
SZLZ103 - Method RAINFLOW

Summary:

The purpose of this test is to test the method of counting of cycles RAINFLOW starting from a history of loading in constraints.

One also tests the functionality of filtering of the history of loading, and the taking into account of a coefficient of stress concentration K_T .

This example is a test of validation of software POSTDAM developed by Department REME, provided in the Manuel de Validation of version 1.0 of this software.

Results provided by the operator `POST_FATIGUE` are completely identical to those provided by software POSTDAM.

1 Problem of reference

1.1 Geometry

The analysis consists in extracting the elementary cycles by the method of counting of cycles of RAINFLOW [R7.04.01].

One filters initially the history of loading in constraints with a level of filter of 0.9.

Then one applies a coefficient of stress concentration $K_T = 1$.

History of the loading

t	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
$\sigma_1(t)$	4.	7.	2.	10.	9.6	9.8	5.	9.	3.	4.	2.	2.4	2.2	12.
14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.
5.	11.	1.	4.	3.	10.	6.	8.	12.	4.	8.	1.	9.	4.	6.

2 Reference solution

2.1 Method of calculating used for the reference solution

This test is resulting from the handbook of validation of software POSTDAM version 1.0. The reference solutions are given in this document.

2.2 Results of reference

The counting of the elementary cycles by method RAINFLOW leads to:

Nb_Cycl = 12	Cycle 1	Vale_Min:	5.	Vale_Max:	11.
	Cycle 2	Vale_Min:	3.	Vale_Max:	4.
	Cycle 3	Vale_Min:	6.	Vale_Max:	10.
	Cycle 4	Vale_Min:	1.	Vale_Max:	12.
	Cycle 5	Vale_Min:	4.	Vale_Max:	8.
	Cycle 6	Vale_Min:	4.	Vale_Max:	6.
	Cycle 7	Vale_Min:	4.	Vale_Max:	7.
	Cycle 8	Vale_Min:	2.	Vale_Max:	9.
	Cycle 9	Vale_Min:	5.	Vale_Max:	9.
	Cycle 10	Vale_Min:	3.	Vale_Max:	4.
	Cycle 11	Vale_Min:	2.	Vale_Max:	10.
	Cycle 12	Vale_Min:	1.	Vale_Max:	12.

2.3 Uncertainty on the solution

Analytical solution.

2.4 Bibliographical references

1. Handbook of validation POSTDAM 1.0. Baker I., Vatin E. HP-14/93/016/B.

3 Modeling A

3.1 Sizes tested and results

Identification		Reference
NB CYCL		12.
Cycle 1	VALE_MIN	5.
	VALE_MAX	11.
Cycle 2	VALE_MIN	3.
	VALE_MAX	4.
Cycle 3	VALE_MIN	6.
	VALE_MAX	10.
Cycle 4	VALE_MIN	1.
	VALE_MAX	12.
Cycle 5	VALE_MIN	4.
	VALE_MAX	8.
Cycle 6	VALE_MIN	4.
	VALE_MAX	6.
Cycle 7	VALE_MIN	4.
	VALE_MAX	7.
Cycle 8	VALE_MIN	2.
	VALE_MAX	9.
Cycle 9	VALE_MIN	5.
	VALE_MAX	9.
Cycle 10	VALE_MIN	3.
	VALE_MAX	4.
Cycle 11	VALE_MIN	2.
	VALE_MAX	10.
Cycle 12	VALE_MIN	1.
	VALE_MAX	12.

4 Summary of the results

Results *Aster* are perfectly identical to the values of reference provided in the Manuel de Validation of version 1.0 of software POSTDAM.