SSNL116 - Length of cable with gas insulation

Abstract:

The problem is quasi-static nonlinear in structural mechanics.

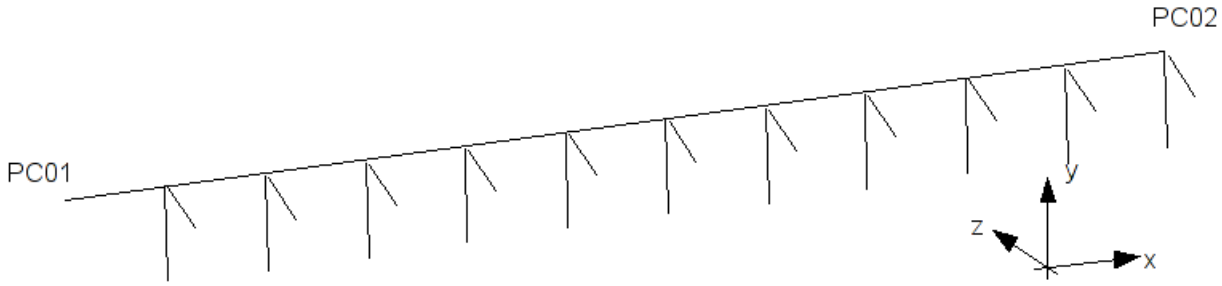
One analyzes the behavior of a length of cable with gas insulation, hidden with a low depth modelled by bars. The interaction with the soil is taken into account by elements of bar with nonlinear behavior. In the vertical meaning, this behavior is asymmetrical.

Only one modelization implements this cable at gas insulation (C.I.G.), whose mesh is obtained by a FORTRAN program associated with the test. Problem

1 of reference Geometry

1.1 a section

of C.I.G (corresponding to an experiment carried out on the site of the Fox farms). The cable is modelled by beam elements multifibre of Eulerian. To model the behavior of the soil, with each mesh of line, one associates 6 bars: 3 in each node of the mesh. In each node, a bar is directed in the same direction that the C.I.G, and makes it possible to take into account the axial loads of the soil on the C.I.G. A bar is directed according to the vertical, and makes it possible to take into account the action (asymmetrical) of the soil following the vertical. Third is directed in order to supplement the trihedron. The characteristics



of the sections are: •Beam elements
: circular section , external Radius 0.25765, thickness 0.01 •Elements of BAR
: unspecified section , of area (without physical $A=1$ meaning) Material properties

1.2 C.I.G elasticity plasticity

of the beams	$E=7.2\text{E}10\ Pa$ $\nu=0,3$	$\alpha=22.4\text{E}-6$
with hardening formulates formula horizontal Bars linear	$D\_SIGM\_EPSI=0.$	$SY=75.E6$
Hardening vertical	$E=5000000.\text{Pa}$ $\nu=0,3$	$\alpha=0.$
Bars elasticity linear	$D-SIGM-EPSI=1000000\ Pa$	$SY=5000.\ Pa$
Hardening Boundary conditions	$E=5000000.\text{Pa}$ $\nu=0,3$	$\alpha=0.$
and	$DT\_SIGM\_EPSI=1000000.$ $DC-SIGM-EPSI=1000000.$	$SY_C=10000.0$ $SY_T=5000.0000000000$

1.3 loadings the ends (off-line

to the IGC) of all the bars are blocked. The point is clamped. The point $PC01$ has all its blocked $PC02$ degrees of freedom, except for which one imposes DZ the following history of displacement: 12Instant 0 0 1 -0.004 2

-0.004 3	$DZ(m)$
0.002	
	4 0.002
Reference solution	

2 Method of calculating used

2.1 for the reference solution Solution of non regression

. Results of reference

2.2 Values of vertical

displacement and the normal force in the vertical bar to the node to and. Time 0.1 – 4.0 $t=0.1,1.,2.6$ E-04 4s –

2000 1	Dz	N
. –	4.0E-03 –	12000 2.6
	– 4.0E-04	5200 4. 2.0
E	03 7600	
	Uncertainty	
	on	the solution

2.3 Solution of non regression

. Bibliographical references

2.4 [1] J.C. MASSON, A. STROOBANT

1: “Study of displacements and the stresses due to the cyclic heating D `a buried model of Cable with Gas Insulation” Notes EDF RETD HT-2C/99/22/A Modelization A Characteristic

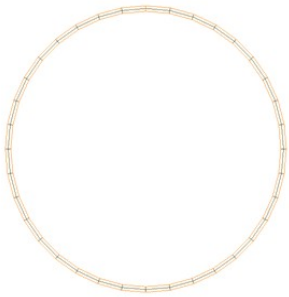
3 of

3.1 the modelization Modelization: 10 beam elements

multifibre for the C.I.G, 60 elements of bar Characteristic of the mesh

3.2 Mesh of beam: 70 meshes

- SEG2 Mesh of the section: 108
- nodes; 72 QUAD4 Quantities tested and vertical



3.3 Displacement results formulate

, at the point formulates Urgent Dz Standard $PC02$

Identification of	Reference	Reference	Tolerance formulates	PC02 DEPL	DZ NON-REGRESSION
0.1		formula	formulates PC02	−4.0E−04	0.10 %
1.0		formula	formulates PC02	−4.0E−03	0.10 %
2.6		formula	formulates PC02	−4.0E−04	0.10 %
4.0		formula	normal Force	2.0E−03	0.10 %

formulates, in N bar $PC02$ Nets Standard Node

Identification	of	Reference	Reference	Tolerance formulates	N MV01F010	PC 02
0.1	- REGRESSION	formulates	formula	N formulates	−2000	0.10 %
1.0	- REGRESSION	formulates	formula	N formulates	−12000	0.10 %
2.6	- REGRESSION	formulates	formula	N formulates	5200	0.10 %
4.0	- REGRESSION	formulates	formula	generalized Forces	7600	0.10 %

, with node NP01_006. N , MT , MFY , MFZ Nets Standard Node

Identification	of	Reference	Reference	Tolerance formulates	MP01_005 NP	01_006 EFGE_ELNO
0.1	NON-REGRESSION	formulates	formula	formulates MP01_	0.	1.0E−03
1.0	NON-REGRESSION	formulates	formula	formulates MP01_	0.	1.0E−03
2.6	NON-REGRESSION		formulates formula	formulates MP01_	1087.2296	0.10%
4.0	NON-REGRESSION		formulates formula	Urgent Does not net	0.	1.0E−03

Subpoint		Identification	of Reference	Reference	Tolerance formulates	MP01_0051	1 NON
0.1	- REGRESSION		formulates	formula	Remarks	0.	1.E−03

3.4 to build

the mesh as well as the data of this program are associated with the test (files ssnl116a.38 and ssnl116a.39). Summary of the results This test

4 makes it possible to validate

behavior VMIS_ASYM_LINE on a real `structure`.