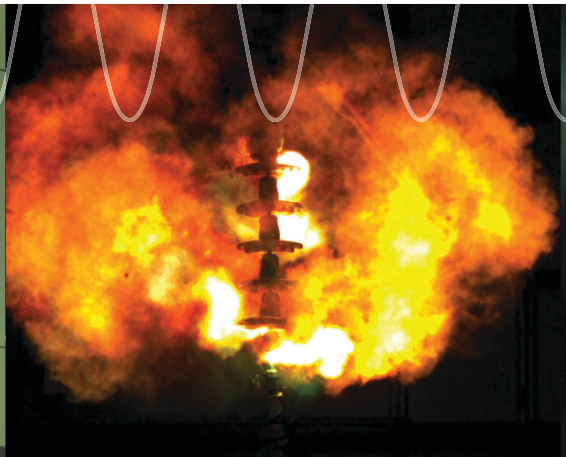
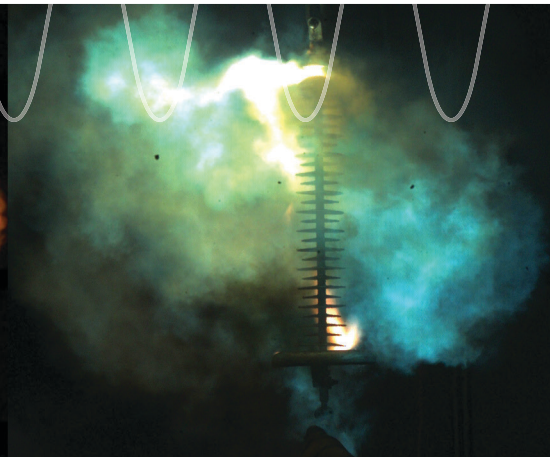
KINECTRICS

High Current Testing of Transmission and Distribution Equipment





Independent Confidential Quality Testing Services

Assure quality products. **Be confident.** **Maximize your grid reliability.**

In modern transmission and distribution power systems, system reliability, power quality, and public safety are the key factors in system design and planning. These important system characteristics are tightly entangled to the design decency, robustness, and safety margins of the key equipment installed in the system. Flaws and inaccuracies can find their ways in design and manufacturing of this equipment. Equipment designed merely based on computer-aided simulations are often deemed to have inherent design flaws and inaccuracies that are impractical or extremely difficult to foresee without testing under realistic conditions. For this reason, products not adequately tested are often either insufficient, or over-designed with higher than required safety margins to avoid failures. The former may result in premature failures, and the latter results in high manufacturing costs.

500+

Customers Served

38

Countries Served

15,000+

Equipment Tested

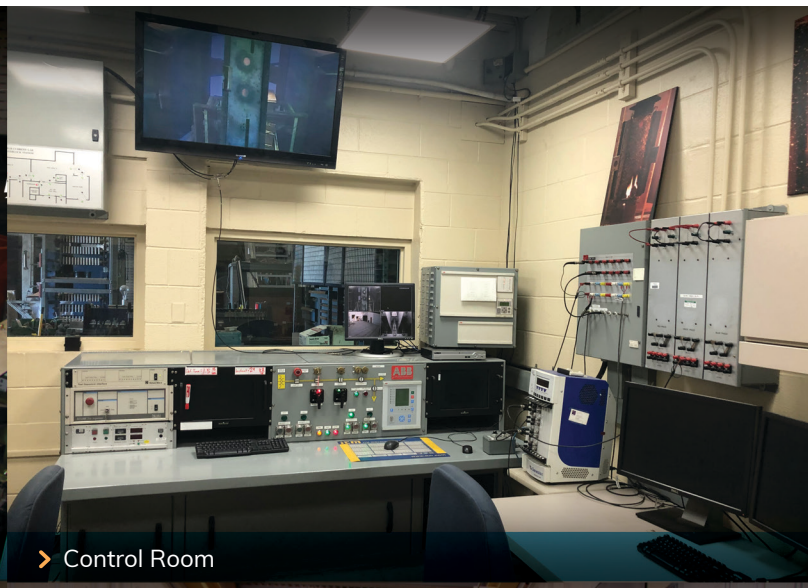
For over four decades, Kinectrics has been at the forefront of testing transmission and distribution equipment. We have served over 38 countries and tested with over 500 manufacturers and utilities from around the world. We have delivered over 4,000 projects to qualify high-quality products and instill confidence in your system reliability. This adds up to over 15,000 pieces of equipment tested in our High Current Lab.

High Current Lab Test Capabilities

Test Capability		Voltage Range	Maximum Continuous Current	Maximum Short Time Current	Maximum Momentary Peak Current
60 Hz **Continuous** Current Test	Single Phase	Up to 75 V	16,000 A	---	---
		150 V to 2,400 V	4,000 A	---	---
	Three Phase	Up to 25 V	8,000 A	---	---
		300 to 1,200 V	4,000 A	---	---
60 Hz **Momentary** Current Test	Single Phase	50 V to 3,000 V	---	80,000 Arms	200,000 A
		3,000 V to 20,000 V	---	12,000 Arms	30,000 A
	Three Phase	300 V to 1,500 V	---	50,000 Arms	120,000 A
DC Current Test		Up to 2,000 Vdc	12,000 Adc	50,000 Adc	

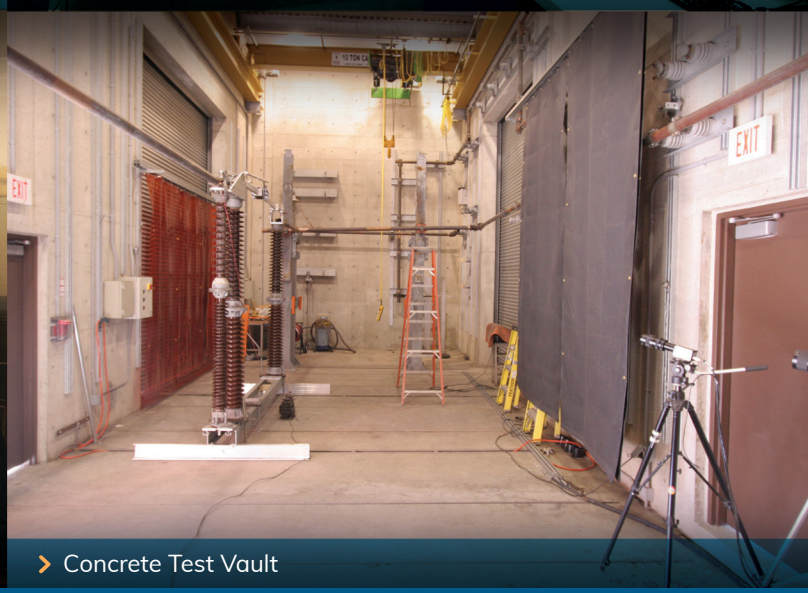
High Current Lab Features

DC Rectifier



Control Room

Draft Free Temperature Rise Test Room with Controlled Ventilation



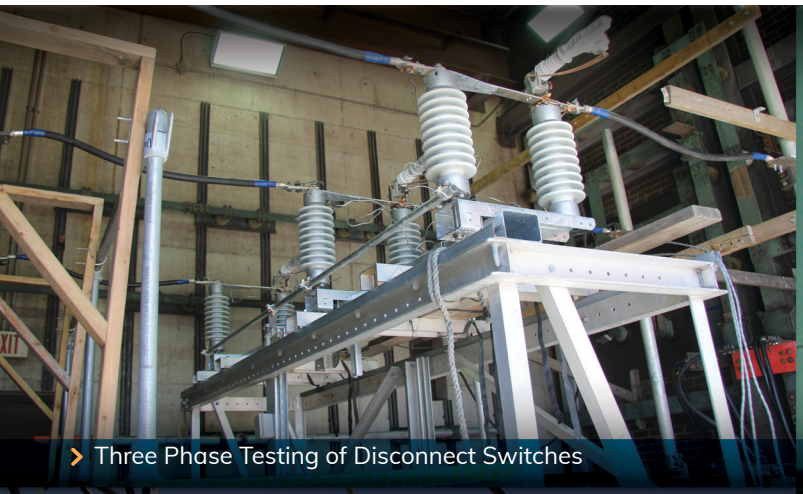
Concrete Test Vault

- Single phase, three phase, and DC test capabilities
- Directly fed from the grid
- Precision point-on-wave switching control to ±0.1 mS
- Three custom-made sturdy supply transformers
- Programmable test sequencer
- Programmable protection relays
- 1 ks/sec high-speed video recording camera
- Modern control room
- Real-time monitoring of tests
- High-speed multichannel waveform recorder
- Comfortable client viewing areas
- Enclosed concrete test cell for destructive testing: 16 m (L) x 6 m (W) x 7 m (H) area
- Three explosion-proof concrete vaults

Kinectrics High Current Lab transformers are fed from the grid. As opposed to a generator fed current, the short circuit current generated from the grid is stiff, stable, and reliable, especially due to constant source impedance, unlike different transient, subtransient, and steady state reactance variations found in generators during short circuits. This eliminates the test current overshoot for the first few cycles, which is inevitable when using generators.

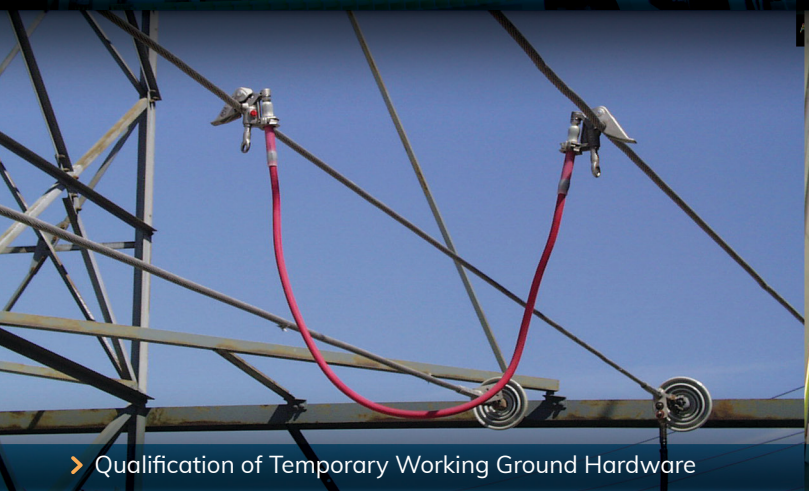
Simulation of Real-Life Conditions

Many equipment are designed to perform under short circuit tests taking into consideration several real-life application conditions. An example is the method of connection to the terminals of a disconnect switch. This includes the size, length, weight, flexible or rigid, and many other factors of the conductors used to connect to the switch. Kinectrics High Current Lab technologists have sound expertise and knowledge, not only in the electrical technology field, but also in construction of test setup and fixtures simulating real-life applications as realistically as possible.

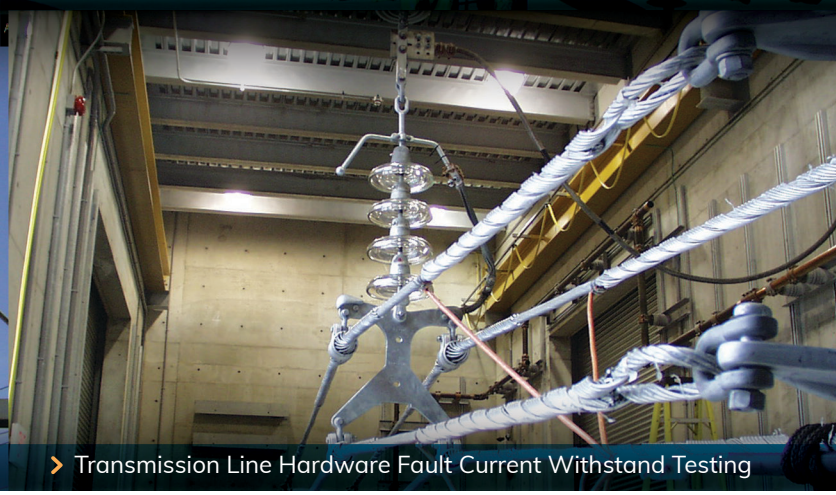


› Three Phase Testing of Disconnect Switches

› Replication of Accidents on Overhead Lines

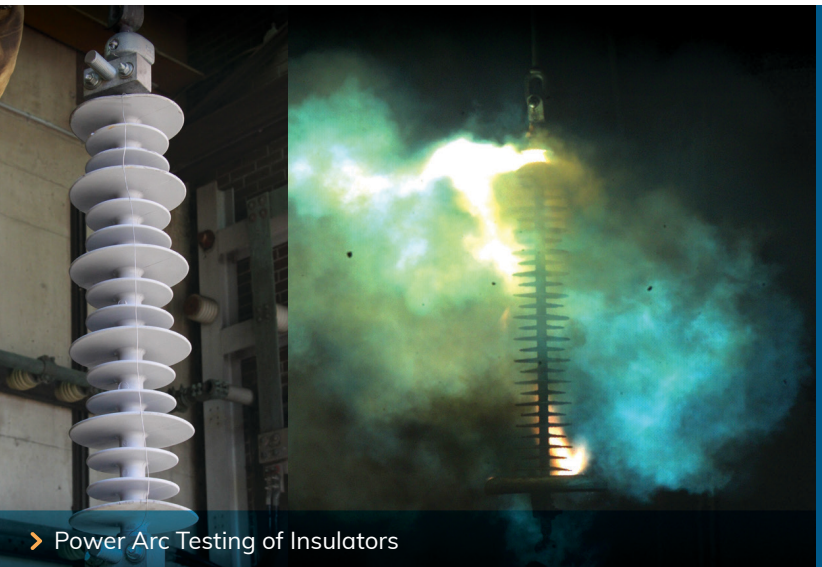


› Qualification of Temporary Working Ground Hardware



› Transmission Line Hardware Fault Current Withstand Testing

Examples of Equipment Tested

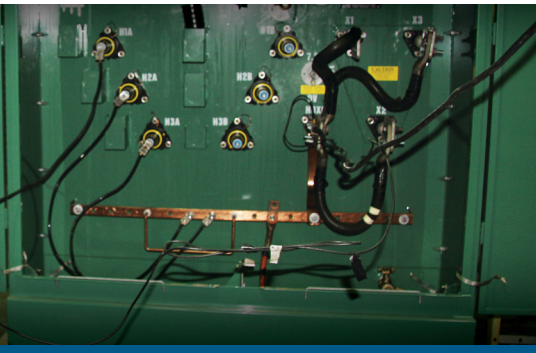


› Power Arc Testing of Insulators

Why Test?

- Arc testing across the insulator followed by mechanical tests are performed to ensure that the insulator retains its structural and mechanical strength when exposed to a power arc.
- Test results help to indicate whether exposure of an insulator design to power arcs will reduce its lifetime expectancy.
- Due to widespread use of all types of insulators in power grids, the system reliability is directly related to power arc withstand capability of the insulators.

Pole-Mount and Pad-Mount Transformers



Examples of tests performed

- Short circuit current withstand tests
- Internal arcing fault current withstand tests
- SFRA measurements
- DC resistance measurements
- Impedance and load loss measurements
- No load losses measurements
- Applied voltage tests
- BIL tests
- Other standard transformer measurements

Why Test?

Short circuit current withstand tests are performed to ensure:

- Windings have adequate cross section to withstand the thermal stress from a series of tests.
- Integrity of turn to turn, winding to winding, and winding to ground insulation after applying the tests.
- Transformer impedance variation during a series of tests remains within acceptable limits.
- The transformer has adequate structural design and mechanical strength to withstand high electromagnetic forces during asymmetrical current tests.

Internal arcing fault withstand tests are performed to ensure:

- An enclosure is not ruptured due to the shock or impulse-type application of internal pressure caused by an internal arc.
- No hot oil is expelled from the enclosure.
- No mechanical components or bushings are ejected.
- Public safety is not compromised.

Disconnect and Ground Switches

Examples of tests performed

- Short time current withstand test
- Momentary peak current withstand test
- Load current interrupting tests
- Loop switching and other interrupting tests
- Heat run tests
- Wet and dry dielectric tests
- BIL tests

Why Test?

Short time current withstand tests are performed to ensure:

- The switch conductive parts and joints are not fused and melted due to thermal effects of short time high current.
- The joints and contacts remain latched and do not cause arcing under asymmetrical momentary current.
- The contacts are not welded, and the switch remains operational after short time and momentary current tests.
- The switch can withstand the electromagnetic forces of the asymmetrical current;
- The overall resistance of conductive parts does not increase beyond acceptable limits after completion of the tests.

Post heat run tests are performed to ensure:

- The temperature rise of joints, contacts, terminals, and blades under rated current does not exceed the rated value after performing short time current tests.
- The short time current tests did not compromise the switch function under rated conditions.

Temporary Protective Grounds (TPG)

Examples of tests performed

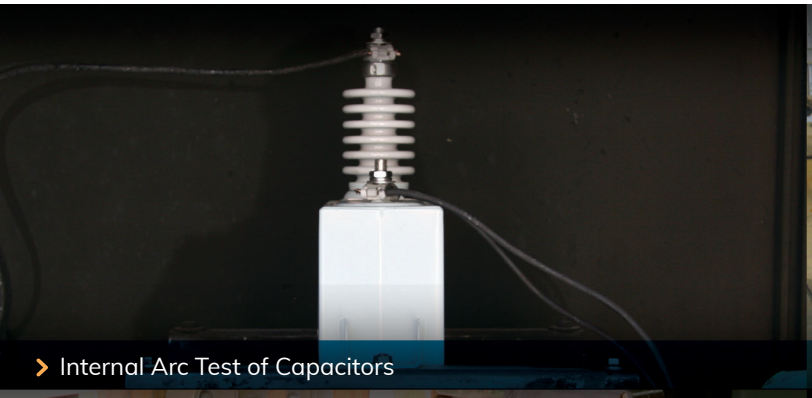
- ASTM F855 fault current tests and setup
- IEC 61230 fault current tests and setup
- Replication of field application setup

Why Test?

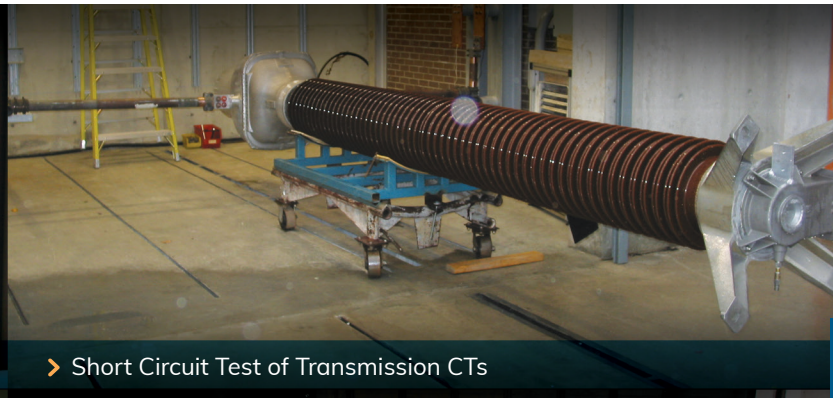
Temporary Protective Grounds (TPG) are tested:

- For manufacturers to ensure TPG assemblies withstand the thermal effects and electromagnetic forces of their rated fault current levels.
- For manufacturers, to qualify, and in case of failures, detect failure mode of new components at manufacturing development stage.
- For utilities to protect their personnel working on deenergized lines or equipment.
- For utilities to replicate real-life incidents.
- For utilities to verify their safe work methods and proper installation of TPGs.
- To verify the whole assembly when different components from different manufactures are mixed, in order to avoid unexpected failure modes.

Other Examples

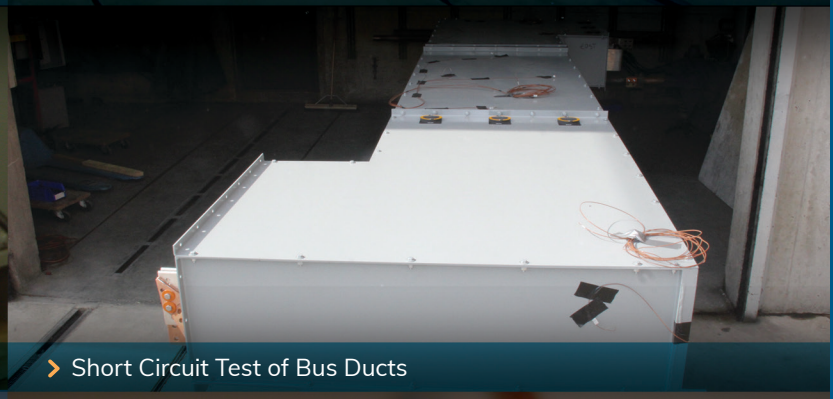


Internal Arc Test of Capacitors



Short Circuit Test of Transmission CTs

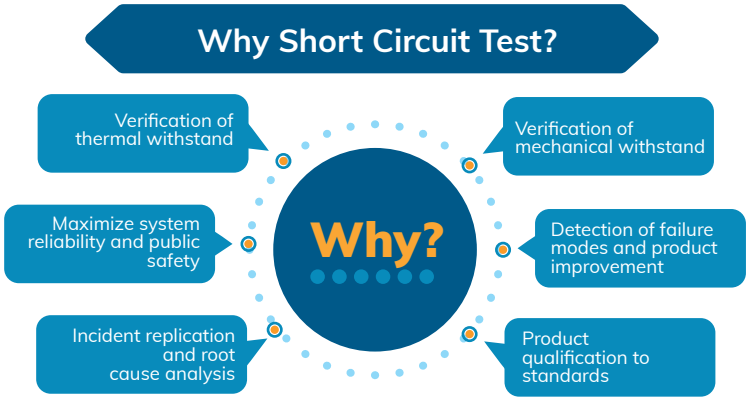
Endurance Test of 600 V Equipment

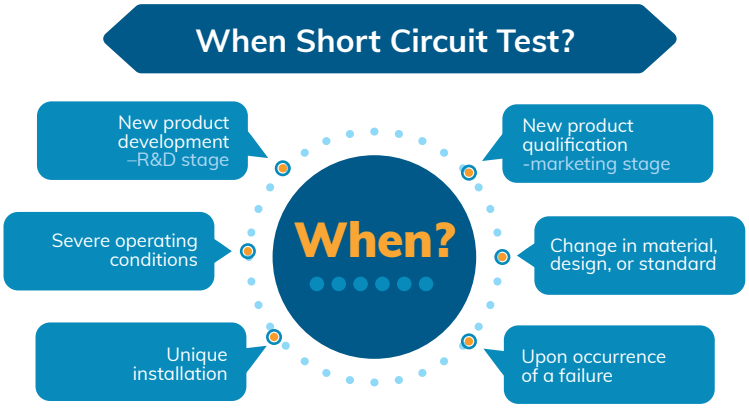


Short Circuit Test of Bus Ducts

Short Circuit Test of Underground Cables

IEEE 837 EMF & FC Tests of Connectors





Commitment to Quality

Kinectrics is accredited to ISO/IEC 17025:2017 by the Standards Council of Canada (SCC).

Standards Council of Canada
Conseil canadien des normes

The SCC is a member of the International Laboratory Accreditation Cooperation (ILAC) and a signatory member of the ILAC's Mutual Recognition Arrangement (MRA).

Kinectrics' accreditation is recognized internationally and demonstrates our unrivalled technical capabilities to provide a full range of engineering and testing services for fiber optic cables.

Commitment to Safety

Kinectrics promotes a safe work environment and empowers all employees to create and maintain a safe and healthy environment. We believe that no task is so important that we cannot make the effort to do it safely.

Commitment to Our Customers

Our vision is to be the premier technical solutions provider from concept to completion. Our mission is to improve our customers' business by delivering sustainable and innovative life cycle management solutions to nuclear and electricity industries, through our facilities, processes, and people.

About Kinectrics

Kinectrics' origins can be traced to 1912. With over 100 years of delivering technical excellence, Kinectrics is the category leader in providing life cycle management services for the electricity industry. Trusted by clients worldwide, our experts in engineering, testing, inspection, and certification is backed by our independent laboratory and testing facilities, a diverse fleet of field inspection equipment, and an award-winning team of over 1,000 engineers and technical experts.

From initial design and type testing to operational deployment and maintenance services, Kinectrics collaborates closely with customers to ensure that utility assets perform safely, reliably, and efficiently throughout their entire life cycle.

www.kinectrics.com

Head Office
800 Kipling Ave., Unit 2
Toronto, ON M8Z 5G5
Canada
416-207-6000

Canada
393 University Ave. 4th Floor
Toronto, ON M5G 1E6

USA
2135 City Gate Lane, Suite 100
Naperville, IL 60563

United Kingdom
17 Frederick Sanger Road
Surrey Research Park
Guildford, Surrey GU2 7YD

Germany
Hertha-Lindner-Strasse 10-12
01067 Dresden

Romania
59 Grigore Alexandrescu Street.,
2nd Floor Bucharest 010623

India
Sy No. 125,
Bandan Mailaram Village
Mulugu Mandal, Siddipet District
Medchal, Telangana – 502336

HC041422