STATIC GROUND AND BOND TEST SYSTEM KIT

For Hazmat Applications

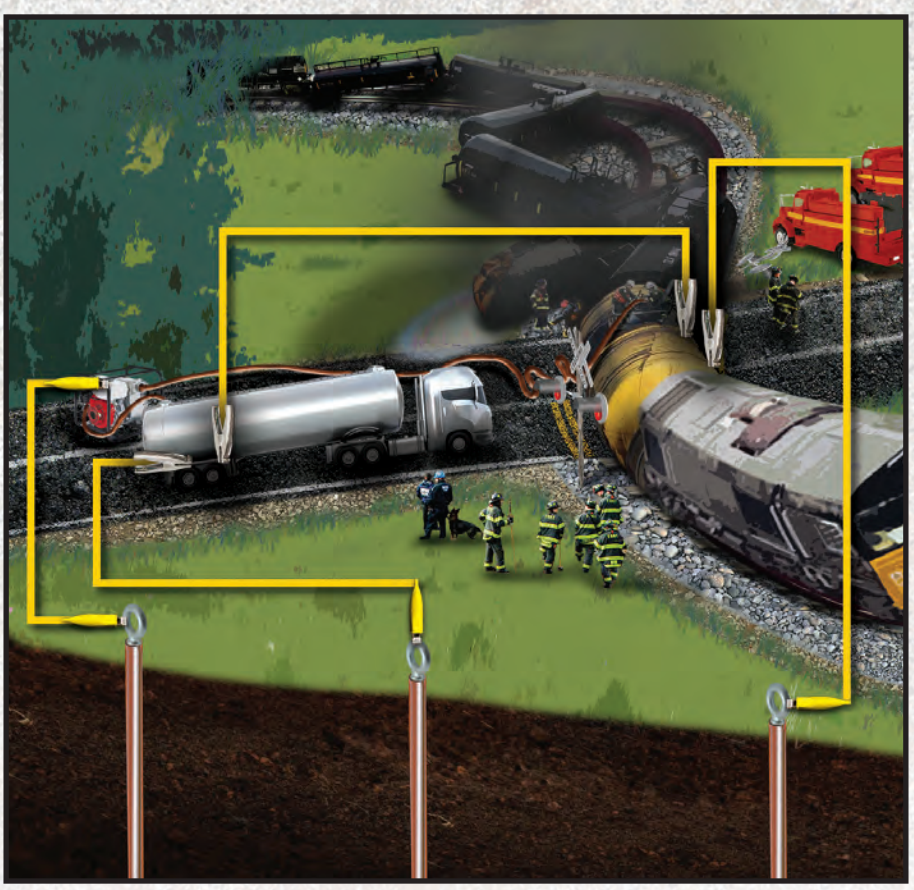
APPLICATION NOTE

Our products are backed by over 130 years of experience in test and measurement equipment, and encompass the latest international standards for quality and safety.

To learn more or contact us visit our website: www.aemc.com

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

First responders know that a single spark can mean the difference between a hazardous situation and disaster.



This application note will explain how to properly utilize the Static Ground and Bond Test System Kit from AEMC® Instruments.

To help lower the risk of electrostatic discharge when offloading flammable liquids, standards like NFPA 472 require first responders to bond any tankers[1] to a temporary grounding system.

A temporary grounding system creates an equipotential plane between the tankers and the equipment used to pump the liquid. The electrically conductive pathway from the vehicles to the ground allows any static electricity to safely dissipate into the ground. However, if the tankers or equipment are not properly bonded and grounded, static electricity could build up and create a spark capable of igniting the vapors and causing an explosion.

To safely set up an effective temporary grounding system, you will need the tools and knowledge to install it correctly.

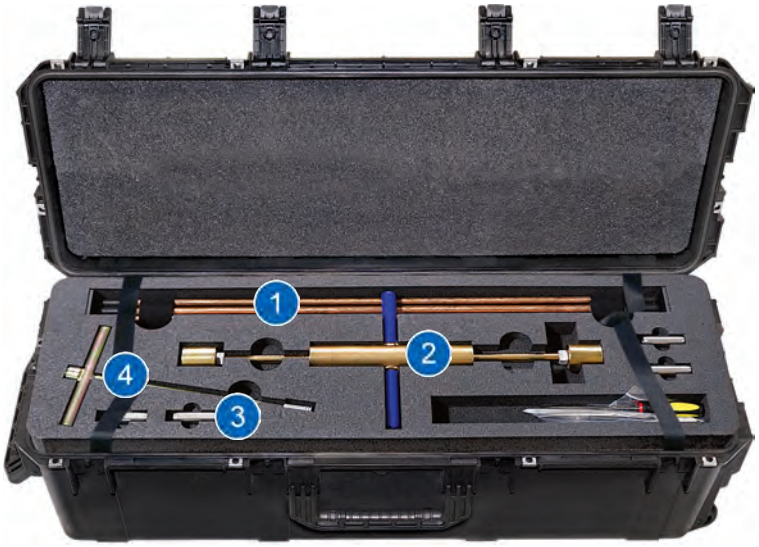
Luckily, a Static Ground and Bond Test System Kit from AEMC® Instruments includes the necessary components to safely install temporary grounding systems.

Footnotes:

1. This application note uses the term “tankers” to refer to any vehicle carrying hazardous flammable material.

1. REVIEWING THE KIT COMPONENTS

The kit is packaged in a hard-shell waterproof case designed for use in rugged environments and contains two trays with the necessary components to create and test a temporary grounding system.



The **top tray** consists of an instruction sheet and the following equipment:

1. Ground rods to ground the tankers.[1]
2. Insertion/extraction tool to install and extract the ground rods.
3. Couplers to connect the ground rods together for greater depths.
4. Auxiliary electrodes to test the grounding system.[2]

The **bottom tray** of the kit consists of the following:

1. AEMC® Instruments Ground Resistance Tester Model 6422.[3]
2. Color-coded leads to connect the auxiliary electrodes to the Model 6422.
3. Jumpers to connect the tankers to the grounding systems and each other.
4. Stainless steel jumpers to connect multiple ground rods.[4]

Footnotes:

1. These are steel rods with copper cladding to prevent corrosion and rust.
2. These electrodes are used to inject test current and measure potential.
3. This instrument is used to verify that the grounding system meets any local or national requirements, as explained later in this article.
4. These are used to connect the rods together for situations where multiple rods are necessary to create a satisfactory grounding system.

2. SELECTING A LOCATION

To select an adequate location for the grounding system, your first step is to identify the hot zone around the tanker.

What is the hot zone?
The hot zone refers to the area where flammable gasses could be present, like an area where fuel has leaked into the ground and evaporated.

How can the hot zone be identified?
You can identify the hot zone with a gas detector designed to detect the dangerous gases and display the Lower Explosive Limit (LEL) percentage.

How does the hot zone relate to the grounding system?
Any grounding system must be set up outside of the hot zone to prevent potentially dangerous situations. If possible, select a location that is uphill and upwind from the hot zone.

3. INSTALLING THE GROUNDING RODS

After a suitable location has been selected, the next step is to install the ground rods.

Depending on the soil conditions, you may be able to insert the rod by hand, or you may need to use the insertion/extraction tool.

How to use the insertion/extraction tool

1. Attach the threaded end of the rod into the tool.
2. Then, install the rod with a hammering motion until it reaches a depth of 24 to 36 inches.
3. Then, unscrew the rod from the tool.

Static Ground and Bond Test System Kit

Be Ready For Any Hazmat Spill Application Big or Small!

MEMBER OF NFPA

IP 67

UL 94 HB FLAME RETARDANT

- Complies with grounding and testing standards of NFPA 472
- Significantly reduces or eliminates the potential for sparks and explosion due to static electricity
- Contains all the equipment needed to properly ground and test prior to flammable hazardous material transfer
- One button test operation provides quick results minimizing valuable time to transfer potential combustible material

Kit Includes:

- Meter and two 150 ft color-coded leads on spools (red/blue)
- One 30 ft lead (green)
- Two 14.5” T-shaped auxiliary ground electrodes
- One calibration checker
- Six threaded copper clad 3 ft ground rods
- Four ground rod couplers
- One 50 ft bonding cable with REB clamps
- Three 50 ft grounding cables (REB clamp on one end, Mueller clip on the other end)
- Six 10 ft ground rod jumper cables with Mueller clip on both ends
- One ground rod driver/extractor tool
- Waterproof utility carrying case with wheels and handle
- Batteries and user manual

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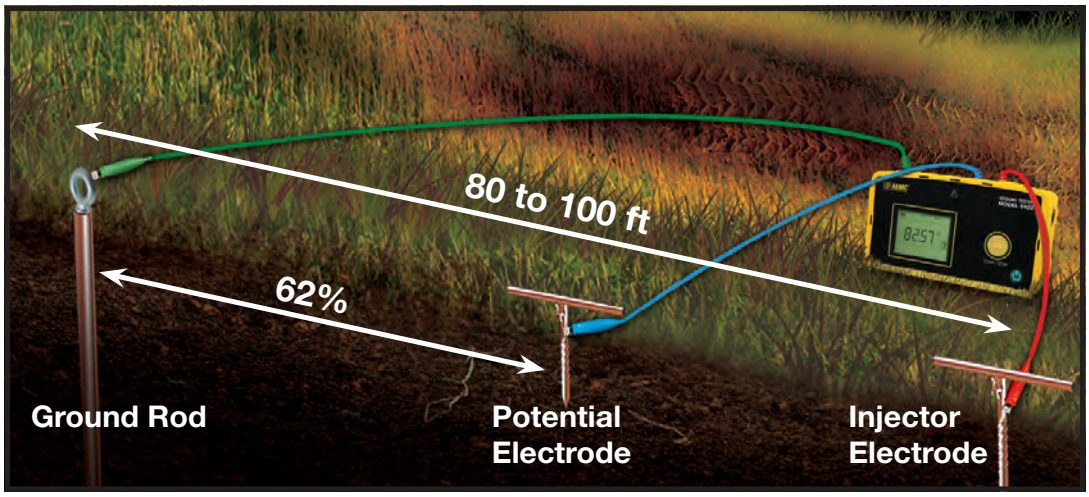
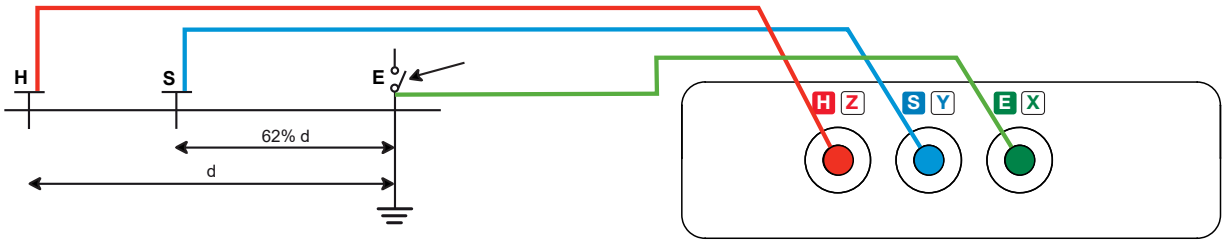
4. MEASURING THE GROUND RESISTANCE VIA FALL-OF-POTENTIAL TEST

After the ground rod is installed, you must measure the ground resistance to determine if the ground rod is sufficient or if other steps are needed to create an effective grounding system. With our Static Ground and Bond Test System Kit, you have the necessary components to perform a Fall-of-Potential test and verify the effectiveness of your temporary grounding system.



How to perform a Fall-of-Potential test

1. Insert the injector electrode between 80 and 100 feet from the grounding rod.
2. Connect the red lead to the injector electrode.
3. Insert the spindle tool that comes with the kit into the spool to allow it to spin freely, and bring the spool back to the instrument.
4. When a sufficient length of lead has been played out, push the lever on the spool to release the tool.
5. Insert the red jumper into the spool's banana jack.
6. Insert the other end of the jumper into the red terminal on the instrument labeled H/Z.
7. Similarly, use the blue lead to attach the potential electrode to the instrument's blue S/Y terminal.
8. Finally, use the green lead to attach the instrument's green E/X terminal to the grounding rod.

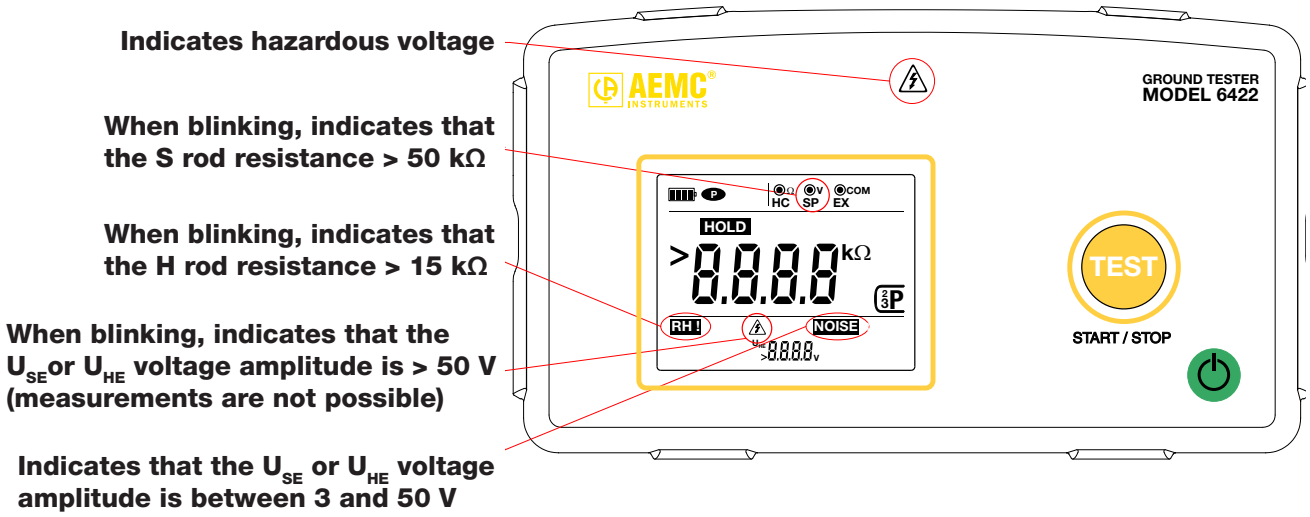


9. To take the measurement, simply press the TEST button and wait a few seconds for the reading on the display to stabilize.
    a) In some jurisdictions, a resistance under 1000 Ω is acceptable for a temporary grounding system.

b) Other jurisdictions may require the resistance to be under 25 Ω.

c) Be sure you know the requirements of your location before connecting any cables and pumping equipment to the damaged tanker.

10. When performing the test, pay attention to the fault indicators on the Model 6422's front panel and display. If any fault indicators are on, check every connection between the instrument, auxiliary electrodes, and grounding rod.



11. After the grounding field is set up for the damaged tanker, follow the same procedure to create and test a separate grounding field for the receiving tanker.[1]

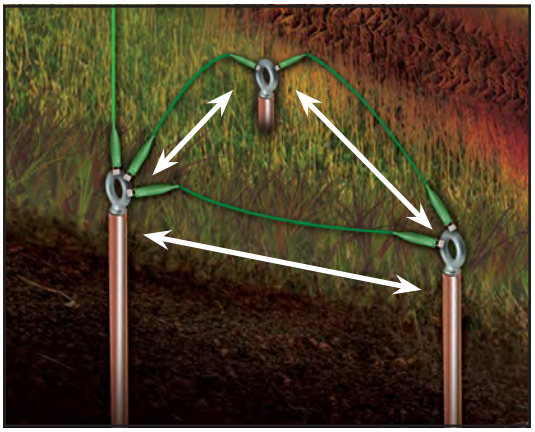
12. As an extra safety measure, you can also create a separate grounding field for the transfer pump equipment.

Your temporary grounding system must comply with your local jurisdiction, which usually follows NFPA 472 (1000 Ω or less) or NEC (25 Ω or less). Lower resistance is always better because high resistance indicates a longer static discharge time.

Footnotes:

1. While it is possible to use a single grounding field for both the damaged and receiving tankers, we recommend having separate fields for each tanker for redundancy in case a cable is accidentally disconnected during liquid transfer.

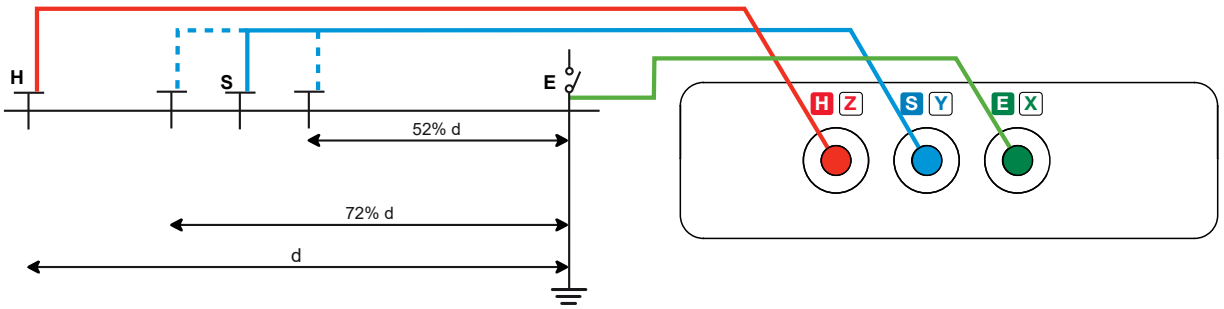
If the measurement results do not meet the standards mandated for your location, you can improve the results in a few ways.



- You can moisten the soil around the temporary grounding system to improve conductivity.
- You can add one or more ground rods to the grounding system. Insert the second ground rod a minimum of one rod length away from the first, and use the green stainless steel jumper cables supplied with the kit to connect them. If you add a third ground rod, it will need to be placed a minimum of one rod length away from the other two.[1]
- If a guard rail is available, use the jumpers to connect the guard rail to the grounding system.[2]
- The distance between rods must be greater than the length of one ground rod (indicated by the white arrows on image).

If you attempt any of the above steps to improve the soil's conductivity, perform a Fall-of-Potential test afterward to ensure that the grounding system meets your local requirements.When the readings are acceptable, and if time permits, we recommend taking a few minutes to perform two additional measurements.

- You will need to move the potential auxiliary electrode to 52% and 72% of the distance between the injector electrode and grounding system and take a measurement at each.
- If all three measurements are within 3% of each other, the injector electrode is positioned far enough away from the grounding system to provide an accurate measurement.



Tips

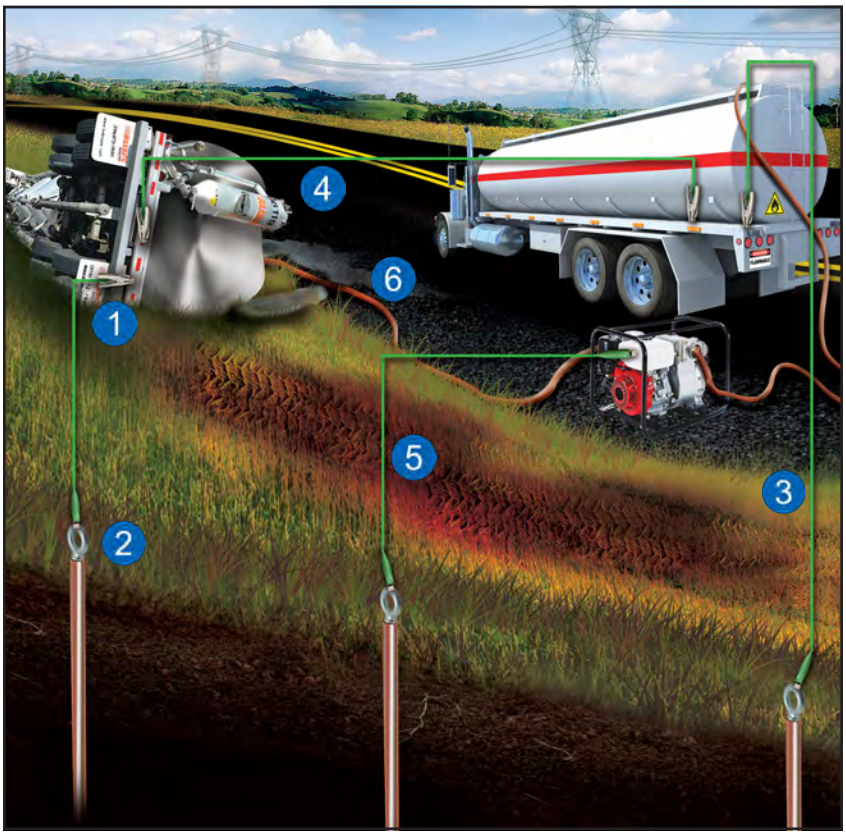
- The Model 6422 runs on six AA batteries, so we recommend storing an unused set of batteries in the responding vehicle and installing them on-site to ensure that the instrument always has fresh batteries to provide power.
- Another good practice is to remove the batteries after returning to the station since the instrument will generally not be used on a frequent basis.
- For more information about performing a Fall-of-Potential test, see the workbook "Understanding Ground Resistance Testing" available for free on the AEMC® Instruments website at www.aemc.com/ground-workbook

Footnotes:

1. You can also use the provided connectors to attach the ground rods and then use the insertion/extraction tool to hammer them deeper into the ground.
2. In some locations, a guard rail can provide a satisfactory grounding system by itself.

5. CONNECTING THE GROUNDING SYSTEM TO THE TANKERS AND OTHER EQUIPMENT

The final step is to connect the grounding fields to the tankers. Always start with the damaged tanker.



1. Connect the grounding jumper to a point on the damaged tanker that is directly welded to the vehicle's frame.
   - Connect to the damaged tanker first to ensure that any electrostatic spark resulting from the connection occurs outside of the hot zone.
2. Then, connect the other end of the grounding jumper to the grounding field.
3. Connect the receiving tanker to its grounding field.
4. Connect the damaged tanker to the receiving tanker.
   - Again, connect to the damaged tanker first to avoid any electrostatic spark within the hot zone.
5. Connect the transfer pump to its grounding field if one was created *(optional)*.
6. Connect the transfer hoses to the pump.

You have created an equipotential plane that will minimize the risk of static spark during flammable liquid transfer.

You can use this equipotential plane to ground any buckets that will be used to capture leaks from the damaged tanker.

Please note that static electricity can build up on the surface of plastic containers, so grounding any container used to catch leaking fluid is necessary regardless of the container's material.

How to ground the buckets

1. Place the bucket outside of the hot zone.
2. Connect a grounding jumper to the tanker.
3. Connect the other end to the bucket.

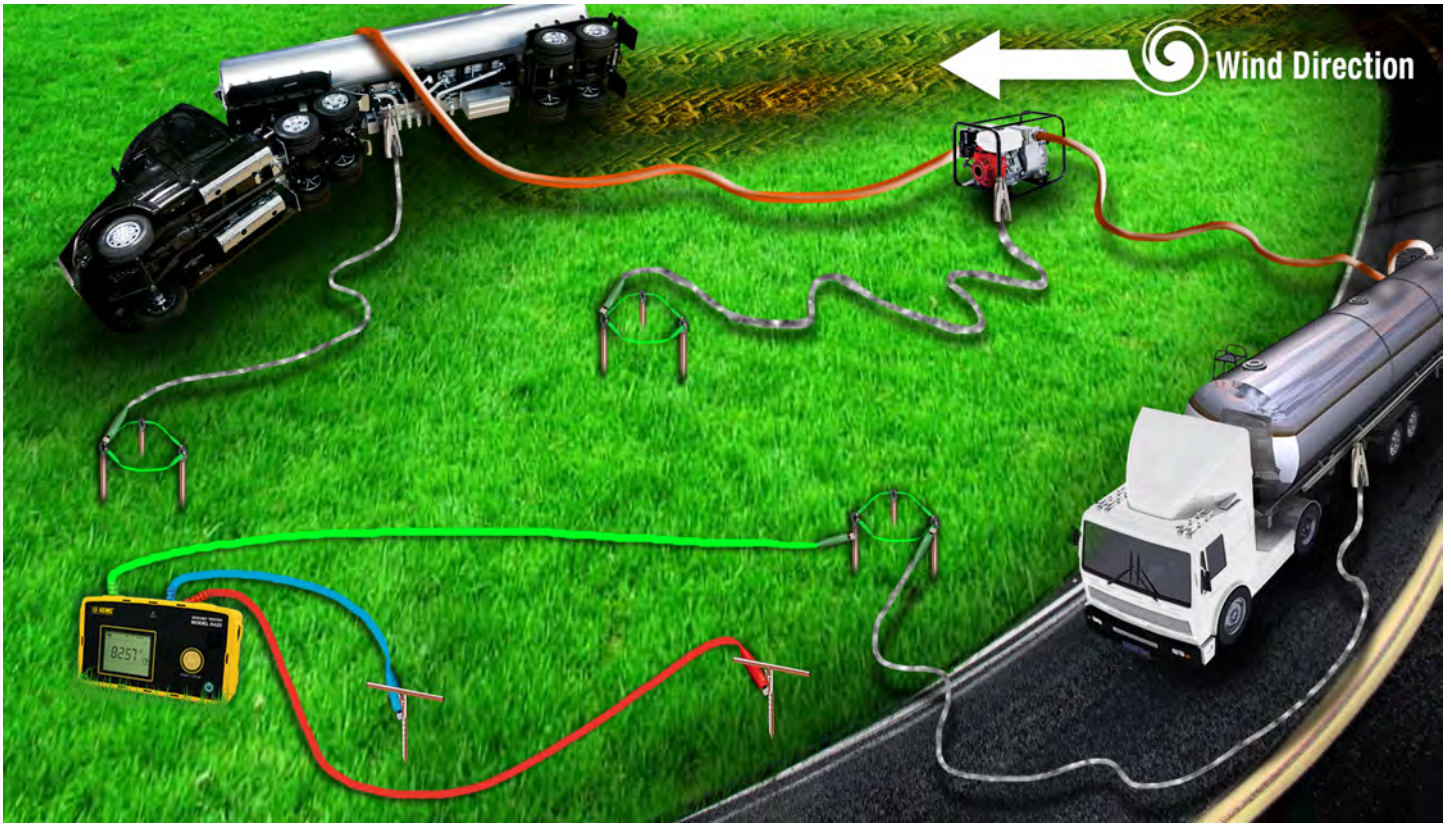
Now, you can bring the bucket into the hot zone to catch any leaking fluid.

6. DISCONNECTING THE SYSTEM

1. Before attempting to disconnect the grounding system, be aware that volatile vapors may be present on or around the empty tanker.
2. After all fluid has been offloaded, remove every connecting lead from the ground rods, tankers, and pumping equipment.
3. Then, extract the rods using the insertion/extraction tool supplied with the kit.

For more information about the kit or the Model 6422, visit the AEMC® Instruments website at www.aemc.com

COMPLETED SETUP



NOTES

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