Scope of Materials

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>AT20C Control Panels with alarm horns</td>
</tr>
<tr>
<td>850’</td>
<td>TFH Hydrocarbon Sensing Cable</td>
</tr>
<tr>
<td>970’</td>
<td>JMP-UD Jumper Cable</td>
</tr>
<tr>
<td>46</td>
<td>CAJMP5 Connectors with shrink tubing</td>
</tr>
<tr>
<td>30</td>
<td>CATFH Connector for TFH cable</td>
</tr>
<tr>
<td>1</td>
<td>Cable tags</td>
</tr>
<tr>
<td>2</td>
<td>Cable mounts</td>
</tr>
<tr>
<td>5</td>
<td>Crimp Tool Kit CRPKIT</td>
</tr>
<tr>
<td>11</td>
<td>PHLR-S Hydrocarbon Probes</td>
</tr>
<tr>
<td>1</td>
<td>Updated CAD files for layout</td>
</tr>
</tbody>
</table>

The following is a partial list of the materials not included and to be furnished by others:

1) Electrical conduit for running leak detection jumper cable
2) Solder, soldering iron, hand tools, etc.
3) Power wiring and conduit
4) Two way radios for testing the system
Data Sheets
**PRINCIPLE OF OPERATION**

PAL-AT's technology operates similar to radar. Thousands of times each minute, safe energy pulses are sent out on sensor cables. As these energy pulses travel down the cable, reflections are returned to the monitoring unit and a "map" of the reflected energy from the cable is stored in memory. The presence of liquids on the sensor cable, in sufficient quantities to "wet" the cable, will alter its electrical properties. This alteration will cause a change of the reflection at that location. When the PAL-AT recognizes a change, it enters into alarm mode and displays the location of the liquid. After the leak alarm is acknowledged, the current condition of the cable is stored in memory as a new map. This becomes the base line for the system, allowing PAL-AT to continue monitoring the cable for new leaks, breaks and/or faults.

**SECURITY SYSTEM**

PAL-AT requires a security code entry before accepting an alarm acknowledgment and writing or erasing data from memory. This feature limits access to only those employees who have been authorized to perform the advanced functions.

**SYSTEM ARCHIVES**

Date and time history of all significant events including power failure, cable leak/fault/break and alarm silencing are permanently stored in nonvolatile memory providing a documented record of system alarms and operator interfaces.

**OUTPUT RELAYS**

Two SPDT output relays rated for 10 A @ 250 VAC, are activated when a fault occurs. This permits remote annunciating of alarms or activation of control devices wired to the monitoring unit.

**INTELLIGENT INTERFACES**

PAL-AT has a standard, RS-232 serial interface which provides intelligent communication to computers using PALCOM® Communication Software. Refer to the Communication Options Data Sheet or the Modbus RTU Interface Option for detailed information. ASCII commands can allow other monitoring systems to interface to the PAL-AT system.

**OUTPUT RELAY SYSTEM**

The optional Output Relay System provides 4 to 60 additional alarm relays. Each relay can be assigned to activate if a leak is detected in a specific section of cable. This provides precise control when a single cable string monitors several pipes or sensitive areas.

---

**PRODUCT FEATURES**

- Locates multiple leaks without loss of accuracy or sensitivity
- Locates breaks and shorts
- Stores information with time and date
- User-friendly
- RS-232 serial port
- Accepts probe and cable sensors in one sensor string
- One cable for all liquids or multiple cables for differentiation (user's option)
- AT40K and AT80K monitor up to eight separate cable strings when equipped with Cable Expansion Modules
- UL Listed and FM Approved to provide intrinsically safe sensor cable output circuits for Class 1, Division 1, Groups C & D Hazardous Locations
- Modbus RTU Interface Available
- Optional Output Relay System

---

**Model | Part Number | Cable Capacity | Maximum Cable Range***
--- | --- | --- | ---
AT20C | 8027550 | 1 | 2,000 (600)
AT50C | 8027555 | 1 | 5,000 (1,500)
AT40K | 8027560 | 8 | 5,000 (1,500)
AT20K | 8027558 | 2 | 7,500 (2,300)
AT80K | 8027563 | 8 | 7,500 (2,300)

* Refer to Sensor Cables Product Data for details

Approved by the New York City Board of Standards and Appeals under calendar number 17-90-SA.
The Leak Detection/Location System shall consist of a microprocessor based panel capable of continuous monitoring of a sensor string for leaks, breaks and shorts. The unit shall have a sensing range of [2,000] [5,000] [7,500] feet per cable [with up to eight cables per panel].

The alarm unit(s) shall operate on the principle of pulsed energy reflection and be capable of mapping the entire length of the sensor cable and storing the digitized system map in nonvolatile memory. The alarm unit(s) shall provide continuous indication that the sensor cable is being monitored.

After proper acknowledgment of a minor leak, the Leak Detection/Location System shall be capable of monitoring the entire sensing string for additional leaks even if they are smaller than the leak previously acknowledged. The system shall be capable of accounting for minor installation irregularities, static moisture and puddles (such as condensation) with no loss in accuracy or sensitivity. The system shall locate the point of origin of the first water leak or fault (break/short) within \( \pm 0.1\% \) ( \( \pm 0.2\% \) for hydrocarbons) of the sensor string length or \( \pm 5\% \) whichever is greater. The monitoring unit shall report and record, to nonvolatile memory, the type of fault (leak/break/short/probe), distance, date and time of an alarm.

Tests shall be performed to demonstrate the ability of the system to detect and locate breaks, shorts and probes on the sensor string. Leak testing shall be done per the following procedure to verify operation and ability to work with condensation pools or other static moisture:

1) Break the cable at a connector and verify alarm type and location.
2) Short the cable at a connector and verify alarm type and location.
3) Wet the sensor cable near the start of the sensor string and acknowledge the detection/location alarm and remap the system.
4) Wet the sensor cable near the end of the sensor string with the first location still wetted and acknowledge the detection/location alarm and remap the system.
5) Wet the sensor in three additional locations between the first and second leak locations with each detection/location alarm being acknowledged and all prior leak locations still wetted. Prepare and submit a report verifying the performance of the system.

The system manufacturer shall have at least ten years of experience with leak detection/location sensor cable technology and provide a factory trained representative at two on-site meetings for pre-construction and sensor/electronics installation.

The system shall have multilevel security passwords for access to operating functions with recording of all password entries to nonvolatile memory.

The alarm unit(s) shall be enclosed in a modified NEMA 12 enclosure and have a two line by forty character display providing status and alarm data. The monitoring unit(s) [shall be field connected to an] [shall have a factory mounted] alarm horn. The unit(s) shall have a red LED optical alarm that is illuminated when any cable is in alarm. The monitoring unit shall be UL Listed and FM Approved to provide connections for intrinsically safe sensor circuits for use in Class 1, Division 1, Group C and D Hazardous Locations.

The system shall be tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules and so labeled.

The system shall be evaluated by an independent third party according to the Third Party Procedures developed according to the U.S. EPA’s “Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors”. The evaluation results shall verify the system manufacturer’s claims regarding sensitivity, range and other performance data.

Ability to locate a leak shall not depend on battery backed-up functions. In the event of power failure, system conditions and parameters shall be stored in nonvolatile memory allowing the units to automatically resume monitoring without resetting, upon restoration of power.

The monitoring unit(s) power requirements shall be 120/240 VAC, 100 VA, 50/60 Hz, single phase. Monitoring units shall be equipped with an RS-232 communication port and a common alarm relay for the panel and one relay per cable. SPDT relays are rated for 10 A @ 250 VAC.

The sensor cable, connectors, [probes] and jumpers shall be supplied by the manufacturer of the monitoring unit(s). The cable sensing principle shall provide for continuous monitoring while short lengths of the cable are in contact with liquids, without altering the system’s sensitivity and/or accuracy.

Software will be available that allows the manufacturer to remotely or on-site interface thru the RS-232 serial port for troubleshooting and diagnostics. Software shall have the ability to operate the PAL-AT monitoring units and retrieve each of the stored reference maps and current condition TDR traces. Software shall also be available for the customer to purchase including the above features and also having Graphic Locator System (GLS) and continuous monitoring. The GLS will allow a stored CAD site drawing to be recalled with a flashing icon at the trouble location on the cable.

### SPECIFICATIONS

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### DESCRIPTION

- **Unit Dimensions:**
  - AT20C/50C/20K - 14” H x 12” W x 7” D (360 mm x 305 mm x 180 mm)
  - AT40K/80K - 18” H x 16” W x 7” D (460 mm x 410 mm x 180 mm)
- **Power:**
  - AT20C/50C/20K - 120/240 VAC, 50/60 Hz, 50 VA
  - AT40K/80K - 120/240 VAC, 50/60Hz, 100 VA
- **Unit Weight:**
  - AT20C/50C/20K - 25 lb (12kg)
  - AT40K/80K - 40 lb (18 kg)
- **Ambient Operating Range:** 0°F to 120°F (-18°C to 50°C)

### ALARM OUTPUTS

- **Fault Conditions:** Leak, Break, Short or Probe Activation
- **Distance to Fault Location**
- **Activation of Output Relays**
- **Date and Time of Fault**
- **Red LED Optical Alarm**
The PAL-AT® family of sensor cables are able to meet the specific requirements of a wide variety of applications and environments including subfloors, containment pipe systems, direct burial and foam insulated pipes. The sensor cables offer the leak detection designer flexibility and choice in selecting the proper cable for the desired system sensitivity.

All PAL-AT cables and connectors are easily spliced or repaired in the field to minimize downtime and repair cost.

PAL-AT AGW-Gold and AGT-Gold sensor cables have the ability to detect both water-based and hydrocarbon liquids. This reduces the number of sensor cables required in many applications. Each of these PAL-AT sensor cables can be dried and reused after a water-based or volatile hydrocarbon leak has been cleaned up. These cables have no exposed metal and are designed for corrosive chemical applications. Each individual strand of braid wire is coated with a high-temperature, corrosion-resistant polymer and the length of the cable is covered with a fluoropolymer overbraid. Because there is no exposed metal, the Gold cables eliminate the need for special isolation precautions in cathodic-protected pipe applications.

PAL-AT TFH hydrocarbon sensor cable uses a hydrocarbon permeable jacket to detect hydrocarbon liquids while ignoring water-based liquids. In most cases, the sensor cable must be replaced after exposure to hydrocarbons.

ATP is a cable designed to monitor prefabricated polyurethane insulated pipes. The twisted pair type sensor cable will detect water-based liquids. The cable is factory installed in the insulation of each pipe length. The sections of ATP cable are easily spliced together as the pipe is assembled in the field.

AGW-Gold is a quick drying cable that is chemically resistant and designed to detect highly corrosive liquid leaks such as acids, bases and solvents. Typical applications are secondary contained pipes in chemical installations, subfloors of clean room manufacturing areas, computer rooms and high temperature applications such as steam pipe containment systems. The cable has passed UL 910 for Plenum Rating.

AGT-Gold is a wicking cable that is chemically resistant and designed to detect highly corrosive acid, base, and solvent leaks. Typical applications are clean rooms, subfloors, aboveground single-wall pipes and equipment applications. AGT-Gold should be installed in temperature and humidity controlled environments. This cable requires more drying time than AGW-Gold.

TFH is a wicking cable specifically designed to detect only hydrocarbons. This cable may be direct buried to a maximum depth of 20 ft (6 m) to locate fuel leaks while ignoring the presence of water. This cable is ideal for monitoring single-wall pipes and tanks. In applications where hydrogen sulfide or other corrosive gases may be encountered, such as refineries and oil fields, cable life may be reduced.
Sensitivity is the length of wet cable that is required to activate the PAL-AT under standard sensitivity settings. The length required for quick-drying AGW-Gold refers to the submerged length of the cable. Wicking cables AGT-Gold and TFH will quickly draw a liquid into the cable through capillary action when it is in contact with a \( \frac{1}{16} \) (2 mm) film of liquid. The length of wet cable required for wicking cables is the saturated length of cable. For example, if a few inches of AGT-Gold cable contact a film of water at 5,000 ft (1,500 m), in less than two minutes, the cable will be saturated sufficiently and the PAL-AT will go into alarm. The PAL-AT sensitivity can be adjusted.

<table>
<thead>
<tr>
<th>Sensitivity and Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Length ft m</td>
</tr>
<tr>
<td>AGW-Gold, AGT-Gold</td>
</tr>
<tr>
<td>Water</td>
</tr>
<tr>
<td>Hydrocarbon</td>
</tr>
<tr>
<td>TFH</td>
</tr>
<tr>
<td>AGW-Gold, AGT-Gold</td>
</tr>
<tr>
<td>Hydrocarbon</td>
</tr>
<tr>
<td>TFH</td>
</tr>
<tr>
<td>ATP</td>
</tr>
<tr>
<td>Accuracy ft(m)</td>
</tr>
<tr>
<td>AGW-Gold, AGT-Gold</td>
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<tr>
<td>Water</td>
</tr>
<tr>
<td>Hydrocarbon</td>
</tr>
<tr>
<td>TFH</td>
</tr>
<tr>
<td>ATP</td>
</tr>
</tbody>
</table>

NOTES:
- Effective length is the total length of sensor cable, and effective length of jumper cable and probes (see Jumper Cable Data Sheet) that are connected together to form the "sensing string". For cables longer than 5,000 ft, an additional effective length of 50 ft is added for each connector exceeding 1 connector per 500 ft of cable.
- The actual length or the effective length of a sensor string cannot exceed the maximum cable range for the selected Leak Detection System.
- Temperatures shown are continuous operating exposures.

**SENSOR CABLE SPECIFICATIONS**

**AGW-Gold**
Sensor cable shall be of fluoropolymer and polymer coated wire construction with no exposed metal parts. Cable shall detect water-based, chemical and hydrocarbon liquids. The sensor cable can be flushed and dried in-place and will not require replacement after a leak event of any volatile liquid. The cable shall have a breaking strength of at least 100 lb (45 kg) and shall be resistant to corrosion, abrasion and most chemicals tested in accordance with exposure procedures in ASTM D-543.

**AGT-Gold**
Sensor cable shall be of fluoropolymer and polymer coated wire construction with no exposed metal parts. Sensor cable shall detect accumulations at a shallow depth of \( \frac{1}{16} \) (1.5 mm) and be resistant to most acids, bases and solvents and be capable of being flushed and dried in place. The cable will not require replacement after a leak event of any compatible and/or volatile liquid. The cable shall have a breaking strength of at least 100 lb (45 kg) and shall be resistant to corrosion, abrasion and most chemicals tested in accordance with exposure procedures in ASTM D-543.

**TFH**
Sensor cable shall detect only hydrocarbons while ignoring water and water-based liquids. The cable is designed for direct burial to a maximum depth of 20 ft (6 m) and capable of providing a response time of not more than four minutes to most hydrocarbon liquids. The sensor cable is not reusable after exposure to hydrocarbons.

**ATP**
Sensor cable shall be a twisted-pair construction. The cable shall be designed to detect water-based liquids and be factory installed in polyurethane foam insulation.

**ATP COMPONENTS**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8017732</td>
<td>ATP Sensor Cable</td>
</tr>
<tr>
<td>8027800</td>
<td>ATP Crimp Splice Kit</td>
</tr>
<tr>
<td>8068308</td>
<td>ATP Crimp Tool</td>
</tr>
</tbody>
</table>

The information contained in this document is subject to change without notice. PermAlert, a Division of PERMA-PIPE, Inc., believes the information contained herein to be reliable, but makes no representations as to accuracy or completeness. PermAlert offers a sole and exclusive one year warranty as is stated in the Standard Terms and Conditions of Sale for these products. In no event will PermAlert be liable for any indirect, incidental or consequential damages.
Coaxial Jumper Cable is used to connect sensor cable segments and probes in series to form the sensing string. A minimum of 30 ft (9 m) of JMP-U/UD jumper cable [40 ft (12 m) of JPP] must be installed at the very end of a sensing string. Refer to the PAL-AT Installation Manual for specific requirements.

NOTE:
1. The effective length of jumper cable is determined by multiplying the actual jumper cable length by the range correction factor.
2. Long lengths of JPP will reduce the maximum allowable length of a sensing string.
3. Type JMP-U jumper cable is UL Listed for plenum application.
4. Type JMP-U jumper cable has a polyethylene jacket for outdoor, direct burial and wet application where the jacket may be damaged. A waterblock material limits the spread of water through a cut in the jacket. JMP-UD jumper cable has a polyethylene jacket without the waterblock for dry or wet location where the cable jacket is unlikely to be damaged. The connector installation is easier without the waterblock.

When a cable splice is required, connection in the field is easily accomplished utilizing standard Cable Connectors.

CONNECTOR ASSEMBLY
• Consists of two plugs and one adapter as shown

SPECIFICATIONS
• Plug material: Brass-Nickel-Plated
• Max. Overall Length: 3.875" (98 mm)
• Max. Diameter: 0.75" (19)

NOTE:
1. RTV sealant (Part No. 8047640) is required in corrosive or wet environments for all cable connectors with shrink tubing.

CRIMP TOOL
A Crimp Tool is required to crimp connectors for all sensing cables and jumper cables. It ensures a correct crimp each time. The Gold cables require a different die than the JMP-U/UD cables. This PermaAlert approved crimp tool must be used with any crimp style connection.

NOTE: CRPC and CRPG include tool and die.

<table>
<thead>
<tr>
<th>Connector</th>
<th>Part No.</th>
<th>Model No.</th>
<th>Cable Type</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRPCKIT</td>
<td>8068299</td>
<td>CRPC</td>
<td>JMP-U/UD</td>
<td>Includes CRPC &amp; CRPG</td>
</tr>
<tr>
<td>CRPC</td>
<td>8068300</td>
<td>JMP-U/UD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRPG</td>
<td>8068301</td>
<td>CRPG</td>
<td>GOLD CABLES, TFH, JPP</td>
<td></td>
</tr>
<tr>
<td>CRPT</td>
<td>8068305</td>
<td>CRPT</td>
<td>TOOL ONLY/LESS DIES</td>
<td></td>
</tr>
<tr>
<td>DIEC</td>
<td>8068306</td>
<td>DIEC</td>
<td>DIE-JMP-U/UD</td>
<td></td>
</tr>
<tr>
<td>DIEG</td>
<td>8068307</td>
<td>DIEG</td>
<td>DIE-GOLD CABLES, TFH, JPP</td>
<td></td>
</tr>
</tbody>
</table>
A Cord Grip provides a means for passing a cable through a bulkhead or into a junction box to form a watertight seal. Contact PermAlert for pressurized applications.

**SPECIFICATIONS**
- Housing Material: Steel-Zinc Plated
- Grip Material: Neoprene

---

A Cable Pulling Grip is used to grip the end of the cable during pulling operations.

**SPECIFICATIONS**
- Material: Stainless Steel
- Maximum Cable Diameter: .370" (9 mm)

---

The adhesive-backed Cable Mount is used to attach cables to flat surfaces. This fastener is normally spaced at 6 ft (2m) intervals along the cable length. When installations require mounting to concrete surfaces, construction mastic should be used.

**SPECIFICATIONS**
- Material: Nylon
- Size: 1.0"L x .75"H x .75"W (25mm x 19 mm x 19mm)
- Package Quality: 100 Pieces

---

The Cable Tag is an adhesive-backed water resistant tag that can be attached to a PAL-AT cable. It identifies the cable as a PAL-AT leak detection cable and also provides an area to write the cable number and distance.

**SPECIFICATION**
- Package Quantity: 100 Tags
The PHLR series probe is a resettable hydrocarbon probe that detects hydrocarbon liquids in interstitial spaces of tanks and pipes, sumps and other containment areas where hydrocarbon liquid can accumulate to a depth of \( rac{1}{4} \)" or more.

The probes will detect liquid fuels (gasoline, diesel fuel, jet fuel, crude oil, etc.) and many hydrocarbon solvents, but ignore vapors, thus eliminating false alarms due to vapors.

The unique design of the probe employs reusable sensor elements which swell upon exposure to hydrocarbon liquids and activate a sealed switch. The sensor elements can be easily removed, cleaned and reused numerous times after exposure. This enables the system to be quickly reset after testing.

The standard PHLR probe is designed for non-pressurized applications. The PHLR-P probe is available for pressurized locations. This probe is ideal for typical sealed, containment piping systems which are maintained under pressure with a nitrogen or air blanket.

Easy installation - The PHLR probe slips into the end of a \( \frac{3}{4} \)" Schedule 40 PVC pipe. The pipe can then be mounted in any orientation, horizontal or vertical. The PHLR-P probe slips into a \( \frac{3}{4} \)" PVC coupling and must be mounted vertically.

A PHLR series probe is available for the PAL-AT® or LiquidWatch® systems.

The PHLR series can easily be connected to a PAL-AT cable "sensing string" providing increased utilization of the PAL-AT capabilities. Each probe assembly for PAL-AT includes a probe integrator with 60 ft (18 m) of jumper cable to connect to the sensing string, and 20 ft (6 m) of lead cable to attach the probe to the integrator.

The PHLR series for LiquidWatch includes the probe adapter that is incorporated in the 20 ft (6 m) long probe lead wire. Additional lead wire is used if necessary.

**PAL-AT NOTE:**
- A "-S" probe must be connected in the first 5,000 ft (1,500 m) of the sensing string.
- A "-L" probe must be connected more than 5,000 ft (1,500 m) from the PAL-AT panel.

### Typical PHLR Response Times

<table>
<thead>
<tr>
<th>Liquid*</th>
<th>Response Time (@70°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 1, 1, Trichloroethane Acetone MEK Xylene Naptha Gasoline</td>
<td>&lt;1 minute</td>
</tr>
<tr>
<td>Diesel Fuel Kerosene Jet Fuel Crude Oil Alcohols</td>
<td>&lt;5 minutes**</td>
</tr>
</tbody>
</table>

* Long exposure to some aggressive solvents like acetone or xylene may soften the epoxy sealing the probe, requiring probe replacement.

** Response time at room temperature. Response times will be longer for lower temperatures.
APPLICATIONS

Part Numbers:

- PAL-AT Liquidwatch
- PHLR-S 8027888 PHLR-LW 8027890
- PHLR-P 8027899 PHLR-P-LW 8027913
- PHLR-P-S 8027912
- PHLR-P-L 8027912

Replacement Sensor Package: 8027895
- includes all removable parts, including replacement sensor elements, 8027896

Replacement Sensor Elements: 8027896
- includes sensor disks and sensor screens

PROBE TECHNICAL DATA:

- Operating Temperature: -20°F to 122°F (-29°C to 50°C)
- Length: 1.88" (48 mm) PHLR / 5.5" (140mm) PHLR-P
- Diameter: 1.06" (27mm)
- Lead Length: 20 ft. (6m)
- Activation Level (min):
  - Vertical - 0.25" (6.4mm)
  - Horizontal - 0.50" (12.8mm)

JUNCTION BOX: (PAL-AT ONLY)

- NEMA 4X (IP66) 10" x 8" x 4" (250mm x 200mm x 100mm)
- Maximum Temperature 140°F (60°C)

APPLICATIONS:

- Double Wall Tank • Sumps
- Double Wall Pipes • Manholes
- Sealed Trenches • Valve Pits

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Drawings
1. WHEN THE UNIT IS OPERATED PROPERLY, THE DISPLAY WINDOW ALTERNATES MESSAGES.

2. IF AN ALARM MESSAGE APPEARS IN THE DISPLAY WINDOW:

3. TO SILENCE ALARM PRESS "#" KEY.

4. ATTEMPT TO OPERATE THE SYSTEM. AN OPERATING SUMMARY IS PROVIDED IN THE SYSTEM PERSPECTIVE TH IMITING POSITION:

5. TOOLS TO OPERATE THE SYSTEM:

6. THE ENVIRONMENTAL SPECIFICATIONS ARE AS FOLLOWS:

7. MOUNTING DIMENSIONS

8. Sensor Conduit 88" Dia. Hole Power Cable

9. Holes (4) on Back Panel

10. 12.00" x 10.50" x 5.50" Dimensions
1. All cutting and patching required for the removal of existing and the installation of all work shown on these drawings shall be performed by this Contractor.

2. All new openings through existing floor slabs and masonry walls shall be saw cut or core drilled. All such openings shall be located to minimize the requirements for furred chases and soffits. Except where specifically otherwise noted, no new floor openings shall penetrate the reinforced portions of beams or ribs but may be required to penetrate thickened portions of floor slabs and beam projections. The Contractor shall locate all floor openings in the field and review proposed locations with the Architect for compliance with the above before cutting or drilling. DO NOT CUT STRUCTURAL REINFORCING WITHOUT SPECIFIC WRITTEN DIRECTIONS FROM THE ARCHITECT.

3. All new floor openings, and openings through fire walls created for the installation of new ductwork and or piping or conduit, or any existing openings discovered by the contractor during execution of the project shall be fire sealed in accordance with BJH Barrier Integrity Policy & Procedures (BIPP) dated March 31, 2009.

4. Building Fire Integrity: Construction operations shall not violate the fire integrity of the existing building structure. Any breaks, penetrations or discrepancies in existing fire rated walls, ceilings, floors, shafts or chases made necessary by construction or discovered by the contractor during execution of the project must be brought to the immediate attention of the Manager of Facilities Engineering. Appropriate interim life safety measures shall be developed and increased hazard surveillance shall be undertaken until the fire separation is intact.

5. Should asbestos, or any other hazardous material, be encountered during the execution of the work, or should the presence of asbestos or any other hazardous material be suspected, the contractor shall immediately notify the owner and suspend all work in the affected area. The Owner will activate an assessment study to determine the presence of asbestos, or other hazardous material, and evaluate what condition it is in. Removal of asbestos, or other hazardous material, if required, will be contracted for separately by Owner. Asbestos removal is not in this contract.

6. Provide all labor, equipment and material required for the reinstallation and re-support of existing services (ductwork, electrical conduit, piping, existing equipment, etc.) disturbed by the installation of new work under this contract. All new piping and conduit shall be painted per the hospital's color code. See specifications.

7. Entire leak detection system shall be UL listed and FM approved.

8. All new conduit shall be painted per the hospital's color code.

TEMPERATURE CONTROL

A. The controls shall be JCI.

B. Alarms

1. Provide the following alarms at the operator's terminal for each building:
   a. Fuel oil leak detected

D. Graphics

1. Provide graphics for each building indicating the location of the pumping stations, sensors and the fuel monitoring panels, as well as the fuel tanks locations and volumes.