



SESAM EXAMPLE

Fatigue Analysis with Manually Specified Oscillating Loads





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1 Introduction

This example involves using Sesam Manager, GeniE, Sestra and Framework. Create a new job in Sesam Manager (any name) and import the zip file to run the example.

The example demonstrates how to run a so-called *direct deterministic fatigue analysis* of a structure subjected to manually specified oscillating loads. (As opposed to wave loads computed by Wajac followed by a *deterministic fatigue analysis*.) An example of such oscillating load is rotating machinery with eccentric mass.

The example is a simple tower subjected to acceleration fields, horizontal and rotational, all together 4 loading situations. Each loading situation is modelled by two loads, one positive and one negative, representing the two extremes of the loading situation.

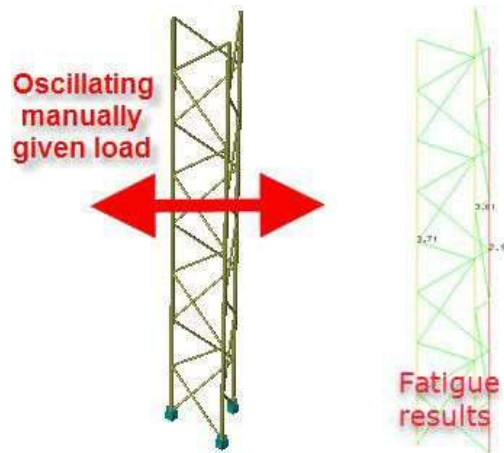


Figure 1-1 Tower subjected to manually specified oscillating load causing fatigue damage

2 Loads

For simplicity, acceleration loads are used in this analysis:

- Loading situation 1:
 - LC1: acceleration field of 2 m/s^2 in X-direction
 - LC2: acceleration field of -2 m/s^2 in X-direction
- Loading situation 2:
 - LC3: acceleration field of 2 m/s^2 in Y-direction
 - LC4: acceleration field of -2 m/s^2 in Y-direction
- Loading situation 3:
 - LC5: rotational acceleration field of 0.1 rad/s^2 about X-axis
 - LC6: rotational acceleration field of -0.1 rad/s^2 about X-axis
- Loading situation 4:
 - LC7: rotational acceleration field of 0.1 rad/s^2 about Y-axis
 - LC8: rotational acceleration field of -0.1 rad/s^2 about Y-axis

For a case with rotating machinery causing the oscillatory force, two opposite concentrated forces may be more suitable but the analysis process is otherwise the same as in this simple example.

3 Structural Analysis

Based on the assumption that the oscillating forces do not cause significant inertia forces, a simple static analysis is performed. The analysis is run from GeniE.

4 Fatigue Analysis

The fatigue analysis is run in Framework. This program is designed for fatigue analysis of wave and wind loads. In a deterministic fatigue analysis with wave loading, a distribution of wave height vs. number of waves is specified and the number of oscillations for a given stress range is found from this distribution.

In the case of a constant amplitude oscillating force, however, the number of oscillations for a given stress range (pair of loads representing the two extremes of a loading situation) is given directly. To achieve this the following commands to Framework are essential:

- SELECT FATIGUE-CHECK-TYPE DIRECT-DETERMINISTIC
- CREATE FATIGUE-LOAD-SERIES ...
This command refers to the load cases analyzed and groups them (pair by pair) and specifies the number of oscillations for each pair.

The fatigue results are displayed by Framework below.

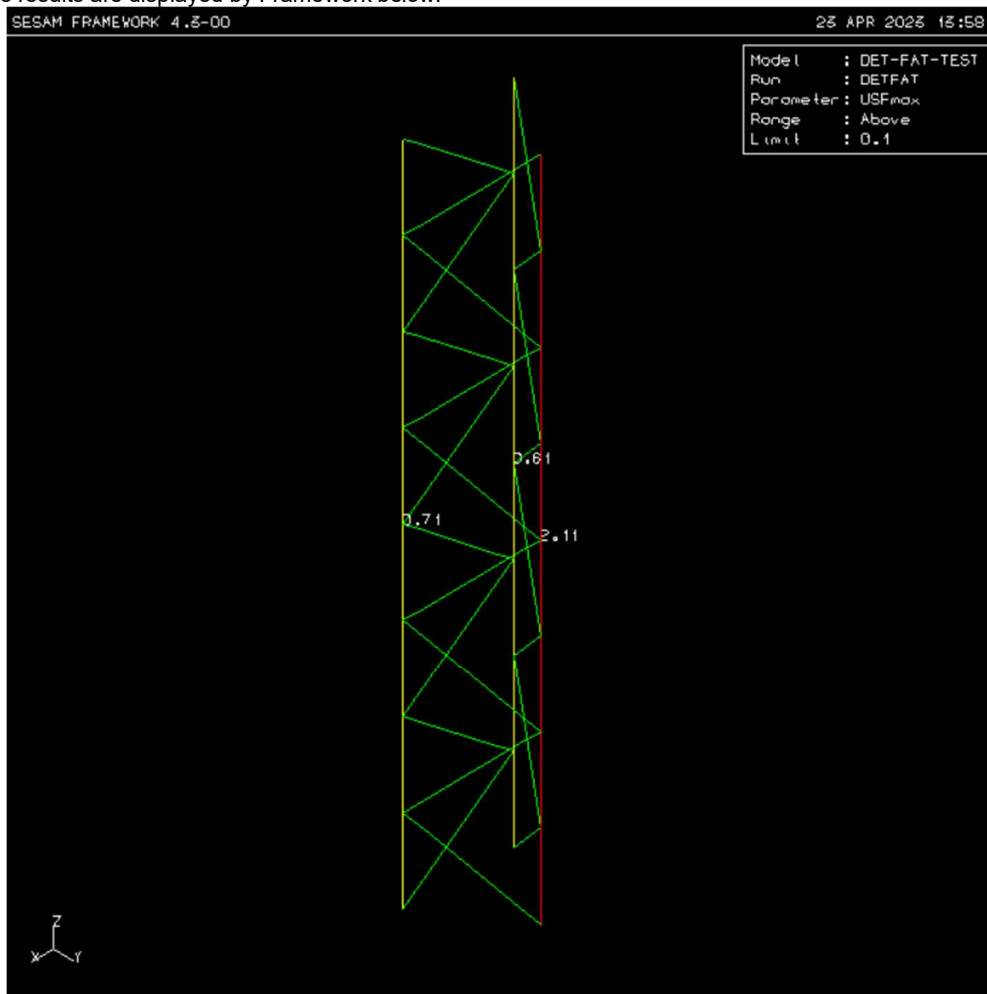


Figure 4-1 Fatigue damage displayed by Framework



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