20 rated			
Mounting	4 holes for mounting to any convenient vertical surface			

e. TTA-SIM-2 Sensor Interface Module with integrated Form C Relay, Leak Location LCD display, and Audible Alarm

LED Indicators for	Power	Leak	Service	Communication
Display	LCD with leak location			
Communications	RS-485 up to 4000 ft			
Protocols	Modbus	OptoMux	Johnson Metasys	



Max Cable Length	500 feet			
Precision	0.5% of sensor length			
Voltages <b>[select]</b>		120VAC	230VAC	
Relay – Form C	SPDT	NO or NC	2A @ 250VAC	Software selectable
Audible Alarm	60 decibels at 1 ft, with Silence Button			
Enclosure	Rugged polycarbonate, NEMA1/ IP20 rated			
Mounting	4 holes for mounting to any convenient vertical surface			

2. The sensor interface module shall continuously monitor the sensor cable for continuity faults. The loss of continuity in any of the wires shall result in an LED indication of the trouble condition, and optional actuation of the alarm relay by user.
3. The number and location of the Sensor Interface Module shall be indicated on the system drawing.
4. For additional details refer to Table B and Table 2 in H53147 Design Guide.

F. Central Control Panel –CCP (Optional). **[Select from one of the following]:**

1. **[Option 1]** TTDM-128
  - a. The CCP shall be powered by (24 Vdc / 24 Vac / 120 Vac / 230 Vac) [select one]
  - b. The CCP shall be capable of polling data from up to 127 external Sensor Interface Modules via RS-485 serial data communications using MODBUS, OptoMux or Metasys protocols.
  - c. The CCP shall provide at a minimum a 4 x 20 character LCD display that shall inform the user of the status of each connected Sensor Interface Model and its associated sensor cable circuit. Conditions reported shall include, NORMAL, LEAK DETECTED with LEAK LOCATION, LOOP BREAK, LOOP IMBALANCE, CABLE BREAK, LOST COMMUNICATIONS.
  - d. The CCP shall maintain a user settable real time clock with time recorded to the nearest minute. All significant systems events including leak detection, locations, leak cleared, alarm relay reset, etc. shall be recorded to an Event History log and shall include a date and time stamp. The Alarm panel shall maintain a log of the most recent 2048 events.
  - e. The CCP shall be equipped with Status LEDs for NORMAL (Power on); LEAK; TROUBLE; and SERVICE NEEDED.
  - f. The CCP shall be equipped with summary status relays for LEAK DETECTED, TROUBLE and SERVICE NEEDED. Relay contacts shall be Form-C, Double Pole, Double Throw and rated to at least 5A at 250 VAC.
  - g. The CCP shall scan for all connected Sensor Interface Modules at power up and automatically commence polling of all discovered channels. Any user configuration settings shall be maintained in non-volatile memory. The Alarm Panel shall automatically recover from any loss of power and restart with full functionality without loss of user specific set-up options or event history. For any loss of power exceed 5 minutes, the Alarm Panel shall record a power loss event and a system restart event to the Event History.
  - h. The CCP shall be equipped with a user selectable RS232/RS485 serial port for external communications. The CCP shall be capable of acting as a Modbus slave device and the manufacturer shall provide a Modbus register map allowing a Modbus master device (PC, PLC, DCS, etc.) to access all current status information for any connected SIM including leak detections and locations; all event history; user adjustable set-up parameters and alphanumeric channel and region tags.
  - i. The CCP shall be UL/FM approved.



2. **[Option 2]** TT-TS12
  - a. Contractor shall install a TraceTek model TT-TS12 central control panel to monitor & manage all leak detection circuits up to a total of 250 external circuits.
  - b. CCP shall include a 12" full color, high resolution SVGA touch screen display panel as a user interface panel for control & monitoring of the hydrocarbon leak detection system.
  - c. CCP connection to Sensor Interface Modules shall be RS-485 communication wiring as specified under other sections.
  - d. CCP shall indicate the zone and locations of any leak on the display panel. The display shall feature an interactive and dynamic leak location map, with the location of any leak displayed as a flashing icon positioned over the floor plan, piping layout, or photo of the piece of equipment at the user's discretion.
  - e. CCP shall provide event data logging by circuit in non-volatile memory up to the most recent 5000 events. Each event shall include a date and time stamp.
  - f. CCP shall have 8 integrated relays (5A at 250VAC/30VDC, 4 x Form A, 4 x Form C), with 4 relays in use by the system and 4 relays available for general use.
  - g. CCP shall have the ability to send Email and SMS alerts for LEAK, SERVICE, and TROUBLE events.
  - h. CCP shall provide multi-level password protection for proper protection of leak detection system control
  - i. CCP shall include a MODBUS output for communication to a BMS.
  - j. CCP shall be UL/FM approved.

## 2.2. ACCESSORIES

- A. Contractor to provide all TraceTek brand modular branch connectors, jumper cables and cable connectors for a complete leak detection system. For additional details refer to Tables 4, 5 and 6 of H53147 Design Guide.

## 2.3. EXAMPLE TYPICAL COMPONENT SELECTIONS FOR VARIOUS APPLICATIONS, AS DETAILED IN H53147 DESIGN GUIDE, ARE AS FOLLOWS:

- A. Large scale system under raised floor in computer room, data center or server room:
  1. Central Control Panel TT-TS12 to manage and display data from network of up to 250 external Sensor Interface Modules.
  2. Sensor Interface Modules TTSIM-1A to monitor the status of sensor cables and point sensors.
  3. Leader cables TT-MLC-PC or TT-MLC-MC to connect Sensor Interface Modules to sensor cables and point sensors.
  4. Point Sensors TT-FLAT-PROBE for sumps and drip trays.
  5. Water sensing cable TT1000 or TT3000 for monitoring leaks under raised floors, utility rooms, flat surfaces.
  6. Other components including modular jumper cables TT-MJC-X-PC or TT-MJC-X-MC, modular end terminations TT-MET-PC or TT-MET-MC, modular branching connectors TT-MBC-PC or TT-MBC-MC, weighted lengths TT-WL-4.5M/15FT-PC or TT-WL-4.5M/15FT-MC, hold down clips TT-HDC-1/4, and identification tags TT-TAG as required.



- B. Suspended pipe applications:
  - 1. Sensing cable TT1100-OHP which is designed to be attached directly onto pipes either by using nylon tie or Velcro straps and detect a water leak originating from a small pin hole or crack in the pipe.
  - 2. Can be added to the system components as described in the above Large Scale System application.
  
- C. Sumps and drip trays:
  - 1. Water detection point sensor TT-FLAT-PROBE to detect water in low spots, drip trays or sumps.
  - 2. As an alternative, the TT1100-OHP-THIN can be placed inside drip pans.
  - 3. TT-FLAT-PROBE can be interconnected with other TT-FLAT-PROBE or cable sensing segments and can be monitored with TT-TS12 or TTSIM alarm module.
  
- D. Small area systems:
  - 1. A simple cost effective leak detection system shall consist of TTA-SIM-1A, TT1000 water sensing cable, system components such as modular leader cable, jumper cable, modular end terminations, tags and hold down clips.

## PART 3 EXECUTION

### 3.1. INSTALLATION

- A. All TraceTek leak detection system components shall be installed in accordance with the manufacturer's installation instructions, NEC, and local code requirements.
  
- B. The sensing cable shall be installed after all piping, air conditioning, raised flooring, and other mechanical work has been completed, and prior to installation of other data or power distribution cabling. The sub floor sensing cable path shall remain clear of water, oil, solder, flux, dirt or other materials that may soil the sensing cable. Contractor shall prepare floor surface for cable installation, install hold down clips for sensing cable, route and fix the sensor cable, route and fix any interconnect accessories such as jumper cable, point probes, branch connectors, leader cables and end terminations.
  
- C. The sensing cable shall be installed beneath the raised flooring and around the perimeter of all rooms, a maximum of three feet from the outside wall. Route the sensing cable a minimum distance of three feet beyond the perimeter of all A/C units. The sensing cable should be kept clear of any sharp edges, floor pedestals and uninsulated ground conductors. In addition, lay the cable in a serpentine pattern, on 4-8 foot minimum centers, to protect interior surface areas where water sources are found, such as A/C unit, CPU piping, floor drains, chillers, etc. The sensing cable should be installed under the center of floor tiles to facilitate access to, and visual location of, leaks. Sensing cable shall be secured to the sub floor with hold-down clips (TT-HDC-1/4) at approximately six-foot intervals and at every change in direction.
  
- D. The sensor cable shall be on the bottom layer of all cabling in contact with the slab floor and positioned such that it will be in the path of any water leaking from chilled water supply and return





lines, valves and fittings in the chilled water system, leaks from condensate tray overflows in air handlers, and similar source of water in the sub-floor and surrounding wall spaces.

- E. The installer shall be responsible for providing a clean and functional system. The installer shall be responsible for installation of the sensing cable, functional testing, and mapping of the system. Contractor shall supply supervision and training to the end user for the leak detection system.
- F. A graphic display map, prepared from "as- built" drawings, shall be furnished upon completion. The map shall indicate the location of the sensing cables, landmarks such as equipment, A/C units, walls, floor drains, change of cable direction, and cable distance readings. The map shall be mounted next to the alarm and locating module.

### 3.2. TESTS

- A. The system shall be tested in accordance with the manufacturer's recommendations and industry standards.

### 3.3 COMMISSIONING

- A. The system shall be commissioned upon completion of the installation by personnel authorized by the manufacturer in accordance with manufacturer's instructions. At this time demonstration and basic operation shall be provided to the owner.
- B. At the time of commissioning the system, the system supplier shall provide the Owner or Owner's Representative with the name of an authorized manufacturer's Service Contractor who can provide preventive maintenance and service contracts for the leak detection system at least once a year, inclusive of removing debris from sensing cables, ensuring the interconnection and integrity of the electronic components in accordance with the manufacturer's recommendations.

END OF SECTION