Modelings D_PLAN_GRAD_EPSI, C_PLAN_GRAD_EPSI

Summary:

Modelings D_PLAN_GRAD_EPSI, C_PLAN_GRAD_EPSI (Phenomenon: MECHANICS) correspond to finite elements whose meshs supports are surface. These modelings enrich the traditional surface finite elements by mechanics by adding degrees of freedom of generalized deformations making it possible to carry out nonlocal calculations, the regularization utilizing the gradient of the deformations (from where the name of modeling), for more details to see document [R5.04.02].

The assumptions of modeling are the following ones:

- D_PLAN_GRAD_EPSI for the plane deformations,
- C_PLAN_GRAD_EPSI for the plane constraints.

1 Discretization

1.1 Degrees of freedom

Modeling	Degrees of freedom (with each node top)
D_PLAN	DX : following displacement X DY : following displacement Y EPXX : generalized deformation XX EPYY : generalized deformation YY EPZZ : generalized deformation ZZ EPXY : generalized deformation XY
C_PLAN	DX : following displacement X DY : following displacement Y EPXX : generalized deformation XX EPYY : generalized deformation YY EPZZ : generalized deformation ZZ EPXY : generalized deformation XY

Modeling	Degrees of freedom (with each node medium)
D_PLAN	DX : following displacement X DY : following displacement Y
C_PLAN	DX : following displacement X DY : following displacement Y

1.2 Mesh support of the matrices of rigidity

The meshs support of the finite elements can be quadratic triangle or quadrangles: displacements are interpolated with an order higher than the deformations generalized. One indicates in the column interpolation of the table following the couples of interpolation (displacements/generalized deformations). The elements are isoparametric.

Modelings	Mesh	Interpolation
D_PLAN	TRIA6	Quadratic/linear
C_PLAN	QUAD8	Serendip/bi-linear

1.3 Mesh support of the loadings

Modeling does not require a boundary condition specific to the generalized deformations (boundary condition natural), one thus uses for the meshs support of the loading modeling D_PLAN or C_PLAN (Cf [U3.13.01]).

2 Significance of the symbols

•	corresponds to a functionality available
	corresponds to a functionality which could exist but noncurrently available
Name of CAS-test	corresponds to a test implementing the functionality

3 Supported materials

DEFI_MATERIAU	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
% Behaviors elastic generals	
ELAS	SSNV131B
% Behaviors mechanical nonlinear generals	
ECRO_LINE	SSNV131B
BETON_ECRO_LINE	•
MAZARS	•

The case of the nonlinear operators is approached further.

4 Supported loadings

The loadings are to be affected on a modeling 3D, cf [§1.3].

5 Non-linear possibilities

This modeling has direction only into non-linear.

5.1 STAT_NON_LINE

BEHAVIOR	RELATION	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
	ENDO_FRAGILE	SSNV131B
	ENDO_ISOT_BETON	•
	MAZARS	•

BEHAVIOR	DEFORMATION	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
	'SMALL'	SSNV131B

5.2 DYNA_NON_LINE

BEHAVIOR	RELATION	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
	ENDO_FRAGILE	•
	ENDO_ISOT_BETON	•
	MAZARS	•

BEHAVIOR	DEFORMATION	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
	'SMALL'	•

6 Postprocessing of calculation

6.1 Option CALC_CHAMP

	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
ECIN_ELEM	•
ENEL_ELGA	•
ENEL_ELNO	•
EPME_ELGA	•
EPME_ELNO	•
EPOT_ELEM	•
EPSI_ELGA	•
EPSI_ELNO	•
EPMQ_ELGA	•
EPEQ_ELGA	•
SIEQ_ELGA	•
EPMQ_ELNO	•
EPEQ_ELNO	•
SIEQ_ELNO	•
SIEF_ELGA	•
SIEF_ELNO	•
VARI_ELNO	•

6.2 Option CALC_CHAM_ELEM

	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
ECIN_ELEM	
EPOT_ELEM	•
ENEL_ELGA	•
ENEL_ELNO	•
EPSI_ELNO	•
EPEQ_ELGA	•
SIEQ_ELGA	•
EPEQ_ELNO	•
SIEQ_ELNO	•
SIEF_ELGA	•

6.3 Option CALC_CHAMP

	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
FORC_NODA'	•
REAC_NODA'	•
ENEL_NOEU'	•
EPME_NOEU_DEPL'	•
EPSI_NOEU'	•
EPMQ_NOEU'	•
EPEQ_NOEU'	•
SIEQ_NOEU'	•
SIEF_NOEU'	•
VARI_NOEU'	•

6.4 Option POST_ELEM

	D_PLAN_GRAD_EPSI C_PLAN_GRAD_EPSI
MASS_INER	•
ENER_POT	•
ENER_CIN	
ENER_TOTALE	•
ENER_ELAS	•