Static calculation of stresses on porcelain SF$_6$/air bushing

**Calculation of safety factor**

SF$_6$/air bushing type

SF$_6$/air bushing dimensions and weight acc. to attached drawing

Height of SF$_6$/air bushing

Weight of SF$_6$/air bushing

Minimum failing bending moment for insulator

Rated static terminal load on X, Y and Z directions (including tensile force and weight due to connected conductors)

Short circuit terminal load (short circuit current acc. to Specification)

Wind velocity on SF$_6$/air bushing and connected conductors

Height of mounting of SF$_6$/air bushing (will be considered in calculation of seismic load)

**Earthquake load characteristics**

Horizontal earthquake accelerations

Vertical earthquake accelerations

Frequency

Damping of critical damping

Horizontal acceleration response

Vertical acceleration response

---

1) **Condition 1** - Routinely expected loads

(Design pressure 100%, Mass 100%, Rated terminal load 100%, Wind pressure 30%)

Bending moment on bottom insulator

- by design pressure X/Y direction

- by rated terminal load (X/Y direction)

- by wind pressure (X/Y direction)

TOTAL

Safety factor for insulator

(Permissible failing bending moment/
TOTAL bending moment on bottom insulator)

Vertical forces on bottom insulator:

- by design pressure (Z direction)

- by rated terminal load (Z direction)

- by weight (Z direction)

TOTAL

---

2) **Condition 2** - Rarely occurring loads (Alt.1)

(Design pressure 100%, Mass 100%, Rated terminal load 50%,
Wind pressure 100%, Short circuit load 100%)

Bending moment on bottom insulator

---

Please add the calculation of each required value of bending moment.
### 3) Condition 3 - Rarely occurring loads (Alt.2)

(Design pressure 100%, Mass 100%, Rated terminal load 70%, Wind pressure 10%, Seismic load 100%)

#### Bending moment on bottom insulator

- by design pressure X/Y direction  
  .....kNm/kNm
- by rated terminal load (X/Y direction)  
  .....kNm/kNm
- by wind pressure (X/Y direction)  
  .....kNm/kNm
- by seismic load (X/Y direction)  
  .....kNm/kNm
  **TOTAL**  
  .....kNm/kNm

#### Safety factor for insulator

(Permissible failing bending moment/  
TOTAL bending moment on bottom insulator)

#### Vertical forces on bottom insulator:

- by design pressure (Z direction)  
  .....N
- by rated terminal load (Z direction)  
  .....N
- by seismic load (Z directions)  
  .....N
- by weight (Z direction)  
  .....N
  **TOTAL**  
  .....N
## 4. Total loading and Safety Factors

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total bending moment (Nm)</th>
<th>Required/Offer safety factor</th>
<th>Vertical forces on Z directions (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Condition 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Bottom section of insulator</td>
<td>2.1/……</td>
<td>2.1/……</td>
<td></td>
</tr>
<tr>
<td><strong>2. Condition 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Bottom section of insulator</td>
<td>1.5/……</td>
<td>1.5/……</td>
<td></td>
</tr>
<tr>
<td><strong>3. Condition 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Bottom section of insulator</td>
<td>1.2/……</td>
<td>1.2/……</td>
<td></td>
</tr>
</tbody>
</table>