Guide of reading of the documentation of Use

Summary:

This document has as an ambition to propose an assistance to a first access to the contents of the documentation of use of *Code_Aster*.

1 Documentation of *Code_Aster* : organization and access

1.1 A logical cutting in Handbooks: the ARDUV

The technical documentation of *Code_Aster* comprise:

- five handbooks,
- a set of other documentary objects which come in complement from basic technical documentation Ci above.

Handbook of**Use**	**U**	Instructions of the orders, structures of user data, examples of use
Handbook of **Reference**	**R**	Formulation of the modelled phenomena, digital methods of analysis, algorithms
Handbook of **Data-processing description**	**D**	Structures of data, algorithms, architecture, environment
Handbook of **Validation**	**V**	Elementary test probes in all the fields of modeling
Handbook of**Administration**	**With**	Quality plan, procedures of development and maintenance, commitments of services, versionnement

Other documentary elements exist (the newsletters, the plate of presentation of the code, various talks, presentations at the annual day…) and are all accessible on the website http://www.code-aster.org.

Basic handbooks of the user of *Code_Aster* are the Handbook of**Use**, the Handbook of **Reference** and the Handbook of **Validation**. Manuel d'Utilisation frequently returns to Manuel de Référence. Data-processing Manuel de Descriptif is reserved for the developers, in theory it does not concern the users; he is the same for Manuel d'Administration. An exception of size for this last: the user has access to the Cards Quality and Cards Followed Quality which indicate to him for the versions of exploitation and of development of the code which are the evolutions, the identified errors corrected or not and the solutions of skirting.

The handbook is subdivided in ten named parts (numbered from 0 to 9), the parts in also named booklets (00 to 99), the booklets in documents (00 to 99).

1.1.1 The documentary key

A document is located in the documentary space of the handbooks by a documentary key:

Manuel_Partie.Numéro_du_fascicule.Numéro_du_document

Example of a documentary key: **U1.02.00**

Naturally, one indicates a document by his documentary key. For reasons of convenience two classes of documents are also indicated by the function *Aster* that it document:

- documents of the instructions of the orders (Manuel d'Utilisation) indicated by **name of the order** documented,
- documents of description of the elementary cases test dedicated to the validation of the code (Manuel de Validation) indicated by **the code of the case test**.

Examples :

U4.43.01 document the order DEFI_MATERIAU, the document will be said DEFI_MATERIAU.
V7.90.04 document the case test of thermomechanics HNSV100: Thermoplasticity in simple traction, one will say document HNSV100

Other documentary objects that those contained in the handbooks are not affected key of which it has just been question.

1.1.2 With which version of the code applies the document?

Each technical document of the handbooks carries in heading a certain number of bibliometric indications (the title of the document, the name of the person in charge, the key, the summary, the version of the code). Among those, three deserve a special attention because they touch with **Quality assurance** code and with the update of the documents:

- the Version of the code concerned with the document,
- the revision number of the document,
- the date which corresponds to the publication date of the revision concerned of the document.

In top and on the right of top of the page of the document an indicator appears which specifies the version of Code_Aster to which the document applies. This indicator can take two types of values:

- “Version Development” if the document is in the current cycle of production, related to the version of development of Code_Aster. The visible document of the reader is then the last state published, which replaces the possible former states attached to this version.
- A number of version, “10” for example, when the document is attached to a version of exploitation of Code_Aster. This number is then the number of major version of Code_Aster. Documentation applies to the version of under-index in exploitation (“10.6” for example) then into force.

There is always, at least, 2 versions of the code available:
- The version known as ofExploitation validated and qualified which must be used for the studies under AQ.
- The version of Development, not yet validated nor qualified. The user of Code_Aster must constantly know which are officially the version of exploitation and the version of development.

These versions evolve every 2 years (increment of the number of version). With each commissioning of a version and of under versions of exploitation or development, a Card Followed Quality and Cards are commissioned Quality. These documents index, for a version or under version given, the list of the fields (features) qualified and the remarks and the restrictions on the qualified fields. These cards (which are documents resulting from the File of Administration) are available as documents A.

1.2 To reach the documentation of use of *Code_Aster*

The technical documentation of Use of *Code_Aster* is a subset of its general documentation.

1.2.1 It is an entirely electronic documentation

Documentation is published on the website of the code to the address:

http://www.code-aster.org/

Each night, an automatic process allows the edition on this site of the documents which will have been published in the documentary business application **a-ged** in the course of the day previous. In practice, the updates relate to primarily the version of development whose documentation evolves to the rhythm of new integrated developments each week in the code.

1.3 General presentation of the documentary resources of use

In fact the basic user will draw his documentary resources **in 3 handbooks**, in this order:

- **Handbook U** it must have the structuring at the head well

Documented features	Parts of handbook
Instructions of the orders	U4: basic commands U7: orders of data exchanges with other software
Characteristics of modelings	U3
Note of use of modelings	U2
Access to the code	U1

- **Handbook R** : finite elements, the formulation of modelings of the phenomena
- **Handbook V** : the cases test of validation

2 Making of contact

It is obviously not question exhaustively of reading all the instruction manual. In May 2011, it comprises 338 documents (of which 242 relate to the use itself of the orders) which represent thousands of physical pages. Many documents undoubtedly do not concern the user at the time of his first modeling and its first calculation; it is however absolutely necessary to consult the documents describing the features implementing this first modeling. This for two reasons:

- to avoid the errors of use,
- but also, to be aware of the possibilities of *Code_Aster* neighbors of those which are required (solutions of skirting) and which could perhaps prove to be useful.

It is thus advised to consult the documentation of use according to the approach suggested hereafter.

2.1 *Code_Aster* can it cover issue of my problem?

Four documents claim to answer this question. They are presented more synthetic to most complete.

2.1.1 For a prompt response

To consult the pages of the plate of presentation of the fields of modeling of the code, on the Web site section Produced, where are described synthetically the physical phenomena being able to be modelled by the code.

2.1.2 For a more excavated answer

To consult on the document **[U1.02.00] Introduction to *Code_Aster***, in particular the chapters 1.3 (Phenomena, modelings, finite elements and behaviors) and 1.4 (Several methods of analysis) where the phenomena modélisables by the code are described synthetically.

2.1.3 For a more up to date answer (taking account of the last developments)

To consult transparencies of the last presentation of the new features of the code at the annual day of the users of *Code_Aster* at the date of publication of this document: section Produces Web site.

2.1.4 For an answer more developed even…

One approaches a field of questioning there where the answer cannot be any more directly brought by objects present on the documentary waiter. For example, the answer can be YES and consist into cubes subtleties of modeling or the circumvented ways of modeling. She addresses herself, in any event, with already informed users. Service **AOM** (**With** ide with **O** ptimisation of **M** odelisation) of the Experience feedback (REX) allows to submit to the Development team *Aster* (EDA) a problem of modeling particular to implement with the means *Aster* . A person of the EDA is then charged to help the applicant to carry out her modeling.

2.2 *Code_Aster* did he already deal with a problem comparable (close) with the mien?

Two ways are proposed: the way of the elementary cases tests, the way of the industrial applications.

2.2.1 The elementary cases tests

The base of CAS-tests associated with Code_Aster is provided with the installations local or consultable on the centralized waiter. These tests serve three objectives:

- the checking of the models programmed by comparison with reference solutions (analytical or calculated);
- the data-processing checking of Code_Aster: the exhaustive cover of the data-processing ways, the checking of the not-regression of operation at the time of the bearing on different solutions system.
- teaching presentation of simple implementations: small studies whose comprehension is fast with the reading of the command files and the associated documents of validation (V).

It is of this third function of the CAS-tests about which we speak here. The user will look at if an elementary CAS-test milked a problem similar to his: Documentary waiter, heading VALIDATION/ *Cas Test Par Noms*, the list of documentations of the names of the cases tests (classified by scope of application) is displayed like their titles, or, section Use/Examples of the site.

2.2.2 Industrial studies

A certain number of studies (applications) industrial, carried out using *Code_Aster,* were the object of one presentation at the annual day of the users.

These documented studies are available on the site, section Produced/Applications. One finds there the collection of the cards Studies of the periodical *ASTER* echoes since its creation (10/91, 39 numbers published to the 01/2003) and a collection of industrial studies in all the fields of modeling of the code presented at the time of the annual days of *Code_Aster*.

The database of studies http://aster-etudes.der.edf.fr:8080/ also allows to consult a set of studies already carried out, accessible by versions from the code.

3 First use of *Code_Aster*

To consult the document **[U1.01.04]** describing **the graphic interface of access** with *Code_Aster* **`astk`**.

The simplest way to carry out a calculation with *Code_Aster* is to start from a nearby example which is often in the elementary cases tests described in Manuel de Validation. The command files associated with the cases tests described in documentation with validation are located in the repertoire `astest` version used. On the waiter of calculation centralized of EDF R & D, they are in `/aster/vx/STAx/astest` where `X` is the number of the version in exploitation.

This way of proceeding by analogy, appreciated generally well by the community of the mechanics, should not replace a constructive approach completely. Many possibilities are generally offered to complete the same work which are more or less well adapted to each case.

It is thus necessary, to take the practice to consult this handbook of validation to each new need.

3.1 Great principles and key stages of a calculation

One exposes hereafter a read path taking as a starting point the great obliged stages of a mechanical study with *Code_Aster*. In this approach, three documents are proposed with the reading.

3.1.1 Great principles of *Code_Aster*

To consult on the document **[U1.03.00] great principles of *Code_Aster***, which summarily presents the principles of operation and the principal rules of use.

3.1.2 Simple example of use of *Code_Aster*

To consult on the document **[U1.05.00] simple Example of use of *Code_Aster***, orders “impossible to circumvent”, on a calculation of cylindrical reserve mean in hydrostatic pressure, axisymmetric modeling.

3.2 Grid

The structure of the file of grid *Aster* is described in the document **[U3.01.00] Description of the file of grid of *Code_Aster***.

If the initial grid is resulting from an external maillor with *Aster* such as for example GMSH, GIBI or I-DEAS, interfaces and orders *Aster* who create starting from the objects produced by these preprocessors of the objects of the grid of*Aster* (which is not a copy of the initial objects; their significance can change, of new objects can be created) are described in the documents:

[U3.02.01] Interface of the file of grid GMSH with *Aster* ,
[U3.03.01] Interface of the file of grid I-DEAS with *Aster* ,
[U3.04.01] Interface of the file of grid GIBI with *Aster* ,
[U7.01.01] Procedure `PRE_IDEAS` ,
[U7.01.11] Procedure `PRE_GIBI` ,
[U7.01.31] Procedure `PRE_GMSH` ,

The format of grid advised during the use of **code_aster** is format MED (Model of Data exchange). It is the format by default during the reading of the grids and the writing of the results.

3.3 Orders

The description of the orders of *Code_Aster* are contained in the parts U4 and U7 of Manuel d'Utilisation. It is undoubtedly with these 2 parts of handbook that the user *Aster* recourse will generally have. They are organized in the U4 handbook according to a scenario which logically follows the great stages of a calculation:

U4.1-	Allocation of resources disc and memory,
U4.2-, U7.01. - in U7.03. -	Acquisition of the data of grid,
U4.3- and **U4.4-**	Modeling (assignment of the finite elements, materials, the loadings, etc…),
U4.5-	Resolution of the system of equations (calculation)
U4.6-, U4.7- , **U4.8-, U7.03 with U7.05. -**	Post treatment and examination of the results

Finally the document **[U4.01.00] How to read the documentation of the orders**, explains in particular the significance of the méta-characters and the typography which one meets in the documentation of the syntax of the orders.

3.4 Notes of use

A certain number of modelings or of type of modelings (such as for example under static structuring, mechanical cushioning, thin hulls, etc) are the object of notes of use. The related documents will be available on the waiter in the U2 part of the Instruction manual.

3.5 Finite elements, modelings of the phenomena

From the digital point of view, the choice of the finite elements for a kind of modeling is responsibility for the user. The mathematical description of the modelings supported by finite elements is in **Manuel de Référence**. The description of the degrees of freedom of these elements like their possibilities of modeling (supported loadings, produced fields, non-linear possibilities, etc…) are in the documents:

U3.1- : Mechanical modelings,
U3.2- : Thermal modelings,
U3.3- : Acoustic modelings.

3.6 Structures of user data of the type `result`

The operators (orders) of calculation *Aster* create objects whose structuring of the data which they contain must be absolutely known users.

It is imperative of very carefully reading the documents devoted to the orders *Aster* dedicated to the impression of the results (on listing or files).
Initially two generic documents:

[U4.91.01] Procedure `IMPR_RESU (FORMAT = 'RESULT' and 'ASTER')`

Then five documents of description of the orders which generate files of results to the format `MED`, `GMSH` and with the formats accepted by post-processor I-DEAS:

[U7.05.01] Procedure `IMPR_RESU (FORMAT=' IDEAS')`,
[U7.05.21] Procedure `IMPR_RESU (FORMAT=' MED')`,
[U7.05.32] Procedure `IMPR_RESU (FORMAT=' GMSH')`,

3.7 Errors in the command file

The constitution of a command file *Aster* is a stage obliged for the user. Currently, the user has the choice between constituting this file with the hand or building it using the graphic interface **EFICAS** "**Editor of Command file *Aster* …**", of rather natural use.
Moreover, he gives access directly to electronic documentation.

If the command file is built with the hand and if *Aster* detect a syntactic, grammatical error even semantic in this file, of the brief replies to cure the errors met are in **[U1.03.01] Supervisory and process control language**.

3.8 Hotline

Telephone Technical assistance *Aster* for the use is ensured by an external speaker, whose coordinates are reproduced on the Web site, heading Services (necessary access Intranet).

4 Questions and answers about the documentation of *Code_Aster*

4.1 Do I have the most up to date version of the document?

If the document is consulted electronically on the waiter the answer is **YES**.

4.2 Which is the documentation (the whole of the documents) which applies to the current version of exploitation of the code?

They are the documents contained in the waiter even if those Ci carry a number of version of code lower than the current version and carry old dates. For each Handbook, the list of these documents (documents valid for the current version) appears under heading ***Synopsis***.

4.3 Do I have the right to contact the author of the document directly? …

… because I do not understand something or that I discovered an error there?

It is advised to pass initially by the Hotline Aster (cf [§3.8]) which will answer the majority of the questions.

In the event of complex request, it is possible to contact the author of a document by taking care to trace this intervention by emitting a card of the type AOM (cf [§2.1.4]) in the Experience feedback.

4.4 Can I contribute to a better quality of documentation *Aster* ?

YES, (it is even recommended), errors and suggestions are to be announced by the writing of one **Card of Evolution of Documentation** in the Experience feedback of the graphic interface of access to *Code_Aster*.

4.5 I want to perfect my knowledge in the possibilities and the use of*Aster*

The technical documentation of *Code_Aster* (more generally all documentary objects *Aster* present on the documentary waiter) are not the only tools which meet this need. In addition to the documents of which it was question at the time of the presentation of the read path of the documentation of use, one will approach the following events:

- Training courses: initiation with *Aster*, basic training with the use, thermoplasticity, postprocessings,
- flashnews and newsletters published regularly on the site *Code_Aster*,
- Quarterly ordinary meeting of the Club of the Users *Aster*,
- Annual day of the Users *Aster*, generally at the beginning of March.

Note:

> *The training courses organized by EDF R & D are intended to the EDF users and to their partners. Users of Free Code_Aster, consult the section Services to know the list of the distributors.*

For these events, information with `code-aster@edf.fr`