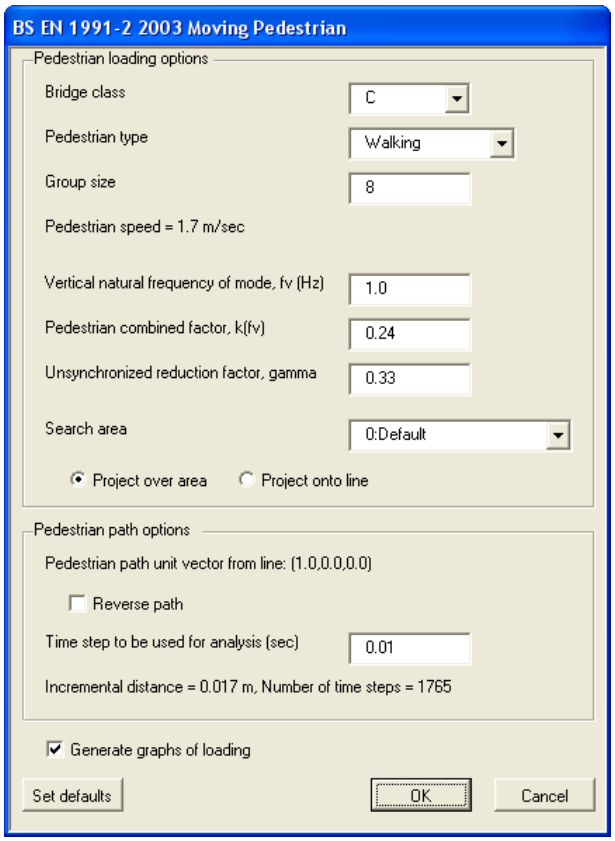
Vertical Pedestrian Loading to BS EN 1991-2 2003 for LUSAS

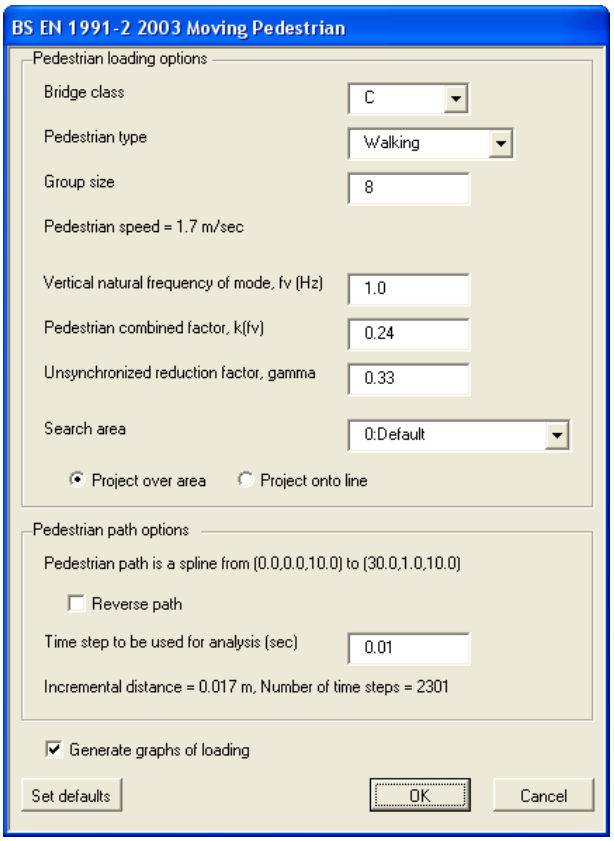
The **BS_EN_1991-2_2003-PedestrianV15.tfm** scriptable dialog provides the ability to apply vertical oscillating pedestrian loading to a structural model in accordance with **NA to BS EN 1991-2 2003 cl NA.2.44.4 Dynamic actions representing the passage of single pedestrians and pedestrian groups**. This dialog provides similar functionality to the BD37/01 pedestrian loading scriptable dialog demonstrated at past LUSAS Special Interest Groups.

In order to use the dialog, a straight line, arc or spline must first be selected in the model which will represent the path of the pedestrian movement. The scriptable dialog can be run from LUSAS Modeller by clicking on the **Run Script** toolbar button or through the **File>Script>Run Script...** menu item. Select the **BS_EN_1991-2_2003-PedestrianV15.tfm** scriptable dialog from its current location and click **OK**.

NOTE: The pedestrian loading dialog sets up a dynamic analysis to analyse the behaviour of the current structure to the moving and pulsating pedestrian load. The units of the model must therefore be in SI units (N,m,kg,s,C). The user must also ensure any Rayleigh damping parameters are set in the material properties to correctly represent the damping behaviour of the materials / structure.

The front-end of the BS EN 1991-2 2003 pedestrian loading dialog is shown in the following figure for a straight line path (left image) and a spline path (right image).





In the V15 implementation a new analysis (named Moving Load Analysis) will be created to contain the loadcases for the moving load. The existing analyses in the model will be unaffected.

The **Bridge class** and **Pedestrian type** should be selected in the dialog. Classes available are **A**, **B**, **C** or **D** in accordance with the code of practice. The pedestrian types are either **Walking** or **Jogging/running** which control the reference load and speed of the moving pulsating load representing the pedestrian or pedestrian group. Based on the selection of bridge class and pedestrian type the recommended group size from Table NA.7 will be set in the dialog. This group size can be adjusted but the wizard will request confirmation for using the entered value if it is different from the table.

The **Vertical natural frequency** governs the frequency of the pulsating pedestrian load and it is also required for the determination of the **Pedestrian Combined factor** from Figure NA.8 to deal with (a) the effects of a more realistic pedestrian population, (b) harmonic responses and (c) relative weighting of pedestrian sensitivity to response. This combined factor should be manually obtained and entered into the dialog input. The **Unsynchronized reduction factor** which is dependent upon both the effective span and structural damping should be obtained manually from Figure NA.9.

The search areas defined within the model will be listed in the combobox with the default (all model) set initially. These search areas should be used for targeting the loading, especially if the load is to be projected onto beam elements.

The **Project over area** and **Project onto line** options allow control over the load projection method. If the default **Project over area** is used then the load projection will apply to surfaces in the model. The **Project onto line** option allows the projection of the load onto simplified beam models. As noted above, search areas must be used for these types of models to ensure the pedestrian loading is projected correctly onto the model.

The pedestrian path options control the direction of the pedestrian movement and the time step / incremental distance for each stage of the analysis. By default the pedestrian will move in the direction of the line definition in the model which is indicated by the direction unit vector in the dialog for a straight line or the start and end coordinates for an arc or spline. If the opposite direction is required then the movement can be reversed using the **Reverse path** option in the dialog.

The time step that is to be used for the dynamic analysis should be specified in the dialog. By default this is 0.01 seconds which should generally be suitable for both pedestrian types / speeds for structure frequencies up to 5Hz but it is up to the user to ensure that the time step is sufficiently small to capture the dynamic response of the structure.

NOTE: For analyses that have over 1000 time steps the analysis may need to be broken up into a restart analysis with 1000 time steps per data file – refer to the LUSAS Solver Reference Manual on the Restart Facilities. Alternatively, the master index tables can be adjusted for LUSAS Modeller and Solver to allow more time steps to be solved. For more information on either method please contact the LUSAS Customer Support Department.

Selecting the **Generate Graphs** option before clicking the **OK** button will generate two LUSAS graphs showing the loading applied to the model. The first graph will plot the variation of pedestrian load versus distance along the path and the second will plot the variation of pedestrian load versus time. These two graphs can be printed and / or included in any report for the analysis. They are also very useful to ensure that a good representation of the loading has been achieved in the analysis. If the graphs do not look like sine curves and are uneven or very spiky then the time step may be too large for the analysis as indicated in the following figures.