Table 2: Failure Modes and Causes

<table>
<thead>
<tr>
<th>Failure Modes</th>
<th>Internal Causes</th>
<th>Primary Factors</th>
<th>Unavoidable Factors in Normal Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Circuit</td>
<td></td>
<td>Mismanaged Production</td>
<td>Mishandled Application</td>
</tr>
<tr>
<td>Open Circuit</td>
<td></td>
<td>Burred Foil/Metal Particle</td>
<td>Local Deficiency in Oxide Film</td>
</tr>
<tr>
<td>Capacitance Drop</td>
<td>Less Electrotye</td>
<td>Mechanical Stress</td>
<td>Mechanical Stress</td>
</tr>
<tr>
<td>Tan δ (ESR) Increase</td>
<td>Thermal Decomposition of Electrotye</td>
<td>Poor Terminal Connection</td>
<td>Poor Connection</td>
</tr>
<tr>
<td>Leakage Current Increase</td>
<td>Deterioration of Oxide Film</td>
<td>Excessive Thermal Stress</td>
<td>Excessive Thermal Stress</td>
</tr>
<tr>
<td>Open Vent</td>
<td>Corrosion</td>
<td>Reverse Voltage</td>
<td>Reverse Voltage</td>
</tr>
<tr>
<td>Electrolyte Leakage</td>
<td>Internal Pressure Rise</td>
<td>Excessive Ripple Current</td>
<td>Excessive Ripple Current</td>
</tr>
<tr>
<td></td>
<td>Poor Seal</td>
<td>Contamination By Chloride</td>
<td>Excessive Charge-Discharge Duty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Poor Sealing</td>
</tr>
</tbody>
</table>

- **External Causes:**
  - Short Circuit Between Electrodes
  - Dielectrical Break of Oxide Film
  - Dielectrical Break of Separator Paper
  - Disconnection of Terminal Construction
  - Burred Foil/Metal Particle
  - Local Deficiency in Oxide Film
  - Metal Particles in Separator Paper
  - Mechanical Stress
  - Poor Terminal Connection
  - Poor Connection
  - Less Electrotye
  - Thermal Decomposition of Electrotye
  - Anode Foil Capacitance Drop
  - Cathode Foil Capacitance Drop
  - Less Electrotye
  - Thermal Decomposition of Electrotye
  - Anode Foil Capacitance Drop
  - Cathode Foil Capacitance Drop
  - Contamination By Chloride
  - Excessive Thermal Stress

- **Extraneous Causes:**
  - Electrolyte Leakage
  - Poor Seal
  - Internal Pressure Rise
  - Poor Sealing
  - Excessive Charge-Discharge Duty
  - Excessive Ripple Current
  - Excessive Operating Voltage
  - Deterioration With Time