



Calibration: Equipment and Frequency

INDIANA UTILITY REGULATORY COMMISSION

James Skomp Operation Manager of Pipeline Safety

What are the Indiana regulatory requirements?

170 IAC 5-3-2.2 Calibration of instruments:

(a) An instrument or tool, the use of which is necessary to comply with this rule, shall be calibrated according to the manufacturer's specifications and at intervals recommended by the manufacturer.

(b) Records of instrument calibration shall include the instrument serial number or unique identifier, date of calibration, the name and signature of the individual or third-party vendor performing the calibration, the process and calibration standard used for the calibration, as-found and as-left data, and the due date for the next calibration.

Source: Indiana Utility Regulatory Commission; 170 IAC 5-3-2.2; filed Mar 17, 2022, 12:34 p.m.: 20220413-IR-170210213FRA

Why was this rule established?

Instruments over time tend to lose their accuracy. If accuracy is lost, a reading from an instrument (pressure gage, multimeter, etc.) may appear to show compliance when, in fact, a true reading would show a non-compliant state.

These readings could have a detrimental effect on a pipeline.

Calibration compliments OQ. We are all familiar with the OQ process that requires knowledge, skills and abilities for people to qualify to perform covered tasks. But what about the instruments used to demonstrate compliance? These instruments now are required to be calibrated as often as the manufacturer recommends.

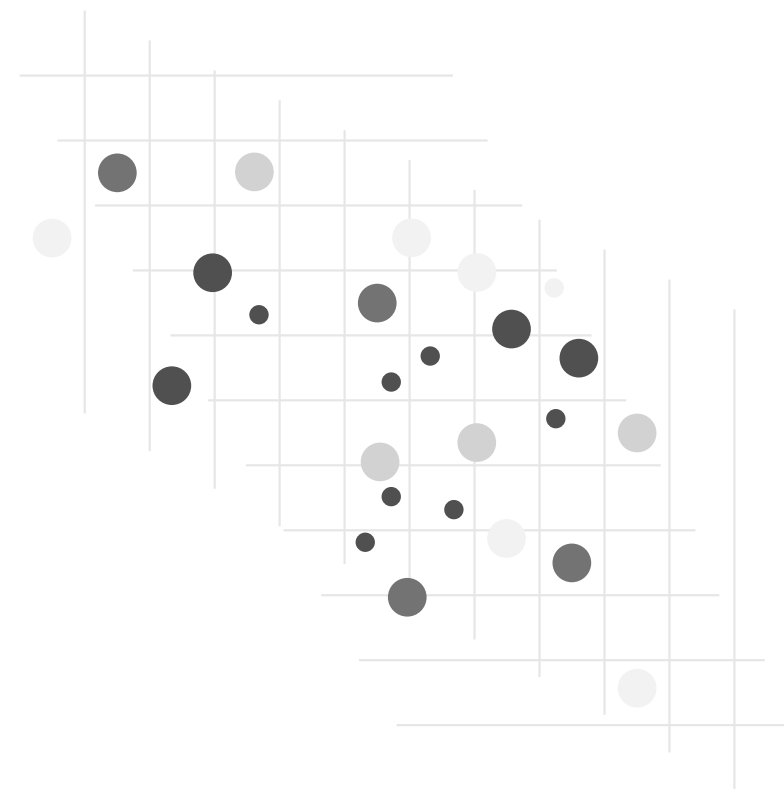
Calibration

What is Calibration?

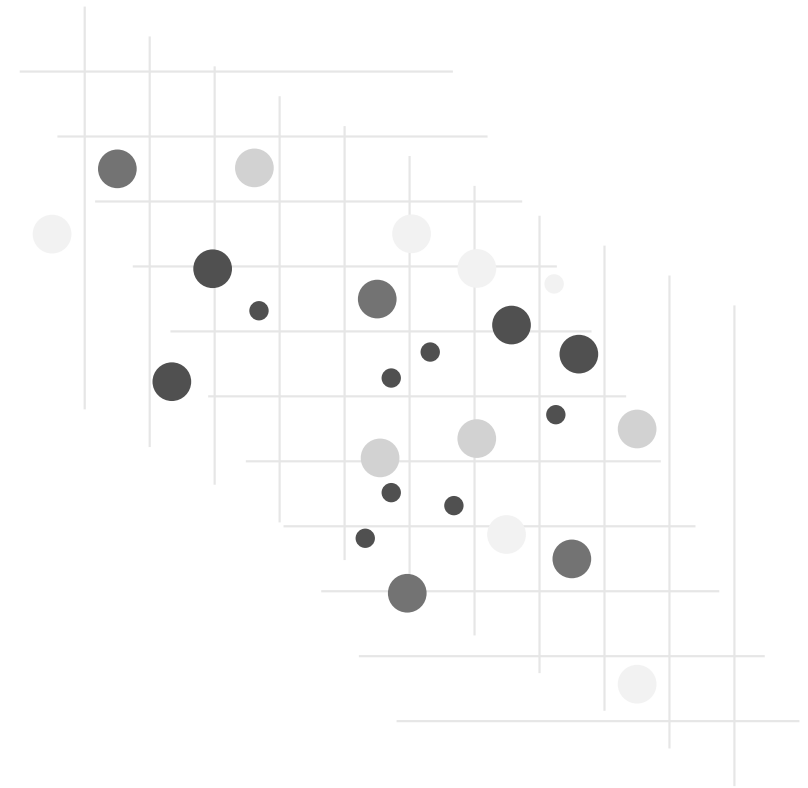
Calibration is the act of comparing a device under test (DUT) of an unknown value with a reference standard of a known value.

A calibration is performed to determine the error or verify the accuracy of the DUT's unknown value.

A calibration is a snapshot in time, **NOT** a guarantee!



Calibration



Calibration

Examples of Instruments that need calibration

- Combustible Gas Indicator (CGI)
- Flame Ionization Unit (FI)
- Remote Methane Leak Detector (RMLD)
- Portable Methane Detector (PMD)
- Electrofusion Equipment
- Half-cell
- Pressure Gauge & Recorder
- Locator (self-testing & non-self testing capable)
- Odorant Detecting Equipment (Heath Odorator, YZ Dtex)
- Odor Handy – TBM instrument (used in pickling)
- Digital Multimeter (DMM)
- Insulation Checker
- Ultrasonic Thickness Gauge
- ACVG
- DCVG

3. Specifications

 IEC 1010 Over Voltage:
 CAT II - 1000V
 CAT III - 600V
 Pollution Degree 2

 LISTED
 UL 3111-1

a. DCV

Range	Resolution	Accuracy	Impedance
200mV	0.1mV	±0.5% of reading, ±2 digits	10M
2V	0.001V		
20V	0.01V		
200V	0.1V		
1000V	1V		

b. ACV (45Hz to 450Hz)

Range	Resolution	Accuracy	Impedance
200mV	0.1mV	±1.2% of reading, ±3 digits	10M
2V	0.001V	±0.8% of reading, ±3 digits	
20V	0.01V		
200V	0.1V		
750V	1V		

c. DCA

Range	Resolution	Accuracy	Overload Protection
200µA	0.1µA	±0.5% of reading, ±1 digit	Fuse* F600V, 2A, 31CM
2mA	0.001mA		
20mA	0.01mA		
200mA	0.1mA	±1.2% of reading, ±1 digit	Fuse* F600V, 10A, 31CM
2A	0.001A	±2% of reading, ±5 digits	
10A	0.01A		

*Warning: Use only correct size, voltage and current rated fuses.
 Test Leads: Use only correct type and overvoltage category rating.

d. ACA

Range	Resolution	Accuracy	Overload Protection
200µA	0.1µA	±1% of reading, ±3 digits	Fuse* F600V, 2A, 31CM
2mA	0.001mA		
20mA	0.01mA		
200mA	0.1mA	±1.8% of reading, ±3 digits	Fuse* F600V, 10A, 31CM
2A	0.001A		
10A	0.01A	±3% of reading, ±7 digits	

e. OHM (Resistance,)

Range	Resolution	Accuracy	Overload Protection
200	0.1	±0.5% of reading, ±1 digit	600V DC or AC Peak
2k	0.001k		
20k	0.01k		
200k	0.1k		
2M	0.001M		
20M	0.01M	±1% of reading, ±2 digits	

f. Diode Test

Test Voltage	Max Test Current	Over Load Protection
2.5V	Approx. 1mA	600 V DC or Peak AC

g. Continuity Buzzer

Test Voltage	Threshold	Over Load Protection
2.5V	<100	600 V DC or Peak AC

h. General Specifications

Power Supply	9 Volt Battery
Battery Life	560 hrs. Alkaline
Size (H x L x W)	33mm x 86mm x 187mm (1.3" x 3.4" x 7.4")
Weight	340g (12 oz)

*Warning: Use only correct size, voltage and current rated fuses.
 Test Leads: Use only correct type and overvoltage category rating.

fpi

133

**Digital Multimeter
Instruction Manual**



Example of Digital Multimeter

Example of Digital Multimeter

FLUKE

110/113/114/115/117
True-rms Multimeter

Uses Vorrat

True-rms Multimeter Specifications

Specifications

Accuracy is specified for 1 year after calibration, at operating temperatures of 18 °C to 28 °C, with relative humidity at 0 % to 90 %.
Extended specifications are available at www.Fluke.com.

Maximum voltage between any terminal and earth ground	600 V
Δ Fuse for A input (115 & 117 only)	11 A, 1000 V, IR 17 kA
Display	
Digital	6000 counts, updates 4/s
Bar Graph	33 segments, updates 32/s
Temperature	
Operating	-10 °C to 50 °C
Storage	-40 °C to 60 °C
Temperature Coefficient	0.1 x (specified accuracy)/°C (<18 °C or >28 °C)
Altitude	
Operating	2000 meters
Storage	10 000 meters
Relative Humidity	95 % to 30 °C, 75 % to 40 °C, 45 % to 50 °C
Battery	IEC 6LR61
Battery Life	
113	Alkaline: 300 hours typical, without backlight
110, 114, 115, 117	Alkaline: 400 hours typical, without backlight
Safety	
113	IEC 61010-1: Pollution Degree 2
110, 114	IEC 61010-2-033
115, 117	Measurement CAT IV 600 V
Ingress Protection	Measurement CAT III 600 V
Electromagnetic Compatibility (EMC)	Measurement CAT III 600 V, 10 A
International	IEC 60529: IP42 (non-operating)

Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.

Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

Emissions that exceed the levels required by CISPR 11 can occur when the equipment is connected to a test object.

Korea (KCC) Class A Equipment (Industrial Broadcasting & Communication Equipment)

Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.

USA (FCC) 47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.

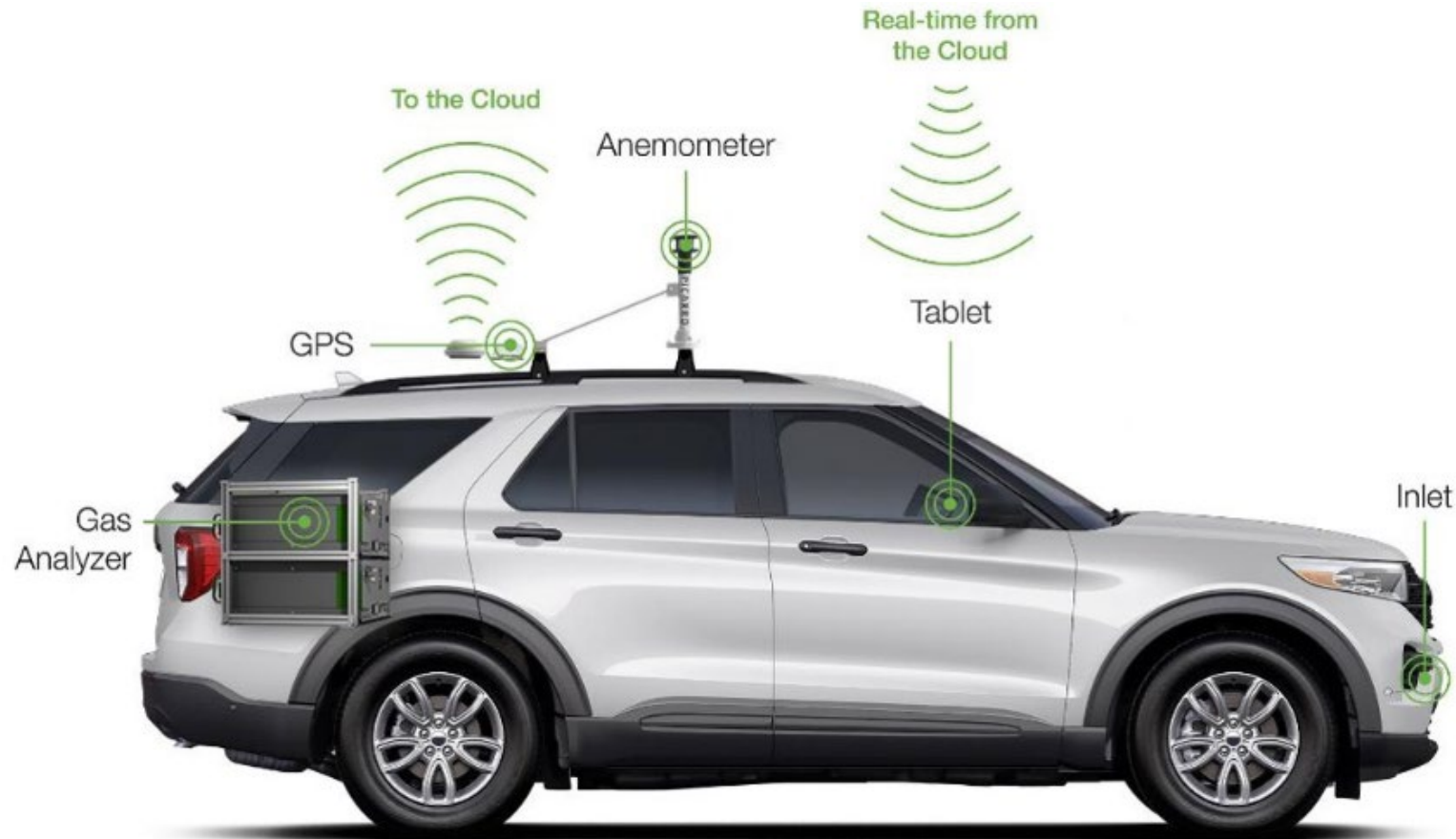
Combustible Gas Indicator (CGI)



Leak Survey Equipment



Leak Survey Equipment



Odor checking Equipment



Odor Handy –TBM instrument



Using Odor Handy in a New Pipeline Pickling Process

Odor Handy is a handheld, chemical sensor-based analyzer designed to measure mercaptans (such as tert-butyl mercaptan, TBM) in gas systems. It can also detect other mercaptans and is useful for verifying % gas in air readings, making it ideal for **pipeline conditioning (pickling) projects** where repeated odorant concentration checks are needed



Pressure Gauge and Recorder



2.5 Self-Test

The Self-Test feature must be run in an area free from interference, such as overhead fluorescent lighting, large transformers, etc. Also, check that any nearby transmitters or sondes are switched off.

Select "Self-Test" from the user menu and press the "Return" button. Keep the receiver stationary while the test is running. After a short while, the test will complete, and the unit will report Passed or Failed.



Examples of the Self-Test results

If the receiver fails the test, try again in an area with less interference. If it continues to fail, return the unit to Vivax-Metrotech or one of its approved repair centers for investigation.

Example of Pipeline Locator



EXAMPLE OF LOCATOR THAT MAY NOT NEED TO BE
CALIBRATED



Example of Half cell verification



Borin
Manufacturing Inc.
310 822-1000

Stelth 3 Portable Reference Electrode maintenance, calibration and testing procedures

Stelth 3 portable reference electrodes require minimal maintenance to achieve their 10 year design life.

Because they are a solid state sealed electrodes, they do not require re-filling of copper sulfate electrolyte nor do they require the internal copper rod to be cleaned.

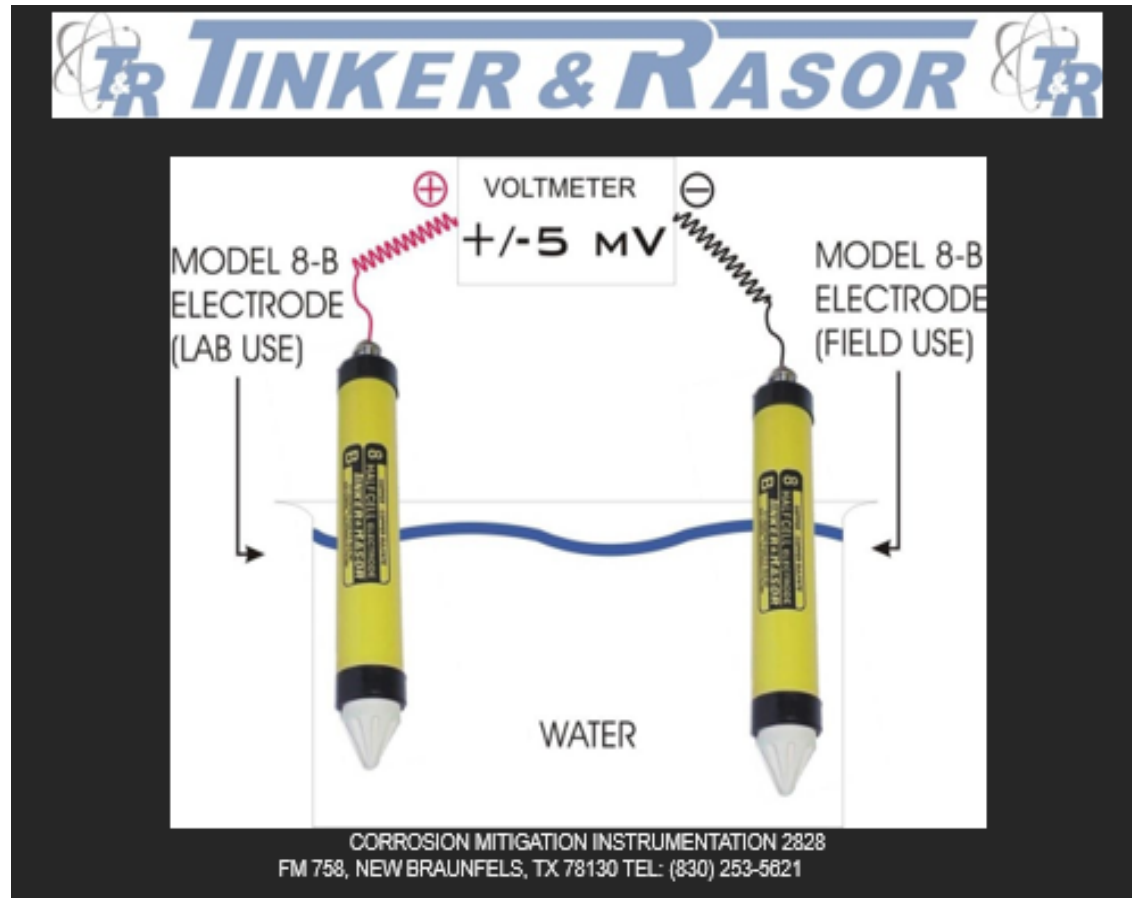
The only maintenance required is to keep the electrode clean and hydrated, this is done by washing with potable water and mild dish soap after use and keeping the ceramic tip covered by the included vinyl cap, when needed a tablespoon or two of water can be added under the cap. In extreme dehydrated situations, simply place the electrode, tip down in a glass of potable water for 5-10 minutes.

For Calibrating/Testing there are two options:

Electrodes can be returned to us and we will test/calibrate in our lab and issue a new certificate, there is a \$10.00 fee for this.

Electrodes can be self test/calibrated. This is done by having a new Stelth 3 deemed "Test Electrode" which cannot be used in the field but used to test against the field electrodes. The procedure is very simple. Both electrodes are momentarily placed in a bucket of potable water and measured against each other with a multi meter with a pass/fail criteria of 10 mV.

Example of Half cell verification



Example of Half cell verification



Testing Electrodes for Accuracy: After prolonged use, the copper sulfate solution can become contaminated by outside elements (reverse osmosis) leading the faulty readings. To check the condition of an in-service electrode, the following procedure is recommended. A new electrode should be prepared as a “standard”. An LC-4 voltmeter is recommended for the test procedure with the DC voltage range set to 200mV and the input impedance set to 200MΩ. Attach the “standard” reference electrode to the negative (or common) side of the meter and the electrode to be tested to the positive side. Place the plug ends of the two electrodes (the “standard” and the in-service electrode) in a plastic bath containing tap water (not de-ionized or distilled water). If the electrodes are evenly matched, the voltmeter should read zero $\pm 10\text{mV}$. Since copper sulfate electrodes are affected by temperature, it is necessary to allow both electrodes to equilibrate at the same temperature prior to the test. 72 degrees F is ideal. When it is found that an in-service electrode has a reading that is outside the acceptable tolerance range, the electrode should be rejuvenated using the procedures outlined above.

Example of soil resistivity tester

M.C.Miller Soil Resistivity Meter, 400A |

Resistance Meter Calibration Checking

It is recommended that resistance meters, other than those that self-calibrate, such as the Miller 400D Resistance Meter, have their calibration checked by the manufacturer on an annual basis.

Periodic calibration checking by users of resistance meters is also recommended. As indicated in the ASTM Standard (ASTM G 57), a commercial resistance decade box is recommended for periodic resistance meter calibration checking. One such commercial source for resistance decade boxes is IET Labs, Inc., of Westbury, NY (www.ietlabs.com/decaderes.html).

Another option is to use an M. C. Miller 4-electrode soil box together with a “standard” solution electrolyte having a known conductivity and, therefore, a known resistivity.

The ASTM Standard (ASTM G 57) suggests using sodium chloride solutions having resistivity values of 1,000 $\Omega\cdot\text{cm}$, 5,000 $\Omega\cdot\text{cm}$ and 10,000 $\Omega\cdot\text{cm}$ for this purpose. These resistivity values correspond to the following conductivity values, respectively: 1000 $\mu\text{S}/\text{cm}$, 200 $\mu\text{S}/\text{cm}$ and 100 $\mu\text{S}/\text{cm}$.



Example of
flange checker
below & above
ground

Miller Insulation Checker (MIC)



Below Ground Miller Insulation Checker (U-MIC)

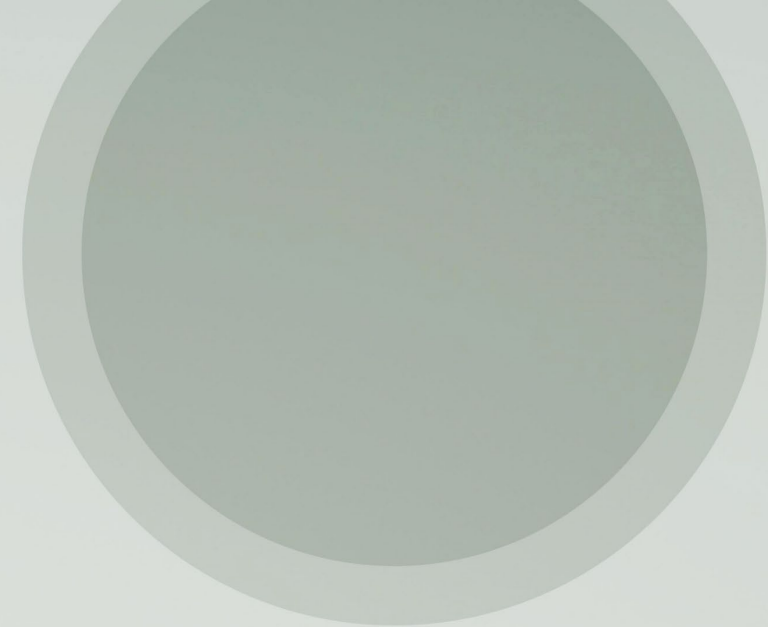


ACVG testing



DCVG Equipment





QUESTIONS





THANK YOU



INDIANA UTILITY REGULATORY COMMISSION

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