SESAM EXAMPLE

Eigenvalue Analysis for Jacket Structure

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Date: May 2024

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1 Introduction

This document is about Eigenvalue Analysis for a jacket structure using GeniE and Sestra. It is recommended to use the latest version of GeniE and Sestra for this example. You may check and download the latest version of the programs at https://sesam.dnv.com/. The example is run in GeniE. Download Model_Eigenvalue.zip file. Unzip the file and there will be two GNX files (Model_Eigenvalue_Completed.gnx and Model_Eigenvalue_start.gnx). Launch GeniE and import Model_Eigenvalue_start.gnx to start. In GeniE, go to File > Import Workspace (GNX) and search for Model_Eigenvalue_start.gnx.

The model is shown in **Figure 1-1**. This is a four-legged jacket structure with diagonal X braces. The jacket is supported by four stiffness springs. There are two decks at the topside with plates.

This workspace was created in SI units (N, m and C). The following programs and versions are recommended to run this example: GeniE 8.9-04, Wajac 7.11-01, Sestra 10.17-02 and Xtract 6.1-01

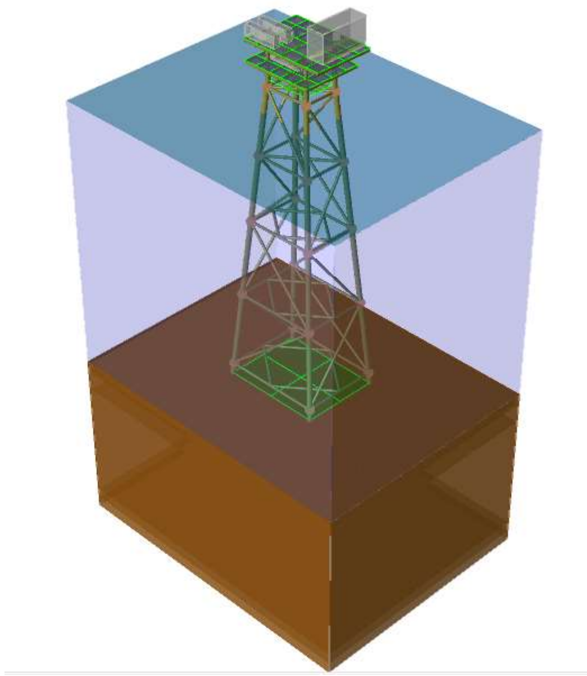

Figure 1-1 Jacket model for this example

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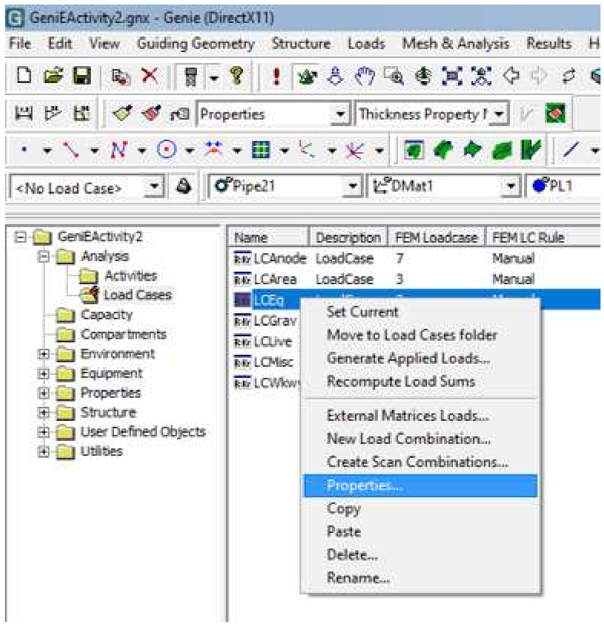
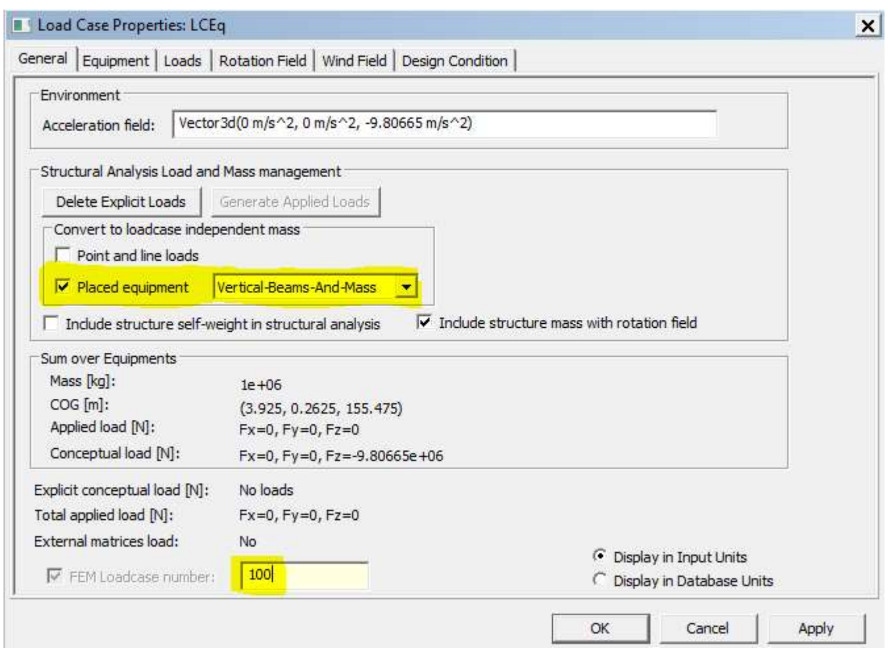
2 Converting the load into point mass

Under Analysis folder, click on Load Cases folder. Select LCEq (equipment load) by left click on the load case. Right click on it again and select Properties:



This will open Load Case properties for LCEq. Under Structural Analysis Load and Mass management, check Placed equipment and select Vertical-Beams-And-Mass from the drop-down menu. Change the FEM load case number to 100:

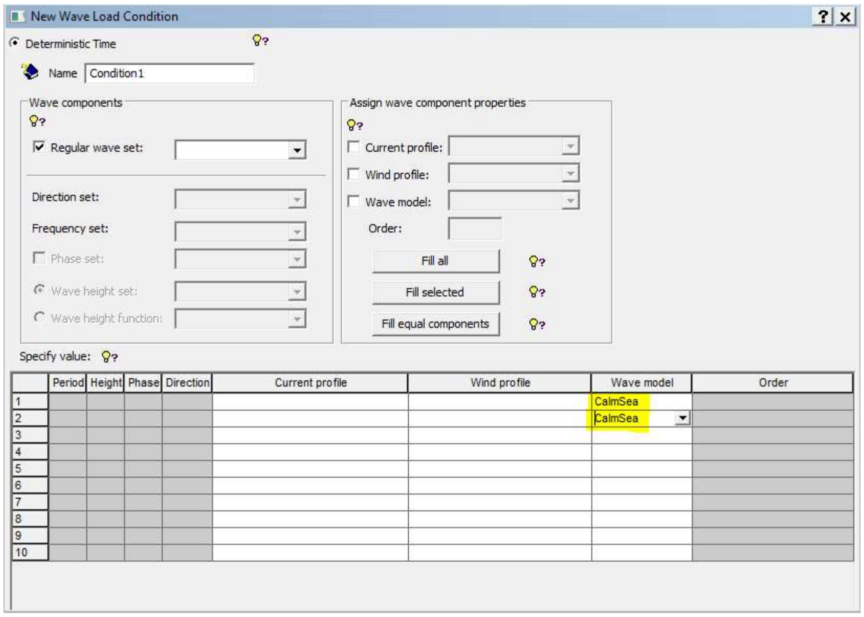


Click OK or Apply and then Cancel.

Note : *A beam cross section and a material must be assigned to the equipment. Right-click on the equipment, select Properties and go to the Section and Material. A suitable beam cross section for the auxiliary beam stubs is a medium to weak one, possibly with reduced shear stiffness. They have a length of 1 m only to limit deformations in the dynamic analysis. A suitable material is one with zero density so as not to add mass to the model. The equipment in this example has been assigned to Deq1 section and DMat1 material.*

3 Create new Wave Load Conditions

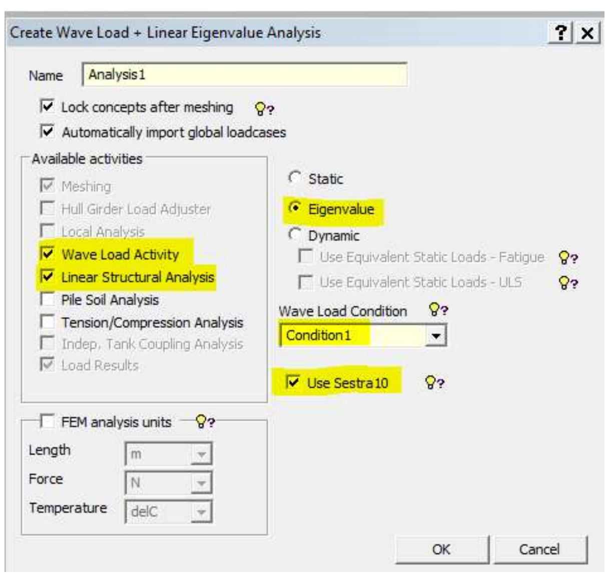
Under Environment folder, right-click on Location1 and select New Wave Load Conditions. Select CalmSea conditions under wave model:



Click OK.

4 Create new analysis.

Right click on the activities folder and select New Analysis. Check Linear Structural Analysis and Wave Load Activity, select Condition1, set the analysis to be Eigenvalue and use Sestra 10 for the solver. Click OK:

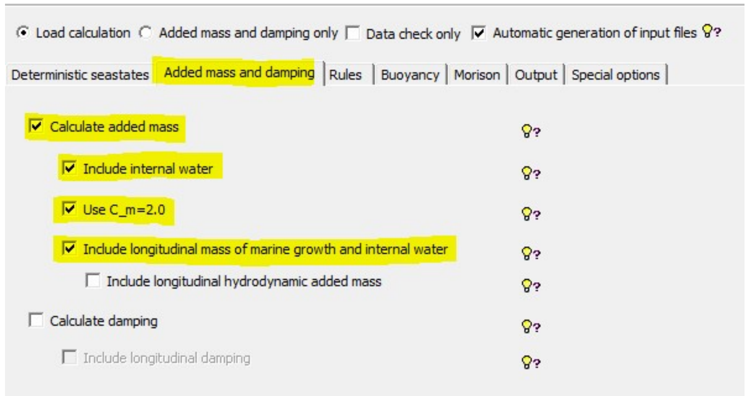


New Analysis1 is now created. Exclude all load cases except LCEq from the analysis.

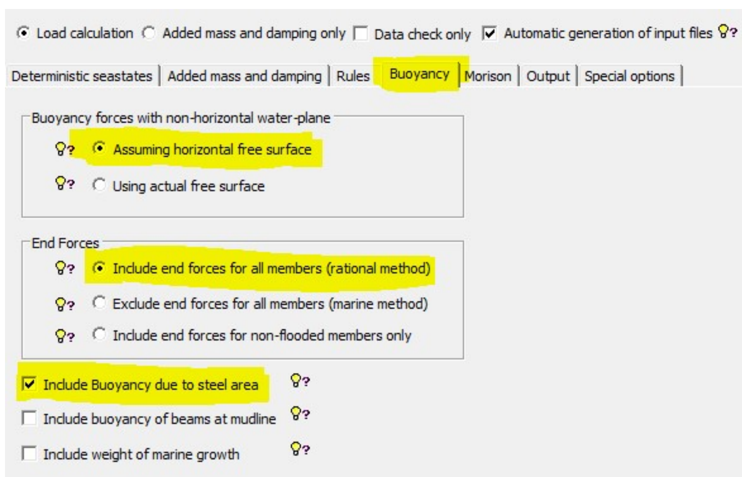
5 Running the analysis

Go to Activity Monitor (Alt + D).

Right click on 1.2 Wave Load Analysis. Under Added mass and damping, set as below:

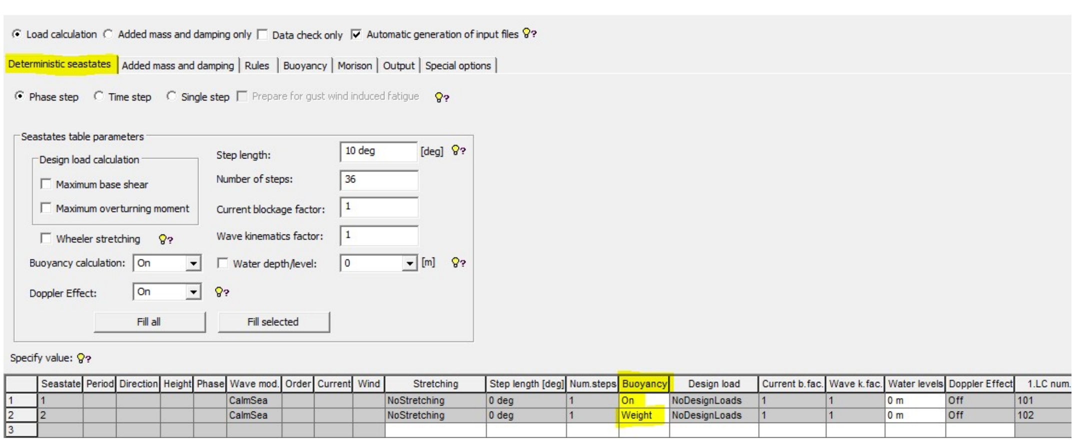


Under Buoyancy tab, set as below:



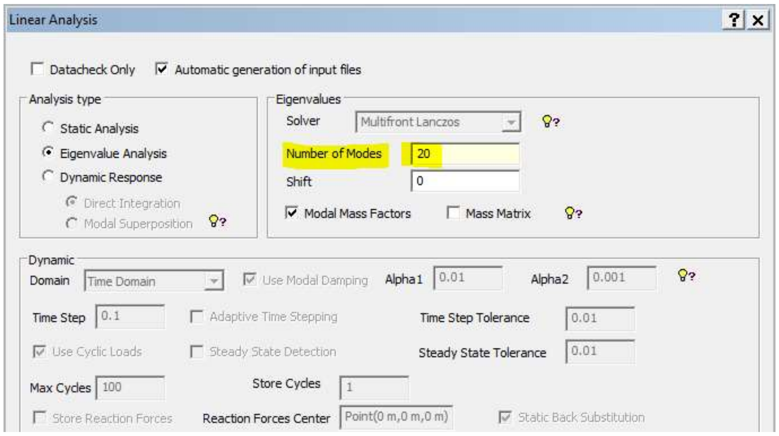
Click Apply.

Go to Deterministic seastates tab, and select Buoyancy On (from drop down menu) for the first seastate and select Weight for the second seastate:



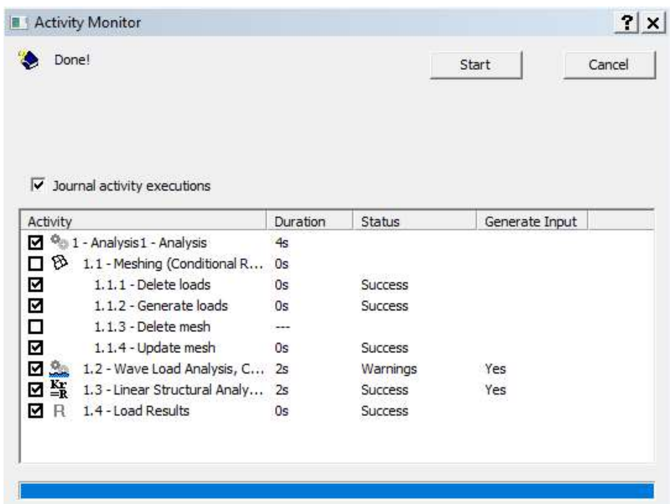
Click OK.

Right click on 1.3 Linear Structural Analysis and change Number of Modes to 20:



Keep other settings as it is and click OK.

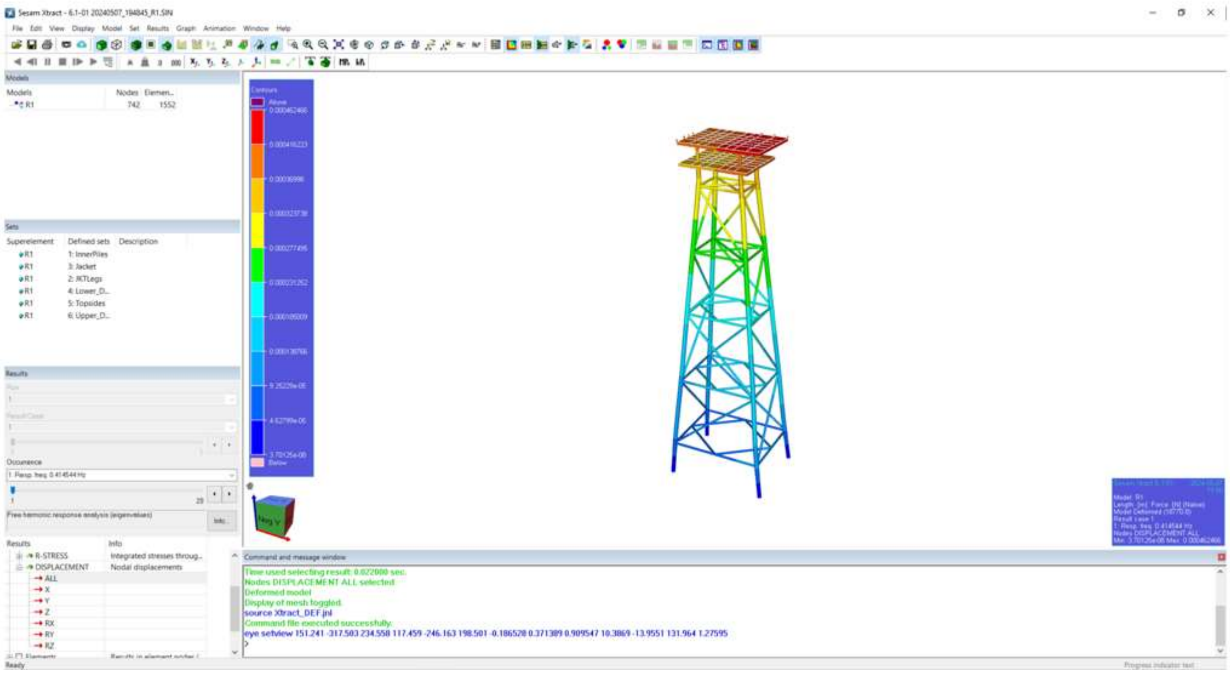
Click Start to run the analysis. Check the analysis status:



6 View the results.

The results may be examined in GeniE. Change the view to Results – With Mesh and check the displacement for each result case.

For more details such as viewing of mode shapes animation, click on Results > Advance Results (Xtract). This will open the result file in Xtract. In Xtract, go to Animation > Mode Shape Animation. Use default settings for number of frame and click OK. Click button to play the animation.



The print of all Eigenvalues is listed in Sestra.lis file:

```
Print of eigenvalues.
Eigenvalues have unit sec^-2; frequency = sqrt(eigenvalue) / (2 * pi); period = 1 / frequency.
        Number;     Eigenvalue;      Frequency;         Period
             1;   6.784234e+00;   4.145439e-01;   2.412290e+00
             2;   8.752629e+00;   4.708574e-01;   2.123785e+00
             3;   1.394419e+01;   5.943152e-01;   1.682609e+00
             4;   2.488864e+01;   7.940004e-01;   1.259445e+00
             5;   2.697936e+01;   8.266771e-01;   1.209662e+00
             6;   4.109720e+01;   1.020296e+00;   9.801076e-01
             7;   8.935131e+01;   1.504425e+00;   6.647057e-01
             8;   9.075874e+01;   1.516227e+00;   6.595316e-01
             9;   1.039518e+02;   1.622692e+00;   6.162599e-01
            10;   1.039647e+02;   1.622793e+00;   6.162215e-01
            11;   1.039691e+02;   1.622827e+00;   6.162084e-01
            12;   1.039752e+02;   1.622875e+00;   6.161905e-01
            13;   1.040685e+02;   1.623603e+00;   6.159142e-01
            14;   1.041469e+02;   1.624215e+00;   6.156822e-01
            15;   1.042072e+02;   1.624684e+00;   6.155042e-01
            16;   1.042345e+02;   1.624897e+00;   6.154235e-01
            17;   1.254252e+02;   1.782430e+00;   5.610319e-01
            18;   1.267107e+02;   1.791541e+00;   5.581786e-01
            19;   1.637114e+02;   2.036384e+00;   4.910666e-01
            20;   1.689654e+02;   2.068803e+00;   4.833714e-01
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