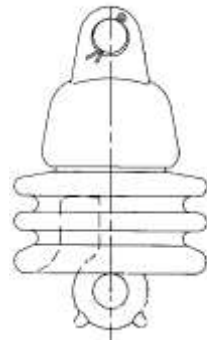
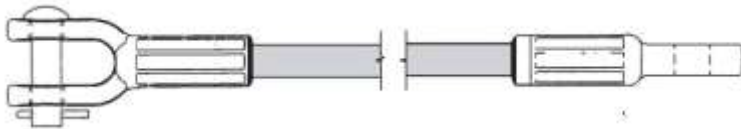
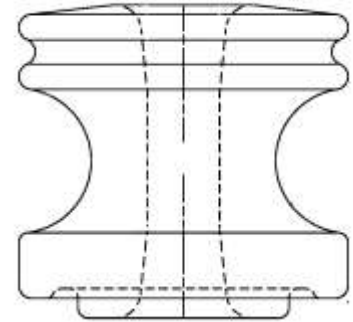
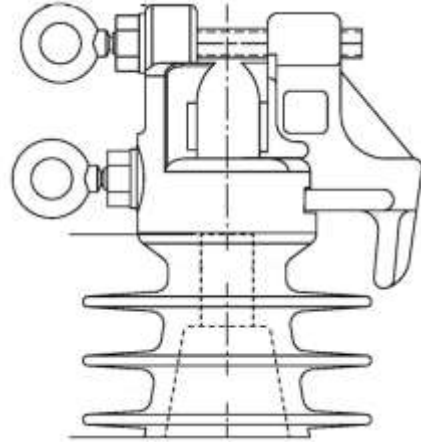
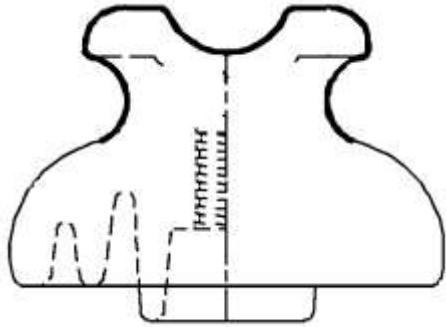
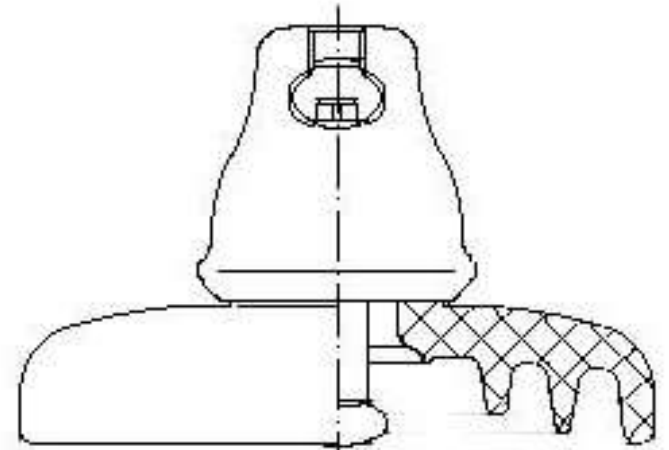
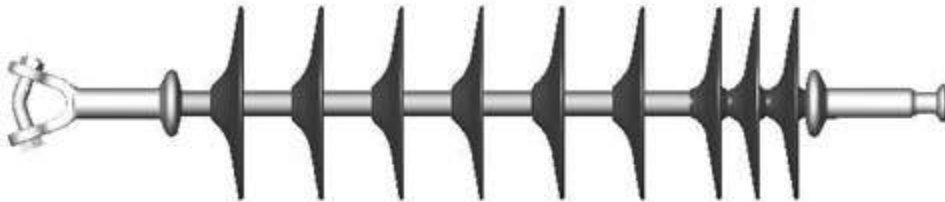
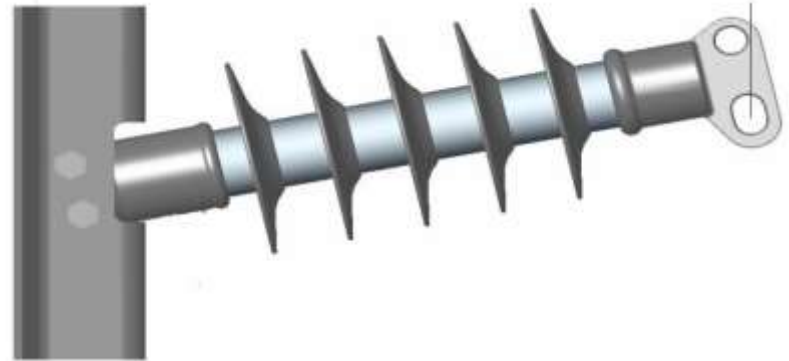


“Insulators”

Types of Insulators – Distribution



Types of Insulators – Transmission

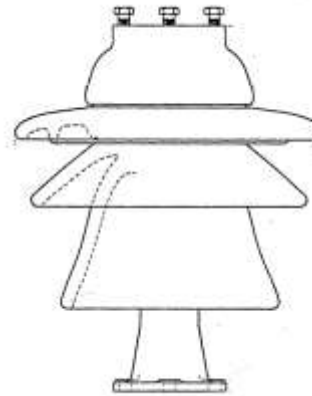
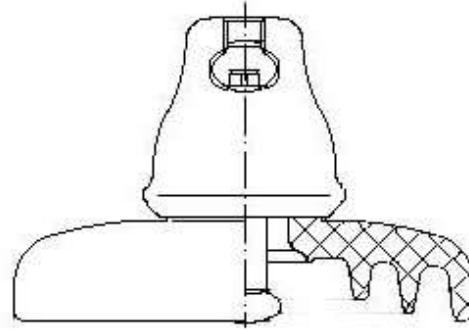
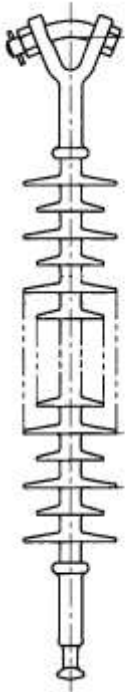


Insulator Types

➤ Substations

- Post insulators – porcelain primarily, NCIs growing in use at lower voltages (~161 kV and below)
- Suspension insulators –NCIs (primarily), ceramic
- Cap and Pin insulators – “legacy” type

Types of Insulators – Substation



Insulator Types - Comparisons

➤ Ceramic

- Generally designs are “mature”
- Limited flexibility of dimensions
- Process limitations on sizes and shapes
- Applications/handling methods generally well understood

➤ Non Ceramic

- “Material properties have been improved – UV resistance much improved for example
- Standardized product lines now exist
- Balancing act - leakage distance/field stress – take advantage of hydrophobicity
- Application parameters still being developed
- Line design implications (lighter weight, improved shock resistance)

Design Criteria - Mechanical

➤ An insulator is a mechanical support!

- Its primary function is to support the line mechanically
- Electrical Characteristics are an afterthought.
- Will the insulator support your line?
- Determine The Maximum Load the Insulator Will Ever See Including NESC Overload Factors.

Design Criteria - Mechanical

➤ Suspension Insulators

- Porcelain
 - M&E (Mechanical & Electrical) Rating
 - ❖ Represents a mechanical test of the unit while energized.
 - ❖ When the porcelain begins to crack, it electrically punctures.
 - ❖ Average ultimate strength will exceed the M&E Rating **when new**.
 - Never Exceed 50% of the M&E Rating
- NCIs (Polymer Insulators)
 - S.M.L. – Specified Mechanical Load
 - ❖ Guaranteed minimum ultimate strength **when new**.
 - ❖ R.T.L. – Routine Test Load – Proof test applied to each NCI.
 - Never Load beyond the R.T.L.

Design Criteria - Mechanical

➤ Line Post insulators

- Porcelain
 - Cantilever Rating
 - ❖ Represents the Average Ultimate Strength in Cantilever – when new.
 - ❖ Minimum Ultimate Cantilever of a single unit may be as low as 85%.
 - Never Exceed 40% of the Cantilever Rating – **Proof Test Load**
- NCIs (Polymer Insulators)
 - S.C.L. (Specified Cantilever Load)
 - ❖ Not based upon lot testing
 - ❖ Based upon manufacturer testing
 - R.C.L. (Rated Cantilever Load) or MDC or MDCL (Maximum Design Cantilever Load) or MCWL or WCL (Working Cantilever Load)
 - Never Exceed RCL or MDC or MDCL or MCWL or WCL
 - S.T.L. (Specified Tensile Load)
 - **Tensile Proof Test=(STL/2)**