Raychem RPG

Analysis of Mechanical and Electrical Performance of Section Insulators

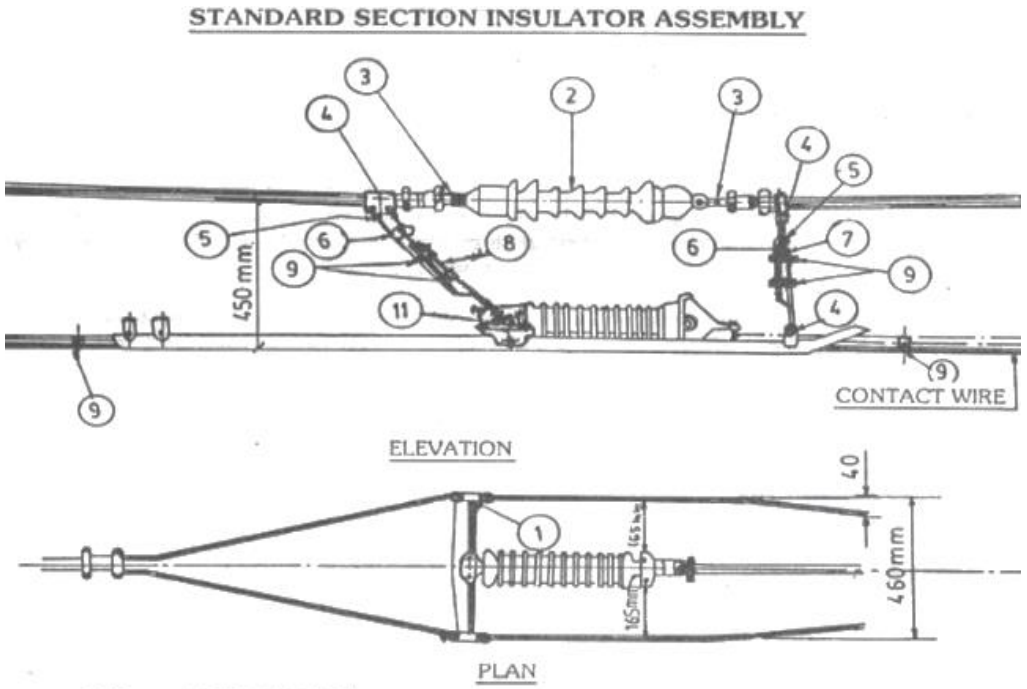
Presented to : COMSOL Conference 2023

Date : 30th Nov & 1st Dec 2023

Inspiring Innovation, Creating the Future

Pioneering technologies, processes, and business practices, challenge the status quo and add value to our stakeholders

Introduction

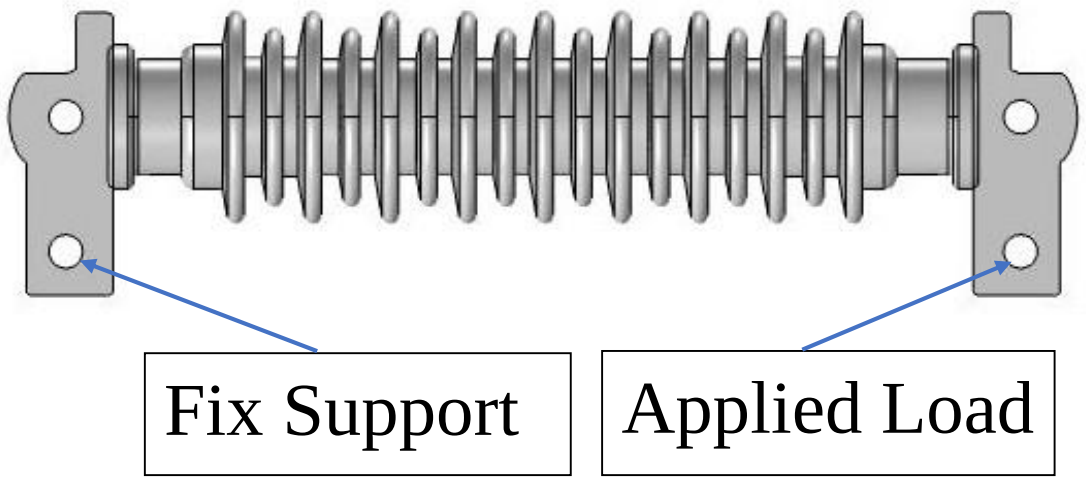


REF.	DESCRIPTION
1.	STANDARD SECTIONING INSULATOR
2.	9 - TONNE INSULATOR ASSEMBLY
3.	ENDING CLAMP CATENARY
4.	CATENARY DROPPER CLIP
5.	DROPPER LINK
6.	SECTION INSULATOR ADJUSTABLE DROPPER (TOP)
7.	SECTION INSULATOR VARIABLE DROPPER (TYPE - I)
8.	SECTION INSULATOR VARIABLE DROPPER (TYPE - II)
9.	PARALLEL CLAMP FOR DOUBLE CONTACT WIRE
10.	SECTION INSULATOR DOUBLE STRAP PART
11.	SECTION INSULATOR SADDLE PIN

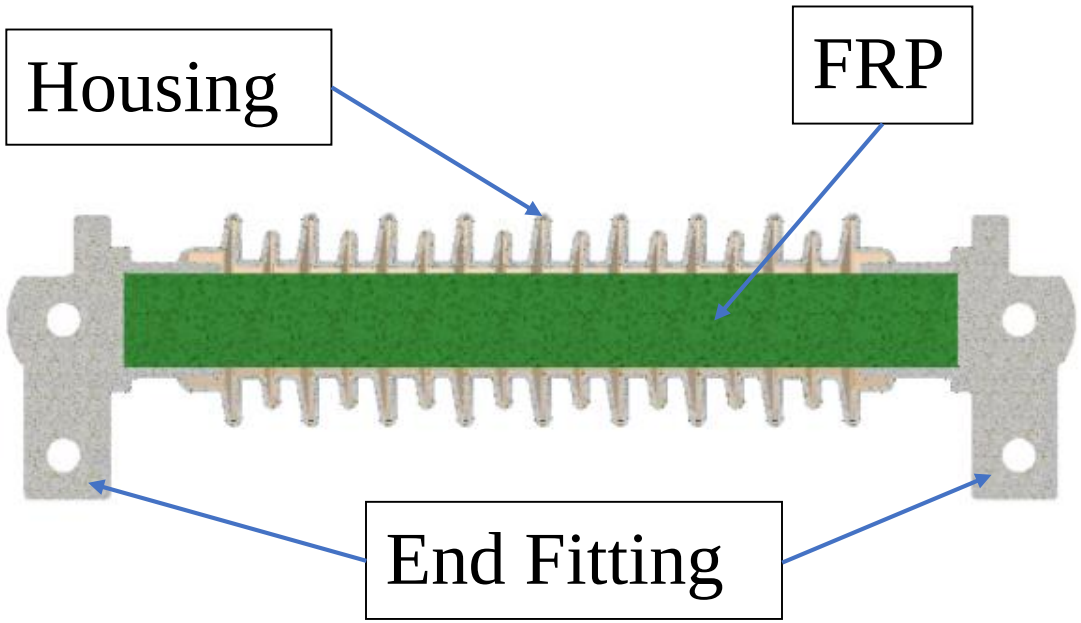
- Section insulator is used in the phase change of OHE line.
- Section insulators are crucial components in overhead railway lines for ensuring the safe and efficient operation of electrified railway systems.
- Analyzing Mechanical Forces & Electrical Creepage in 25 KV Overhead Traction Lines

Methodology

Geometry of Section Insulator

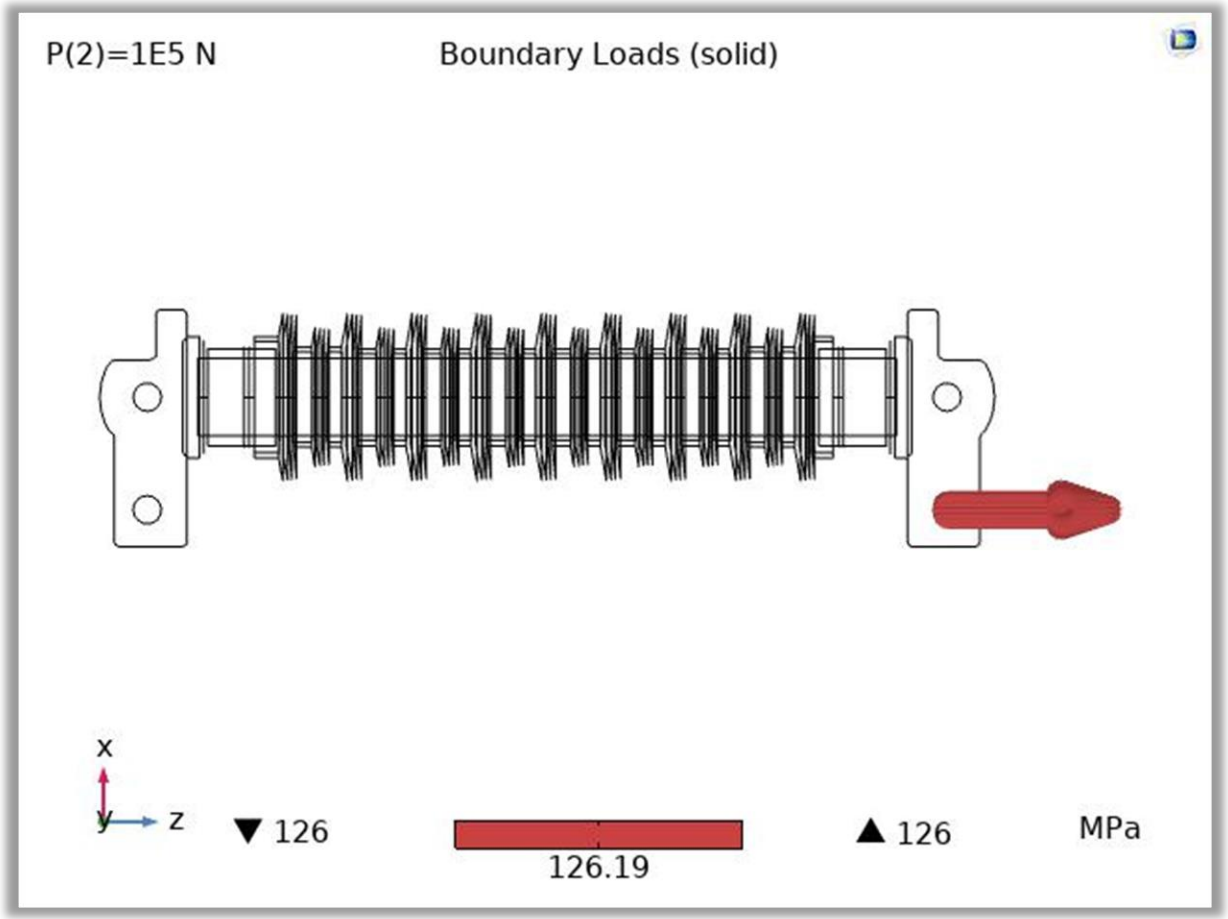


Cut-Section View of Section Insulator.



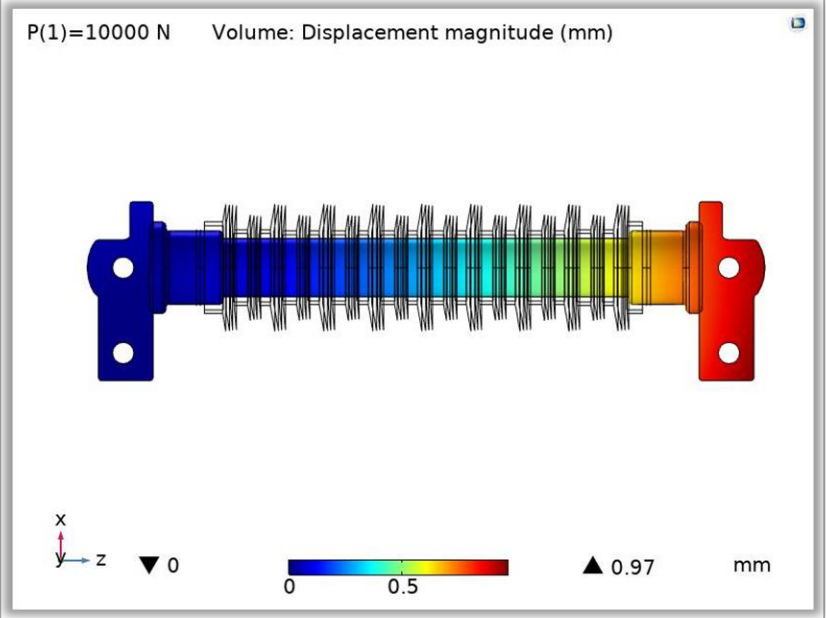
Boundary load

Boundary load of Section Insulator

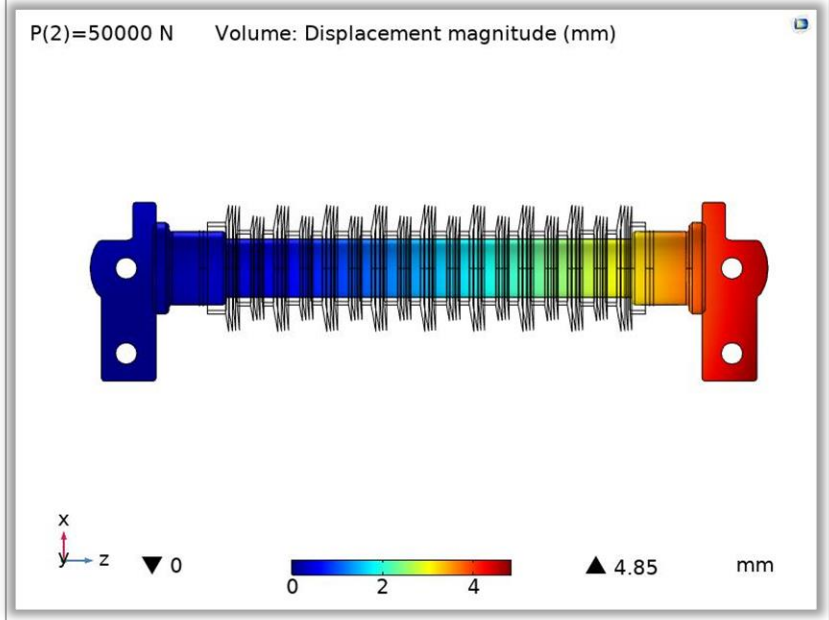


Analysis Results - Displacement

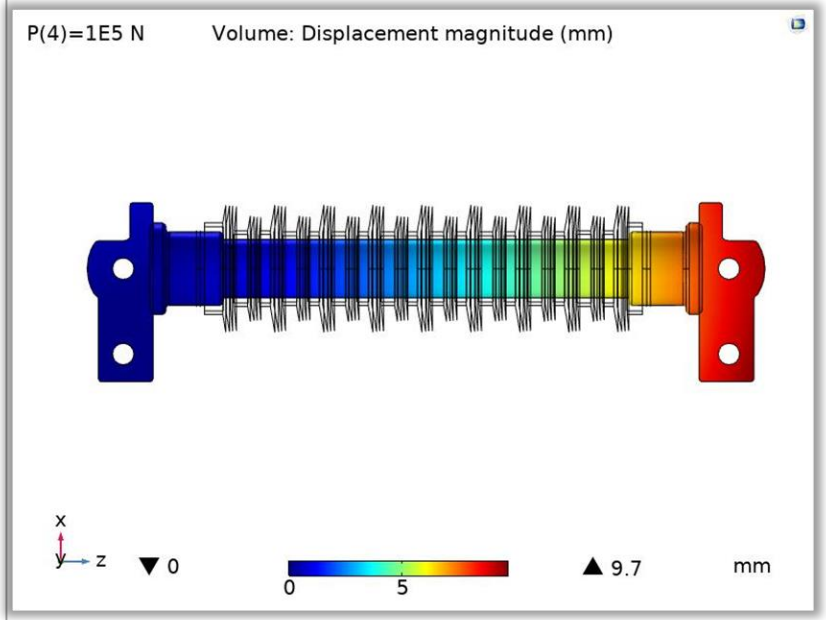
Displacement @ 10 kN Load



Displacement @ 50 kN Load

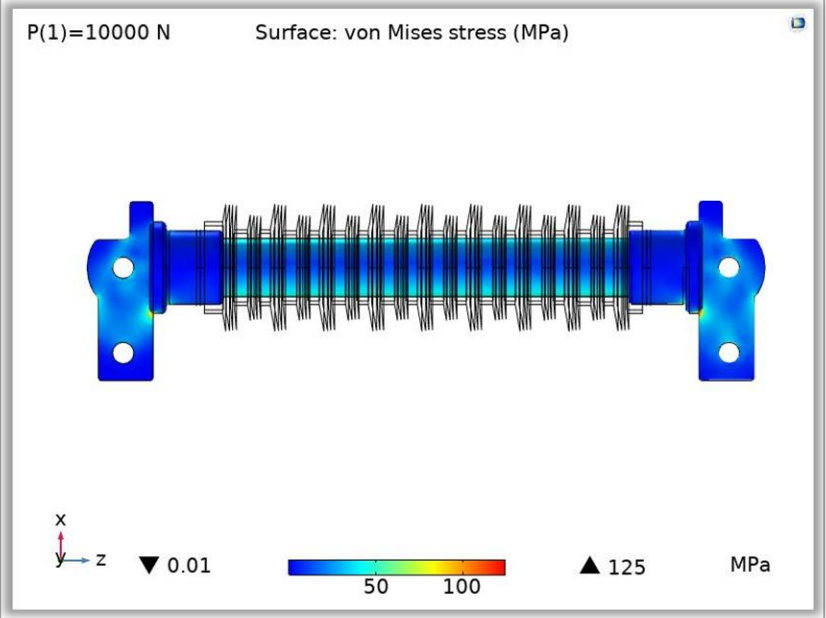


Displacement @ 100 kN Load

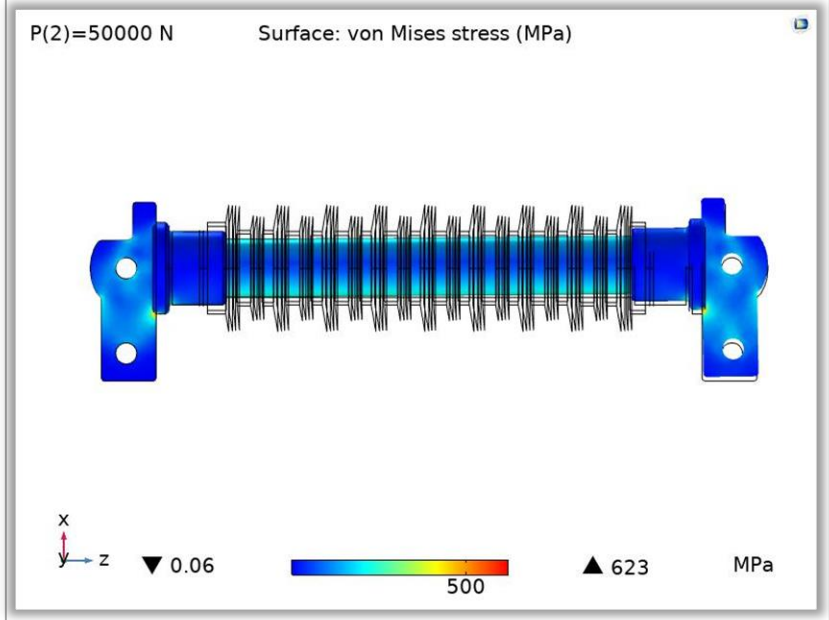


Analysis Results – Von-mises Stress

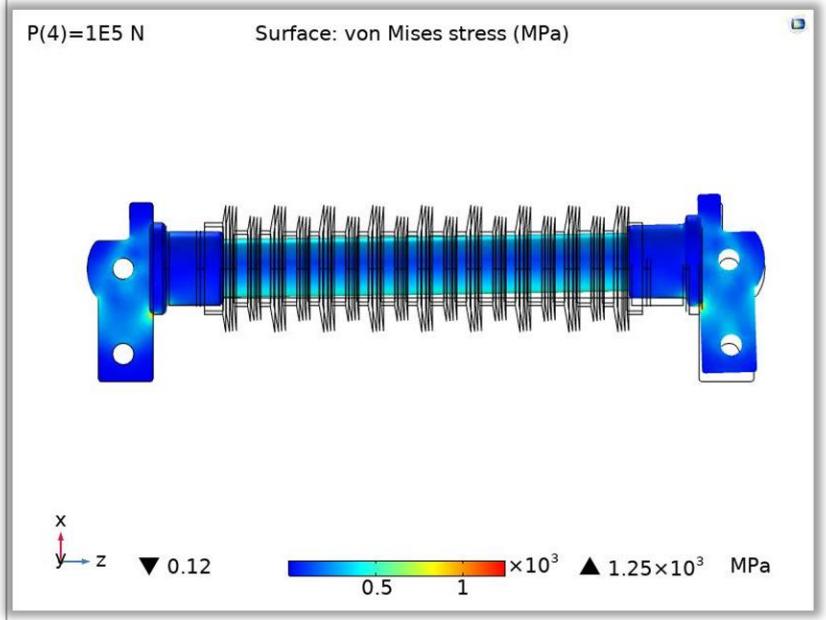
Von mises stress @ 10 kN Load



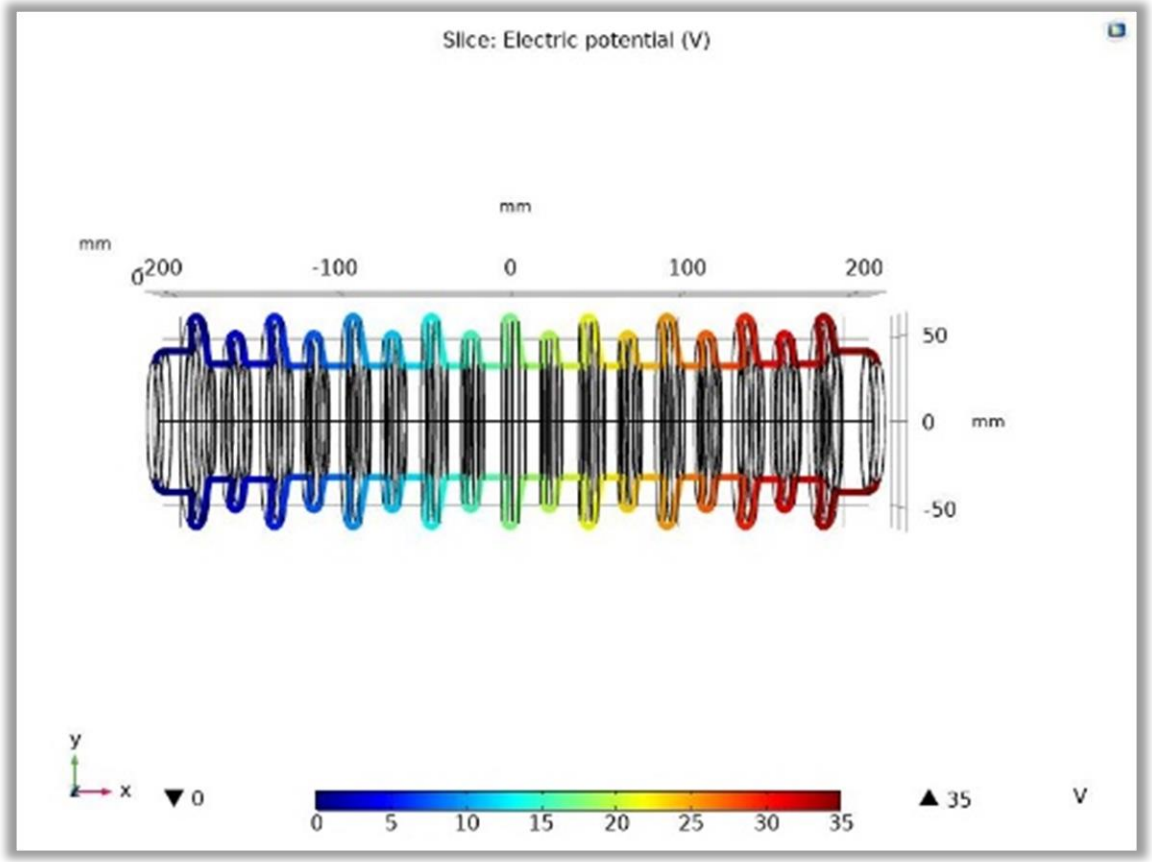
Von mises stress @ 50 kN Load



Von mises stress @ 100 kN Load



Electric Potential



- The electric potential of the section insulator, we conducted a simulation with a test voltage of 35 kV, representing the maximum electrical stress the insulator would face in operational conditions. The critical parameter, known as the creepage distance, was examined.
- Creepage distance defines the shortest path along the insulator's surface between two conductive components, designed to prevent the creation of a conductive path due to environmental factors such as contamination and moisture. Figure illustrates that the specified creepage distance of 1050 mm meets the minimum requirement for ensuring electrical insulation under the 35 kV test voltage.

Conclusion

- FEA analysis study has offered significant insights into the response of section insulators when subjected to eccentric loads.
- These findings are instrumental in enhancing the comprehension of the mechanical behavior of the insulators and can be used in refining the design for diverse engineering applications.
- Based on the investigation, it is evident that section insulators are well-suited for resisting eccentric tensile forces up to 50 kN as per clause no 4.2.3.4 (table-5), while insulators featuring a specified creepage distance of 1050 mm seem to be particularly well-matched for applications involving a test voltage of 35 kV as per clause no 10.1 (Table-4), aligning with the provided specifications.
- These results have the potential to inform and guide future decisions in the field of insulator design and application.

Thank you

Raychem RPG

Corporate Office

Thane

Kapurbawdi, Thane West,
Maharashtra 400607
+91–22–6184 7300
https://www.raychemrpg.com/

Manufacturing Units

Halol
Chakan
Vasai
Naigaon

Sales Offices

Delhi
Bengaluru
Chennai
Kolkata
Pune

Company Website