EEE3112 ELECTRICAL ENGINEERING PRACTICE

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Course Syllabus

Electrical Drwaing:

- Electrical & Electronics Symbols
- Various ypes of Electrical & Electronics Diagrams
  -Electronics/Power Equipments/ Power Systems
- Views of Electrical Equipments

Use of Measuring Instruments:

- Instruments for Electrical/Non-Electrical
- Instrument Specifications Range/ Resolution/Accuracy/Reliability/Linearity/Drift/Limitations
- Earthing, Source of errors, Error calculation
- Fault finding, Maintenance, Repair techniques

Design:

- Ratings/Specification of components/ equipment

Course Syllabus

Static Mechanics

- Deflection of beams with concentrated/Distributed loading
- Torsional stresses/ twisting in circular shafts
- Helical, torsion,leaf springs
- Static equilibrium of coplanar
- 3-D force/ torque systems

Dynamic Mechanics

- Rotating Bodies moment of inertia of plane figures
- 3-dimensional symmetrical objects

Course Breakdown

- Assignments/Tutorials: 5 %
- Min Project: 5 %
- 6 Labs: 10 %
- 1 Mid Semester exam 20 %
- 1 Final Exam 60%

Total **100%**

NOTE: Attendance 80% to sit for Final Exam

Text Books

Prescribed Texts:

- Gregory.B.A., An Introduction to Electrical Instrumentation and Measurement Systems, 2rd Ed., 1981, Longman (ELBS) ,ISBN 0-333-32836-1.
- Meriam J.L., Engineering Mechanics Vol.I: Statics, 1980, Macmillan, ISBN 0-471-05808-4.

Recommended Text:

- Meriam J.L., Engineering Mechanics Vol.II: Dynamic, 1980, Macmillan, ISBN: 0-471-05810-6.

Electrical Drawing

By M.M

Views of Electrical Equipment

EEE3112 By M.M

Electrical & Electronics Equipments

Capacitors:

- **Unpolarised (Large Values, 1μF+)**

Trimmer Capacitor :

Variable Capacitor:

Graphical Symbols/Rating

- **Polarised(Small values, upto 1µF)**

  Electrolytic Capacitors (EC):

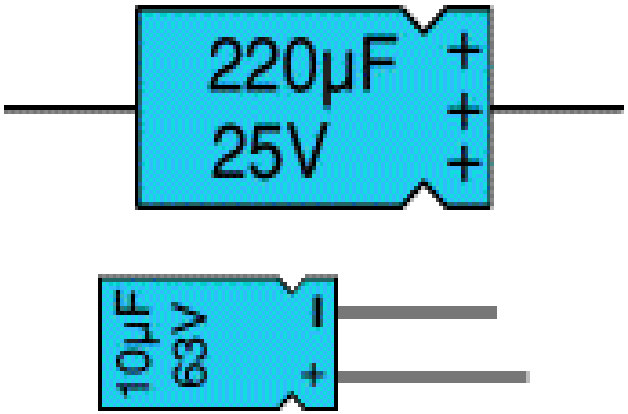
  -Polarised

  -One lead is marked + or -

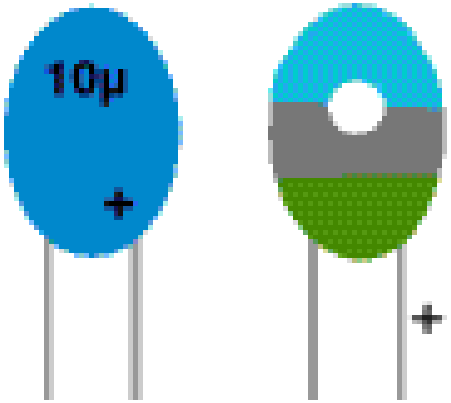
  -Not damaged by heat when soldering

  -**Designs: axial**-leads attached to each end

  Radial-leads attached at same ends

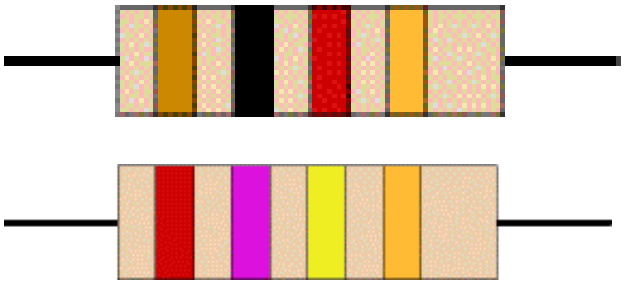


- **Tantalum Bead Capacitors:**



Electrical 6 Electronics Equipments

Resistors:



Function:

-Restrict flow of electric current, e.g resistor is placed in series with LED to limit current passing through LED

Connection and Soldering:

-Connection is either way round

-Not damaged by heat when soldering

Units:

-ohms Ω

Electrical & Electronics Equipment

Diodes:

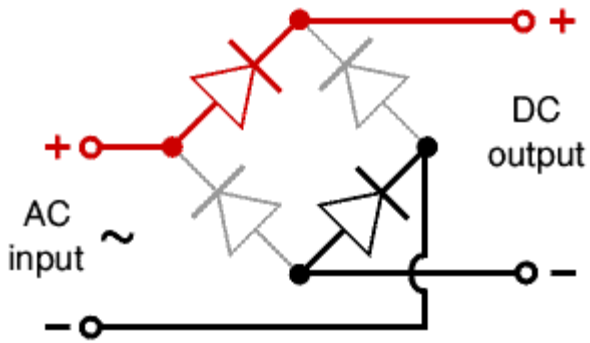
Function:

- Allow electrcity to flow in only one direction
- Arrow of cct symbol shows direction in which current can flow
- Diodes are electrical version of a valve and early diodes were called valves

Electrical & Electronics Equipment

- Zener Diode: regulate output voltage

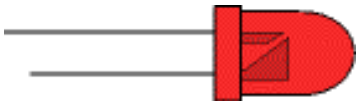
- Types of Bridge Rectifiers: Contain four diodes

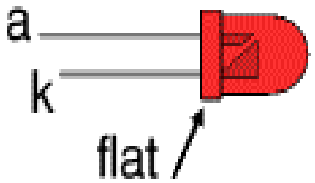


Circuit Diagram

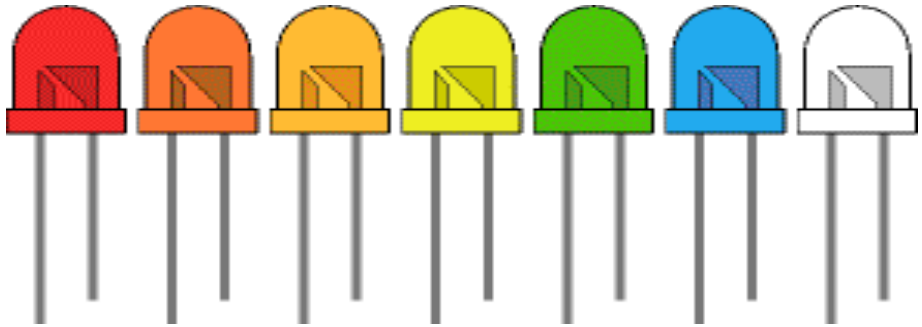
Electrical & Electronics Equipments

- **Light Emitting Diodes (LED):**





- **Function:**
  - LEDs emit light when an electric passes through them
- **Colours of LEDs**
  - Red, Orange,Amber, Yellow, Green, Blue, and White
  - Blue & White are more expensive than other colours



Electrical & Electronics Equipments

- Lamps:

- Lamp Holders:

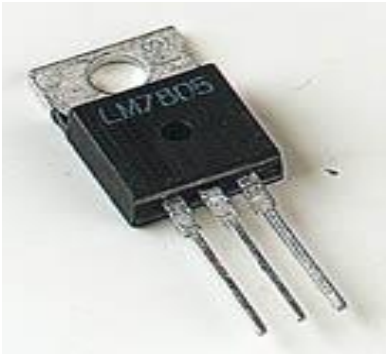
Screw Terminals

Solder Tags

Electrical & Electronics Equipments

- Small Transformer: 230V AC to 5V AC

- Voltage Regulator ICs



Electrical Equipments

Recloser:

Remote operation switch:

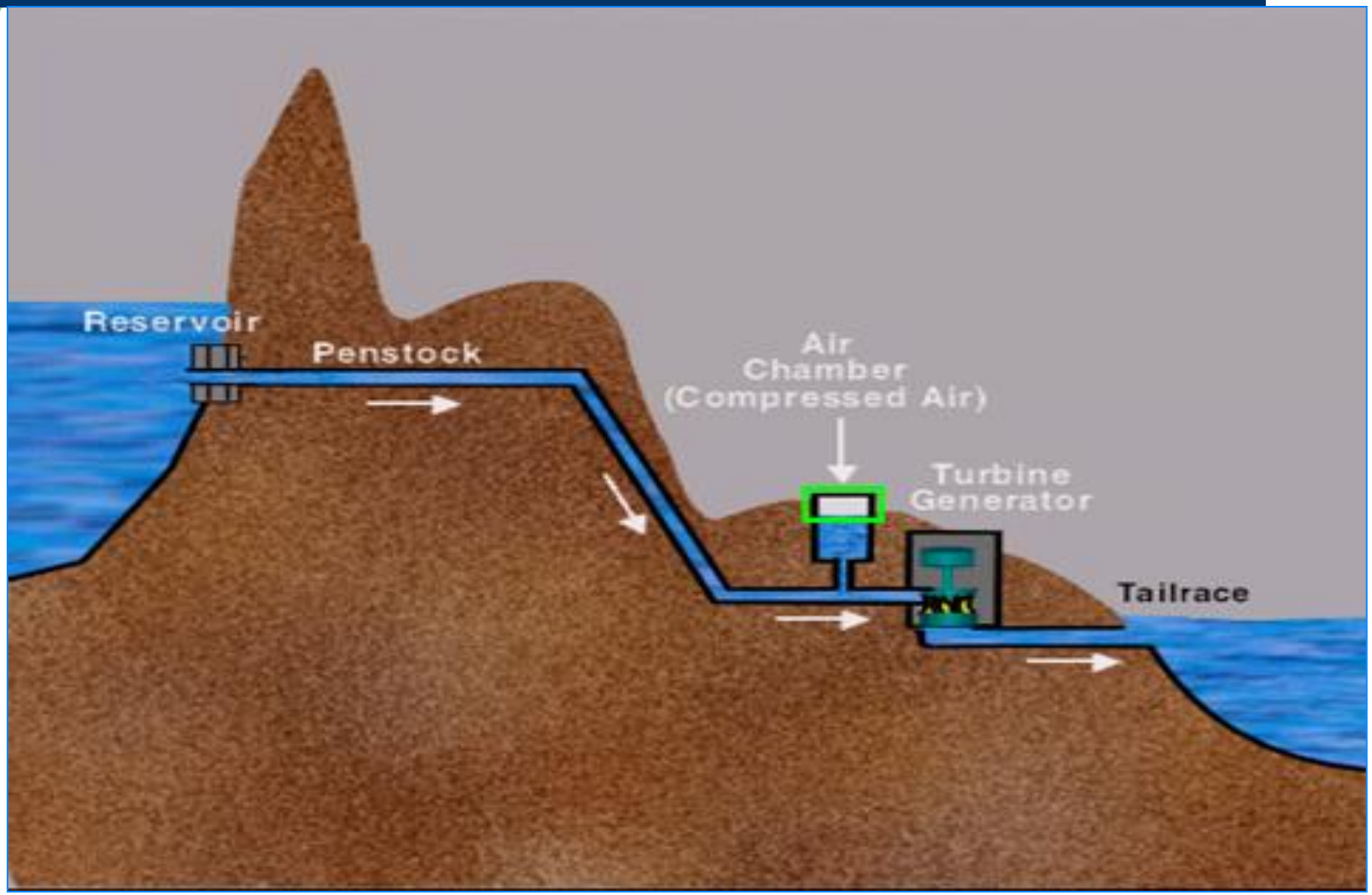
Source: http://www.langley-eng.co.uk/langley_products/pole_mounted_switchgear.html

Electrical Equipments

- Capacitor banks:
  - Reduce voltage drop
  - Reduce losses
  - Improve power factor
- Are often switched off at night

Source: http://www.powercap.in/pole_mounted_capacitor.htm

Electrical Power Generation

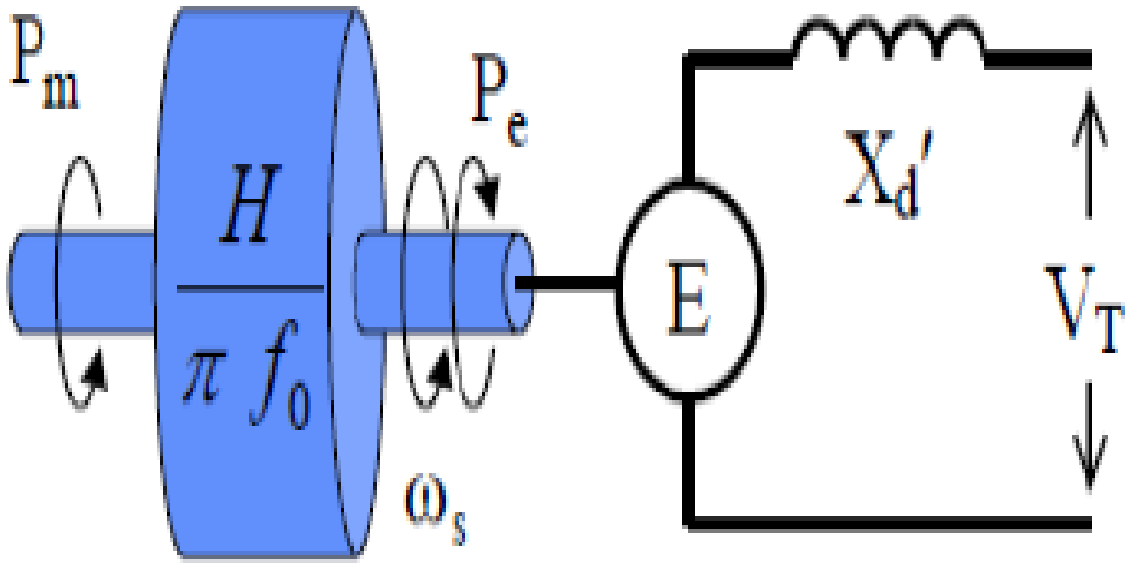


Electrical Generator

Synchronous Machine Model

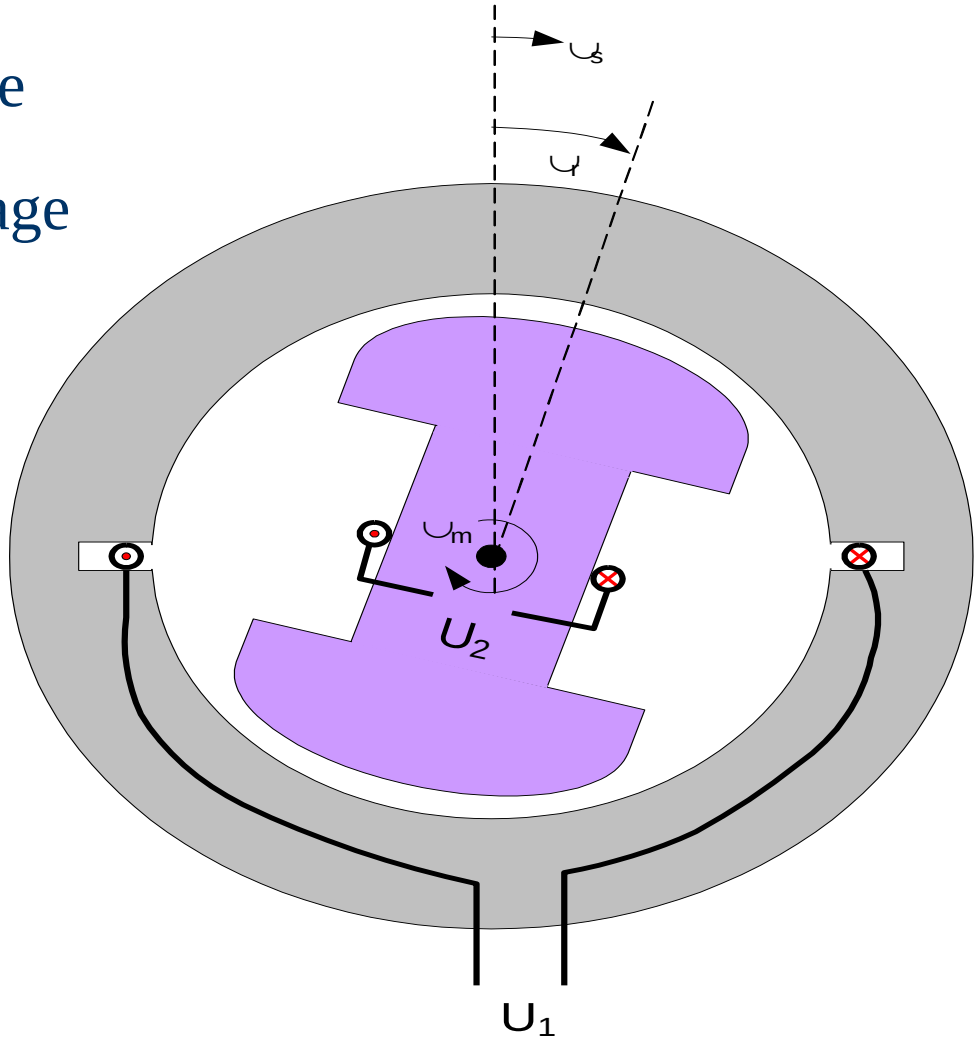
E=Induced Voltage

V_T= Terminal Voltage

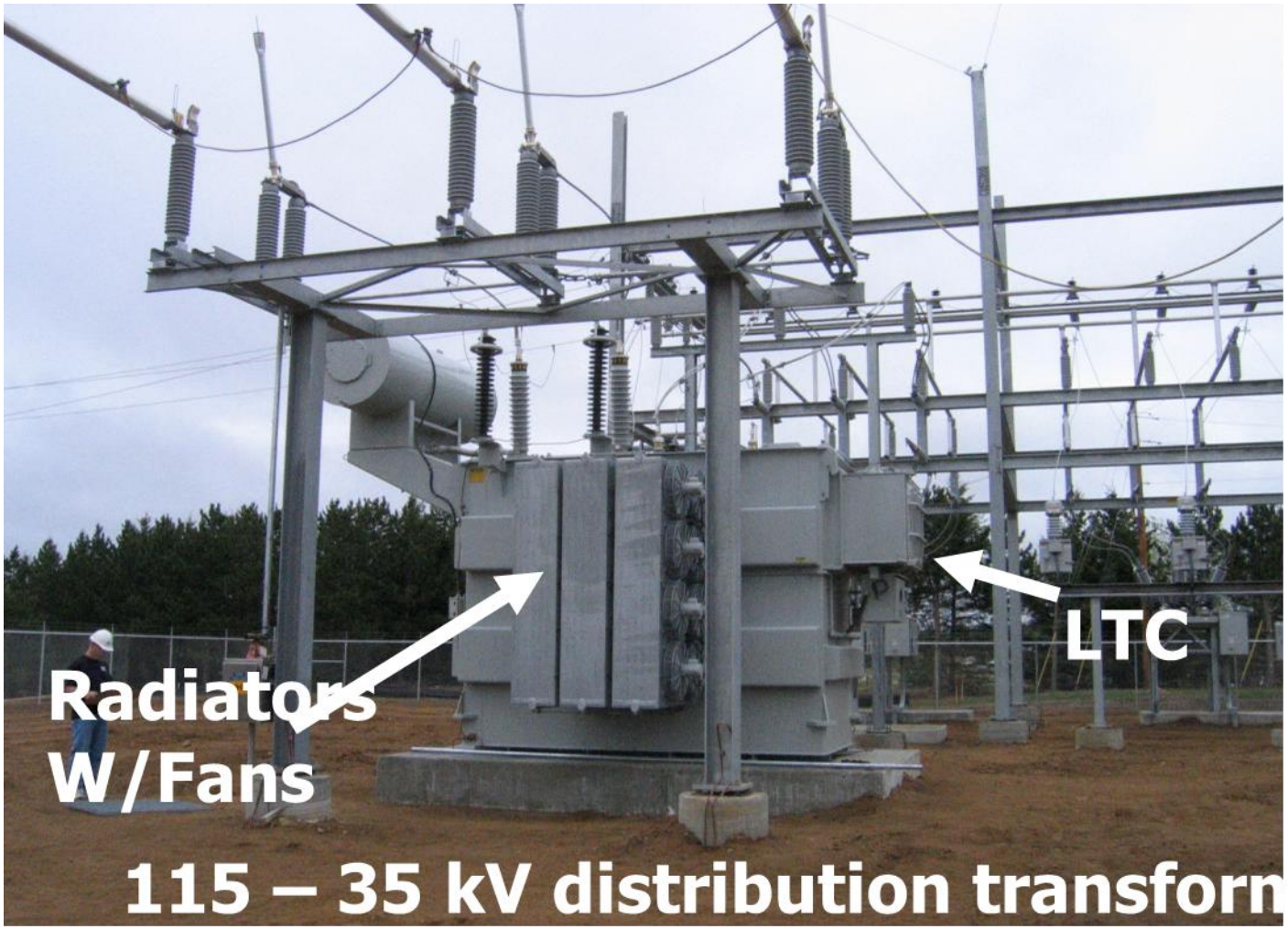


Electrical generator

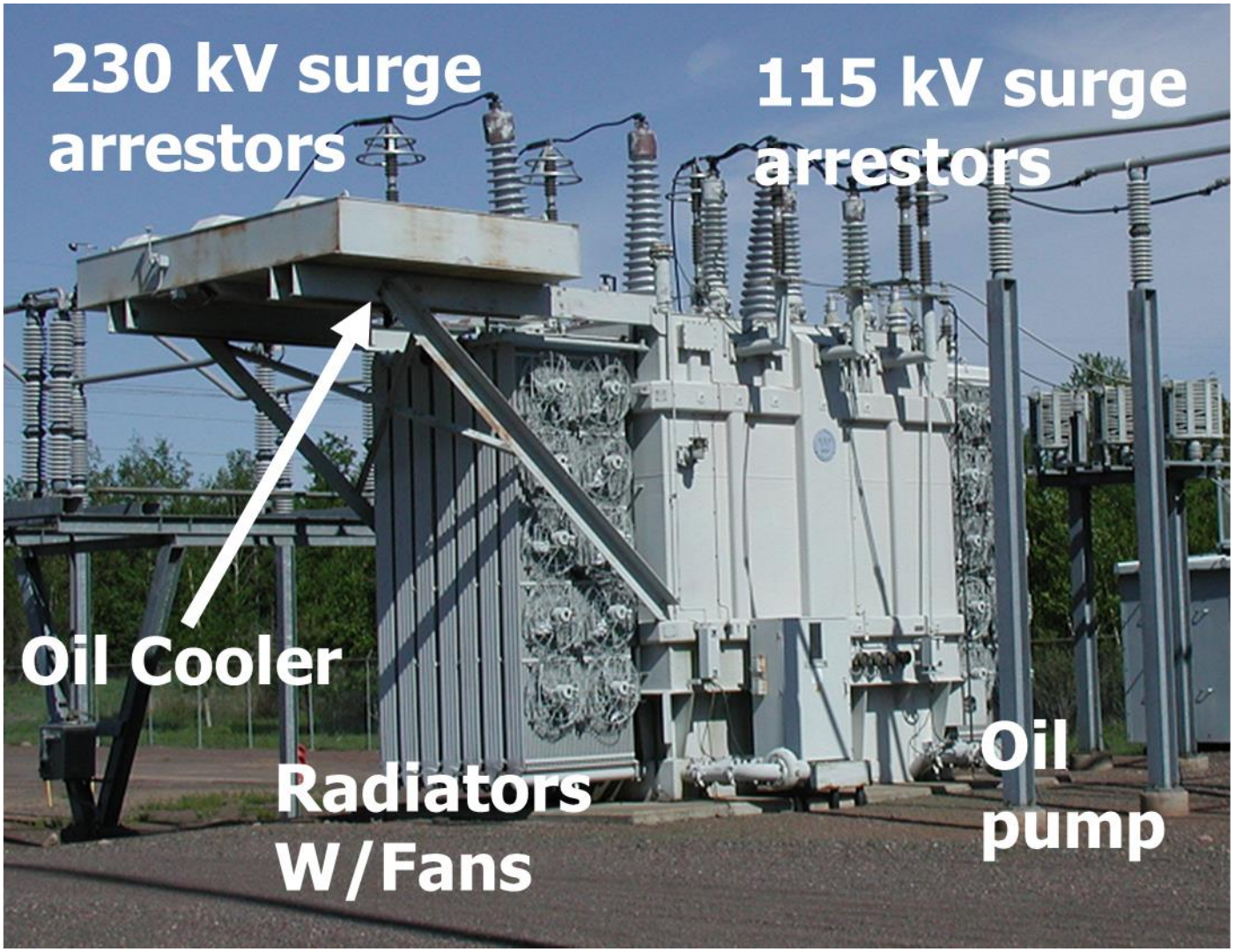
- U_1= Induced voltage
- U_2=Excitation Voltage



Transmission to Distribution Transfomer



Transmission Level Transformer



Transmission Line

- 330kV line

22

Transmission Lines

Power lines near Double circuits

Helsinki, Finland

Power lines showing double circuits

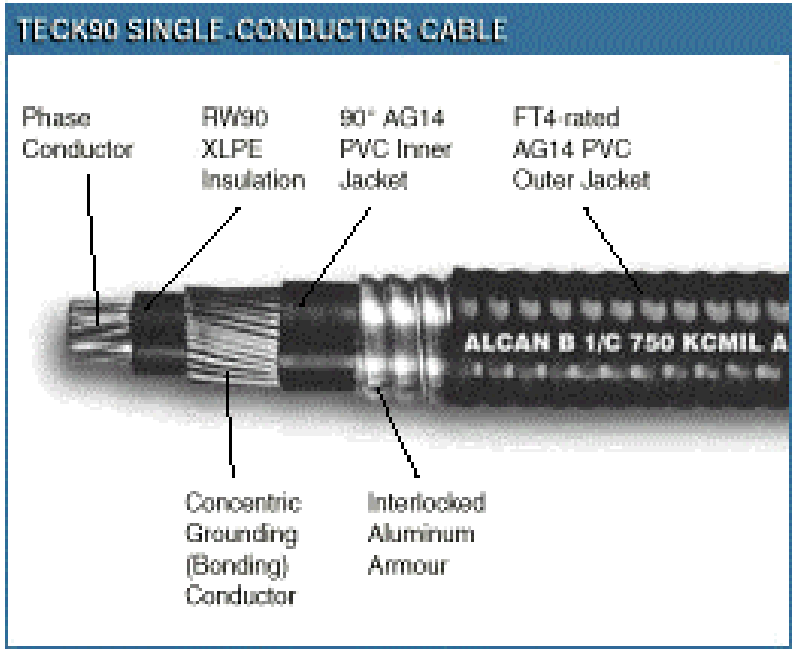
23

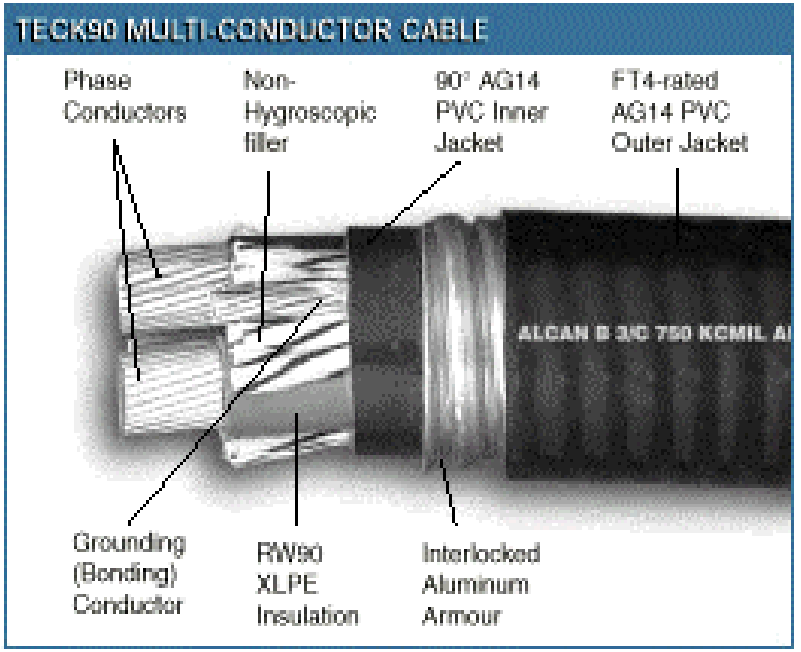
Conductors

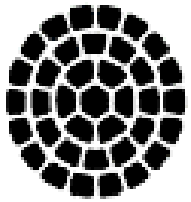
Overhead Cables:

- Where conductor close proximity is required
- Insulating jacket surrounds each conductor
- Plastic spacers keep conductors from coming in contact with each other

Cables







Specification

CSA C22.2 No. 131 (TECK)
CSA C22.2 No. 174 (Hazardous Locations)
FT4-Rated: Vertical Flame Test - cable in cable tray (IEEE P1202)
AG14 inner and outer PVC jacket:
Maximum 14% acid gas emission by weight
FMRC Class 3972 Fire Test GP-2 (jacketed)
GP-1 (unjacketed)

Cables

- Underground transmission /distribution cables
- Semiconducting material surrounds the conductor to grade the electric field
- Plastic jacket provides insulation and protection
- Neutral strands for an outer shell for protection and return path for currents

Circuit Breakers

Current Transformers

Very High Voltage CT

Medium-Voltage CT

Voltage Transformers

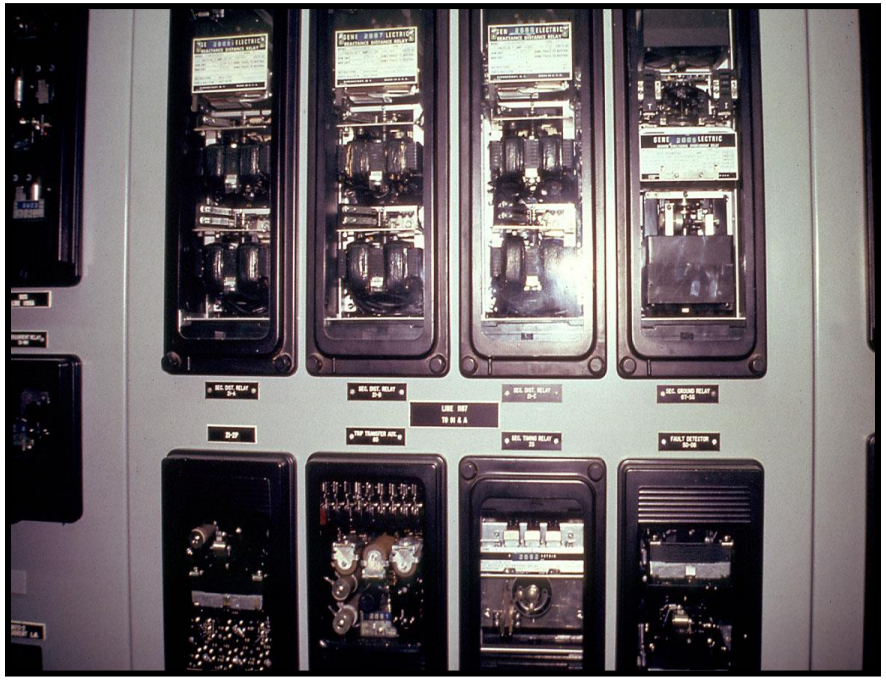
High Voltage

Medium Voltage

Note: Voltage transformers are also known as potential transformers

Protective Relays

Examples of Relay Panels



Old Electromechanical

Microprocessor-Based Relay