

**EDF-R&D/AMA**  
**U4.0- Booklet: Use of the commands**  
**Document: U4.01.03**

## Innovations and modifications of version 7

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### Abstract:

The object of this document is to give a comprehensive view of the modifications of syntax and new opportunities of the commands of Code\_Aster occurred between each version since version 7.0. The index A of this document thus mentions changes introduced since **version 7.3** of April 2004 and valid for **version 7.4** of December 2004.

For more precise details, one will consult the documentation of the commands and the file `histor` of under - corresponding version (e.g.: [7.3.12], section *Development* of the [www.code-aster.org](http://www.code-aster.org) site). The impacted commands are listed alphabetically.

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## 1 Innovations between 7.3 and 7.4

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### 1.1 Modifications of the environment

#### 1.1.1 Med

*Code\_Aster* rests now on the med library 2.2. For reading files to the 2.1.5 med format, they should be converted with the tools `med_import` (it does not exist of tools in the opposite direction).

#### 1.1.2 Homard

Following the change of version of med, homard also evolved to support the same level of library. homard 7.1 also brings other innovations (cf [U7.03.xx]).

### 1.2 New commands

#### 1.2.1 CREA\_TABLE

This command makes it possible to create an array from a function or several lists of integers, realities or character strings. One can create a full array or with holes by indicating the lines which one wishes to inform.

#### 1.2.2 DEFI\_COMPOR

This command makes it possible to define a single-crystal or polycrystalline behavior.

#### 1.2.3 DEFI\_PART\_FETI

This command makes it possible to create a partitioning in subdomains for a resolution by the Feti method.

#### 1.2.4 IMPR\_FONCTION

This new command replaces `IMPR_COURBE`, and it treats only the functions (from where the renaming), the arrays being treated by `IMPR_TABLE` (cf [7.3.13]).

#### 1.2.5 MACR\_ECLA\_PG

This macro-command replace options `ECLA_PG` of two commands `CREA_MAILLAGE` and `CREA_RESU`. Coherence between the two commands is thus ensured.

#### 1.2.6 MODI\_MODELE\_XFEM

This command makes it possible to create of the finite elements with d.o.f. nouveau riches necessary to method XFEM.

### 1.3 Reabsorbed commands

#### 1.3.1 DEFI\_VALEUR

the contents of the Python objects being saved (in the file `pick.1`) “at side” of the base Aster (file `glob.1`), it are not necessary any more to have a specific command to define a parameter.

For example (see also [U3.01.0x]):

```
deuxpi = 2.*pi
```

#### 1.3.2 IMPR\_COURBE

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Replaced by IMPR\_FONCTION (cf [7.3.13]).

### 1.3.3 POST\_GOUJ2E

This command had not been reabsorbed at the same time as macros associated MACR\_GOUJ2E\_MAIL/CALC. The method for calculation is preserved in the zzzz120a benchmarks and zzzz120b (cf [7.2.14]).

## 1.4 Modifications common to several commands

### 1.4.1 Key words **FICHER** and **UNITE**

According to the type of command, one was to use is **UNITE** (reading commands) where one expected a number of logical unit, that is to say **FICHER** (commands of postprocessing) behind which one not expected a file name but a “label” (ddname) which was associated with a unit logical per default or affected via command **DEFI\_FICHER** (ex-DEFUFI).

The notion of label disappears; the commands function all with **UNITE** and, those which can use a true file name accept also key word **FICHER**.

The risk of confusion is reduced: one provides to **UNITE** the logical unit well informed in **astk** and to **FICHER** a file name complete Unix (see also the use of **REPE\_IN/REPE\_OUT** in the documentation of **astk** [U1.04.00]).

### 1.4.2 Commands of postprocessing **CALC\_ELEM**, **CALC\_NO**, **CALC\_G\_LOCAL\_T**, **CALC\_G\_THETA\_T**, **POST\_ELEM**

**MODEL**, **CHAM\_MATER**, **CARA\_ELEM**, **EXCIT** become optional:

- The data structure result (resulting from **STAT\_NON\_LINE**, **THER\_LINEAIRE**...) keep in memory these 4 parameters, it thus becomes optional to provide them to these operators of postprocessings. One can however inform these key words in certain typical cases; it is checked whereas they are the same ones which was used for computation, if it is not the case, one emits an alarm or one stops in error (case of **MODELE**) (cf [7.3.7], [7.3.24]).

## 1.5 Modified commands

### 1.5.1 **AFFE\_CARA\_ELEM**

**ANGL\_L**, **POUR\_CENT\_L**, **POUR\_CENT\_T** removed, renamed **SECTION\_L** in **SECTION** :

- These key words do not have any more interest since the introduction of new elements of grid membrane which make it possible to model the grids of reinforcement in a given direction, and which are usable jointly with a modelization 3D concrete. In the same way the elements roasts (usable with “shell” work from now on in only one direction. The directional sense of reinforcements is defined under **ANGL\_REP** (cf [7.3.10]).

**Modified POUTRE/VARI\_SECT:**

- To guide the user among the possible choices, one chooses a value for **SECTION\_NOW**, then for **VARI\_SECT** (new choice: **CONSTANT** by default) what makes it possible to limit the list of possible for **CARA** (cf [7.3.23]).

**PREC\_AIRE**, **PREC\_INERTIE** new:

- One checks the coherence of the information (area and inertia of the multifibre beams) provided under key words **POUTRE** and **AFFE\_SECT** to the accuracy indicated by these key words (cf [7.3.28]).

### 1.5.2 **AFFE\_CHAR\_MECA/AFFE\_CHAR\_MECA\_F**

**FORMULATION new:**

- During the resolution of a problem of contact with the continuous method, one has the choice between a formulation in displacement (value DEPL) or of velocity (value QUICKLY, adapted well numerically to the processing of the shocks) (cf [7.3.18]).

**TOLE\_PROJ replaced by TOLE\_PROJ\_EXT, new TOLE\_PROJ\_INT:**

- In the case of symmetric pairing MAIT\_ESCL\_SYME, it is necessary to have a tolerance of projection for the detection of the null pivots (cf [7.3.23]).

**New ITER\_MULT\_MAXI:**

- ITER\_MULT\_MAXI multiplied by the number of nodes slaves gives the maximum number of iterations of contact (cf [7.3.23]).

**COEF\_MULT\_2 , VECT\_NORM\_2 , DIST\_1 , DIST\_2 replaced by COEF\_MULT\_ESCL , VECT\_NORM\_ESCL , DIST\_MAIT and DIST\_ESCL :**

- Homogenization of the vocabulary following the renaming of GROUP\_MA\_1/2 in GROUP\_MA\_MAIT/ESCL (cf [7.3.24]).

**GRAPPE\_FLUIDE new key words:**

- Several key words making it possible to locate the forces according to their type and their zone application were added (APPL\_FORC\_XXXX, DIRE\_FORC\_FPLAQ, UNITE\_IMPR\_XXXX) (cf [7.3.23]).

**HARLEQUIN modifications:**

- Improvement of the method Harlequin (cf document de référence) and addition of key words COND\_LIM, SUPERPOSITION, POIDS\_GROSSIER, POIDS\_FIN (cf [7.3.28]).

## 1.5.3 New

**AFFE\_MATERIAU SECH\_REF:**

- Allows to inform the value of the drying of reference; with this concentration, the shrinkage of desiccation is null. The user must think of informing K\_DESSIC if its field of drying is variable (cf [7.3.2]).

## 1.5.4 Removed

**MODEL\_CALC\_FATIGUE:**

- The key word was not useful (cf [7.3.2]).

## 1.5.5 New

**CALC\_FONCTION METHODE:**

- Improvement of the computation of the FFT by adding the method PROL\_ZERO in which one supplements the signal with zeros (cf [7.3.14]).

## 1.5.6 CALC\_G\_LOCAL\_T and CALC\_G\_THETA\_T

**EXCIT replace CHARGE :**

- The multiplicative coefficient of the loads was not taken into account. It is now the case, CHARGE, FONC\_MULT and TYPE\_CHARGE are added under EXCIT. Even modification in CALC\_G\_THETA\_T (cf [7.3.6]). By default, it is not necessary besides to provide EXCIT, which is stored in the SD result (cf [§1.4.2]).

**QUICKLY , ACCE new:**

- Allow to take into account the terms of inertia in the computation of G (cf [7.3.4]).

## 1.5.7 CREA\_MAILLAGE

**NOM\_CHAM new:**

- To burst elements (ECLA\_PG), the family of Gauss points used should be known. For that, one must provide the name of the field (cf [7.3.19]).

## 1.5.8 CREA\_RESU

**MODELS, CHAM\_MATER, CARA\_ELEM new:**

- Allow to create result `elas_mult` type (MACRO\_ELAS\_MULT) (cf [7.3.7]).

## 1.5.9 debut

**FORMAT\_HDF=' OUI ' / "NON" replaces factor key word the HDF :**

- The bases with HDF format (portable binary format between machines of different architectures) are now supported by askt, it is thus enough to specify if one wants to read a base with this format or not (cf [7.3.8]).

**VISU\_EFICAS new:**

- Allows to indicate (in the benchmarks) if a command file is readable in Eficas or not (cf [7.3.5]).

## 1.5.10DEFI\_FICHER

**FICHER replaces NOM\_SYSTEME :**

- In the idea of the simplification of key words UNITE and FICHER (cf [7.3.14]).

**Turn over a free logical unit (primarily for the macros) :**

- In order not to cause conflict by choosing a logical unit already used, DEFI\_FICHER returns a free number of unit (cf [7.3.23]).

## 1.5.11New

**DEFI\_MATERIAU LEMA\_SEUIL/\_FO:**

- Introduction of a constitutive law derived from the model of Lemaître: below threshold the model is elastic, starting from the threshold, it behaves like a typical case of the model of Lemaître (cf [7.3.27]).

**GRANGER\_FP\_INDT new:**

- It is about a model of Granger at a constant temperature (cf [7.3.24]).

**ENDO\_ORTH\_BETON new:**

- Orthotropic constitutive law of the concrete with taking into account of the damage (cf [7.3.23]).

**New DRUCK\_PRAGER/\_FO (old DRUCKER\_PRAGER):**

- Addition of the possibility of calculating the sensitivity in 2D and 3D model of Drucker-Prager, the addition of the \_FO obliged has renamed the model to avoid the conflicts of name (cf [7.3.21]).

**VISC\_SINH replaces ROUSS\_VISC :**

- With the addition of constitutive laws viscoplastic VISC\_ISOT\_TRAC and VISC\_ISOT\_LINE, the model viscous being that already used by ROUSS\_VISC, the key word was renamed to be more general (cf [7.3.19]).

**JOINT\_BA new:**

- New constitutive law of steel-concrete connection in 2D (cf [7.3.8]).

**BARCELONE - ALPHAB new:**

- If it is not provided, the parameter is calculated by the code (cf [7.3.6]).

**ECOUC\_VISCi, ECOUC\_ISOTi, ECOUC\_PLASi, ECOUC\_CINEi new:**

- Allow to define the parameters of the single-crystal behaviors (cf [7.3.1]).

## 1.5.12New

**DEFI\_MODELE\_GENE OPTION=' REDUIT':**

- This option makes it possible to use the dynamic substructuring by a method of modes of interface in order to reduce the size of the generalized modes, associated key words:  
GROUP\_MA\_MAIT\_1/2, MAILLE\_MAIT\_1/2 (cf [7.3.18]).

## 1.5.13 TO DESTROY

### **ALARME new:**

- A to use only in the macro-commands, this key word makes it possible not to emit of alarm when one tries to remove a concept which does not exist (cf [7.3.27]).

### **CLASSE new:**

- Allows to remove an Aster object on the volatile basis (cf [7.3.8]).

## 1.5.14 New

### **DYNA\_NON\_LINE TETA\_METHODE:**

- Introduction of a formulation of velocity for integration of the contact in dynamics. The value of  $\theta$  (parameter of the diagram of integration in time) can be selected enters 0.5 and 1. , this during the resolution allows problem of contact with the continuous method varying dissipation during the phase of separation (cf [7.3.18], [7.3.22]).

### **REAC\_ITER\_ELAS new:**

- Parameter to control the frequency of reactualization of the secant matrix (cf [7.3.21]).

## 1.5.15 DYNA\_TRAN\_EXPLI

*It should be noted that this command will amalgamate with DYNA\_NON\_LINE in version 8.1.*

### **REAC\_ITER\_ELAS new:**

- Parameter to control the frequency of reactualization of the secant matrix (cf [7.3.21]).

## 1.5.16 FIN/POURSUIITE

### **FORMAT\_HDF=' OUI ' / "NON" replaces factor key word the HDF :**

- The bases with HDF format (portable binary format between machines of different architectures) are now supported by atk, it is thus enough to specify if one wants to or not read/write a base with this format (cf [7.3.8]).

## 1.5.17 FORMULATE

### **NOM\_PARA, VALE new:**

- The formulas are now unspecified statements Python (it is enough that one can evaluate them all the same!). The names of parameters and the statement are defined under these two distinct key words (cf [7.3.21] and [U4.31.05]).

## 1.5.18 IMPR\_FICO\_HOMA

### **UNITE\_CONF, UNITE\_DONN replace FICHIER\_CONF, FICHIER\_DONN :**

- In the same spirit as in the paragraph [§1.4.11.4.1] (cf [7.3.23]).

### **MAJ\_CHAM becomes one factor key word...**

- ... to offer more flexibility in the choice of the fields during to update a mesh adaptation (cf [7.3.20]).

## 1.5.19 IMPR\_FONCTION

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*the command was completely rewritten (cf [7.3.13]).*

**FORMAT modified:**

- In a preoccupation with a homogenization with the other commands, format EXCEL becomes TABLEAU.
- Formats XMGRACE and AGRAF are dedicated to the tracers of the same name.
- The formats RESULTAT, COMMAND and SEISME are removed.

## **PILOTE new (if `FORMAT=' XMGRACE '`):**

- By default, one produces a file ready to be visualized in `xmgrace`. One can also invite the various pilots available for `xmgrace` in order to produce a file ready to be introduced into a note of computation like a file `POSTSCRIPT`, `PNG` or `JPEG`.

## **STYLE, COULEUR, MARQUEUR modified:**

- These key words make it possible to define the style of each curve, these are now integers that it is necessary to provide.

## **FREQ\_GRILLE\_X/Y replace GRILLE\_X/Y :**

- Because `agraf` expects a frequency of squaring and `xmgrace` a step of grid.

## **FREQ\_MARQUEUR is moved under factor key word the COURBE .**

## **UNITE, UNITE\_DIGR modified:**

- `UNITE` contains the logical number of unit of the file in which one produces the curve (file `.dogr` with format `AGRAF`). `UNITE_DIGR` makes it possible to choose the logical unit associated with the file `.digr` with format `AGRAF`.

## **TITER replaces TITRE\_GRAPHIQUE, SOUS\_TITRE replaces COMMENTAIRE .**

## **COUNT removed:**

- It is role of the command `IMPR_TABLE`.

## **Removed RECU\_GENE:**

- The command treats only the functions (or three-dimensions functions). It is necessary to proceed in two times: to recover the values with `RECU_FONCTION`, then printing itself with `IMPR_FONCTION`.

## **1.5.20 IMPR\_RESU**

### **FICHER, FORMAT moved:**

- These key words are moved out of factor key word `RESU` so that one cannot use only one `IMPR_RESU` any more to write in two different files (because the files were often incomplete) (cf [7.3.14]).

## **1.5.21 IMPR\_TABLE**

*the command was completely rewritten (cf [7.3.27], [7.3.29]).*

### **FORMAT modified:**

- In a preoccupation with a homogenization with the other commands, format `EXCEL` becomes `TABLEAU`, `TABLEAU` becomes `TABLEAU_CROISE` (a parameter function of 2 others).
- One adds the format `XMGRACE` which produces a directly displayable file in `xmgrace`.

- The Aster formats and AGRAF are unchanged (note: with format AGRAF, the file `.digr` is not created).
- Format MOT\_CLE is removed.

#### **TOUT\_PARA removed:**

- It is enough to omit key word NOM\_PARA to select all the parameters of the array.

#### **Modified SORT:**

- One can sort according to N parameters, in the event of equality on a parameter, one passes to the following; ORDRE CROISSANT or DECROISSANT is worth.
- CRITERE and PRECISE DETAILS are removed.

## **PAGINATION modified:**

- The number of parameter is unlimited.

**TITER** replaces **TITRE\_TABLE**.

## **1.5.22 INFO\_EXEC\_ASTER**

### **LISTE\_INFO news possibility: ETAT\_UNITE**

- One can know if a file attached to a logical unit currently is opened or closed (cf [7.3.20]).

## **1.5.23 LIRE\_FONCTION**

*the command was completely rewritten (cf [7.3.10], [7.3.21], [U4.32.02]).*

### **INDIC\_xxxx, FORMAT, TYPE, SEPAR new:**

- Allow to build a real, complex function or a three-dimensions function from files whose format can slightly vary.

## **1.5.24 LIRE\_RESU**

### **NOM\_CHAM removed:**

- This key word is useless out of specific blocks to each format (cf [7.3.28]).

## **1.5.25 MACR\_ADAP\_MAIL/modified**

### **MACR\_INFO\_MAIL NON\_SIMPLEXE:**

- Processing of the quadrangular elements (cf [7.3.20]).

## **1.5.26 New**

### **MACR\_FIAB\_IMPR PARA\_SENSI:**

- Necessary to treat the case of the sensitivity (cf [7.3.24]).

## **1.5.27 New**

### **MACRO\_MISS\_3D VERSION:**

- Allows to specify the version of the Miss3D software used (cf [7.3.27]).

## **1.5.28 New**

### **MECA\_STATIQUE METHODE=' FETI':**

- Introduction of a method of resolution by decomposition of fields of the Feti type. New key words simple associates: PARTITION, RENUM, RESI\_RELA, NMAX\_ITER, TYPE\_REORTHO\_DD, NB\_REORTHO\_DD, PRE\_COND, SCALING, VERIF\_SDFETI, TEST\_CONTINU (cf [7.3.3]).

### **INFO\_FETI new:**

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- To modulate the amount of information during to print a resolution by the method Feti (cf [7.3.27]).

## 1.5.29New MODE\_ITER\_INV/MODE\_ITER\_SIMULT/

### **NORM\_MODE SENSIBILITE:**

- Possibility of doing sensitivity analyzes for the generalized and quadratic problems (cf [7.3.15]).

## 1.5.30MODI\_MALLAGE

### ORIE\_FISSURE replaces ORIE\_CONTACT :

- This functionality is used for the joined elements (cf [7.3.20]).

## 1.5.31New

### POST\_RCCM TABL\_SIGM\_THER:

- Allows to only calculate  $s_n^*$  starting from the statement of the stresses under thermal loading (cf [7.3.6]).

## 1.5.32STAT\_NON\_LINE

### REAC\_ITER\_ELAS new:

- Parameter to control the frequency of reactualization of the secant matrix (cf [7.3.21]).

## 1.5.33New

### TEST\_FICHER\_EXPR\_IGNORE:

- Allows not to preserve certain lines of the file tested by means of the regular statements (cf [7.3.22]).

## 2 Innovations between 7.2 and 7.3

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### 2.1 New commands

#### 2.1.1 MACR\_FIABILITE

This macro-command calculates the probability that a physical variable (displacement, forced, ...) exceed a threshold defined by the user according to a certain number of parameters which will have been defined like sensitive by the user. These significant parameters can be the Poisson's ratio, Young modulus, a pressure, etc  
the macro-command calls on the software MEFISTO which is external with *Code\_Aster*, and which implements the method FORMS. (cf [7.2.11]).

#### 2.1.2 STANLEY

Stanley, tool for interactive postprocessing, was already present in version 7; this macro-command simplifies its call since one now launches it like an ordinary command. (cf [7.2.25]).

#### 2.1.3 TEST\_FICHER

This macro-command makes it possible to test non regression commands which produce files, for submission to the developers (cf [7.2.25]).

### 2.2 Reabsorbed commands

#### 2.2.1 FACT\_INTE\_SPEC

This command was amalgamated with GENE\_FONC\_ALEA (cf [7.2.3]).

#### 2.2.2 MACR\_GOUJ2E\_MAIL and MACR\_GOUJ2E\_CALC

These two macro-commands are reabsorbed. The method for calculation is preserved in the `zzzz120b` and `command files zzzz120a` which validated these features. (cf [7.2.14]).

### 2.3 Modified commands

#### 2.3.1 AFFE\_CARA\_ELEM

**RIGI\_MISS\_3D new:**

- Allows to affect the terms of a matrix of impedance of soil calculated by MISS3D for a frequency of extraction given (cf [7.2.2]).

#### 2.3.2 AFFE\_MODELE

**\*\_HH2D new modelizations:**

- These modelizations make it possible to take into account two phases in the two components; the dissolved air pressure is connected to the air pressure dryness by the model of Henry (cf [7.2.7]).

**GRILLE\_MEMBRANE news modelization:**

- It is about a new element of three-dimensions functions of reinforcement which works only out of membrane, not of d.o.f. of rotation (cf [7.2.21]).

## 2.3.3 AFFE\_CHAR\_MECA/new

### **AFFE\_CHAR\_MECA\_F GRAPPE\_FLUIDE:**

- Allows to take into account the fluid forces due to the displacement of the cluster in the fluid which bathes the internal elements of the heart. (cf [7.2.2]).

### **New TOLE\_PROJ:**

- Allows to adjust the projection of the nodes slaves towards the meshes main ones (cf [7.2.1]).

### **CONTACT renamed key words:**

- GROUP\_MA\_MAIT, MAILLE\_MAIT, GROUP\_MA\_ESCL, MAILLE\_ESCL respectively replace GROUP\_MA\_1, MAILLE\_1, GROUP\_MA\_2, MAILLE\_2 (cf [7.2.4]).

## 2.3.4 ASSE\_MAILLAGE

### **OPERATION, MAILLAGE\_1, MAILLAGE new:**

- Three types of operation are now available SOUS\_STR, SUPERPOSE, SUPERPOSITION (cf [7.2.4]).

## 2.3.5 CALC\_CHAM\_ELEM/CALC\_ELEM

### **Duplicate:**

- These two commands made duplicate on most calculated options, only some options persist in CALC\_CHAM\_ELEM (cf [7.2.17]).

## 2.3.6 New

### **CALC\_FATIGUE TYPE\_CHARGE:**

- The type of loading defines (periodic or not), under the key word CRITERE, the choice is thus restricted according to the type of loading (cf [7.2.5]).

### **CRITERE=' DOMM\_MAXI ', PROJECTION, DELTA\_OSCI new:**

- These key word are associated with the new criterion adapted to the nonperiodic loadings; it is about a criterion with variable amplitude based on a critical plane selected according to the induced maximum damage (cf [7.2.5]).

### **New CRITERE=' DANG\_VAN\_\_MODI\_AC '/"DANG\_VAN\_MODI\_AV ":**

- It is about a criterion with variable amplitude based on a critical plane selected starting from the maximum damage. This criterion which is adapted if the loading is not periodical is an evolution of the criterion of original DANG VAN. "AC" for constant amplitude, "AV" for variable amplitude (cf [7.2.11]).

## 2.3.7 New

### **CALC\_G\_THETA\_T standard for the field $\theta$ :**

- One can now provide a field  $\theta$  of the `cham_no_depl_r t y p e` (and build it made-to-order!) instead of that provided by `CALC_THETA` (cf [7.2.8]).

## 2.3.8 CALC\_NO

**GROUP\_MA\_RESU, GROUP\_NO\_RESU, MAILLE\_RESU, NOEU\_RESU new:**

- Allow to specify the zone on which the field by element will be reduced before you calculate the values with the nodes because one could get incorrect results when a node is at the border of two modelizations (cf [7.2.7]).

## 2.3.9 CREA\_MALLAGE / CREA\_RESU

### ECLA\_PG news possibilities:

- One can now burst a mesh (by creating an element by Gauss point) on a part only of one mesh; and in 2D, to give one thickness fictitious to flattened elements.

### Caution:

*The parameters provided to CREA\_MALLAGE and CREA\_RESU must be coherent: same mesh groups given in the same order (cf [7.2.25]).*

## 2.3.10 DEFI\_FONCTION

### NOM\_PARA news values:

- Added names of parameter: NORM and DSP (cf [7.2.4]).

## 2.3.11 DEFI\_GROUP

### CREA\_GROUP\_NO / TOUT=' OUI ' limited to option TUNNEL :

- The use of TOUT=' OUI ' is not available for all the options, only for the option TUNNEL (cf [7.2.8]).

## 2.3.12 DEFI\_MATERIAU

### BARCELONE new behavior for KIT\_HHM and KIT\_THHM :

- Mechanical and hydrous constitutive law of the unsaturated soils. This model utilizes two criteria, a mechanical plasticity criterion which is that of CAM\_CLAY and another hydrous criterion controlled by suction (cf [7.2.21]).

### GLRC/GLRC\_FO new behavior:

- Constitutive law of the reinforced concrete plates written in generalized forces; associated finite element DKTG (on meshes TRIA3 and QUAD4) (cf [7.2.4]).

### CORR\_ACIER new:

- Model elastoplastic endommageable of a steel in which the plastic strain with fracture depends on the rate of corrosion (cf [7.2.23]).

### VISC\_IRRA\_LOG new behavior:

- Viscoelastic constitutive law for the axial creep of the tubes guides under irradiation (cf [7.2.1]).

### DRUCKER\_PRAGER new behavior:

- Constitutive law for the soil mechanics (cf [7.2.7]).

### LIQU\_AD\_GAZ\_VAPE new:

- Coupling law of the air dissolved for the THM (model of Henry) which connects the air pressure dissolved to the air pressure dryness (cf [7.2.7]).

### DOMM\_A, DOMM\_B, COEF\_CISA\_TRAC new:

- Associated with the criterion of fatigue DOMM\_MAXI of CALC\_FATIGUE (cf [7.2.5]).

## **EPSP\_SEUIL, EXP\_S new:**

- Associated with the criterion of fatigue DOMMA\_LEMAITRE of CALC\_FATIGUE (cf [7.2.19]).

## **LAMBDA and D\_LAMBDA\_TEMP removed under THM\_\*:**

- Thermal conductivity is now defined like the product of three functions of temperature (LAMB\_T), saturation (LAMB\_S) and porosity (LAMB\_PHI) more one constant (LAMB\_CT), as well as three derivatives of functions (D\_LB\_T, D\_LB\_S, D\_LB\_PHI) (cf [7.2.10]).

In the thermal case, only LAMB\_T is compulsory, other functions being then taken equal to one and their null derivatives.

## 2.3.13 GENE\_FONC\_ALEA/GENE\_MATR\_ALEA/GENE\_VARI\_ALEA

- These commands were completely altered; FACT\_GENE\_ALEA was reabsorbed with the profit of GENE\_FONC\_ALEA. One will refer to documentations of the commands for the new syntax of use (cf [7.2.3]).

## 2.3.14 IMPR\_RESU

### FORMAT=' GMSH ' /VERSION new default:

- The version of file GMSH by default is now 1.2 (in which GMSH can post-treat the quadrangles): the quadrangles are not cut out in triangles (cf [7.2.9]).

## 2.3.15 INCLUDE\_MATERIAU

### New materials available in the catalog material:

- Z3CN20-09M, Z6NCTDV25-15 (cf [7.2.10], to see on the Intranet *Code\_Aster* under Use/Materials).

## 2.3.16 New

### MACR\_RECAL POIDS:

- One can balance the various curves on which retiming (cf [7.2.4] is made).

## 2.3.17 New

### MODI\_MALLAGE SYMETRIE:

- Allows to take the symmetric one of a mesh compared to a line or a plane according to dimension (cf [7.2.16]).

## 2.3.18 POST\_ELEM

### New:

- One can now use POST\_ELEM after a multiple resolution with MACRO\_ELAS\_MULT (cf [7.2.22]).

## 2.3.19 POST\_K1\_K2\_K3

### TOUT new:

- Allows on all to calculate the stress intensity factors nodes of meshes composing the crack tip (cf [7.2.4]).

## 2.3.20 PROJ\_CHAMP

### DISTANCE\_MAX new:

- Allows A to project astutely fields of a model towards a model B. When nodes of the mesh B are not in an element of the mesh A and that they are beyond a certain distance, the field is not project (cf [7.2.16]).

## **NUAG\_DEG\_\* removed methods:**

- These methods of projection of fields were removed, vague results (cf [7.2.22]).

## **2.3.21New**

### **POST\_RCCM TYPE\_RESU\_MECA, modification of the options:**

- This key word can take values "UNITAIRE" or "PIPEWORK", OPTION='FATIGUE' replaces B3200 and B3600... (cf [7.2.17]).

## 2.3.22MACRO\_CARA\_POUTRE

### RT new result:

- One can obtain under this key word of radius of torsion of the section of a beam (cf [7.2.2]).

## 2.3.23STAT\_NON\_LINE/DYNA\_NON\_LINE

### ALGO\_1D new:

- One can thus use all the behaviors (small strains) 3D in the elements of bar, grids, multifibre beams, one extended the method suggested by R. De Borst for the plane stresses to the behaviors 1D. That is translated, as for the plane stresses, by 4 local variables (cf [7.2.18]).

**Compulsory ETAT\_INIT in reentrant mode** (when one enriches result) (cf [7.2.1]).

### BARCELONE new:

- Behavior soils in medium unsaturated (cf [7.2.21]).

### New GLRC:

- Behavior reinforced concrete plates written in generalized forces (cf [7.2.4]).

### CORR\_ACIER, CORROSION new:

- Allow to provide the parameters necessary to the elastoplastic model endommageable of a steel in which the plastic strain with fracture depends on the rate of corrosion (cf [7.2.23]).

### SOUS\_STRUC new:

- Integration of the static macro-elements. The application concerned is to optimize the resolution of the problems of important size in which only a restricted part with a nonlinear behavior (cf [7.2.23]).

### THER\_HOMO, THER\_POLY removed:

- Suppression of the thermal constitutive law under RELATION\_KIT in THM (cf [7.2.16]).

## 2.3.24THER\_NON\_LINE\_MO

the command is not any more réentrante because only one time is calculated (steady computation out of mobile coordinate system).

## 3 Innovations between 7.0 and 7.2

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One finds here the consecutive modifications of syntax to the evolutions introduced into versions 7.1 and 7.2 (version 7.0 being similar to the 6.4).

### 3.1 New commands

#### 3.1.1 CALC\_PRECONT

This command makes it possible taking into account to define and apply the prestressing of the cables of a structure out of reinforced concrete in various types of anchorage, and while making it possible to tighten individually each cable while respecting the norms of the BPEL (cf [7.0.14]).

#### 3.1.2 CREA\_TABLE

This command makes it possible to create an array from a function or of two lists (cf [7.1.17]).

#### 3.1.3 DYNA\_TRAN\_EXPLI

It acts of the first grinding of the explicit operator of dynamics into which all the possibilities were not introduced yet (master-slave contact for example) (cf [7.1.16]).

#### 3.1.4 EXTR\_TABLE

This command makes it possible to recover the contents of a cell of an array; only type MATR\_ASSE\_GENE\_R is treated for the moment (cf [7.1.17]).

#### 3.1.5 MACR\_CABRI\_MAIL - MACR\_CABRI\_CALC

These commands make it possible to net flanges automatically, and of launching computations on these meshes (cf [7.1.5]).

### 3.2 Reabsorbed commands

commands MACRO\_CHAR\_F\_U and MACRO\_MADMACS were removed in version 7.1.

### 3.3 Renamed commands

- MACR\_CARA\_POUTRE replaces MACRO\_CARA\_POUTRE.
- DEFI\_FICHIER replaces DEFUFI and TO\_CLOSE (these last will be reabsorbed in version 7.3). Moreover, DEFI\_FICHIER gives access a file by indicating its name system (and not only with its number of logical unit FORTRAN) (cf [7.1.16]).

## 3.4 Modifications common to several commands

### 3.4.1 FOND\_FISS replaces BOTTOM, FOND\_3D

In commands **CALC\_G\_LOCAL\_T**, **CALC\_G\_THETA\_T**, **CALC\_THETA**,  
**POST\_K1\_K2\_K3**

- Homogenization of the vocabulary in fracture mechanics (cf [7.0.9]).

## 3.4.2 Options of preconditionning of the solver – key word **PRE\_COND**

In commands **CALC\_FORC\_AJOU**, **CALC\_MATR\_AJOU**, **DYNA\_NON\_LINE**, **MACR\_ASCOUF\_CALC**, **MACR\_ASPIC\_CALC**, **MACRO\_MATR\_AJOU**, **MECA\_STATIQUE**, **STAT\_NON\_LINE**, **THER\_LINEAIRE**, **THER\_NON\_LINE**, **THER\_NON\_LINE\_MO**

- option **PRE\_COND**= ' DIAG ' is removed, only remains option **LDLT\_INC** (incomplete) (cf [7.0.14]).

## 3.5 Modified commands

### 3.5.1 **AFFE\_CARA\_ELEM**

**GROUP\_MA\_POI1** new:

- Key word introduced to affect characteristics of **RIGI\_PARASOL** on elements of the type **POI1** (cf [7.0.14]).

### 3.5.2 **AFFE\_CHAR\_MECA**

**DDL\_POUTRE** new:

- Allows to impose boundary conditions in the local coordinate system of a beam (cf [7.0.10]).

**LIAISON** new:

- Under **DDL\_IMPO**, to block all displacements of a blow (cf [7.1.5]).

**SIGM\_BPEL** default value:

- The default value is now "NON", the value "YES" is usually used only for the setting in prestressed cables (cf [7.0.13]).

### 3.5.3 New

**AFFE\_CHAR\_MECA\_C\_LIAISON**:

- Under **DDL\_IMPO**, to block all displacements of a blow (cf [7.1.5]).

### 3.5.4 **AFFE\_CHAR\_MECA\_F**

**LIAISON** new:

- Under **DDL\_IMPO**, to block all displacements of a blow (cf [7.1.5]).

New **EFFET\_FOND**:

- The taking into account of the basic effect according to time (cf [7.0.1] allows).

### 3.5.5 **AFFE\_MATERIAU**

**GROUP\_NO, NOEUD removed:**

- The assignment is possible only if on meshes (cf [7.1.8]).

### 3.5.6 AFFE\_MODELE

**SHB8 new modelization:**

- New shell element under-integrated without mode of blocking (cf [7.1.18]).

**AFFE modification:**

- possibility of providing a list under AFFE, with rule of overload (cf [7.1.18]).

## 3.5.7 CALC\_ELEM

### **EQUI\_ELNO\_SIGM different method of calculating:**

The equivalent stresses (Von Mises, Tresca,...) were calculated starting from the stresses extrapolated with the nodes. One calculates from now on the equivalent stresses by extrapolation of the equivalent stresses calculated with Gauss points (as for the local variables). The only provided stress fields are thus SIEF\_ELGA\_DEPL into linear and SIEF\_ELGA in nonlinear.

On the other hand for the shell elements, the way of calculating of the equivalent stresses did not change: the user must calculate the stress field in a point of the thickness (SIGM\_ELNO\_DEPL into linear and SIGM\_ELNO\_COQU in nonlinear), and option EQUI\_ELNO\_SIGM calculates the invariant of this field at nodes.

## 3.5.8 CALC\_FATIGUE

### **CRITERE news possibility:**

- Addition of the criterion of DANG\_VAN (cf [7.0.7]).

### **MODEL, MAILLAGE, GROUP\_MA, MESH, GROUP\_NO, NOEUD new:**

- Allow by means of post-to treat with the nodes on part of the mesh the method of critical plane (cf [7.1.7]).

## 3.5.9 CALC\_FONC\_INTERP

### **VALE\_PARA replaces VALE\_R ;**

### **NOM\_PARA, NOM\_PARA\_FONC, VALE\_PARA\_FONC, LIST\_PARA\_FONC, INTERPOL\_FONC, PROL\_GAUCHE\_FONC, PROL\_DROITE\_FONC new:**

- Possibility of creating a three-dimensions function from a formula with two parameters (cf [7.0.14]).
- The command is not any more réentrante: it treats a function and produces a function or a three-dimensions function.

## 3.5.10 CALC\_FONCTION

### **new AB:**

- Computation the absolute value of a function (cf [7.0.14]).

### **INVERSE new:**

- Computation the reverse of a function (cf [7.0.14]).

### **ECART\_TYPE new:**

- Computation of the standard deviation of a function (cf [7.0.15]).

## 3.5.11 CALC\_G\_THETA\_T

## **CALC\_DG removed option:**

- The computation of derivative of G follows now the standard formalism (key word SENSIBILITE) (cf [7.1.12]).

## **3.5.12 COMB\_SISM\_MODAL**

### **TYPE\_COMBI replaces TYPE :**

- Under the key words factors COMB\_MULT\_APPUI and COMB\_DEPL\_APPUI. The possible choices are "QUAD" and "LINE", "AB" was removed (cf [7.0.14]).

## 3.5.13 CREA\_CHAMP

### OPTION new:

- Allows to initialize a field as if it had been created by such option (cf [7.0.15]).

## 3.5.14 CREA\_MALLAGE

### COQU\_VOLU new:

- Create a voluminal mesh from a surface mesh and of one thickness (cf [7.1.11]).

### LINE\_QUAD new:

- Create a quadratic mesh from a mesh made up of linear elements (cf [7.0.5]).

### QUAD\_TRIA3 new:

- Create the meshes triangular ones with three nodes from quadrangles (cf [7.1.9]).

## 3.5.15 debut / POURSUITE

### HDF new:

- With HDF format to define the parameters for the reading of a base (portable between machines) (cf [7.1.16]).

## 3.5.16 New

### DEFI\_CABL\_BP CONE:

- Allows to define a cone which will support the tension loads of the cable (cf [7.0.16]).

### Note:

| *It is now about a macro-command.*

## 3.5.17 DEFI\_GROUP

### APPUI\_LACHE new:

- The group of meshes defines leaning on a node or a nodes group (releases: “containing at least a node of the group”) (cf [7.1.10]).

### TUNNEL new:

- The group of the nodes contained in a tunnel defines describes by its axis and its radius (cf [7.0.16]).

### ALARME new:

- Allows to disable the release of alarms emitted normally by the command.

### Caution:

| *Must be used only by macro-commands which make sure in addition of the validity of the groups obtained.*

## 3.5.18 New

### DEFI\_MATERIAU BETON\_ECRO\_LINE:

- Taken into account of containment for the model ENDO\_ISOT\_BETON, one adds like material parameter SYC maximum stress in simple compression (cf [7.0.17]).

**BETON\_UMLV\_FP new:**

- Addition of a behavior model for the taking into account of the clean creep of the concrete (cf [7.0.4]).

**BPEL\_ACIER / SY becomes F\_PRG :**

- F\_PRG is the guaranteed stress of the maximum loading with fracture (cf [7.1.17]).

## **COMP\_THM new:**

- Regrouping of the parameters required for a computation THM according to coupling law used (cf [7.1.18]).

## **DIS\_CONTACT / ANGLE\_i and MOMENT\_i :**

- For connection grid-pencil, one introduces the angles and moments function of the temperature and the fluence (cf [7.1.7]).

## **In fatigue:**

- Addition of the CRITERE of DANG\_VAN (cf [7.0.7]).
- For criterion MATAKE, ENDU\_FT is replaced by COEF\_FLEX\_TORS.

### **3.5.19 TO DESTROY**

#### **OBJET new:**

- Possibility of destroying objects associated with concepts inaccessible to the user (cf [7.1.9]).

### **3.5.20 DYNA\_LINE\_TRAN and DYNA\_NON\_LINE**

#### **SENSIBILITE new:**

- Addition of the computation of derivatives of the fields results compared to the material characteristics or boundary conditions (cf [7.1.5] for DYNA\_LINE\_TRAN, [7.1.3] DYNA\_NON\_LINE).

### **3.5.21 FIN**

#### **HDF new:**

- With HDF format to define the parameters for the writing of a base (portable between machines) (cf [7.1.16]).

### **3.5.22 FORMULATE**

#### **WHOLE removed:**

- The whole formulas are henceforth prohibited (cf [7.0.17]).

### **3.5.23 IMPR\_FICO\_HOMA**

There are changes of syntax in this procedure, called by MACR\_ADAP\_MAIL, which are thus not described here.

### **3.5.24 IMPR\_RESU**

#### **VERSION new:**

- Allows to specify the level of version of the files to format GMSH. With version 1.2 (available in the recent versions of GMSH), the quadrangles are not cut out any more in triangle, GMSH knowing to treat all the linear elements (cf [7.0.3]).

## 3.5.25New

### **IMPR\_TABLE TITRE\_TABLE:**

- Possibility of defining a title during the printing of an array (cf [7.0.16]).

## 3.5.26New

### **INCLUDE\_MATERIAU UNITE\_LONGUEUR:**

- Allows to use the data of the catalog material with the millimetre like unit of length (cf [7.0.14]).

## 3.5.27New

### **LIRE\_CHAMP INST:**

- One can now locate it (S) field (S) with reading with time in a file with med format (cf [7.1.10]).

## 3.5.28LIRE\_RESU

### **FORMAT replaces FORMAT\_IDEAS :**

- One specifies behind this key word the format of reading: IDEAS or IDEAS\_DS58 (cf [7.0.13]).

## 3.5.29New

### **MACR\_ADAP\_MAIL NON\_SIMPLEXE:**

- Acceptance of the quadrangular, hexahedral, pentaedric elements allows (which are not refined) in a mesh subjected to Homard (cf [7.1.10]).

### **MAILLAGE\_FRONTIERE new:**

- Possibility of providing a mesh for the follow-up of border (cf [7.1.10]).

### **TYPE\_CHAM modification:**

- One now expects the same thing as in command CREA\_CHAMP (cf [7.0.12]).

## 3.5.30New

### **MACR\_INFO\_MAIL NON\_SIMPLEXE and MAILLAGE\_FRONTIERE:**

- See MACR\_ADAP\_MAIL.

## 3.5.31MECA\_STATIQUE

### **INST\_FIN new:**

- The operator is now reentrant to be able to treat long transients (cf [7.1.8]).

## 3.5.32MODE\_ITER\_SIMULT

### **APPROCHE news possibility:**

- Addition of approach "COMPLEXE" to deal with the quadratic problem with the eigenvalues, for the strongly damped cases for example (cf [7.0.12]).

## 3.5.33New

### **MODI\_MAILLAGE\_ORIE\_SHB8:**

- Allows to direct shell elements SHB8 (cf [7.1.18]).

## 3.5.34MODI\_OBSTACLE

## **TUBE\_NEUF removed:**

- The key word was moved in command POST\_USURE (cf [7.0.2]).

## **3.5.35MODI\_REPERE**

### **GROUP\_MA, MESH, GROUP\_NO, NOEUD new:**

- Allows to restrict the change of reference to part of the mesh (cf [7.0.9]).

## 3.5.36 PROJ\_CHAMP

### **SENSIBILITE new:**

- Allows to project fields derived from a mesh on another (cf [7.1.10]).

## 3.5.37 New

### **POST\_USURE TUBE\_NEUF:**

- Allows to provide new values of wear (cf [7.0.2]).

## 3.5.38 New

### **POST\_RCCM TYPE\_KE**

- Offers two méthodes de calcul of That.

## 3.5.39 Removed

### **PRE\_GMSH MODI\_QUAD:**

- This functionality is taken again in CREA\_MAILLAGE and applies to an Aster mesh some is its origin (cf [7.0.6]).

### **Note:**

| *PRE\_GMSH is again a procedure.*

## 3.5.40 PRE\_IDEAS

### **CREA\_GROUP\_COUL new:**

- Allows to create or not the groups associated with the colors with IDEAS (cf [7.0.2]).

## 3.5.41 STAT\_NON\_LINE

### **RESI\_REFE\_RELA, SIGM\_REFE, EPSI\_REFE, FLUX\_THER\_REFE, FLUX\_HYD1\_REFE, FLUX\_HYD2\_REFE new:**

- New method for the test of convergence compared to a value of reference defined for each quantity (cf [7.0.16]).

### **SELECTION new:**

- Choice of parameter of control: NORM\_INCR\_DEPL, ANGL\_INCR\_DEPL, RESIDUAL : one minimizes respectively the increment of displacement (default), the angle between  $u+$  and  $U$ , the residue (cf [7.0.9]).

### **ETA\_PILO\_R\_MAX, ETA\_PILO\_R\_MIN, PROJ\_BORNES new:**

- Allow to define the limits of the interval of search (cf [7.0.9]).

### **PAS\_MIN\_CRIT, ITER\_LINE\_CRIT, RHO\_MAX, RHO\_MIN, RHO\_EXCL new:**

- Limits of the linear search in the event of control (cf [7.0.9]).

### **CRIT\_FLAMB new:**

- Search buckling modes of a structure (cf [7.1.17]).

## **SENSIBILITE new:**

- Introduction of the sensitivity analyzes in nonlinear (cf [7.1.3]).

### **3.5.42New**

#### **TEST\_TABLE SENSIBILITE:**

- The test of the derived arrays allows (cf [7.1.12]).

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