The transformer and its foundation is assumed to be rigid but not stiff, so the ground acceleration $a_{\text{HG}}$ is considered to be amplified through the transformer tank to the tank cover with the amplification factor $K$, which is prescribed to be 1.5 (IEC 61463).

Static calculation on a somewhat flexible structure, taking into consideration the response factor $R$ as an alternative to the method by dynamic analysis, gives a simple and at the same time a more conservative method for calculation.

The bending moment $M_s$ in the critical cross-section on the part of the tap-changer under consideration is then calculated from an equivalent acceleration $a_{\text{MP}}$ of the center of gravity of that part:

$$M_s = a_{\text{MP}} \cdot h \cdot m_p$$

The acceleration $a_{\text{MP}}$ is calculated from the cover acceleration $a_{\text{HC}}$ by multiplication with a coefficient $S_c$ and the response factor:

$$a_{\text{MP}} = a_{\text{HC}} \cdot S_c \cdot R$$

The value of $S_c$ depends on the natural frequency of the mounted part and if no value is known, the conservative value $S_c = 1.5$ should be used. This coefficient aims to take into account the effects of both multifrequency excitation and multimode response. $R$ can be assumed to be equal to the conservative value 1.74 when information for frequency and damping of the tap-changer on a transformer is not available. This value corresponds to the frequency range 2.4 Hz to 9 Hz and 5 % damping ratio.
Calculation
For the tap-changer UCC/UCD is the following valid:

\[ m_p = 950 \text{ kg} \]
\[ h = 2.0 \text{ m} \]
\[ K = 1.5 \]
\[ R = 1.74 \]
\[ S_c = 1.5 \]

Assume the strongest type of earthquake with a ground acceleration level \( a_{HG} = 0.5 \text{ g} \) (Richter scale >7.0) which gives that:
\[ a_{HG} = 5 \text{ m/s}^2 \]
\[ a_{HC} = K \cdot a_{HG} \]
\[ a_{MP} = a_{HC} \cdot S_c \cdot R \]

The bending moment \( M_c \) in the critical cross-section will be:
\[ M_c = a_{MP} \cdot h \cdot m_p \]
\[ M_c = 3.719 \cdot 10^4 \text{ Nm} \]

Bending tests has been made on an UCC, which show that a bending moment of about 58 kNm does not give any problem with leakage or damage. As this moment is much greater than the calculated moment \( M_c \), the tap-changer is capable to withstand even the most severe earthquake.

Note
The mass \( m_p = 950 \text{ kg} \) does not include the top-section flange bolted to the transformer cover but only the mass below the top-section flange (cylinder, active insert parts, bottom flange and the tap selector).