

Level Basics

Why measure level?

- Control
- Alarm
- Report
- Troubleshooting
- System Health

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Level Basics

Used to control:

- Pump Operation – On/Off
- Sump Level – High/Low
- Tank Level – High/Low/Full
- Leak Detection
- System Alarms

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Level Basics

Types of Level Sensors

- Conductivity Probes
- Floats
- Submersible Pressure Sensors



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Level Basics

Conductivity Probes

Pros:

- Lowest Cost
- Variety of Materials Available
- No Moving Parts
- Variety of Styles and Configurations

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Conductivity Probes

Cons:

- Can Only Use In Conductive Liquid
- Needs to be Repositioned to Change Set Point
- Has Limited Range
- May be Affected by Precipitating Material
- Requires Power Supply & Processor or Control Relay

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Conductivity Probes



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Conductivity Sensors



Uses:

Dual Containment
Pipe

Dual Wall Tank

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Floats

Pros:

- Low Cost
- Easier to Adjust Position
- Less Susceptible to Electrical Noise / Interference
- Open or Closed Output
- Less Susceptible to Fouling
- Single or Dual Point

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Floats

Cons:

- Only Open or Closed Signal
- Requires Large Area to Work In
- Requires One Float For Each Set Point
- Requires Power Supply
- Requires Relay for Larger HP

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Level Basics

Float Switch – Small Diameter Sensor



Uses:
Small Sumps
Bore Holes

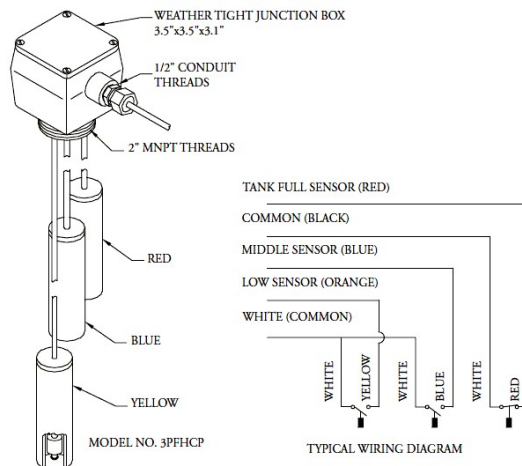
These float switches are weighted so that they will hang straight up and down.

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Level Basics

3-Point Level Sensor



Uses for small diameter floats:

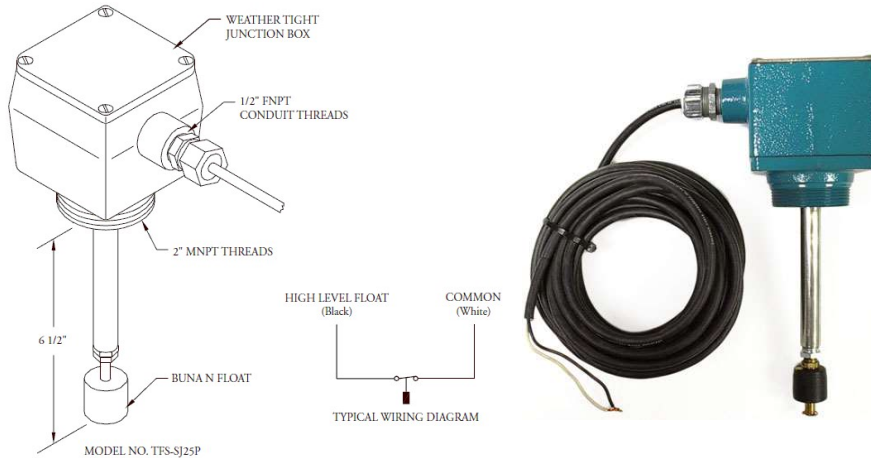
High turbulence tank or sump.

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Float Switch – Single Point



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Level Basics

Float Switch – Dual Point



Uses:

Turn low HP pumps on & off.

These are called “tear drop” floats and must rotate 90 degrees to change.

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Level Basics

Pressure Transducer / Transmitter

Pros:

- Suitable For Aggressive Environments
- Small In Size
- Accurate
- Scalable and Range-able Signal Output
- Available in Wide Range of Sizes
- No Calibration Required
- Is Repeatable
- Suitable for Vertical AND Horizontal Applications

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Level Basics

Pressure Transducer / Transmitter

Cons:

- Requires Well Grounded Circuit Protection
- Higher Cost
- Care During Installation & Cleaning
- Proper Venting
- Protection of Vent Tube
- Requires Power Supply
- Requires Process Meter

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Level Basics

Pressure Transducer / Transmitter



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Level Basics

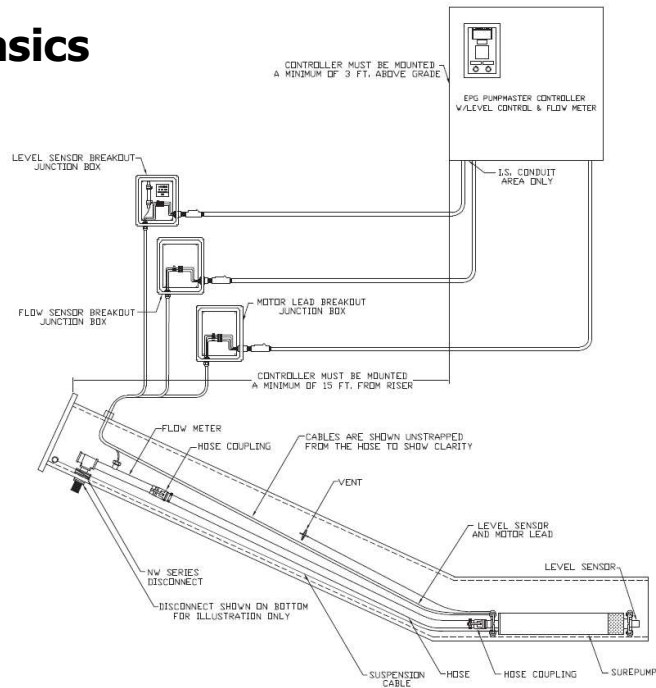
Submersible Level Sensors Have Many Applications

- Side Slope Risers
- Sumps
- Wells
- Tanks
- Reservoirs
- Settling Ponds

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Level Basics



Horizontal Pump Installation

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Level Basics

SurePump Integrated Level Sensors

The patented submersible level sensor is mounted along the central axis of the sump drainer, is removable from the bottom and assures accurate, repeatable level control.

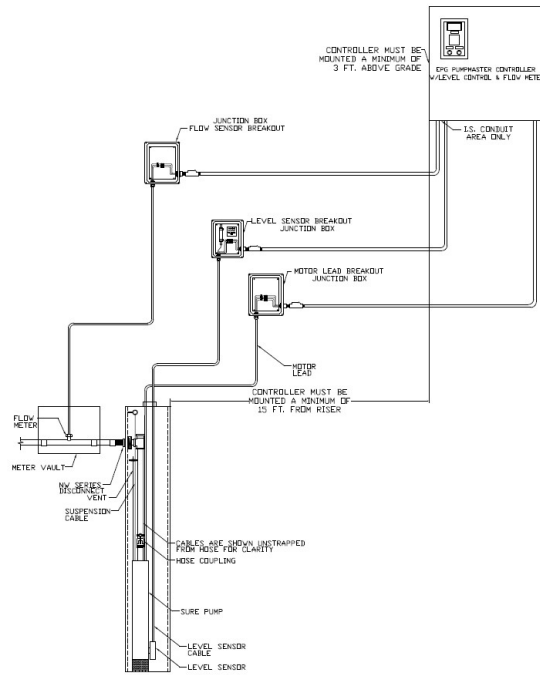


WSDPT

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Vertical Pump Installation

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Level Basics

SurePump Integrated Level Sensors



VSDPT, VSDCPT,
and TSP for
Vertical Sump, Gas
Condensate and
Tank

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Level Basics

SurePump Integrated Level Sensors

Custom WSD2PT featuring dual level sensors.

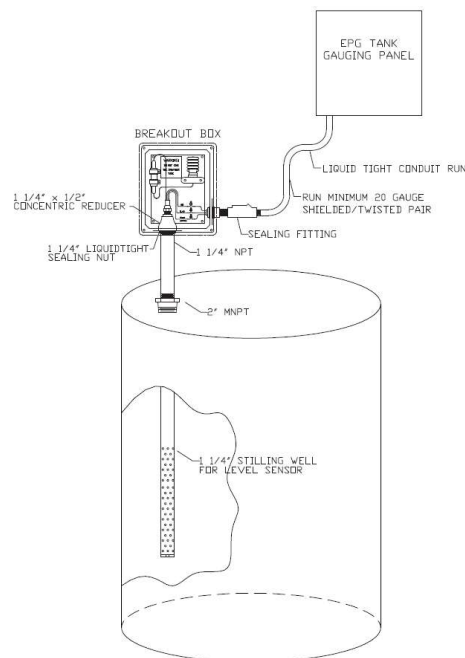


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Tank Gauging Installation



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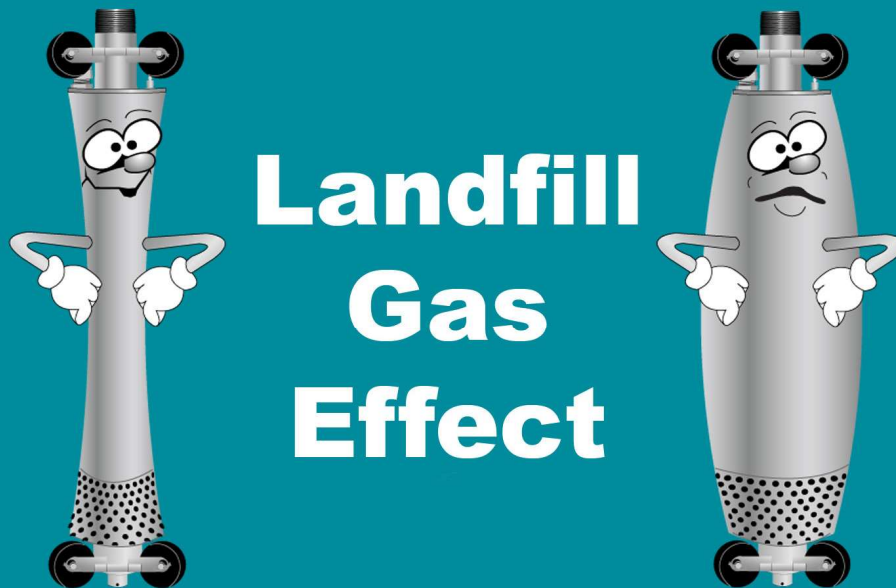
Level Basics

Factors Affecting Level Meter Performance:

- Vacuum
- Pressure
- Bad Connections
- Stuck in Mud at Bottom of Sump
- Incorrect Range

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Landfill Gas Effect – Pumps & Sensors

We call it gas effect; you can call it a problem.

It is a problem when you have pumps in a gas well, leachate collection sump (riser) or condensate sump and they also feel the positive pressure as gas is being created or negative pressure if a vacuum is being applied to collect the gas.

The positive gas pressure will help push liquid into the pump while the negative pressure is going to add to the system head loss that the pump must overcome.

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Landfill Gas Effect – Pumps & Sensors

Both positive and negative gas pressure have an adverse effect on a submersible level sensor (transducer or transmitter).

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Landfill Gas Effect – Pumps & Sensors

For example: If the sensor is in a sump with 24" of liquid above the sensor, its display meter will read 24". If this same sump has 35" of positive gas pressure as well as 24" of liquid, then the meter will read 59".

If the level meter is set to start pump at 55" and stop at 12" of liquid, sump will not stop at 12" because meter will not drop below 35". Pump will pump down until there is no more liquid to pump and run dry, reducing pump and motor life.

Example of positive gas pressure.

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Landfill Gas Effect – Pumps & Sensors

If you have the same liquid level, but now the sump is under vacuum of 35" and you programmed the level meter to start at 55", your pump will not start until the level reaches 90" of liquid depth and then shut off at 47" if programmed at 12". This error can easily put you out of compliance.

If the system switches from pressure to vacuum effect the pump will behave erratically, causing excessive wear and early failure.

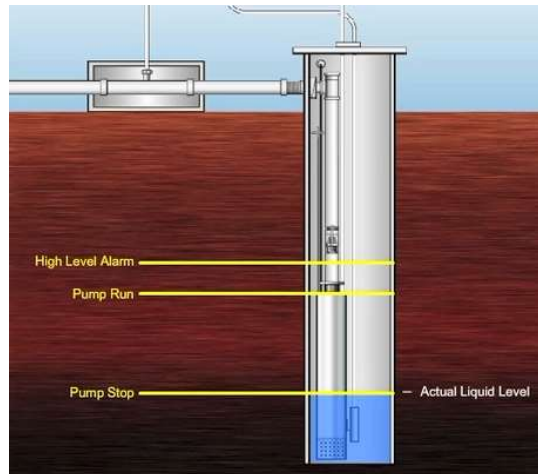
Example of negative gas pressure (vacuum).

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Landfill Gas Effect – Pumps & Sensors

- Why should we care?
- What will it affect?
- What harm could it cause?



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Landfill Gas Effect – Junction Box

Standard junction boxes will not hold a pressure or vacuum over two to five inches of water column.

To combat the gas effect you need a junction box designed and tested to withstand both pressure and vacuum (100" of water column pressure or vacuum recommended).

If the junction boxes leak when under a vacuum, it will contaminate the landfill gas. If under pressure, then they become a source of fugitive landfill gas.

Inside of the box is a desiccant dryer and equalizing bellows to protect the back side of the sensor from moisture and landfill gas.

Water proof wire connectors are also used to provide superior protection against the damaging effect of moisture and corrosion.

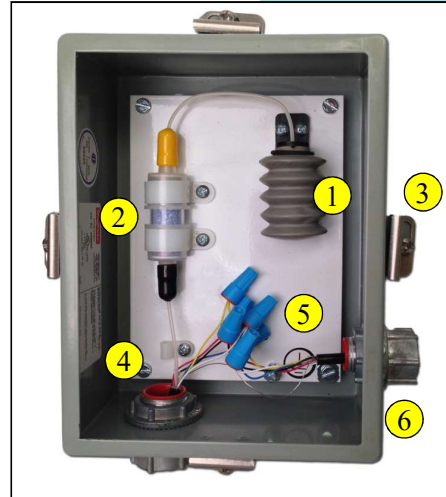
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Landfill Gas Effect – Junction Box

1. Bellows to seal backside of sensor
2. Desiccant dryer to keep sensor free of moisture
3. Four cover clamps for a gas tight seal
4. Clamp to secure sensor cable
5. Water-proof wire connectors to prevent corrosion
6. Gasketed hubs for liquid & gas tight seals

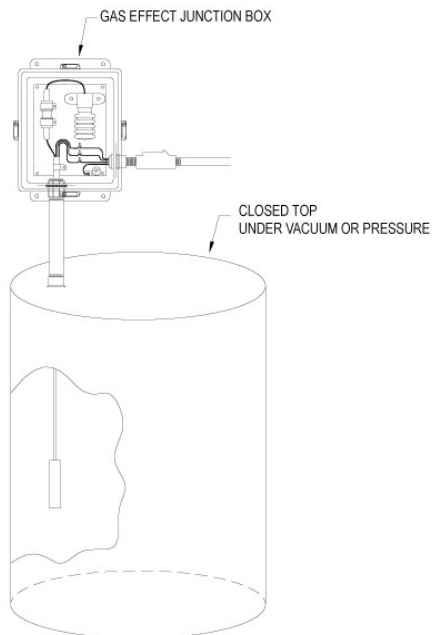
Refer to page O-13, Bulletin 8225a
and O-17, Bulletin 6095a



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Landfill Gas Effect BJBGE-100B



Note:
BJBGE is to be
connected directly
to vacuum or
pressure source.

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Landfill Gas Effect – Junction Box

Label Explanation:

“Because this breakout junction box is protected by an intrinsically safe circuit, does not store energy and is not a source of ignition, the box can be mounted directly to the riser or sump which is under gas effect. This close connection is what makes it work.”



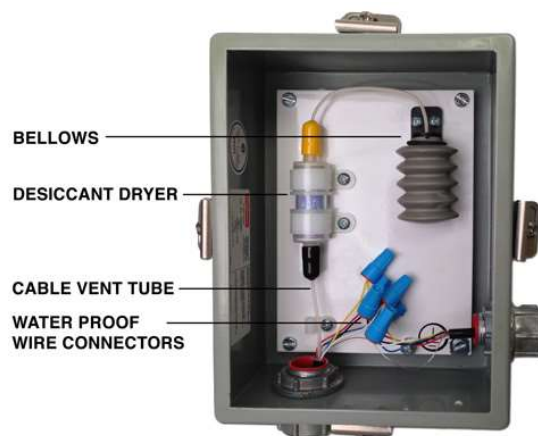
Refer to page O-13, Bulletin 8225a

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BJBGE-100B



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Bellows



Used to equalize pressure on level transducer to atmosphere for accurate readings.

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Landfill Gas Effect – Junction Box



Items used to install BJBGE:

- Teflon Tape
- Electrical Pipe Nipple
- Myer's Hub
- Water-proof wire connectors

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Landfill Gas Effect – Junction Box

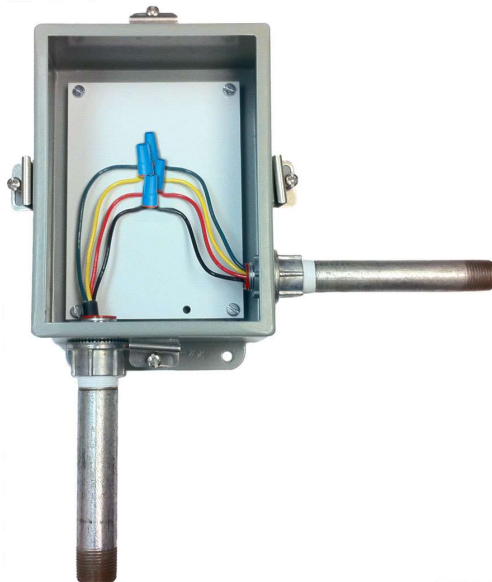
Note: When using screwed electrical fittings at a landfill, you should use Teflon® sealing tape on all of the thread joints to create a liquid and vapor tight seal. This tape will eliminate the conduit as a ground. This procedure requires you to pull a separate ground wire to maintain a good ground.



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Landfill Gas Effect – Junction Box



Breakout Box
assembled using:
Teflon Tape
Electrical Pipe
Nipples
Myer's Hubs
Water-proof wire
connectors

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Landfill Gas Effect

Desiccant Dryers



Used to remove and protect level sensor form moisture.

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Landfill Gas Effect



Myer's Hub



Seal-Off Fitting

The proper use of thread seal tape on electrical conduit connections to prevent gas migration DOES eliminate the conduit as a ground.

A separate, dedicated ground wire must be pulled to insure a good ground.

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Landfill Gas Effect

The How & Why of Breakout Junction Boxes

Follow the electrical code and use common sense when installing breakout junction boxes.

Reason to use:

- Prevent migration of landfill gas into the control panel
- Simplify installation and maintenance
- Increase overall safety of the pump and control system
- Reduce operation problems
- Reduce replacement costs
- Increase life of sensors, controls and pumps

*Refer to page
O-15.
Bulletin 8230*

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Landfill Gas Effect – Control Panel

We have found two main entry points for landfill gas to enter the control panel:

- The absence of seal-offs.
- Seal-offs that have not been potted.

Other openings in the control panel not made liquid and vapor tight can allow entry of gas as well.

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Landfill Gas Effect – Control Panel



A site visit to a landfill resulted in this discovery:

A seal off which had not been potted.

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Landfill Gas Effect – Control Panel



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Landfill Gas Effect – Control Panel



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Level Basics

Process Meters



Level Meter



Flow Meter



OCS

Used to:
Power the Sensors

Display Level and
Set Points

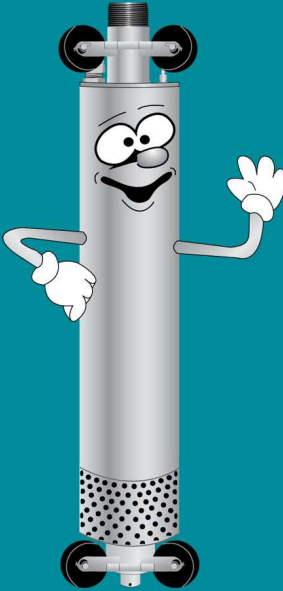
Control Pump
On/Off

Annunciate Alarms

Communicate

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The End