Code_Aster

Version default

Titre : SZLZ102 - Fatigue avec différentes méthodes de com[...]
Responsable : TRAN Van Xuan

Date : 12/12/2011 *Page : 1/5*
Clé : V9.01.102 *Révision :*
b18c57a5203f

SZLZ102 - Tiredness with various methods of counting

Summary:

This test relates to the methods of countings of cycles (RAINFLOW, RCCM) starting from a history of loading in constraints.
Starting from a simple history of loading defined by DEFI_FONCTION, one extracts the elementary cycles by the method of counting of cycles of the RAINFLOW [R7.04.01], then by the method of counting of cycles RCCM [R7.04.01].

One also tests the taking into account of the 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.

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Titre : SZLZ102 - Fatigue avec différentes méthodes de com[...]
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Version default

Date : 12/12/2011 Page : 2/5
Clé : V9.01.102 Révision :
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1 Problem of reference

1.1 Geometry

The analysis consists in extracting the elementary cycles starting from a history from loading in constraints.

- First call to POST_FATIGUE :

  One extracts the elementary cycles by the method of counting of cycles RAINFLOW, on the history of loading $\sigma_1(t)$.

- Second call to POST_FATIGUE :

  One extracts the elementary cycles by the method of counting of cycles RCCM, on the history of loading $\sigma_1(t)$.

- Third call to POST_FATIGUE :

  One extracts the elementary cycles by the method of counting of cycles RAINFLOW, on the history of loading $\sigma_2(t)$ and one uses a coefficient of stress concentration $K_T=2$.

- Fourth call to POST_FATIGUE :

  One extracts the elementary cycles by the method of counting of cycles RCCM, on the history of loading $\sigma_2(t)$ and one uses a coefficient of stress concentration $K_T=2$.

History of the loading

t	0.	1.	2.	3.	4.	5.	6.	7.	8.
$\sigma_1(t)$	0.	500.	200.	400.	300.	500.	-300.	200.	-500.

t	0.	1.	2.	3.	4.	5.	6.	7.	8.
$\sigma_2(t)$	0.	250.	100.	200.	150.	250.	-150.	100.	-250.

Code_Aster

Titre : SZLZ102 - Fatigue avec différentes méthodes de com[...]
Responsable : TRAN Van Xuan

Version
default

Date : 12/12/2011 *Page : 3/5*
Clé : V9.01.102 *Révision   :*
b18c57a5203f

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

- **First call** with POST_FATIGUE : method RAINFLOW from $\sigma_1(t)$

Nb_Cycl = 4		Vale_Min:		Vale_Max:	
	Cycle 1	Vale_Min:	300.	Vale_Max:	400.
	Cycle 2	Vale_Min:	200.	Vale_Max:	500.
	Cycle 3	Vale_Min:	− 300.	Vale_Max:	200.
	Cycle 4	Vale_Min:	− 500.	Vale_Max:	500.

- **Second call** with POST_FATIGUE : method RCCM from $\sigma_1(t)$

Nb_Cycl = 5					
	Cycle 1	Vale_Min:	− 500.	Vale_Max:	500.
	Cycle 2	Vale_Min:	− 300.	Vale_Max:	500.
	Cycle 3	Vale_Min:	0.	Vale_Max:	400.
	Cycle 4	Vale_Min:	200.	Vale_Max:	300.
	Cycle 5	Vale_Min:	88.8889	Vale_Max:	200.

- **Third call** with POST_FATIGUE : method RAINFLOW from $\sigma_2(t)$ with $K_T = 2$.
  (Results identical to the first call to POST_FATIGUE since a loading is taken $\sigma_2(t) = 1/2\,\sigma_1(t)$, then one multiplies the history of loading by a coefficient of stress concentration $K_T = 2$.).

Nb_Cycl = 4					
	Cycle 1	Vale_Min:	300.	Vale_Max:	400.
	Cycle 2	Vale_Min:	200.	Vale_Max:	500.
	Cycle 3	Vale_Min:	− 300.	Vale_Max:	200.
	Cycle 4	Vale_Min:	− 500.	Vale_Max:	500.

- **Fourth call** with POST_FATIGUE : method RCCM from $\sigma_2(t)$ with $K_T = 2$.
  (Results identical to the second call to POST_FATIGUE since a loading is taken $\sigma_2(t) = 1/2\,\sigma_1(t)$, then one multiplies the history of loading by a coefficient of stress concentration $K_T = 2$.).

Nb_Cycl = 5					
	Cycle 1	Vale_Min:	− 500.	Vale_Max:	500.
	Cycle 2	Vale_Min:	− 300.	Vale_Max:	500.
	Cycle 3	Vale_Min:	0.	Vale_Max:	400.
	Cycle 4	Vale_Min:	200.	Vale_Max:	300.
	Cycle 5	Vale_Min:	88.8889	Vale_Max:	200.

2.3   Uncertainty on the solution

Analytical solution.

2.4   Bibliographical references

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

Code_Aster

Titre : SZLZ102 - Fatigue avec différentes méthodes de com[...]
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Version default

Date : 12/12/2011   Page : 4/5
Clé : V9.01.102   Révision : b18c57a5203f

3 Modeling A

3.1 Sizes tested and results

Identification		Reference
First call to POST_FATIGUE		
and Third call to POST_FATIGUE		
NB_CYCL		4.
Cycle 1	VALE_MIN	300.
	VALE_MAX	400.
Cycle 2	VALE_MIN	200.
	VALE_MAX	500.
Cycle 3	VALE_MIN	-300.
	VALE_MAX	200.
Cycle 4	VALE_MIN	-500.
	VALE_MAX	500.
Second call to POST_FATIGUE		
and Fourth call to POST_FATIGUE		
NB_CYCL		5.
Cycle 1	VALE_MIN	-500.
	VALE_MAX	500.
Cycle 1	VALE_MIN	-300.
	VALE_MAX	500.
Cycle 1	VALE_MIN	0.
	VALE_MAX	400.
Cycle 1	VALE_MIN	200.
	VALE_MAX	300.
Cycle 1	VALE_MIN	88.8889
	VALE_MAX	200.

Code_Aster

Titre : SZLZ102 - Fatigue avec différentes méthodes de com[...]
Responsable : TRAN Van Xuan

Version default

Date : 12/12/2011 *Page : 5/5*
Clé : V9.01.102   *Révision :*
b18c57a5203f

4   Summary of the results

Results of *Code_Aster* are identical to the values of reference provided in the handbook of validation of version 1.0 of POSTDAM.