STEP 2: IDENTIFYING MOUNTING LOADINGS

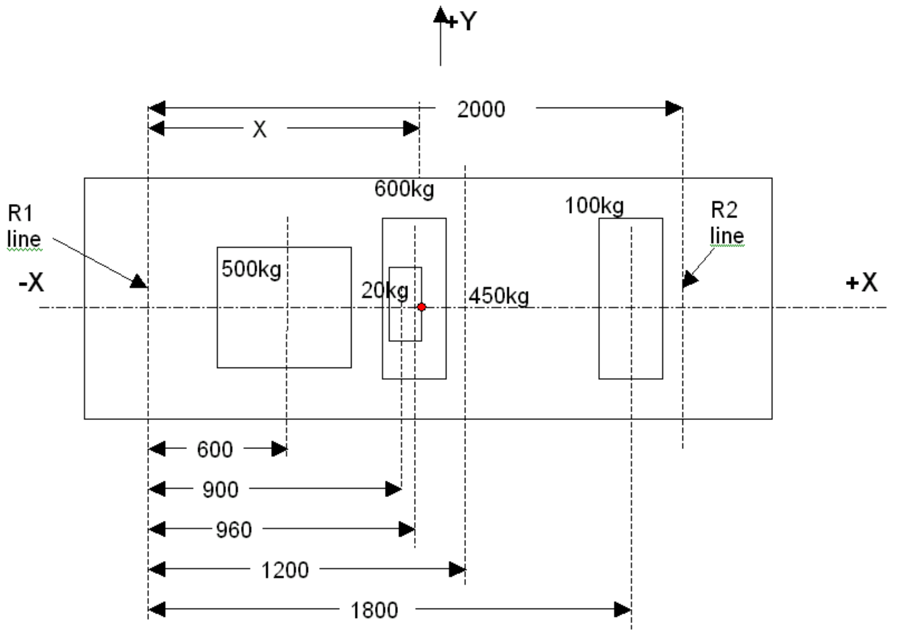
STAGE 2.1. Determining the Centre of Gravity position.

Firstly it is necessary to either measure or calculate the Centre of Gravity position of the total equipment to be mounted.

A typical calculation is presented below, for an example installation consisting of a base-frame of 450kg on which are rigidly mounted four separate masses. AVMs are to be fitted at the R1 and R2 line positions either side of the 'XX' axis of the base-frame. In this example, the installation is symmetrical about the 'X' axis.

Centre of Gravity Calculations

Diagram



R1 & R2 are the proposed longitudinal mounting positions.

The masses represent individual components and the 450kg the centre of gravity of the base frame only.

Taking "Moments" about R1, the calculations are as follows to determine the Total C of G position.

Position		Mass		Total Moment
600 mm	x	500 Kg	=	300,000 Kg. mm
900 mm	x	20 Kg	=	18,000 Kg. mm
1200 mm	x	450 Kg	=	540,000 Kg. mm
1800mm	x	100 Kg	=	180,000 Kg. mm
960mm	x	600 Kg	=	576,000 Kg. mm
Total		**1670 Kg**		**1,614,000 Kg. mm**

This total moment must equal the total mass multiplied by the distance to the combined Centre of Gravity.

Dividing the Total Moment by the Total Mass we therefore obtain the longitudinal position of the Centre of Gravity from R1. i.e. '**X**'

i.e. **X = 966mm from R1**.

N.B. When the individual masses are not all on the 'XX' centre line, it is also necessary to take moments in the 'Y' direction using either the centre line, or a corner of the base-frame, as the 'Y' datum position.
A similar calculation will then determine the transverse position of the Centre of Gravity.

STAGE 2.2. Determining the optimum number of AVM's required.

The "Minimum" number of mountings required to use under a base-frame, based on a maximum 1500mm mounting spacing, for base dimensions given below:

Base-frame Length	Number of Mountings
< 2000mm	**4 off**
< 3500mm	**6 off**
<5000mm	**8 off**
< 6500mm	**10 off**
>6500mm	**12 off plus**

The above figures are based on narrow rectangular form base-frames, as an example. Square or larger rectangular units must take into account the maximum spacing figure of 1500mm throughout the whole area of the base frame.

Where a stiffened base, deep section construction exists, fewer mountings than suggested above, may prove satisfactory.

To achieve a good suspension it is generally necessary to balance the stiffness moments about the Centre of Gravity position.

N.B. These figures are intended as a guide only, there are applications involving heavy machinery on short base-frames where more mountings are used to support the total weight of the machine.

Vibracoustics Limited, Prestwold, Loughborough Leicestershire. East Midlands. LE12 5SH.
Tel: +44(0)1509 881333 Fax: +44(0)1509 881662 E-mail: mail@vibracoustics.com Website address : www.vibracoustics.com

STAGE 2.3. Determining AVM loadings by choice of fixing positions.

Consider the Centre of Gravity calculation above. From 2.2 above, the base length exceeds 2000mm with a proposed mounting spacing of 2000. If the base-frame is stiff enough we can use a minimum four mountings otherwise six or more would be preferable.

For mountings to be positioned on the R1 and R2 lines we need to establish the loadings.

To determine the supported load at R2 i.e. 2000 from R1,

We need to take Moments about R1 again,

For static equilibrium, 966 x (1670 Kg) = 2000 x R2

Therefore R2 = 966 x (1670)/ 2000 Kg = 807Kg.

Using two mountings, equally spaced in the 'Y' direction, either side of the centre line, the 807kg will be split equally between them.

The mountings at R1 must support the remaining load and therefore at R1 the load will be equal to 1670Kg - 807 Kg = 863Kg

Using two mountings, equally spaced in the 'Y' direction, either side of the centre line, the 863kg will be split equally between them.

At the R1 end of the installation the loads imposed on each mounting will be 863Kg / 2=431.5kg per mounting and at the R2 end 807 Kg / 2=403.5 kg per mounting. I.e. almost equal loadings on all mountings.

With the indicated 2000mm mounting spacing and using only four mountings of the same size and stiffness, the base-frame must be of stiff construction.
For a lighter base construction, the positions of the mountings could be set about 1500mm apart at equal distance about the Centre of Gravity providing the end overhangs are not too great.

On light base frame and occasions where the loadings are clearly unequal, a better solution could be provided by using more than 4 mountings.

To use six or more similar stiffness mountings on any installation, it is necessary to balance the supporting stiffness moments about the combined Centre of Gravity.

In the case above, where the mounting positions on the left are 966mm from the C.o.G. and 1034 to the right of the Centre of Gravity, an extra pair of mountings introduced at (1034-966) mm. i.e. 38mm to the left of the Centre of Gravity will balance the stiffness moments.

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This approach, using six identical AVM mountings positioned in this way will ensure that all support equal loads and therefore have equal deflections (Provided support floor and underside of base frame are flat and parallel).

N.B. On any application of more than three mountings, it is possible to impose unwanted loads by poor installation or poor site conditions. Supporting floors and base-frames should ideally be flat and parallel, otherwise shimming or packing may be required.

If in doubt consult Vibracoustics staff, who will be pleased to assist and advise you, if necessary using in-house programmes to provide full analysis.
On occasions where the equipment, to be supported has predetermined fixed positions for all the mountings, balancing the stiffness moments about the Centre of Gravity is achieved by selecting different mountings (i.e. different stiffness versions of the same mounting) at the various support points.

Having determined the number of mountings and predicted the working loads proceed to Step 3 Sheet 02-S-30 to identify the excitation present and determine the preferred mounting deflections.

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