Equivalence ("atomic site") representation (G_{eq}) is formed by vibrational displacements of all atoms consistent with the symmetry operations of the group.

In general, G_{eq} is reducible. Expand G_{eq} over irreps.

$$C_{2v}: \quad G_{eq} = a_1 A_1 + a_2 A_2 + a_3 B_1 + a_4 B_2$$

Some of the coefficients should be zero.
Consider rotation by angle θ
about some symmetry axis of the molecule in 3D

$$U_\theta = \begin{pmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

Its character:

$$\chi(U_\theta) = \mathrm{Tr} U_\theta = 1 + 2\cos\theta$$

If there are N_a atoms on the same axis,

$$\chi(U_\theta) = N_a(1 + 2\cos\theta)$$

Each of the N_a atoms was subjected not only to vibrations but also to translations and rotations $\Rightarrow$
$\chi(U_\theta)$ contains extra degrees of freedom.