PLEXU05 – Plate prestressed reinforced concrete under uniform pressure with model GLRC_DAMAGE

Summarized:

The purpose of this test is validating the sequence of a computation of setting in tension of a cable of prestressed in *Code_Aster* with a fast computation of dynamics in Europlexus via the macro-command of *Code_Aster* CALC_EUROPLEXUS, and in the presence of constitutive law GLRC_DAMAGE.

More precisely, it validates the following points:

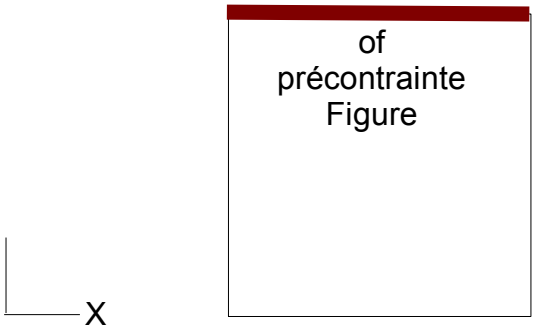
•good transmission of information of model GLRC_DAMAGE of *Code_Aster* towards Europlexus via macro-command CALC_EUROPLEXUS,
•the taking into account of the kinematic relations resulting from DEFI_CABLE_BP in the presence of model GLRC_DAMAGE.

1 Description

1.1 Geometry

the concrete plate is formed of a square length of edges $L=0,9\,m$ and of thickness $e=0,6\,m$. The four tops of the plate are named A_1, A_2, A_3 and A_4.

A cable, located on the segment $[A_3\,A_4]$, crosses the plate horizontally, without eccentricity in the thickness. The area of the straight section cable is worth $S_a=1.10^{-4}\,m^2$.



1.1-1: Geometry

1.2 Properties of the materials

the plate is out of reinforced concrete and the rope steel wire. The properties of the reinforced concrete results from the homogenization of the properties of the concrete and the properties of reinforcements thanks to command DEFI_GLRC.

	Concrete mat	ıents	Steel of the cable
Modulus Yo		$^{11}\,Pa$	$E_a=2.1.10^{11}\,Pa$
Poisson's ra	$\nu_b=0.2$	$\nu_a=0$	$\nu_a=0$
Density	$m_b=2500\,kg/m^3$	$m_a=7500\,kg/m^3$	$m_a=7500\,kg/m^3$

Table 1.2-1: Properties of the materials.

1.3 Boundary conditions and loadings

the segments $[A_1\,A_2]$ and $[A_1\,A_3]$ are respectively blocked according to the direction Y and the direction X. The segment $[A_2\,A_4]$ as for him is blocked according to the direction Z like in rotation around the three axes.

The loading is applied in two stages. The first quasistatic computation makes it possible to prestress the cable with a tension $T=2,0.10^5\,N$. Then one applies a uniform pressure directed positively according to the direction $-Z$ to the complete surface of the plate. Its maximum amplitude is $P_{max}=0,15\,MPa$, and it is associated with a slope going from 0 to 1 between times $t_{initial}=0\text{s}$ and $t_{final}=0.004\text{s}$.

2 Reference solution

It acts of a test of non regression concerning the computation carried out with command DYNA_NON_LINE . This last is used then as reference to the computation carried out by Europlexus thanks to macro-command CALC_EUROPLEXUS .

3 Modelization A

3.1 Characteristic of the modelization

the reinforced concrete plate uses modelization Q4GG while the cable is in modelization BARS.

3.2 Characteristics of the mesh

the reinforced concrete plate is made up of 72 elements T3GG, while the cable is modelled by 6 elements BARS.

3.3 Quantities tested and results

One tests displacement according to the direction Z top A_1. The first computation with DYNA_NON_LINE is instrumented by a test of non regression, which is used as reference to the computation carried out with Europlexus via macro-command CALC_EUROPLEXUS .

Standard	identification of reference	Value of reference	Tolerance
DYNA_NON_LINE - Not A_1 - DZ	"NON_REGRESSION"	-4,3214499919696. 10-4	1.10-6%
CALC_EUROPLEXUS - Not A_1 - DZ	"AUTRE_ASTER"	-4,3214499919696. 10-4	0,5%

Table 3.3-1: Quantities tested

4 Synthesis

The computation made with Europlexus via CALC_EUROPLEXUS took well into account the various parameters of model GLRC_DAMAGE.

The computation of prestressed cable allowed to validate this functionality when the concrete is modelled by constitutive law GLRC_DAMAGE .