

## SZLZ103 - Method RAINFLOW

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### Summarized:

The purpose of this test is testing the method of counting of cycles RAINFLOW from a load history in stresses.

One also tests the functionality of filtering of the load history, 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 Handbook of 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

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### 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 load history in stresses with a level of filter of 0.9.

Then a coefficient of stress concentration is applied  $K_T = 1$ .

#### 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

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### 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 analytical

solution Solution.

### 2.4 Bibliographical references

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

## 3 Modelization A

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### 3.1 Quantities 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

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the Aster *results* are perfectly identical to the values of reference provided in the Handbook of Validation of version 1.0 of software POSTDAM.