

ECCC RECOMMENDATIONS - VOLUME 4 PART I [Issue 6]

**GUIDANCE FOR THE EXCHANGE
AND COLLATION OF CREEP
RUPTURE, CREEP STRAIN-TIME,
STRESS RELAXATION DATA FOR
ASSESSMENT PURPOSES**

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GUIDANCE FOR THE EXCHANGE AND COLLATION OF CREEP RUPTURE, CREEP STRAIN-TIME AND STRESS RELAXATION DATA FOR ASSESSMENT PURPOSES

PREPARED BY ECCC - WG1 AND WG1.1

Dr P Auerkari	VTT, Finland (1997-)	
Mr M Askins	RWE npower, UK (2001-)	
Dr A Baker	British Energy, UK (2003-)	
Dr D R Barraclough	ASTEC, UK (1992-94)	
Dr P Bernasovsky	Slovakian Welding Institute (2001-)	
Dr L Buchanan	Mitsui Babcock, UK (2001-04)	
Prof B Buchmayr	TU Graz, Austria (1992-2002)	
Dr C K Bullough	ALSTOM Power ETC, UK (1992-)	
Dr S Brett	RWE npower, UK (2001-)	
Mr S Concari	CESI Piacenza, Italy (2001-)	
Dr G L Cosso	IW Genova, Italy (2003-)	
Ir C Coussement	Belgian Welding Institute (1997-99)	
Dr G Fedeli	ENEL Piacenza, Italy (1998-2001)	
Dr S Fenton	E.ON Power Technology, UK (1997-)	
Dr A Fleming	ETD, UK (2004-2005)	
Prof. E. Gariboldi	Politecnico di Milano, Italy (2001-)	
Dr-Ing J Granacher	IfW TU Darmstadt, Germany (1992-2001)	
Dr R Hales	ETD, UK (2001-04)	
Mr J Hannigan	Mitsui Babcock, UK (2004-)	
Dr S R Holdsworth	ALSTOM Power, UK (1992-)	[Convenor WG1]
Mr S Holmström	VTT, Finland (2000-)	
Dr A Klenk	MPA Stuttgart, Germany (1997-)	
Dipl-Ing H König	ALSTOM Power, Germany (1992-2000)	
Mr V Kanta	Skoda, CZ (2001-)	
Dr Z Kubon	Vitkovice, CZ (2001-)	
Dr P McCarthy	ALSTOM Power, UK (2001-03)	
Dr-Ing G Merckling	ISB Milan, Italy (1992-)	[Convenor WG1.1]
Dr P F Morris	Corus, UK (2000-)	
Dipl-Ing K Niel	Siemens KWU, Germany (1992-95)	
Mr J Orr	Corus, UK (1992-1999)	
Mr J H Rantala	JRC IAM, Petten (1997-2001)	
Dr D G Robertson	ETD (formerly ERA), UK (1997-)	[Secretary]
Dr-Ing W Rohde	VDEh, Germany (1992-96)	
Prof R Sandström	SIMR, Sweden (1992-)	
Dr M Schwienheer	IfW TU Darmstadt, Germany (2001-)	
Dr P Seliger	Siempelkamp, Germany (2001-)	
Dr C Servetto	IW Genova, Italy (1999 -)	
Dr I A Shibli	ERA Technology, UK (1995-96)	
Prof S Spigarelli	University of Ancona, Italy (2001-)	
Dipl-Ing H Theofel	MPA Stuttgart, Germany (1992-96)	
Dr A Tonti	ISPESL, Italy (2002-)	
Dr A Vanderschaeghe	Stein Industrie, France (1992-94)	

EDITED BY: G. Merckling¹, N. Nespoli¹, F. Calvano¹, C.K. Bullough²

¹Istituto Scientifico Breda (Italy), ²ALSTOM Power ETC (UK)

APPROVED


On behalf of ECCC

DATE 31/8/05

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ABSTRACT

Volume 4 part I was prepared by ECCC-WG1 and WG1.1 in order to:

- outline a general approach for the collation and exchange of creep rupture and creep strain data for parent and weld material and stress relaxation data for parent material within ECCC,
- introduce a digital working tool for data collation and exchange (i.e. a Microsoft Excel workbook, containing several spreadsheets, formatted to provide easy and user friendly collation and exchange of creep and relaxation meta and test data within ECCC),
- standardise the handling of data within ECCC, and
- give general guidelines for the manipulation of data by the donor and receiver (i.e. the up- and down-loading of data to and from local data bases).

The data exchange workbooks are contained in appendix A to this document.

The design and use of the data exchange workbooks have been validated in field trials by ECCC-WG1 to guarantee, as far as possible, compatibility with other data storing systems.

Feedback on the use of this document, from both within ECCC and elsewhere, is sought so that it may be improved in subsequent issues. Please contact the editors through:

Dr G Merckling [Document Controller]
Istituto Scientifico Breda S.p.A.
Viale Sarca 336
20126 Milano, Italy
Tel. +39 02 66172 219
Fax. +39 02 66172 240
E-mail: merckling@isbreda.it

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IMPORTANT NOTE ABOUT INSTALLATION:

1. The spreadsheet can be run with **MS-Excel Version 97 or higher**, but care should be taken, in order to make all simplification macros fully available and reliably responding, to implement the spreadsheets within an **ENGLISH version of Excel**. This is unavoidable, because the translation within Excel from English to other languages does not operate properly for more sophisticated functions and tools.
2. The Excel Version 97 macros may have no effect in some of the versions of Excel 2000

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CONTENTS

	Page
1. INTRODUCTION	3
2. INTRODUCTION TO VOLUME 4 FURTHER ISSUES.....	3
2.1 To VOLUME 4 ISSUE 5	3
2.2 To VOLUME 4 ISSUE 4	4
2.3 To VOLUME 4 ISSUE 3	4
3. COLLATION OF CREEP AND RELAXATION DATA	5
3.1 FUNDAMENTALS	5
3.2 GENERAL PRINCIPLES IN DESIGN AND USE OF SPREADSHEETS	7
4. SIMPLIFYING DATA INPUT AND DATA SCROLLING ON SCREEN.....	11
5. DATA HANDLING FOR EXCHANGE.....	12
5.1 USER DATA HANDLING	12
5.2 DATA HANDLING BY ECCC.....	14
6. MAINTENANCE AND UPDATING OF DATA SETS	15
7. NOTE FOR 123-LOTUS USERS	15
8. SUMMARY	15
9. REFERENCES.....	16
10. ACKNOWLEDGEMENTS	17

APPENDICES

listed overleaf

APPENDICES

APPENDIX A	DATA EXCHANGE WORKBOOKS "Empty" Files (with examples)
APPENDIX B	(deleted and included in appendix A)
APPENDIX C	GUIDANCE FOR ENTERING DATA INTO THE EXCHANGE WORKBOOKS
APPENDIX D	GENERAL APPROACHES FOR DATA HANDLING USING THE DATA EXCHANGE WORKBOOKS

1. Introduction

The European Creep Collaborative Committee (ECCC) is an independent group of alloy producers, manufacturers, plant operators and research organisations formed to co-ordinate creep data development activities throughout Europe. The main areas of collaboration are:

- i) the co-ordination of the generation of creep data throughout Europe;
- ii) the interaction with and the supply of information to the formal European standards organisations and their technical committees,
- iii) the mutual exchange of technical information related to current and future activities on material developments, and
- iv) the development of rules for data generation, collation and assessment.

The present document - referred to as "ECCC Volume 4 part I" for short - has been prepared by Working Group 1 (WG1) of ECCC as one of several volumes to address the underlying technical issues of creep data validation and assessment. It is, in particular, intended to permit *test data* from the participating laboratories to be collected and combined in a systematic manner and with the least misunderstanding, prior to the assessment of strength values for standards.

Full recommendations for the collation and exchange of data are given in the body of the report. The physical format by which data are transferred is based on Microsoft Excel spreadsheets (Appendix A). These have been designed following a detailed review of the electronic data banks and paper-based methods of data storage of ECCC participants and other organisations. The content of the spreadsheets is in full accordance with the information defined and, respectively, required by the "Terms and Terminology ECCC Volume 2" and the "Data Generation ECCC Volume 3" [1,2], previously issued by Working Group 1.

Recommendations for the use of the spreadsheets are given.

2. Introduction to Volume 4 (part I) Further Issues

2.1 To Volume 4 part I Issue 6

The only changes in this new issue consist in some amendments and corrections to the spreadsheets and the re-structuring of the volume in itself.

2.2 To Volume 4 Issue 5

In 2001, ECCC had to recognise, that in spite of all efforts to make the spreadsheets as user friendly as MS Excel 4 allowed, the WG3.x groups did not use them for data collation. Deeper analysis gave several results:

1. The big number of single spreadsheets composing one work book required the collator to run through a huge amount of potential entries, which he does often not need.
2. The structure of the spreadsheets (see issue 4 final pages of the main text) was too complex to allow quick data handling and checking; the “summary spreadsheets” were not flexible enough.

As a consequence WG1 was requested by the Management Committee to revise the spreadsheet, reducing their ability for being also a simple data base, but becoming more user friendly to the creep data assessor.

The present issue 5 of Volume 4 included now these completely restructured spreadsheets, which as a fundamental innovation, now require information entry as a sequence of data importance, so that data sets with less information available can be quicker compiled and easier overlooked. In addition the spreadsheets were updated to MS-Excel 97, that allowed more comfortable macro-handling.

2.3 To Volume 4 Issue 4

Issue 4 of Volume 4 includes again two new amendments:

1. In the Workbook WELDDAT.XLW related to the collation of creep data on welds, a further spreadsheet SIMULA*.xls has been added. This allows the insertion of the significant pedigree information for **simulated weld materials**, i.e. for material with microstructure obtained by adequate processes to simulate the heat affected zone regions of welds. As SIMULA*.xls can be linked via weld identifier to a real weld, eventually creep tested simultaneously, the full set of actually used techniques to creep test welds can be transferred via a unique workbook. More details on the new work book are included in appendix C-6 of appendix C.
2. A new workbook is now available for the collation and exchange of **post exposure creep data**, i.e. creep data which were produced using material sampled from a component which has already experienced for a known time period service conditions in the creep regime. CREEPPE.xlw is quite similar to its origin CREEPDAT.xlw, but contains different M/R/O rankings and requires entries for component details and its service conditions. More extended details on this workbook can be found in the new appendix C-7 of appendix C.

2.4 To Volume 4 Issue 3

The third issue of ECCC Volume 4 has two main purposes, based on the experiences with the first two issues:

First, it guarantees a wide range of entries for information related to creep test data, the material used for the testing and the technical testing details but now includes tools to simplify data entry, overview and print-out of the spreadsheets following the user suggestions. In this way the new spreadsheet set-up compromises the needs of the researcher willing to transfer the most information possible with those of the immediate practical situation, in which only a minimum of relevant data for assessment or overview purposes are sent out.

Second, a new, third workbook WELDDAT.xlw is included, that contains several new spreadsheets specific to welds and their characteristics. This new Volume 4 Issue III

workbook on welds accompanies Volume 2 Parts IIa and IIb concerned with weld creep data. Due to the relatively complex structure of this new workbook, induced by the complicated information required to characterise welds, their parent materials and related weld zone simulating material a more extended explanation on the new spreadsheets are given in the new chapter C-6 of appendix C.

3. Collation of Creep and Relaxation data

3.1 Fundamentals

3.1.1 Origin and Scope of Volume 4 part I

A number of high temperature materials properties data banks exist amongst the participants of ECCC, and it was recognised at an early stage in the life of this organisation that the procedure by which data are collated and exchanged should:

- i) use participants' experience in the design and modelling of materials property data;
- ii) use a generally agreed terminology; and
- iii) provide a procedure for the *transfer* of data, without preparing a mechanism of *storing and maintaining* data sets.

It was also noted that there are a number of ways in which data may be exchanged electronically, such as SQL Tables [3], and the files written in the Express language based on the Part 45 Materials Model from the emerging STEP standard [4]. However, it was generally agreed amongst the participants that such methods were either overly complex and/or insufficiently developed for present day use, and a more pragmatic method was required that would correspond more closely with the experience of the majority of potential users. For that reason, Microsoft Excel Release 97 [5] spreadsheet files, keeping best compatibility also to the release 2000, were chosen as the medium for transfer, their structure having been designed to employ a combination of experience in modelling materials data [6-8] and the use of such data for assessments for design [9-10].

3.1.2 The Structure of Volume 4 Part I

A The Overall Procedure

A number of stages, besides the preparation of the physical media (i.e. the diskette), are required to perform the successful collation and exchange of materials property data. These stages may be summarised, with reference to the ECCC Working Group 3.x committees, as follows:

- i) a specification is agreed by ECCC Working Group 3.x against which to collect data;
- ii) the ECCC Working Group 3.x participants together with any outside organisation determine how much data are available, and obtain the necessary permissions for release;
- iii) each participant prepares a workbook, i.e. a grouped set of spreadsheet files, containing his data, either from his own database system or from paper-based re-

cords. The participant should take care to insert only data that meet the requirements of the WG 3.x specification for the actual material as well as the acceptability requirements for creep or relaxation data as stated in ECCC Volume 3 [2]. Thereafter the workbook is sent to the *Collator* (see v) on diskette together with a complete print out;

- iv) (optionally) a nominee of the ECCC Working Group 3.x prepares one or more workbooks from paper-based records submitted from outside of ECCC;
- v) a nominee of the ECCC Working Group 3.x, the *Collator*, collects the separate diskettes, collates the data into a single data set, and checks for errors or omissions (particularly missing "mandatory" data) which are resolved with the participant providing the data;
- vi) the *Collator*, in accordance with the WG3.x-Convenor, distributes the data to a list of recipients in accordance with the guide lines of the latest Memorandum of Understanding and the confidentiality rules issued by the ECCC Management Committee;
- vii) (optionally) the recipients up-load the data onto their computerised systems;
- viii) the data are assessed according to the rules of ECCC Recommendations Volume 5 [11] by an ECCC Working Group 3.x member, or another organisation acting on that committee's behalf
- ix) the strength values are published according to ECCC Confidentiality Procedures

Several of these stages require procedural documents, and those which are directly relevant to the preparation of electronic data files are summarised in the present document, while examples are given in Apps.C, D.

B The Data Processing Tool for Collation

The Data Processing support for data transfer was chosen to be Microsoft Excel, in order to make several features available to the data collator and assessor that a simple ASCII file compilation could not provide. In fact the only advantage of direct ASCII file collation, the easy transfer to and from other somewhat simpler data banks, is included in the Excel spreadsheets as well, because Excel data may simply be transformed and/or stored into ASCII file.

On the other hand Excel allows

- i) mathematical, logical and statistical operations within the spreadsheets,
- ii) simple unification of data coming from different sources,
- iii) easy pre-assessment due to automated macros and search-routines and is, in every case,
- iv) often used to create graphs of assessment input, output and data comparison. Many participants in ECCC perform their analyses and post-assessment tests already in Excel.
- v) Macros allow to ease significantly the input of data, the controlling of inserted data and the summary of the data in "one-look" intelligible tables.

C Operational Procedure

The spreadsheets prepared for data collation within ECCC (see appendices A and B) are inserted in four workbooks, meant for the collation of

1. creep data (virgin or parent material)

2. relaxation data
3. weld and simulated weld creep data
4. post exposure creep data,

to permit the correlation between the single files. For each material and data source one workbook for the actually collated data type (i.e. basing on the creep, relaxation or weld creep data spreadsheets depending on the sort of data collated) should be prepared. The workbook name should be related to the designation of the material contained.

Within all four workbooks a group of dedicated sheets is provided, organised as detailed in chapter 2.2 of the present document.

During data collation, it is expected that each data submitting member of ECCC should:

- make a copy of the original workbook provided by ECCC
- rename this workbook with the material name to which it is related and which was agreed within the WG 3.x group, to which the data are supplied,
- read carefully through the "ReadMe"-sheet
- completely fill in the ORGANIZ-sheet,
- duplicate the raw data collating files (RAWCREE-sheets for creep data or RAWRELA-sheet for relaxation data) as many times as test data ($\epsilon_p(t)$ or $\sigma(t)$, respectively) are supplied,
- fill in the spreadsheets accurately taking care to submit all mandatory information as required by Volume 3 [2].

D The Information Required Within the Spreadsheets

The structure and definition of the information held in the spreadsheets is intentionally closely related to the definition of terms in ECCC Volume 2 "Terms and Terminology" [1].

This document defines, in a mandatory way for all activities within ECCC, information data blocks and several data presentation procedures, including a system for the identification of materials, which are directly encapsulated in the spreadsheets. Moreover, the identification of information that is "mandatory" or "recommended" is consistent with the latest recommendations included in the current issue of ECCC Volume 3.

3.1.3 Spreadsheet Validation

The format of the spreadsheets was evaluated observing the way creep and relaxation data were usually exchanged in the WG3.x groups, i.e. introducing a "suitability for assessment" ranking, that has been kept valid through out all workbooks.

3.2 General Principles in Design and Use of Spreadsheets

3.2.1 General

High temperature materials properties data can be said to exist in at least three connected, but different forms depending on their origin and ultimate purpose.

- In the first instance, *raw test data* are obtained from a sample of material that has been produced to a certain specification.
- Raw test data from several materials produced to the same specification are then assessed to produce *design data* for that particular grade.
- In some circumstances, the design data are summarised still further, by means of constitutive equations or other simplifying procedures, to provide *analytical data* for input into finite element packages.

At present, the collation and exchange procedures developed in ECCC are devoted entirely to *raw test data*.

The ECCC experience showed, that there is a group of data, that is required as a minimum for assessment taking place, hereafter called “main data”. Very often these data are handled much earlier than all others, often they are deemed as sufficient to work with. These data are not necessarily the mandatory data, which are required to make a data set valuable for assessment.

Nevertheless, taking this experience forward, all new workbooks are structured in the following way:

1. Main data are inserted first.
2. All remnant mandatory data are included
3. Recommended information is added
4. Optional information can be included
5. Raw data files are appended

This should allow the collator to fill in data following a usual scheme of data importance ranking that could facilitate the typing work. In the same way the assessor could have all relevant main data immediately available to proceed with his work. Only if data should encounter problems during the assessment, the assessor can relay back on the additional information, that is regarded as recommended or optional.

3.2.2 Workbooks and Spreadsheets

The Volume 4 part I workbooks, available in appendix A, are :

CREEP_V0002.XLS :	Workbook for creep data collation (virgin material)
RELAX_V0002.XLS :	Workbook for stress relaxation data collation
CREEPWELD_V0002.XLS :	Workbook for weld and simulated weld creep data
CREEPPE_V0002.XLS:	Workbook for creep data on post exposure material

In principle each work book is then built up in the same way, by containing the following list of sheets:

- ❑ Var: This sheet is hidden (i.e. not visible to the standard user), because it contains some information used in the automation macros. Please do not touch it.
- ❑ ReadMe: Brief explanation of the various buttons available in the data spreadsheets. Reference on how to contact the author for help, explanation or feedback..
- ❑ The “ORGANIZ”-sheet asks for the data supplier, collator and receiver identity.

- ❑ The “MAINDATA”-sheet contains all entries, limited to the absolute minimum, that are generally requested for a creep assessment.
- ❑ The “MANDATA”-sheets contains all entries with MANDATORY information, which are not already included in “MAINDATA”. Missing such information causes the data set to be discarded from the collation.
- ❑ The “RECDATA”-sheets contain all RECOMMENDED information,
- ❑ The “OPTDATA”-sheets contain all OPTIONAL information
- ❑ The “RAWCREEP” (for creep data collation) or “RAWRELAX” (for stress relaxation data collation) are meant respectively for the collation of the $\epsilon(t)$ and $\sigma(t)$ data point tables for the single tests.

The data ranking and the entries are defined in the ECCC Recommendations Volume 2 [1] and Volume 3 [2].

Within each spreadsheet, cell back ground colours identify the information type required:

- White: Material identifier
- **Deep Blue**: Certification and interlink information
- **Yellow**: Material pedigree data
- **Reddish**: Metadata and non time dependent properties
- **Green**: Chemical composition
- **Grey**: Welding process details (only CREEPWELD)
- **Light blue**: Creep test details and results

Generally the MAINDATAsheet will only contain white and blue cells; all other sheets may contain all background colours. Grey background appear only in the CREEPWELD-workbook.

Only within the RELAX-workbook, information related only to **model bolt test**, is written in **red** letters, that related to **uniaxial relaxation test** in **blue**.

3.2.3 Design of the Data Spreadsheets

The data spreadsheets, i.e. all excluded ReadMe and Organiz, are prepared according to the same format rules, stated and explained in appendix C. The general line is that

- all entries are in accordance with the required information as listed in ECCC Volume 2 [1] and Volume 3 [2].
- the data insertion is as user friendly as possible (see additional help in chapter 4)
- the spreadsheets screening and print-out can be read easily.

For any additional information, the detailed explanation of the column headings, the data types required per each column etc. refer to Appendix C.

3.2.4 File, Material and Specimen Identification

The collation is performed according to a material specification set-up by the collating WG3.x group and identified by a *material name*.

To distinguish the single casts or lots belonging to the same material type a *material identifier* (CREEP, CREEPPE, CREEPWELD (here used for parent and filler materials) or RELAX), and a *weld identifier* or *simulated weld identifier* (only CREEPWELD) in accordance to Volume 2 have to be added and repeated throughout the whole workbook. This information is intentionally provided to aid the preparation of a relational database at the user's site thereby permitting the examination of, for example, the effect of composition on rupture properties. The "flat-file" (i.e. tabular) structure of the spreadsheets and the fact that they are separate files prevent the data from being interrogated in this way in their present form.

If for the same batch more than one information set is to be inserted, they are identified by the same material identifier and by a *test piece identifier* (to be stored in the adjacent column) that may be freely chosen.

The handling of weld material, that often includes information on parent material, filler material, weld simulated material and the weld itself is a little more complex and is therefore more detailed in chapter C-6 of appendix C.

The handling of post exposure material is in principle identical to of virgin material (see chapter C-7 of appendix C). The material identifier will throughout have ".PE" ending to underline the "post exposure" origin of the material.

3.2.5 The "ReadMe"-Sheet

This sheet contains the format and version of the spreadsheet file, and brief comments and explanations about the various buttons available to help the information entry.







If the user should need comments specific to actual data rows, these should be entered alongside in the column labelled "Comments" at the far right of each spreadsheet.






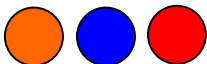
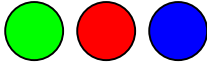
3.2.6 The "ORGANIZ"-Sheet

This file contains the summary information describing the originator (i.e. the organisation and person supplying the data), the collator (i.e. the person, who on behalf of the WG 3.x Group will summarise, verify that the data conform to the specification etc.) and the receiver, (i.e. the member(s) of the WG 3.x Group, who get(s) data from the common pool according to the confidentiality mechanisms foreseen by the Management Committee.

4. Simplifying Data Input and Data Scrolling on Screen

Due to the large number of available data entries on several spreadsheets, a number of data input simplifying procedures has been prepared that should ease the data entering from paper-based records (see also appendix C):

Button	Denomination	Available in Workbook	Available in Sheet	Explanation
	CLEAR DATASHEET	All	All	!!!BEWARE!!! Deletes all information in the workbook Rawcreep and Rawrela are not affected
	GENERATE RAWCREEP (in CREEP, CREEPPE and WELDCREEP) or RAWRELA (only in RELAX)	All	All	Adds a scheme for entering respectively creep strain or relaxed stress time data points The appearing tab at the bottom is named, with the "material identifier - test piece identifier". Position the cursor on the row of the material which You want to create the RAW.... Sheet. Click on the button, the sheet appears and some information will be directly present, if already entered in the MAINDATA sheets
	ORDER by Followed by several choices	All	All	These buttons allow to order the entire workbook according to the choice in ascending order
	FIND	All	All	This button allows to locate specific combinations of "material identifier – test piece identifier" NOTE: The search is capital letter sensitive.
	GET INFO	All	All	Summarises spreadsheet statistics
	SHOW/HIDE field Followed by several choices	All	NOT in MAINDATA	Shows only the selected information type The selection keeps hidden also for print-out.

Button	Denomination	Available in Workbook	Available in Sheet	Explanation
	Show all elements	All	NOT in Maindata, only for chemical information	Shows all elements available in the chemical entry area
	Show all elements (for a specific material type)	All	NOT in Maindata, only for chemical information	Shows all elements required for the selected material in the chemical entry area acc. Vol 2. table 1.5.1
	Select joint type (to be added)	CREEP-WELD	Not in Maindata	Shows the columns requiring information for the particular weld joint type chosen
	Select	All	Not in Maindata	Position the cursor in the column, where this button appears, in the row or range of several rows within the same column, where the entry is needed. Click on the button, select the appropriated entry from the window appearing
	Copy composition	All	NOT in Maindata, and Mandata, only for chemical information	Clicking this button will transfer all already inserted chemical information from Mandata-sheet to Recdata-Sheet or from Recdata-Sheet to Optdata-Sheet.
	Select test	RELAX	Only Maindata	By selecting model bolt or uniaxial relaxation test or "all", the corresponding testing information is displayed.
	Select Material	CREEP-WELD	Only Maindata	By selecting weldment or parent metal/filler or "all", the corresponding testing information is displayed.

5. Data Handling for Exchange

5.1 User Data Handling

The normal user, i.e. an active member of a WG 3.x group that contributes data, must address the following aspects when dealing with the present ECCC workbooks:

- Which is the most easy to follow procedure for inputting data into the spreadsheets ?
- When the WG 3.x group returns the ECCC collation of data, how should they be "up-loaded", i.e. input into the user's data bank?
- How can the workbooks contents be printed in an acceptably readable way ?

The following chapters try to give answers to these questions.

Details and explanations for some entries are included for all workbook and all sheets in appendix C.

Important Note

It is recommended that procedure documents are prepared which define the means of communication between external data banks and ECCC to alleviate the process of data exchange. This is even more important if the same data bank system is accessible to more than one user.

5.1.1 Down-loading Procedures

There are two main sources of data for input into the spreadsheets. In both case it will be essential to ensure that the information exactly matches that required in the spreadsheet columns. For example it may be necessary to translate the information into English or to convert material designations used only within the laboratory to those used within ECCC.

1) Paper Based Data

Data are copied from paper based records and typed into the spreadsheets. For details refer to appendix D. Some hints to simplify the data entering are given in chapter 4.

2) Data stored in data bank systems

a) Data Bank systems that can communicate with Excel, for instance "dbase". In this case a direct data exchange is possible (see Appendix D).

b) Data banks not supported by Excel or not running on Windows.

In both cases the most suitable method of transfer seems to be the creation of an ASCII file from the data bank output, containing all information to be inserted in the ECCC spreadsheets. A so-called "*pre-processor*" program should then transfer the adapted data to the ECCC-spreadsheets.

More details on how to approach these problems are given in appendix D.

5.1.2 Up-loading Procedures

1) Paper Based Data

To eventually "up-load" data in a paper based data bank in the codified format, the user should prepare an additional Excel spreadsheet into which the exchanged data can be copied and from there printed in the usual form.

2) Data Stored in Data Banks

a) Data Bank systems that can communicate with Excel, for instance "dbase". The transfer of the exchange data obtained from ECCC in return can be performed by reversing the down-loading procedure (chapter 5.1.1.2a).

b) Data banks not supported by Excel or not running on Windows. The exchanged data could be up-loaded in a similar manner as explained in 5.1.1.2b, if a *post-processor* program is developed that communicates with the user's data bank.

Suggestions for a general approach to the data up-loading problems are given in appendix D.

5.1.3 Printing

Each spreadsheet is expected to be printed comprehensively page by page, if the "page print set-up" is not modified. The prepared printing format includes the repetition of the header (row 1 to 8) on each new page. The user, eventually, should insert horizontal "page breaks" in suitable positions to avoid data belonging for instance to the same cast being printed on different pages.

Should problems appear, in spite of the editors' efforts, they are probably caused by the way the different printer drivers deal with the Excel formats. If not all columns are printed on the same page, a slight reduction in the magnification ("page print set-up" menu) may force the printer to print the pages as desired.

5.2 Data Handling by ECCC

The collated data, i.e. a number of workbooks filled in by the various contributors working for the same WG 3.x group, are meant to be handled for ECCC by member(s) of the same WG. The collator(s), who is/are responsible for the data belonging to the same material type, should

- prepare a common workbook that contains all supplied data
- cross check the accomplishment of the collated data with the collation specification set up by the WG 3.x
- verify for all data sets the presence of the mandatory information
- distribute in return the common data to all contributors according to the confidentiality procedures issued by the Management Committee.
- prepare the data set for assessment according to ECCC Volume 5 [11]
- perform or supervise the assessment, to be executed according to ECCC Volume 5 [11].
- distribute the assessment results to all that are allowed to receive them in accordance to the confidentiality procedures issued by the Management Committee.

To simplify these tasks use the macros as explained in chapter 4.
Strength values and assessment presentation forms are given in Volume 5.

Final Remark :

ECCC does not intend to keep an internal data bank. After the results have been distributed, there is therefore no requirement to maintain the data sets.

6. MAINTENANCE AND UPDATING OF DATA SETS

As the data collected by ECCC are NOT stored in a common data bank, there is no direct need for any data maintenance in the literal meaning of the word, i.e. there is no need to verify that all stored data are always up to date.

If a WG 3.x committee wishes to repeat an assessment sometime in the future, an entirely fresh collation should be performed. This may be done most efficiently by amending the original data set.

7. NOTE FOR 123-LOTUS USERS

Lotus-for-Windows Versions 3, and 4 are only nominally 100% compatible to Excel Version 4. There are often smaller problems when converting Excel files to Lotus due to the @CELL or similar not compatible commands. The ECCC-workbook was prepared trying to AVOID such problems, but it cannot be guaranteed that it really has succeeded.

Conversion to 123-Lotus-for-Windows Release 5 showed no problems. The Excel workbook is converted in a "sandwich" spreadsheet, in which the single worksheets can be addressed as traditionally used by Lotus. The conversion vice-versa, i.e. from Lotus to Excel, leads to the loss of the printing formats for the single spreadsheets.

Care should be taken to save LOTUS worked through files in EXCEL format (*.xlw, NOT *.wk* !!), because only the EXCEL format is the standard for ECCC data exchange.

The conversion of the macros may not work in the elder Lotus-versions.

8. SUMMARY

The present Volume 4 part I was prepared by the ECCC-WG1 and WG1.1 in order to

- outline a general approach for the data collation and exchange of creep rupture and creep strain data for parent and weld material and relaxation data for parent material within ECCC.
- introduce a digital working tool for data collation and exchange (i.e. Microsoft Excel Workbooks, containing several spreadsheets, formatted in order to provide easy and user friendly collation and exchange of creep and relaxation meta and test data within ECCC).
- standardise the handling of data within ECCC.
- give general guidelines for the manipulation of data by the donor and receiver (i.e. the up- and down-loading of data to and from local data banks).

The data exchange workbooks are contained in Appendix A.

The design and use of the data exchange workbooks have been validated in field trials by ECCC-WG1 and WG1.1 to guarantee, as far as possible, compatibility with other data storing systems.

The Issue 3 of Volume 4 further includes the third workbook WELDDAT.xlw, prepared to allow the beginning of the creep data collation for welds, and a number of tools for simplifying data entry, overview and print-out.

The Issue 4 of Volume 4 includes spreadsheets within WELDDAT.xlw to handle creep test results obtained from specimens made of material treated to simulate weld heat affected zone microstructure. In the same issue a new workbook CREEPPE.xlw was added to handle creep test results gained from material sampled from components, which were already serviced, i.e. so called post exposure (PE-) material

The current Issue 5 completely restructured the layout of the spreadsheets, upgraded them to Excel 97 version and introduced additional helpful tools for data entry simplification.

The current Issue 6 (now part I of a more structures Volume 4) is essentially a slightly upgraded and improved version of issue 5, but includes the new re-numbering according to the new volume structure.

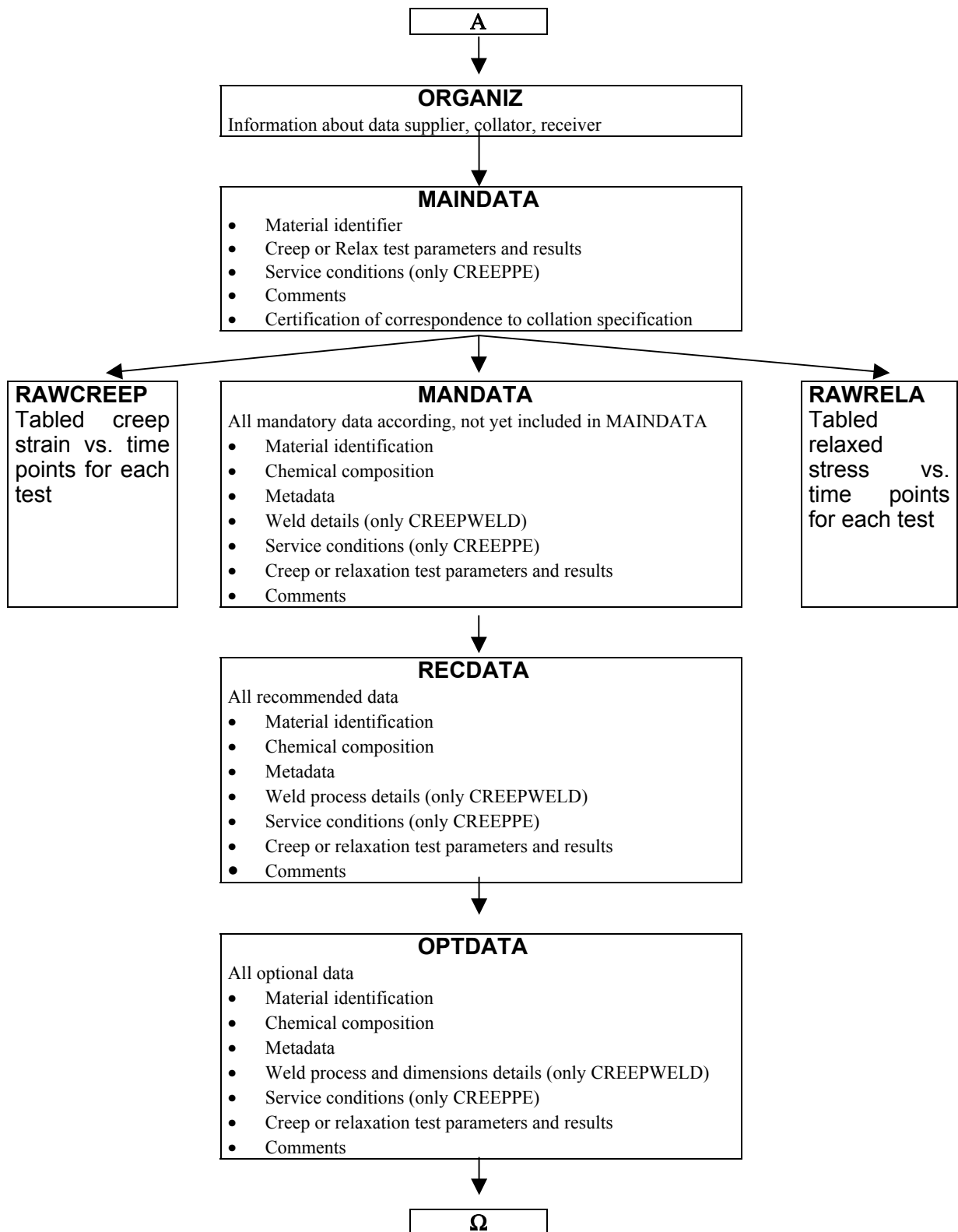
9. REFERENCES

- [1] ECCC Recommendations Volume 2, 2005, 'Terms and terminology for use with stress rupture, creep, creep rupture and stress relaxation: Testing, data collation and assessment', Eds. Morris P., Orr J., Servetto C., Seliger P. & Holdsworth S.R. & Brown T.B., *Publ. ETD, UK*, (a) Part I: Generic terms and item specific to parent and virgin materials, (b) Part IIa: Welding processes and weld configurations, (c) Part IIb: Weld creep testing, (d) Part III: Post exposure creep data, (e) Part IV: Creep crack initiation and data assessment, (f) Part V: Multi-axial features and components.
- [2] ECCC Recommendations Volume 3, 2005, 'Recommendations for data acceptability criteria and the generation of creep, creep rupture, stress rupture and stress relaxation data', Eds. Granacher J., Holdsworth S.R., Klenk. A., Buchmayr B. & Gariboldi E., Brett S, Müller F & Gengenbach, T., *Publ. ETD, UK*, (a) Part I: Generic recommendations for creep, creep rupture, stress rupture and stress relaxation data, (b) Part II: Creep data for welds, (c) Part III: Creep testing of PE- (ex service) materials, (d) Part IV: Testing practices for the generation of creep crack initiation data.
- [3] Vinard D R, Pelleing C, and Dereims M, Neutral Format for Materials Databanks Based on Z99-001 AFNOR Standard, in : Computerisation and Networking of Materials Databases, Volume III, ASTM STP 1140, Barry T I and Reynard K W editors, ASTM 1992
- [4] ISO DIS 10303/45 Industrial Automation Systems and Integration - Product Data Representation and Exchange - Part 45 : Integrated Generic Resources: Materials, 1995
- [5] MS-Excel for Windows, Version 1997, The Microsoft Company, 1997

- [6] Bamkin R J, MacRae S C F, Experience of Designing a Relation Database, in : s. [3]
- [7] Newley R A, Integration of Materials Information into Engineering Design, in : s. [3]
- [8] Sargent P M, Materials Information for CAD/CAM, Butterworth-Heinemann Ltd, Oxford 1991
- [9] Anon. HTM-EVAL Manual - Description of the HTM-DB Evaluation Program Library, Joint Research Centre - Petten Site, November 1991
- [10] Jeffery C M, Bullough C K, In-Service Structural Integrity Assessment Using Computerised Models and Data, in : s [3]
- [11] ECCC Recommendations Volume 5, 2003, 'Guidance for the assessment of creep rupture, creep strain and stress relaxation data', Eds. Holdsworth S.R. & Merckling G., *Publ. ERA Technology Ltd, Leatherhead, UK*, (a) Part I: Full-size datasets, (b) Part IIa: Sub-size datasets, (c) Part IIb: Weldment datasets, (d) Part III: Datasets for PE (ex-service) materials

10. ACKNOWLEDGEMENTS

The editors wish to thank all members of ECCC-WG1 and WG1.1 and in particular its Convenor, Dr S.R. Holdsworth, for their effort in working through and improving the present document. Further thanks are given to all ECCC participants who constructively commented on the first Volume 4 issue, to Dr. Francesca Calvano of ISB for the invention and the programming of the more "user friendly" innovation on the issues 3 and 4 and to Dr. N. Nespoli for the upgrading and restructuring occurred during issue 5.



APPENDIX A to ECCC Volume 4 Part I

DATA EXCHANGE WORK BOOKS

Edited by:

**G. Merckling, N. Nespoli & F. Calvano [Istituto Scientifico Breda, Italy]
C.K. Bullough [ALSTOM Power ETC, UK] and**

Four data exchange workbooks are provided for the collation and exchange of:

- Creep-rupture data
Creep_v0003
- Stress relaxation data
Relax_v0002
- Creep-rupture data for weldments
CreepWeld_v0003.xls
- Creep-rupture data for post exposed (service exposed) materials
CreepPE_v0003.xls

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VOLUME 4 part I

APPENDIX C

GUIDANCE FOR ENTERING DATA INTO THE EXCHANGE WORK BOOKS

**G. Merckling [Istituto Scientifico Breda, Italy] and
C.K. Bullough [ALSTOM Power ETC, UK]**

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APPENDIX C to ECCC Volume 4 part I

GUIDANCE FOR ENTERING DATA INTO THE EXCHANGE WORK BOOKS

Prepared by:

G. Merckling, Istituto Scientifico Breda (Italy)

CONTENTS

C-1	WORKBOOKS	5
C-2	STARTING WORK AND ENTERING DATA	5
C-3	LAYOUT OF THE WORKBOOKS	6
C-4	LAYOUT OF THE DATA SPREADSHEETS.....	7
C-4.1	CONTENTS OF ROWS 1 TO 8	10
C-4.2	CONTENTS OF COLUMNS A TO E.....	11
C-4.3	FORMAT AND RESTRICTIONS FOR DATA ENTRY.....	12
C-4.4	ADDITIONAL COMMENTS REGARDING FORMATTING	12
C-5	MANAGING FILE, MATERIAL OR WELD AND TEST PIECE IDENTIFICATION	13
C-5.1	WORKBOOK NAME	13
C-5.2	MATERIAL, WELD AND TEST PIECE IDENTIFIER MANAGEMENT	13
C-6	INFORMATION COMMON TO ALL COLLATION ACTIONS.....	14
C-6.1	MATERIAL IDENTIFICATION	14
C-6.2	MATERIAL INFORMATION ENTRIES	15
C-6.2.1	<i>Material Identification (White Fields)</i>	15
C-6.2.2	<i>Data Certification and Basic Information (Dark Blue Fields)</i>	16
C-6.2.3	<i>Material Pedigree Data (Yellow Fields)</i>	16
C-6.2.4	<i>Chemical Information (Green Fields)</i>	18
C-6.2.5	<i>Material Property Data</i>	18
C-7	CREEP RUPTURE AND TIME TO SPECIFIC CREEP STRAIN DATA (ONLY CREEP, CREEPWELD AND CREEPPE WORKBOOKS).....	19
C-7.1	CREEP TEST PARAMETERS AND RESULTS (LIGHT BLUE FIELDS)	19
C-7.1.1	<i>Information in MAINDATA</i>	19
C-7.1.2	<i>Information in MANDATA</i>	20
C-7.1.3	<i>Information in RECDATA</i>	20
C-7.1.4	<i>Information in OPTDATA</i>	21
C-7.2	RAWCREEP SHEET	21
C-8	RELAXATION DATA (ONLY RELAX WORKBOOK).....	22
C-8.1	RELAXATION TEST PARAMETERS AND RESULTS (LIGHT BLUE FIELDS)	23
C-8.1.1	<i>Information in MAINDATA</i>	23
C-8.1.2	<i>Information in MANDATA</i>	23
C-8.1.3	<i>Information in RECDATA</i>	23

<i>C-8.1.4</i>	<i>Information in OPTDATA</i>	24
C-8.2	RAWRELA-SHEET	24
C-9	WELD DATA (ONLY CREEPWELD WORKBOOK)	25
C-9.1	GENERAL NOTE	25
C-9.2	WELD PROCESS STEPS (GREY FIELDS)	26
C-9.3	INFORMATION IN MAINDATA	26
C-9.4	INFORMATION IN MANDATA	27
C-9.5	INFORMATION IN RECDATA2	28
C-9.6	INFORMATION IN OPTDATA2	28
C-10	POST EXPOSURE MATERIALS (CREEPPE –WORKBOOK)	28
C-11	SIMPLIFYING DATA INPUT, DATA SCROLLING ON SCREEN AND SUMMARY PRINT-OUTS	29

C-1 Workbooks

The Appendix A is included on the attached CD-ROM, which contains 4 completely re-designed Workbooks, basing on MS-Excel 1997 but also working with the 2000 and 2001 version.

Workbook Name	Application	Remark
CREEP_V0002.xls	Collation and exchange of creep, creep rupture, stress rupture data of virgin parent material	
RELAX_V0002.xls	Collation and exchange of stress relaxation data	
CREEPPE_V0002.xls	Collation and exchange of creep, creep rupture, stress rupture data of post exposure parent material	Reference material, eg. Virgin material of the same grade can be entered also by simply using a "virgin material" identifier, s. below
CREEPWELD_V0002.xls	Collation and exchange of creep, creep rupture, stress rupture data of welds	Parent, filler and simulated weld zone material for the welds can be entered also by simply using appropriated material identifier, s. below

C-2 Starting Work and Entering Data

To work with the workbooks do the following:

1. Copy the workbook You intend to work with onto Your hard disk
2. Rename it according to chapter 3.1.2.C of the main text. Renaming the workbook You may not change the extension (".xls"), which need to be the last four characters of the name.
3. Double click on the renamed workbook: MS Excel will start and load it automatically.
4. **Excel will prompt You before showing the sheets about Macro activation. Click on "Activate Macro", otherwise all button will fail to work.** Macros are the hidden programs that make buttons and roll down tables, etc. run.
5. Now the sheets are ready for entering data.
6. General working remarks
 - a. The macros for simplifying work are prepared for 2000 data rows.
 - b. If intermediate rows are entered, some macro might not work for those specific "new" rows
 - c. If intermediate rows are deleted, i.e removed from the sheet, some macros might not work properly on the rows following the removed one.
 - d. It is recommended to copy data using the "paste – special – formula to value" option instead of simple "paste", in order to avoid formulas to appear in the sheet which may hinder or disturb the correct working of the macros.
7. Do not forget to save the workbook from time to time in order to avoid losing Your work in the case of power failure or a computer crash.

8. After closure, zipping the workbook can help reducing its considerable size.

C-3 Layout of the Workbooks

The layout of all workbooks is very similar: Information is stored in a number of spreadsheets, which show up as “tabs” at the bottom of the screen. The most left arrows allow to cycle through the tabs, if they should not appear all on screen at the same time.

The workbook contain the following sheets, in the sequence You should work them through:

- **Var**: This sheet is hidden (not visible to the standard user), because it contains some information used in the automation macro. Please do not touch it.
- **ReadMe**: Brief explanation of the various buttons available in the data spreadsheets. Reference on how to contact the author for help, explanation or feedback.
- **Organiz**: Information about person and organisation delivering, collating and receiving data.
- Datasheets:
 - **MAINDATA**: Here all assessment relevant data is collated. If this sheet is not properly filled in, the data set is rejected by the collator!
 - **MANDATA**: All mandatory information not already entered in Maindata is to be entered here. If this sheet is not properly filled in, the data set is rejected by the collator!
 - **RECDATA**: All information recommended to be made available, can be entered here. If such information is missing, the data set is acceptable, provided the collating WG has no additional requirements. Often this data is useful to figure out anomalies in data behaviour. **NOTE: CREEPWELD contains two RECDATA sheets.**
 - **OPTDATA**: Optional information can be entered here. **NOTE: CREEPWELD contains two OPTDATA sheets.**
 - **RAWCREEP**: (only in CREEP, CREEPPE and CREEPWELD): Sheets to store strain vs. time data
 - **RAWRELA**: (only RELAX): Sheet to store relaxed stress vs. time data.

The data supplier should work through the datasheets in the sequence as given above. As much as possible, available or releasable, should be entered, but the data set is acceptable if all mandatory information only is entered.

C-4 Layout of the Data Spreadsheets

The data spreadsheets have several common aspects, and it is the purpose of this Appendix to describe in detail how the “data” spreadsheets should be prepared.

An example of the first few rows of some of the spreadsheet files is shown in Figure C-1.1. In essence, the *columns* define each field or “separate item” of data, and each record or “collection” of data items is entered in *rows*. This format is common to all of the spreadsheets for recording data.






Within the sheets buttons (dots or squares) and coloured areas are given to help data entering:

- Dots are generally connected to macros (i.e. automatic procedures which are processed when the button is clicked) that move information in the sheet
- Squares are connected to macros which allow a selection or simplify a selection.
- Background colours identify the information type:
 - White: Material and test piece identifier
 - **Deep blue**: Certification and interlink information
 - **Yellow**: Material pedigree data
 - **Reddish**: Metadata and non time dependent properties
 - **Green**: Chemical composition
 - **Grey**: Welding process details (only CREEPWELD)
 - **Light blue**: Creep test details and results

Generally the MAINDATA sheet will only contain white and blue cells; all other sheets may contain all background colours. Grey background appears only in the CREEPWELD-workbook.

- **Only** within the RELAX-workbook, information related only to **model bolt test**, is written in **red** letters, that related to **uniaxial relaxation test** in **blue**.
- **Only** within the CREEPWELD-workbook, information related only to **weldments**, is written in **red** letters, that related to **parent or filler material** in **blue**

. Figure C-1.1 Part of the MAINDATA Sheet in CREEP

	A	B	C	D	E	F	G	H	I
1	MANDATORY DATA				Material Details				
2					I/1.1 Material Type				
3			Material ID	Test Piece ID					
4					Material Class	Alloy Name	Spec. & Grade	Trade or Proprietary	
5			Vol 2 Ref	0.1/0.2/0.3	I/3.1.2.0	I/1.1.1	I/1.1.2	I/1.1.3	I/1.1.4
6			Comment	-	-	Give at least one of 1.1.2, 1.1.3 and 1.1.4			
7			Units	-	-				
8			Example	IT.02.7zt	AB001		10 CrMo 9 10	Din 17 155, 10 CrMo 9 10	
9									
			Select/Hide Field						
			All						
			Material						
			Chemical						
			Creep						

This button causes a label to appear where directly the appropriated entry can be chosen. Also manual entry is accepted

These button cause the sheet part related to the specified information field appear or disappear

Figure C-1.1b Part of the MANDATA sheet in CREEP

C-4.1 Contents of Rows 1 to 8

The region of the spreadsheet within rows 1 to 8 contains information on the type of the data to be stored in each column beneath. Materials information is often hierarchical, and the headings and the references to Volume 2 reflect this. In addition, entries in column B, rows 5 to 8, provide titles for each row. Therefore this column is coloured white and no data should be entered into it. A more detailed explanation of rows 1 to 8 is given in the following table.

Spreadsheet ref.	Contents	Explanation
row 1	Title	A general description of the type of information in the spreadsheet. In some cases buttons are placed here.
row 2	General heading	The terms are from ECCC Volume 2 providing a broad description in the columns beneath.
rows 3 and 4	Column headings	Specific terms for the data to be stored, generally in the sequence and as defined in Volume 2.
row 5	Vol 2 ref, eg. IIa/1.1.1	The Volume 2 Reference. identifies that term in ECCC Volume 2, and permits the user to obtain more details concerning the information required. In detail the reference is given by a designation of the Volume part according to the following table and, after the slash, an indication of the related paragraph in the foregoing Volume 2 part: I : Volume 2 part I, generic terminology on creep and relaxation testing IIa: Volume 2 part II sub-part a: Terminology on weldment IIb: Volume 2 part II sub-part b: Terminology on creep testing of welds III: Volume 2 part III: Terminology for Post Exposure Material creep testing EXAMPLE: IIa/1.1.1: Volume 2 part IIa (weld terminology), paragraph 1.1.1 of part IIa.
row 6	Comments	A guide for the user when entering data into the spreadsheet.
row 7	Units	Units for the data to be stored. Where these are not stated, or only a dash is indicated, a text entry should be provided. The units are intended to be mandatory. Under certain circumstances, and only related to the data accompanying the results (yellow, grey and reddish areas) they need not to be followed rigorously, if to do so would affect the meaning of the information to be conveyed. An example of this could be the date of primary melting. Ideally, this should be provided as the day on which the melting took place, but the textual entry "March or April, 1964" would suffice if that was the only information available.
row 8	Example	An example entry is provided related to the column contents to aid the user. In some columns here automation buttons are positioned

From row 9 on, data is to be entered.

Rows 1 to 8 are blocked on the top of the sheet, so that the column headings are available wherever data is entered into the sheet.

To aid understanding, two examples for entering data are given below:

Example 1: Explanation of the information to be stored in column G in the spreadsheet shown in Figure C 1.1a

The entire sheet is the MAINDATA sheet of CREEP, intended for the collation of all assessment immanent data, as defined in row 1 column B.

A general heading for the information in columns G to H is "Creep test results" (in row 1 column G), that is, the section number and general term within Volume 2. The term for the specific item of information is "test temperature" (rows 2-4, column G) with the reference in Volume 2 of "I/3.2.1" (row 5, column G). Comments (row 6) are here not needed. Row 7 fixes the unit for this material to "°C", in row 8 an example ("600") is included.

The first row of data should be entered in row 9.

Example 2: Explanation of the information to be stored in column G in the spreadsheet shown in Figure C 1.1b.

The entire sheet is the MANDATA (row 1 column A) in CREEP in the yellow area the collation of "Material Details", as defined in row 1 column F.

A general heading for the information in columns F to I is "1.1. Material type" (in row 2 column F), that is, the section number and general term within Volume 2. The term for the specific item of information is "Alloy Name" (rows 3,4 column G) with the reference in Volume 2 of "I/1.1.2" (row 5, column G). The comment (row 6 common to columns G to I) "Give at least one of 1.1.2, 1.1.3 and 1.1.4" informs the user that not all entries in each of columns G, H and I are required, but that at least one (but more are allowable) of these columns should contain an entry.

Row 7, column G, is empty and therefore no units are required for the data entries within Column G, and in row 8 the example given of an Alloy Name is "10 CrMo 9 10". The first row of data, including an Alloy Name, should be entered in row 9.

C-4.2 Contents of Columns A to E

The columns A and B of each spreadsheet are reserved for the location of the buttons.

Columns C to E in each sheet are reserved for particular information, entered by the user ONCE in MAINDATA and then AUTOMATICALLY repeated in all other sheets of the workbook.

Column C requires the entry of a material identifier, column D that of a test piece identifier(see C-5).

C-4.3 Format and Restrictions for Data Entry

The data entries in row 9 and below may be of three distinct data types shown in the table below.

Type	Restrictions	Comments
text	up to 240 characters per cell	English terms defined in Volume 2 should be used. Accents and symbols should be avoided, wherever possible.
numbers	real or integer (no distinction is made)	Care should be taken in entering numbers, particularly if these are imported from other electronic sources. It will be important to avoid implied precision (the primary cast or heat weight of 46,200 [kg], for example, might be imported into the spreadsheet as the number: 46200.000; implying that it had been weighed with a one-gram precision).
dates	preferably in the format DD/MM/YY - two numbers each for the day, month and year.	This information should be entered as <u>text</u> not Excel date format to permit easy uploading to users databanks.

C-4.4 Additional Comments Regarding Formatting

Two thousand rows are preformatted in tabular fashion for data insertion. If they should not be sufficient, the user can extend the table by inserting rows but not by adding them after the row 2000, if the macros should work properly (see chapter C-2). In the columns that automatically repeat identifiers the last free row should be copied on the new ones added.

In Excel spreadsheets TEXT and NUMBERS can be entered in every cell, i.e. cells are not dependent on the data type. A text information is given, when positioning the cursor on the cell the entry is preceded by " " or " ^ ".

If one cell is too small to contain the whole entry the Excel command "Format/Alignment.../Wrap Text" may be used to make it fit (see for example CREEPWELD sheet "MANDATA", Row 8, Column H)

C-5 Managing File, Material or Weld and Test Piece Identification

C-5.1 Workbook Name

The collation is performed according to a material specification set-up by the WG3.x group and identified by a **material name** (for instance "P22", grouping all 2.25 Cr 1 Mo, 10 CrMo 9 10 etc. steels) or by a **weld name** (for example "weld1") or by a **weld simulating material name** (for example "wesi2").

The workbook summarising these data should therefore be renamed, using the identification system as defined in Volume 2,

"NNIIIn...n.xls"

where

- "NN" is the national,
- "II" the laboratory code as stated in Volume 2 and
- "n...n" the material name abbreviation (here for instance "P22" or "weld1" or "wesi2").
- ".xls" has to be attached unchanged in order to allow the Operating System to recognise the file being an Excel file.

Post exposure material is treated as per virgin material.

Post exposure material is treated as per virgin material, i.e. a *material identifier* is assigned and handled.

C-5.2 Material, Weld and Test Piece Identifier Management

In the spreadsheets, data belonging to the same cast and test piece are stored in a row.

To distinguish the single casts belonging to the same material type a **material identifier**, a **weld identifier** or a **simulated weld identifier** (all abbreviated to "material ident") according to Volume 2 must be added and entered in MAINDATA, column C. It is then automatically repeated throughout the whole workbook.

This information is intentionally provided to aid the preparation of a relational database at users' sites (permitting the examination of the effect of composition on rupture properties, for example). However, the "flat-file" (i.e. tabular) structure of the spreadsheets and the fact that there are separate files prevent the data from being used directly in that manner.

If for the same cast more than one information set is to be inserted, for example more than one specimen within the creep results, they are stored in the subsequent rows and identified by the same material identifier and by a **test piece identifier** (to be stored in column D in MAINDATA and then automatically repeated throughout the sheet).

To make the single spreadsheet more readable, the material and the test piece identifier are repeated in the white coloured column blocked at the beginning of each sheet.

C-6 Information Common to All Collation Actions

C-6.1 Material Identification

The material and weld identification system incorporated in each spreadsheet is defined according to chapter 0 of ECCC- Volume 2 and includes:

1. a code for the country of supply of the data (first 2 letters), selected from table 0.1 of Volume 2
2. a point (".")
3. a code for the test laboratory, (next 2 letters), selected from table 0.2 from table 0.2 of Volume 2
4. a point (".")
5. the laboratory's material code (up to 5 letters)
6. (optional) a point (".")
7. (optional) a type identifier (up to two letters):
 - ".PE": Post Exposure material
 - ".WM": Weld material
 - ".SW": Simulated weld material

Example 1: Material identifier for a virgin parent material is:

DE.01.7zt

composed of:

DE - indicates that the data originated from a German laboratory (ECCC Volume 2 Table 0.1)
 01 - is the code of that laboratory: IfW Darmstadt (ECCC Volume 2 Table 0.2)
 7zt - is the laboratory's material code for that "cast" (see ECCC Volume 2 ref. 0.3 for a more detailed explanation).

Example 2: Material identifier for a post exposure parent material is:

IT.02.H3.PE

composed of:

IT - indicates that the data originated from an Italian laboratory (ECCC Volume 2 Table 0.1)
 02 - is the code of that laboratory: Istituto Scientifico Breda (ECCC Volume 2 Table 0.2)
 H3 - is the laboratory's material code for that "cast" (see ECCC Volume 2 ref. 0.3 for a more detailed explanation).
 PE - identifies the material as post exposure

Example 3: Material identifier for a weld material is:

DE.01.was.WM

composed of:

DE - indicates that the data originated from a German laboratory (ECCC Volume 2 Table 0.1)
 01 - is the code of that laboratory: IfW Darmstadt (ECCC Volume 2 Table 0.2)
 was - is the laboratory's material code for that weld (see ECCC Volume 2 ref. 0.3 for a more detailed explanation).
 WM - identifies the material being a weld.

[NB. It is envisaged that some users' own databases may store such information as separate items. Excel's sub-string functions such as LEFT(), RIGHT() and MID() may be used to extract such information, but this will be the responsibility of the user.]

Note for welds (only CREEPWELD):

Material identification for welds requires a further step: The parent and filler material – material identifier need to be specified when entering data. These (maybe up to 3 different materials) are identified as above for virgin parent material and their data can be entered also in the CREEPWELD-workbook.

The purpose of this information is to:

- i) permit full traceability to the laboratory's permanent records for the material, test conditions and test results; and
- ii) provide a unique reference for a set of test results. Some countries, notably Germany, already employ a national registration system for materials and it should be evaluated, if this or a similar system should be recommended for adoption in ECCC. For the time being, however, the fact that several laboratories may have tested material from the same cast or batch must be determined from information held elsewhere in the spreadsheets (e.g. the column "cast/heat number").

C-6.2 Material Information Entries

Information on the material pedigree (i.e. its production, characterisation and short term [time-independent] properties) are held in all sheets to a different amount.

C-6.2.1 Material Identification (White Fields)

This information is stored in the white area of each spreadsheet. It is to entered only ONCE in MAINDATA and is then repeated automatically.

DO NOT WRITE IN THESE FIELDS IN ALL SHEETS except for MAINDATA.

Notes for the following fields :

Material Identifier : Please refer to chapter C-6.1. of the present document. Please enter here also weld material and simulated weld material identifier (CREEPWELD only) or post exposure material identifier (CREEPPE only)

Test Piece Identifier : Please refer to chapter C-6.1. of the present document.

C-6.2.2 Data Certification and Basic Information (Dark Blue Fields)

This information is stored in the **dark blue** area of each spreadsheet.

Notes for the following fields :

Certification: By entering just an "X" the data supplier certifies that the supplied data is – as best as to his knowledge – complying with the collation specification towards which the data is collated.

Test Type (only RELAX-Workbook): Select whether a model bolt or uniaxial test is entered

Component type (only for welds: CREEPWELD): Select the sort of material, the given identifier marks.

Weld composition (only for welds: CREEPWELD, see also C-9.3): By entering the related parent material or filler material identifier, the weld can be related to the properties of these materials, entered in the same spreadsheet.

Reference Weld Identifier: (only for simulated welds: CREEPWELD): Enter the weld material identifier of the weld that has been simulated with this material.

C-6.2.3 Material Pedigree Data (Yellow Fields)

This information is stored in the **yellow** data area of each sheet.

These sheet areas are to be filled in for parent, virgin and post exposure material only (Workbooks CREEP, RELAX and CREEPPE). In CREEPWELD (weld data) these entries apply only to parent material or filler information.

The post exposure-material related entries are only available in CREEPPE.

Hereunder remarks to some of the fields in each sheet:

C-6.2.3.1 Entries in MAINDATA

Details on Service Conditions: Only applicable to PE-material (CREEPPE).

In MANIDATA the temperature stress and exposure duration of the LAST period are available. Other information (prior different exposure periods etc) can be added in MANDATA

Stress and stress method: Only applicable to PE-material (CREEPPE): Insert the service stress at sampling position and state (method) how this stress is computed (nominal, measured, true service, FEM-von Mises, etc.).

Temperature and temperature method: Only applicable to PE-material (CREEPPE): Insert the service temperature at sampling position and state (method) how this temperature is computed (nominal, measured, true service, FEM-thermal analysis, etc.).

Exposure time: **Only applicable to PE-material (CREEPPE):** Insert the approximate time, during which the material in the sampling location was subjected to the conditions stated in the foregoing columns.

C-6.2.3.2 Entries in MANDATA

Heat Treatment Details : As often heat treatment details are either not well known (i.e. normalised and tempered but no temperatures), or directly stored together in older data banks, i.e. normalised at xxx°C, water quenched, tempered at yyy°C, it is possible INSTEAD of filling in the details in the columns "FINAL STAGE HEAT TREATMENT" to enter all in this text cell.

Final Stage Heat Treatment : It should be noted, that if only one ageing or tempering was done, the SECOND should be filled in.

If more than 2 stages were done, a third column sequence may be added in accordance to the 1st and 2nd one.

Details on Service Conditions: **Only applicable to PE-material (CREEPPE).**

In MANDATA the temperature stress and exposure duration of the LAST period are available. Here other information (prior different exposure periods etc) can be added.

If only one condition applies, the first set and the MAINDATA information should be filled in. If more information is to be added, insert more sets as requested after the second one.

Stress and stress method: **Only applicable to PE-material (CREEPPE):** Insert the service stress at sampling position and state (method) how this stress is computed (nominal, measured, true service, FEM-von Mises, etc.).

Temperature and temperature method: **Only applicable to PE-material (CREEPPE):** Insert the service temperature at sampling position and state (method) how this temperature is computed (nominal, measured, true service, FEM-thermal analysis, etc.).

Exposure time: **Only applicable to PE-material (CREEPPE):** Insert the approximate time, during which the material in the sampling location was subjected to the conditions stated in the foregoing columns.

Comment: **Only applicable to PE-material (CREEPPE):** State here comments on the component service or other relevant service information.

General Comment : Please add everything not yet inserted, that might be relevant for the creep data assessment.

C-6.2.3.3 Entries in RECDATA

In CREEPWELD this information is included in RECDATA1

Sampled Material details: **Only applicable to PE-material (CREEPPE);** Information can be entered on the sampling method, the sampling location (i.e. where on the component material has been removed, i.e. critical region, cold area, etc...) and on the sample size.

C-6.2.4 Chemical Information (Green Fields)

This information is stored in the **green** data area of each sheet.

In CREEPWELD this information is included in RECDATA1 and OPTDATA1

These sheet areas are to be filled in for parent, virgin, post exposure materials and welds.

Please see C-11 for details on the functioning of the buttons.

Hereunder remarks to some of the fields in each sheet:

Chemical Composition : If abbreviations (bal. or rest for the main element) or numerical entries "modifiers", such as "<" are used, it is recommended that such modifiers should be included together with the numerical information *in one cell* in the spreadsheet, and it would be the responsibility of other users of the data to adapt that information as they wish. Excel's string concatenation function could be used, as an intermediate stage, to join together the data from two fields into one.]

Additional Element Details : Please add everything not yet inserted, that might be relevant for the creep data assessment. This will include other compositional information not listed in the main table.

C-6.2.5 Material Property Data

This information is stored in the **reddish** data area of each sheet.

These sheet areas are to be filled in for parent, virgin and post exposure material and welds.

The post exposure-material related entries are only available in CREEPPE.

The weldment related entries are only available in CREEPWELD. In this case, fields with references to Volume 2 Part II are related to welds ONLY. Even if mandatory, they need not to be completed for parent materials!:

Hereunder remarks to some of the fields in each sheet:

C-6.2.5.1 Entries in RECDATA

In CREEPWELD this information is included in RECDATA2

Basis of elongation : Specify whether the entry in field "Tensile Elongation" is based on 4 d₀ (specimen diameter), 5 d₀, 2 in. or any other basis.

Bend test: All entries are of interest only for welds

Hardness: The profile fields are meant for cross weld specimens only

Notes on Post Test Hardness : This field can be used to specify the creep test piece or its test conditions, on which hardness was measured after the creep test.

Grain Size and Microstructure PRIOR to creep test for (Parent materials ONLY)

Grain Size and Microstructure AFTER creep test for (Parent materials ONLY): If more than 1 creep test piece was post test analysed, the *whole* line must be repeated.

Macro structure before creep test (weldment only – CREEPWELD): Please refer carefully to the stated Volume 2 Part II references for the explanation of the requested information.

Damage following service: (PE-material only- CREEPPE): State relevant information on Non Destructive testing (NDT) and if these results are related to the sample (i.e. the area cut from the component) or the entire component . or NDT classification etc. please refer to Volume 2 part III.

Comments : Please add everything not yet inserted, that might be relevant for the creep data assessment.

C-7 Creep Rupture and Time to Specific Creep Strain Data (ONLY CREEP, CREEPWELD and CREEPPE Workbooks)

Creep rupture data are collated in the light blue areas of the sheets in the CREEP, CREEPPE and CREEPWELD-Workbooks. The RAWCREEP sheets additionally can contain the raw strain time information, and is described in section C-7.2

C-7.1 Creep Test Parameters and Results (Light Blue Fields)

This information is stored in the **light blue** data area of each sheet.

This sheet area is to be used for base materials and welds and for both interrupted and non interrupted testing types. Only the CREEPWELD workbook contains entries applicable to weld specimens. PE-material oriented entries are available only in CREEPPE

Notes for the following fields - Fields with references to Volume 2 part II are related to welds ONLY. Even if mandatory, they need not to be completed for parent materials!:

General : u.i.t. : UnInterrupted creep Test
 i.t. : Interrupted creep Test

C-7.1.1 Information in MAINDATA

Current test condition : Insert B , if test ended with specimen fracture.
 Insert UB, if test was discontinued before specimen failure
 Insert C, if the test is continuing.

Current Test Duration: Insert data here if the current test status is UB or C.

Current Total Plastic Strain: Insert data here if the current test status is UB or C.

Time to rupture : Insert data here if current test status is B

Elongation at rupture : Insert data here if current test status is B

Reduction in area at rupture, : Insert data here if current test status is B

Fracture Location (only for welds – CREEPWELD): Insert data here if current test status is B.

General comments on test procedure and Comments on means of interpolation: Please add everything not yet inserted, that might be relevant for the creep data assessment and all comments about determination of results (for instance, time to specific strain). If anelastic strains were measured, they can be entered here.

C-7.1.2 Information in MANDATA

Details of special specimen form : Enter necessary information about geometry if the specimen has special features (i.e. combined plain and notched gauge lengths) as text: For example : combined specimen, smooth gauge length 20 mm, notch diameter 6 mm, notch tip radius = 5 mm
(For PE-material only (CREEPPE): Here details for particular specimen types can be stated (welded specimen heads, etc.)

Test Type : State if u.i.t or i.t. and if creep, stress rupture, creep rupture or time-to-rupture test.

C-7.1.3 Information in RECDATA

In CREEPWELD this information is included in RECDATA2

Test piece position within product (note for PE-material, CREEPPE): This should be referred to the specimen position on the component NOT on the sampled material

Test piece orientation within product (note for PE-material - CREEPPE): This should be referred to the specimen orientation on the component NOT on the sampled material.

Specimen Position in respect to weld (only for weldments CREEPWELD): For the explanation of the abbreviations used please refer to Volume 2 Part IIb and the figures reported there.

- Ls' is the weld metal width at specimen location
- k is the depth of the specimen location from the weld surface (last pass).
- The entry FL (fusion line) requires the number of fusion lines (1 or 2) included in the gauge length.
- The entry CL (specimen centre line) in respect to FL (weld fusion line) can be used to indicate if the specimen was oriented in such a way to have the gauge length parallel or perpendicular to the fusion line.

Parallel length details (only for welds - CREEPWELD): For the explanation of the abbreviations used please refer to Volume 2 Part IIb and the figures reported there.

It is assumed that in the most complicated case (non-homogeneous weld) the parallel length could be composed of:

- a part machined from unaffected parent material 1, LPM1
- the heat affected zone on parent material 1, LH1
- a buttering layer on parent material 1, LB1
- the weld metal, LWM
- a buttering layer on parent material 2, LB2

- the heat affected zone on parent material 2, LH2
- a part machined from unaffected parent material 2, LPM2

Clearly not all these parallel length parts are always present. Where the related length part is not applicable skip the column. If the weld is homogeneous (i.e. PM1 = PM2) it is up to the user to enter either the whole length of parent and HAZ material under one column or to split it for both sides of the weld. The sum of all length parts above should be the value stated under "parallel length" 3 columns ahead.

- nw is the ratio between LWM and Ls'.

Comments about HAZ, WM, PM fraction of gauge length (only for welds - CREEPWELD): Due to the big variety of complex specimen geometries used in weld testing, this field is provided to allow additional comments about the gauge length details, that do not appear covered in an appropriated way by the previous columns.

Heating rate, Heating Time: If referred to an i.t., "typical" values can be stated (i.e. the overall mean value for instance) or include more detailed information, if available

Soak Period prior to loading: If referred to an i.t., "typical" values can be stated (i.e. the overall mean value for instance) or include more detailed information, if available

Cooling Rate after each campaign: If referred to an i.t., "typical" values can be stated (i.e. the overall mean value for instance) or include more detailed information, if available

Cooling Time after each campaign : If referred to an i.t., "typical" values can be stated (i.e. the overall mean value for instance) or include more detailed information, if available.

TC Type : State the type of thermocouple used, for instance type K, R, S, B, N, etc.

Number of interruptions : If referred to an i.t. or to an u.i.t. on a multi string or multi specimen machine a "typical" number may be stated if no detailed information is available.

C-7.1.4 Information in OPTDATA

In CREEPWELD this information is included in OPTDATA2

Details for reference length calculation : Details can be entered as text, i.e. ds = 17 mm, $\alpha = 45^\circ$, dH= 12 mm etc.

C-7.2 RAWCREEP Sheet

This sheet is to be used for parent, virgin and post-exposure materials and welds

For creep strain data, besides the file described in C-7.1, the RAWCREEP file has been prepared to contain the raw strain time data from a single test (from both interrupted and uninterrupted tests).

The following procedure should be applied:

To add a new spreadsheet to the workbook

- Make sure the data for the test You want to add the strain data to, is already included in MAINDATA and has been identified properly by a material identifier and a test piece identifier (s. C-5).
- click on the “Generate RawCreep” button in MAINDATA (see C-11 and figure C-1.1a).
- Automatically an empty RAWCREEP sheet will be added. It will be automatically named with “material identifier – test piece identifier”. NOTE: If the combination is not unique, an error will be generated. Rename the sheet by clicking on the tab at the lower screen edge and entering a unique code.
- If available, the fields in the **blue** headed sheet part will be completed automatically by using the data from MAINDATA.
- If needed extent the **orange** headed sheet to the size required to enter all data.

Notes to the following fields :

**BLUE Headed Table
RAWCREEP**

Material Identifier : Automatically filled in from MAINDATA.

Creep Test Piece Identifier : Automatically filled in from MAINDATA.

Test Temperature, Applied Stress, Test Type, Initial Plastic Strain, Test Status : Automatically filled in from MAINDATA.

**Orange headed Table
Creep Strain Raw Data**

Test Duration, Total plastic strain : points of the $\varepsilon_p(t)$ -curve

Comment : Please add everything, that might be relevant for the creep data assessment.

C-8 Relaxation Data (ONLY RELAX Workbook)

Relaxation test data are collated in the **light blue** areas of the sheets of the RELAX-Workbook. The approach slightly differs for uni-axial and model bolt relaxation tests.

Column Headings

- for **uni-axial relaxation test** data the sheets contain in the **light blue** area columns with **titles written in blue letters**
- **model bolt test** conditions and results the sheets contain in the **light blue** area columns with **titles written in red letters**.
- Only in MAINDATA, at the screen top, buttons of orange (all), blue (only uniaxial) and red (only model bolt) colour let correspondent information appear and disappear (s. C-11).

For both types the RAWRELA sheet collates the raw stress time information.

Details to ease the handling with these sheets are given below.

C-8.1 Relaxation Test Parameters and Results (Light Blue Fields)

C-8.1.1 Information in MAINDATA

Current test conditions (only uniaxial):

- D should be entered if the test is discontinued
- C if the test is still continuing

Current Test Duration (only uniaxial): The values corresponding to the longest available point $\sigma(t)$ should be entered. This is equivalent to the final value for discontinued tests. As the data handling about discontinued and continuing tests does not differ, both result types can be inserted into the same column.

Current Remaining Stress (only uniaxial): The values corresponding to the longest available point $\sigma(t)$ should be entered. This is equivalent to the final value for discontinued tests. As the data handling about discontinued and continuing tests does not differ, both result types can be inserted into the same column.

C-8.1.2 Information in MANDATA

Details of special specimen form (only uniaxial) : Enter necessary information about geometry if the specimen has special features as text

Details of special specimen form (only Model Bolt): Enter necessary information about geometry if the specimen has special features (i.e. particular model bolts that are not standardised) as text

Machine Type (only uniaxial): The relaxation machine type can be abbreviated according to :

- SE : Servo-electrical machine
- SH : Servo-hydraulic machine
- DW: Dead weight machine
- SM: Servo-mechanical machine

C-8.1.3 Information in RECDATA

Load measurement (only uniaxial): Load measurement can be achieved with

- LC : Load cell with electronic or electrical conditioning and indication systems
- W : By weighting the weights directly applied to the specimen
- L : By changing in a calibrated way the lever ratio between weights and specimen

Loading Method (only uniaxial): The way, the static condition for the relaxation test was achieved, should be explained. The following procedures are codified, but others may be used and described by text :

- E1 : Loading in strain control to the specified total strain value
- E2 : Loading in strain control to the total strain value that corresponds to a pre-defined stress

- F1 : Loading in load control to a pre-defined stress value, then change into strain control keeping the strain value corresponding to the pre-defined stress constant.
- F2 : Loading in load control to a pre-defined total strain value, change to strain control and keep this strain value.

Number of interruptions (only uniaxial): An estimate for the number of incidental interruptions and consequent reloading should be given. Interrupted relaxation tests are not considered by ECCC.

Determination method for Modulus (only Model Bolt): Select how the value for the “Elastic Modulus at Test Temperature” (column at the end of MANDATA) has been measured (Hot tensile test or dynamic methods)

C-8.1.4 Information in OPTDATA

Details for reference length calculation (only uniaxial): Details can be entered as text.

Loading Rate (only uniaxial): The loading rate corresponding to the selected loading method should be entered, i.e. methods E1 and E2 require strain rates in %/s, F1 and F2 loading rates in MPa/s and the addition +T moreover a heating rate in K/min.

Details for reference length calculation (only Model Bolt): Details can be entered as text

C-8.2 RAWRELA-Sheet

For stress time data, besides the file described in C-8.1, the RAWRELA sheet has been prepared to contain the raw remaining stress vs. time data from a single test.

The following procedure should be applied:

To add a new spreadsheet to the workbook

- Make sure the data for the test You want to add the strain data to, is already included in MAINDATA and has been identified properly by a material identifier and a test piece identifier (s. C-5).
- click on the “Generate RawRela” button in MAINDATA (see C-11 and figure C-1.1a).
- Automatically an empty RAWRELA sheet will be added. It will be automatically named with “material identifier – test piece identifier”. NOTE: If the combination is not unique, an error will be generated. Rename the sheet by clicking on the tab at the lower screen edge and entering a unique code.
- If available, the fields in the **blue** headed sheet part will be completed automatically by using the data from MAINDATA.
- If needed extent the **orange** headed sheet to the size required to enter all data.

Notes to the following fields :

**BLUE Headed Table
RAWRELA**

Material Identifier : Automatically filled in from MAINDATA.

Creep Test Piece Identifier : Automatically filled in from MAINDATA.

Test Temperature, Specified Total Strain, Initial Plastic Strain, Test Status : Automatically filled in from MAINDATA.

**Orange headed Table
Stress Relaxation Raw Data**

Test Duration, Remaining Stress: points of the $\sigma(t)$ -curve. NOTE : the first test point [$\sigma(t=0s)$] has mandatory to be the initial stress at test temperature, from which the relaxation test started.

The stress at $t=0$ h is automatically reported from MAINDATA, if inserted there.

Comment : Please add everything, that might be relevant for the relaxation data assessment.

C-9 Weld data (ONLY CREEPWELD Workbook)

This workbook is to be used for WELDS and their related parent , filler and weld simulated materials.

Due to the large amount of information, this workbook contains two sheets for recommended (RECDATA1 and RECDATA2) and two sheets for optional (OPTDATA1 and OPTDATA2) data.

C-9.1 General Note

The complete characterisation of a weld is commonly achieved if the characteristics of the following materials are known:

1. Parent material 1
2. Parent material 2 (only if the weld is made of either two different casts of the same material grade or of two different material grades)
3. Filler material (virgin material to be used for filling the weld)
4. Weld material (material affected in the weld process)
5. Weld simulated material

The characteristics of parent material 1, parent material 2 and of the filler material are regarded in the same way as for any other material within CREEPWELD. A usual material identifier is

assigned to them in MAINDATA , under which all additional information is stored in the following sheets. Their pedigree and test data are then inserted in the usual areas.

The weld as well have a weld identifier assigned in MAINDATA and their specific data (welding process, joint dimensions etc.)are inserted in each sheet in the **grey** areas. The Weld Identifier will be accompanying all other characteristics (chemical composition, non time dependent properties etc.) in the same spreadsheets areas as for the base and filler materials, i.e. in the **reddish**, **green** and **light blue** areas. Details on welded materials do not appear in the **yellow** areas.

Materials thermally treated in order to simulate a heat affected zone will be considered also in the **grey** coloured areas. In MAINDATA they will be assigned a HAZ simulated material identifier, that will identify all other characteristics entered in the same spreadsheet areas as for the base, filler and weld materials,. i.e. in the **reddish**, **green** and **light blue** areas. Details on simulated weld materials do not appear in the **yellow** areas.

The correlation between parent material(s), main filler material, simulated weld and weld is given in the **dark blue** area of MAINDATA (see C-6.2.2).

C-9.2 Weld Process Steps (Grey Fields)

The workbook assumes, that up to 5 process steps were involved in producing the weld. For each of them the possibility of entering all relevant information is provided.

The foreseen processes are:

Process #0: Buttering
Process #1: Root welding
Process #2: First filler weld
Process #3: Second filler weld
Process #4: Back weld.

If not sufficient information is available, use the first filler weld for entering generic information.

C-9.3 Information in MAINDATA

(**Dark blue** area)

Component type: Select the sort of material by the given identifier marks (PM = Parent Material, F = Filler, W = Weld, SW = Simulated Weld).

Weld composition: By entering

- the related parent material (also applicable to simulated welds) or filler material identifier, the weld can be related to the properties of these materials, entered in the same spreadsheet.
- If no data are available for the parent material(s) or the filler enter a comprehensive commercial grade

Reference Weld Identifier: Enter the weld material identifier of the weld that has been simulated with this material.

Column headings

- In MAINDATA for **parent, filler and simulated weld material** data the sheets contain in the **light blue** area columns with **titles written in blue letters**
- In MAINDATA **weld test** conditions and results the sheets contain in the **light blue** area columns with **titles written in red letters**.
- In MAINDATA, at the screen top, buttons of green (all), blue (only uniaxial) and red (only model bolt) colour let correspondent information appear and disappear (s. C-11).

C-9.4 Information in MANDATA

Joint Type: Insert the joint standard designation as foreseen by the applicable standard EN29692. A selection of the most common joint types is given in the roll-down table that can be opened with the “choose designation” button.

Ref. N°: Insert the joint reference number as listed in the applicable standard EN29692. If You select a designation from the roll-down table in the foregoing column, this entry is completed automatically.

Position of weld in respect to Parent Material 1 (PM1) or Parent Material 2 (PM2): Include the position or orientation of the weld in respect to the product manufactured in PM, for instance : circumferential (for PM1 and PM2 = weld connecting two pipes)

Weld Preheat Treatment: WPT?: Enter only “yes” if a WPT has been performed and “no/unknown” if not or if unknown. If Your answer is “yes” the columns “Temp.” and “method” are Mandatory or Recommended, respectively, in all other cases no information is required.

Consumable Grade (available for each process): Enter a commercial name or a standard designation for the weld filler material

Consumable Mat.Id. (available for each applied process): See chapters C.3.1 and C.6.1 of the present document and “Parent material one and two” on the actual paragraph for the selection of a Material Identifier, if creep and meta-data on the weld filler material is available.

Intermediate Heat Treatment (available for each applied process): IHT?: Enter only “yes” if a IHT has been performed and “no/unknown” if not or if unknown. If Your answer is “yes” the columns “Temp. range are Mandatory or Recommended, in all other cases no information is required.

Notes on Simulation Method (for simulated weld material only): Enter here all relevant details about the weld simulation procedure and method (Gleeble-, heat treatment, etc.).

Post weld (PW) or Hydrogen Release heat treatment: PWHT?: Enter only “yes” if a PWHT has been performed and “no/unknown” if not or if unknown. If Your answer is “yes” the column “Temp. range” is Mandatory.

C-9.5 Information in RECDATA2

Weld Preheat Treatment: Temp. (Temperature)

Weld Preheat Treatment: Method: Method to perform the Weld Preheating (furnace, by local heating, etc.)

Heat Input Information (available for each applied process): This TEXT column allows to state every sort of information available to compute heat input during welding or to enter heat input parameters (time and temperature) directly.

Consumable Grade (available for each applied process): Enter a commercial name or a standard designation for the weld filler material

Characteristics of weldment: Type of final NDT: State the final Non Destructive Testing Method used for weld qualification.

Defects found: Enter "yes", if zones of the weld had to be excluded due to defects, enter "no" or "unknown" if not or if nothing is known about NDT results. If Your answer is "yes" the column "Type of defects" is recommended.

C-9.6 Information in OPTDATA2

Weldment approval for testing: Enter "yes" if approval has been given after NDT testing

Comments: Please add any supplementary information needed for the use of the data.

Parameters - first side / Parameters - second side: The parameters are identified according to the applicable standard EN 29692 As not all parameters are needed for all joint types, leave the not required columns blank. If the button "Parameters" is pressed, only the columns related to the actually referenced joint type, as given in rows C and D, are shown.

Comments : Please add everything, that might be relevant for the relaxation data assessment.







C-10 Post Exposure Materials (CREEPPE –Workbook)






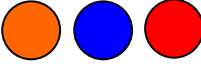
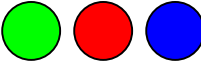
All here included spreadsheets refer to their homonymous in the CREEP - workbook. Note that the rankings "mandatory", "recommended" and "optional", and as a consequence the location in the sheets MANDATA, RECDATA AND OPTDATA, may be different. Note further, that the references are changed and are referring to Volume 2 part III.

The insertion of the new entries in the spreadsheets available also in CREEP happened in such a way, that they do not modify the original sequence. This will allow a simpler data handling if these spreadsheets are used to up- and download data to and from existing data banks.

C-11 Simplifying Data Input, Data Scrolling on Screen and Summary Print-outs

Due to the large number of available data entries on several spreadsheets, a number of data input simplifying procedures has been prepared that should ease the data entering from paper-based records:

Button	Denomination	Available in Workbook	Available in Sheet	Explanation
	CLEAR DATASHEET	All	All	!!!BEWARE!!! Deletes all information in the workbook Rawcreep and Rawrela are not affected
	GENERATE RAWCREEP (for CREEP, CREPPPE and CREEPWELD) or RAWRELA (for RELAX only)	All	All	Adds a scheme for entering respectively creep strain or relaxed stress time data points The appearing tab at the bottom is named, with the "material identifier - test piece identifier". Position the cursor on the row of the specimen for which You want to create the RAW.... Sheet. Click on the button, the sheet appears and some information will be directly present, if already entered in the MAINDATA and MANDATA sheets
	ORDER by Followed by several choices	All	All	These buttons allow to order the entire workbook according to the choice in ascending order
	FIND	All	All	This button allows to locate specific combinations of "material identifier – test piece identifier" NOTE: The search is capital letter sensitive.
	GET INFO	All	All	Summarises spreadsheet statistics
	SHOW/HIDE field Followed by several choices	All	NOT in MAINDATA	Shows only the selected information type The selection keeps hidden also for print-out.

Button	Denomination	Available in Workbook	Available in Sheet	Explanation
	Show all elements	All	NOT in Maindata, only for chemical information	Shows all elements available in the chemical entry area
	Show all elements (for a specific materials)	All	NOT in Maindata, only for chemical information	Shows all elements required for the selected material in the chemical entry area acc. Vol 2. table 1.5.1
	Select joint type	CREEP-WELD	Not in Maindata	Shows the columns requiring information for the particular weld joint type chosen
	Select	All	Not in Maindata	Position the cursor in the column, where this button appears, in the row or range of several rows within the same column where the entry is needed. Click on the button, select the appropriated entry form the window appearing
	Copy composition	All	NOT in Maindata, and Mandata, only for chemical information	Clicking this button will transfer all already inserted chemical information from Mandata-sheet to Recdata-Sheet or from Recdata-Sheet to Optdata-Sheet.
	Select test	RELAX	Only Maindata	By selecting model bolt or uniaxial relaxation test or "all", the corresponding testing information is displayed.
	Select Material	CREEP-WELD	Only Maindata	By selecting weldment or parent metal/filler or "all", the corresponding testing information is displayed.

NOTE:

MACROs, i.e. the programs governing the above listed simplifications, may not run on some Excel versions. Reasons can be found in the insufficient translation facilities of Excel when transferring English written macros (like used here), to National ones (i.e. in German, Italian, French etc.).
If the macros cause errors to appear, the spreadsheet itself can be used without limitation.

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VOLUME 4 part I

APPENDIX D

**GENERAL APPROACHES FOR DATA HANDLING USING THE DATA EXCHANGE
WORK BOOKS**

G. Merckling [Istituto Scientifico Breda, Italy]

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APPENDIX D to ECCC Volume 4 part I

**GENERAL APPROACHES FOR DATA HANDLING USING THE DATA
EXCHANGE WORK BOOKS**

Prepared by: G. Merckling, Istituto Scientifico Breda (Italy)

CONTENTS

	Page
D-1 INTRODUCTION	4
D-2 DOWN-LOADING PROCEDURES	4
D-2.1 PAPER BASED DATA	4
D-2.2 DATA STORED IN DATA BANK SYSTEMS	5
D-3 UP-LOADING PROCEDURES.....	6
D-3.1 PAPER BASED DATA	6
D-3.2 DATA STORED IN DATA BANKS	6

D-1 Introduction

The present appendix summarises the general approach that is suggested for transferring data from external sources to one of the ECCC-WG1 data exchange work book and vice versa. This appendix is meant to clarify some indications given in chapter 3 of Volume 4.

D-2 Down-loading Procedures

It can be assumed that two main possibilities for data insertion could be used.

D-2.1 Paper Based Data

Data are copied from paper based records and typed into the spreadsheets. It seems easiest to proceed material type by material type, cast by cast. This means

For material I

1. create a corresponding workbook (named according 2.2.4)
2. open the MAINDATA-sheet and fill in cast 1
3. do the same for the other sheets. Keep in mind that MAINDATA and MANDATA need to be filled in entirely to make the data set valuable.
4. start again at MAINDATA for cast 2
5. repeat 2-4 for all available casts for material I
6. close workbook for material I
7. start a new for material II from point 1 on.

Obviously any other procedure that seems more suitable for the user is applicable as long as all mandatory data are stated.

D-2.2 Data Stored in Data Bank Systems

D-2.2.1 Data Bank systems that can communicate with Excel,

for instance "dbase". In this case the foregoing could be

For Material I :

- 1) Create a corresponding workbook (named according 2.2.4)
- 2) Connect Excel with the supported external data bank system
- 3) Query and Extract the required information belonging to Material I either
 - according to the files and information sequence as given in the ECCC-workbook-spreadsheets. This implies 4-5 query and extract operations (more easily performed if a macro is prepared), creating new spreadsheets, which are then copied into the format of the ECCC-spreadsheets, or
 - according to the information sequence of the data bank itself, creating one single worksheet. From this sheet information is then copied column by column to the ECCC-spreadsheets. In this case as well a group of macros that automatically for instance create material identifier, change units, unify columns etc. may ease the work.
- 4) Transfer information to the ECCC spreadsheets in the most suitable way, see point 3.
- 5) Close the workbook for Material I
- 6) Start a new from point 1 for Material II

D-2.2.2 Data banks not supported by Excel or not running on MS-DOS.

In both cases the most suitable method of transfer seems to be the creation of an ASCII file from the data bank output, containing all information to be inserted in the ECCC spreadsheets.

A so called "*pre-processor*", i.e. for instance a FORTRAN based program should read record by record the data bank output ASCII file, make all required changes and store the data in 4 (creep rupture) or 5 (creep strain or relaxation) ASCII files with the data ordered in the sequence as stated in the ECCC-spreadsheets.

In detail the "*pre-processor*" should :

- Establish the right sequence of data entries according to the ECCC-workbook-spreadsheets
- Change the units of the data bank entries to those required by ECCC
- Verify and guarantee the cross references between data and files, i.e. create and where required, duplicate the material identifier, the creep test piece identifier etc.
- Save the data for the ECCC-spreadsheets in a suitable format in a set of ASCII-files,
- Take care not to skip columns with no entry available.

In detail the down-load procedure could be :

- 1 Prepare an ASCII output file of the external data bank containing all information required by ECCC
- 2 The pre-processor modifies this output file and creates an ASCII file with the same data sequence as in the workbook for each spreadsheet file, i.e. MAINDATA, MANDATA, RECDATA, OPTDATA, and, if necessary, RAWCREEP or RAWRELA.
- 3 Transfer these ASCII files to a MS-DOS environment (if not done before the pre-processor action)
- 4 Create a correspondent workbook (named according 2.2.4)
- 5 Open one by one all spreadsheet files and up-load the corresponding ASCII file.
- 6 Make "cosmetic" changes, for instance changing styles or formatting data, if necessary.

Another alternative could be, obviously, to get a paper output from the external data bank and transfer the data by hand according to the foregoing paragraph.

D-3 Up-loading Procedures

D-3.1 Paper Based Data

To eventually "up-load" data in a paper based data bank in the there codified format, the user should prepare an additional Excel spreadsheet into which the exchanged data can be copied and from there printed in his/her usual form.

D-3.2 Data Stored in Data Banks

D-3.2.1 Data Bank systems that can communicate with Excel,

for instance "dbase". The transfer of the exchange data got from ECCC in return can be performed exactly turning the above procedure (chapter D-2.2.1) upside down.

D-3.2.2 Data banks not supported by Excel or not running on MS-DOS.

The exchanged data could be up-loaded in a similar manner as explained in D-2.2.2, if a *post-processor* program is developed that

- unifies the single ECCC spreadsheets
- converts units, formats and the data sequence of the ECCC-spreadsheets into those of the external data bank.
- removes or re-maps the references (material identifier, specimen identifier, etc.)

- adds the references, if missing, required by the data bank
- adds "dummy" entries if information mandatory to the external data bank is missing
- removes information that cannot be stored in the external data bank.

In detail an Up-Loading procedure could be :

- 1 Save for each single spreadsheet the data in a separate ASCII file, removing the 11 header rows (those detailed in chapter 2.2.3).
- 2 Run the post-processor that saves all data in one ASCII file compatible with the data bank standard loading format.
- 3 Transfer the ASCII file from MS-DOS to the data bank operating system, if necessary.
- 4 Up-load the ASCII file.

D-3.2.3 About Data-Handling of the Collator

The following chapter gives a little more detailed indications on probably the easiest and fastest way to deal with the tasks of the Collator. Therefore the procedure listed in chapter 3 of the main document is here reported again, completed with "technical" suggestions.

The Collator has to

- 1) prepare a common workbook that contains all supplied data. To do this, the simplest way is to copy only the data (i.e. row 12 to end) one by one from the single spreadsheets of the contributor's workbooks to the collator's. More experienced collators could do the same using the "query and extract" of Excel's data base facilities.
- 2) cross check the accomplishment of the collated data with the collation specification set up by the WG 3.x
- 3) Several possibilities arise to perform this exercise :
 - a visual check can be done
 - an Excel-macro can be prepared that with a loop searches through the spreadsheet columns
 - the Excel spreadsheet can be saved in ASCII and a post-processor FORTRAN program can look through the data all at once.
- 4) verify for all data sets the presence of the mandatory information. The same procedures as stated above can be done here as well.
- 5) distribute in return the common data to all contributors according to the confidentiality procedures issued by the Management Committee.
- 6) Make copies of the common workbook on diskettes and distribute. If the files become too large either disassemble the workbook (but only if really necessary) or compress the files (in the easiest way using "ZIP"-programs).
- 7) prepare the data set for assessment according to ECCC Volume 5 [12]. The data required for assessment can be prepared by
 - using the MAINDATA sheet, eventually deleting columns not used, or by
 - copying the required data columns from the workbook spreadsheets to a new spreadsheet for assessment

- opening a spreadsheet for assessment and transferring the data by query and extract commands from the various workbook sheets.
- 8) perform or supervise the assessment, to be performed according to ECCC-WG1 Volume 5 [12].
 - 9) distribute the assessment results to all that are allowed to receive them in accordance with the confidentiality procedures issued by the Management Committee. Strength values and assessment presentation forms are given in Volume 5.