

Version May 2011

Add-on Module

# **RF-DEFORM**

Deformation Analysis for Members and Sets of Members

## Program Description

All rights, including those of translations, are reserved.

No portion of this book may be reproduced – mechanically, electronically, or by any other means, including photocopying – without written permission of ING.-SOFTWARE DLUBAL.

© Ing.-Software Dlubal Am Zellweg 2 D-93464 Tiefenbach

 Tel.:
 +49 (0) 9673 9203-0

 Fax:
 +49 (0) 9673 9203-51

 E-mail:
 info@dlubal.com

 Web:
 www.dlubal.com



## Contents

	Contents	Page		Contents	Page
					. age
1.	Introduction	4	4.1	Deformation Analysis - Governing	
1.1	Add-on Module RF-DEFORM	4		Members/Sets of Members	12
1.2	RF-DEFORM Team	5	4.2	Deformation Analysis - All Members/Sets of Members	13
1.3	Using the Manual	5	5.	Printout	14
1.4	Open the Add-on Module RF-DEFORM	16	6.	General Functions	15
2.	Input Data	7	6.1	RF-DEFORM Design Cases	15
2.1	General Data	7	6.2	Units and Decimal Places	17
2.2	Limit Deformation	8	6.3	Export of Results	17
3.	Calculation	11	А	Index	19
4.	Results	12			



## I. Introduction

### 1.1 Add-on Module RF-DEFORM

The program system of the DLUBAL company already offers you powerful add-on modules to perform the stress design. The serviceability limit state design, however, can be decisive as well in structural analysis. Therefore, we provide the add-on module RF-DEFORM, a program used to analyze the maximum allowable deformations of members and continuous members.

RF-DEFORM is completely integrated in the main program RFEM. Thus, the add-on module is not only an integral part of the FEA program in its appearance. The results of the RF-DEFORM calculation can be included in the RFEM printout report. In this way, you can present the entire analysis very easily in a consistent form.

We hope you will enjoy working with RF-DEFORM.

Your team from ING.-SOFTWARE DLUBAL



### 1.2 RF-DEFORM Team

The following people were involved in the development of RF-DEFORM:

#### Program coordination

Dipl.-Ing. Georg Dlubal Dipl.-Ing. (FH) Younes El Frem

### Programming

Bc. Ondřej Šašinka Dipl.-Ing. Georg Dlubal Mgr. Petr Oulehle Ing. Roman Svoboda Dis. Jiří Šmerák Lukáš Tůma

### Program design and icons

Dipl.-Ing. (FH) Matthias Entenmann

Dipl.-Ing. Georg Dlubal MgA. Robert Kolouch

Ing. Tomáš Ferencz

Ing. Jan Miléř

Ing. Ctirad Martinec

### Manual, help system and translation

Dipl.-Ing. Frank Faulstich Dipl.-Ing. (FH) Robert Vogl

**Program supervision** 

Dipl.-Ü. Gundel Pietzcker

### Technical support and quality management

Dipl.-Ing. (BA) Markus Baumgärtel Dipl.-Ing. (FH) Matthias Entenmann Dipl.-Ing. Frank Faulstich Dipl.-Ing. (FH) René Flori Dipl.-Ing. (FH) Bastian Kuhn M. Sc. Dipl.-Ing. (FH) Frank Lobisch Dipl.-Ing. (FH) Alexander Meierhofer M.Eng. Dipl.-Ing. (BA) Andreas Niemeier M.Eng. Dipl.-Ing. (FH) Walter Rustler M.Sc. Dipl.-Ing. (FH) Frank Sonntag Dipl.-Ing. (FH) Christian Stautner Dipl.-Ing. (FH) Robert Vogl

### 1.3 Using the Manual

Topics like installation, graphical user interface, results evaluation and printout are described in detail in the manual of the main program RFEM. The present manual focuses on typical features of the RF-DEFORM add-on module.

The descriptions in this manual follow the sequence of the module's input and results tables as well as their structure. The text of the manual shows the described **buttons** in square brackets, for example [Pick]. At the same time, they are pictured on the left. In addition, **expressions** used in dialog boxes, tables and menus are set in *italics* to clarify the explanations.

At the end of the manual, you find the index. However, if you don't find what you are looking for, please check our website **www.dlubal.com** where you can go through our *FAQ pages*.

Ta .



### 1.4 Open the Add-on Module RF-DEFORM

RFEM provides the following options to start the add-on module RF-DEFORM.

#### Menu

To start the program in the menu bar,

point to Others on the Additional Modules menu, and then select RF-DEFORM.



Figure 1.1: Menu Additional Modules  $\rightarrow$  Others  $\rightarrow$  RF-DEFORM

#### Navigator

To start RF-DEFORM in the Data navigator,

select RF-DEFORM in the Additional Modules folder.



Figure 1.2: Data navigator: Additional Modules  $\rightarrow$  RF-DEFORM

3



## 2. Input Data

All data required for the definition of design cases is entered in tables. The [Pick] function allows for a graphical selection of the members and sets of members that you want to design.

When you have started the add-on module, a new window opens where a navigator is displayed on the left, managing all tables that can be selected currently. The pull-down list above the navigator contains the design cases that are already available (see chapter 6.1, page 15).

If you open RF-DEFORM in an RFEM structure for the first time, the module will import the already created load cases, groups and combinations automatically.

To select a table, click the corresponding entry in the RF-DEFORM navigator or page through the tables by using the buttons shown on the left. You can also use the function keys [F2] and [F3] to select the previous or subsequent table.

To save the defined settings and quit the module, click [OK]. When you click [Cancel], you quit the add-on module but without saving the data.

### 2.1 General Data

In table 1.1 General Data, you select the actions that you want to design.

CA1 - Deformation Analysis	1.1 Genera	l Data				
Input Data Input Data General Data Limit Deformation Deformation Analysis Governing Members/Sets of Members	Existing Lo	oad Cases Wind on Beam in Y Wind on Beam in Y	-	Selected fi	or Deformation Analysis Extreme characteristic values	ORM
	LC6 LC7 *LC8 *LC9 *LC10	Wind lifting Load - Floor Imperfections in X Imperfections in -Y Imperfections in Y		)		
	Load Grou LG1 LG2 LG3 LG4 LG5 LG6 LG6	ups and Load Combinations Egw+s+wx+p+Imp Egw+s+Imp Egw+wx+Imp Egw+p+Imp Egw+Wvind liting+Imp Egw+Wvind liting+Imp Egw+wy+Imp		) )		Deformation and Deflection Analysis (Serviceability)
< <u> </u>	Comment Serviceab	Egyerevery) (mp	•			

Figure 2.1: Table 1.1 General Data

### **Existing Load Cases / Load Groups and Load Combinations**

These two table sections list all load cases, load groups and load combinations defined in RFEM that are relevant for the design. Use the button  $[\blacktriangleright]$  to transfer selected actions or combinations to the list *Selected for Deformation Analysis* on the right. You can also double-click the items. To transfer the complete list to the right, use the button  $[\blacktriangleright \blacktriangleright]$ .



Load cases that are marked by an asterisk (\*), like load cases 8 to 10 in the figure above, cannot be designed. This may be the case when no loads are defined or when the load case contains only imperfections.

### Selected for Deformation Analysis

The column on the right lists the loads selected for the design. Use the button  $[\blacktriangleleft]$  to remove selected load cases, groups or combinations from the list. You can also double-click the entries. To empty the complete list, use the button  $[\triangleleft\triangleleft]$ .

#### Comment

In this input field, you can enter user-defined notes describing in detail, for example, the current RF-DEFORM design case.

### 2.2 Limit Deformation

In this table which is subdivided into two parts you define the 1D objects that you want to design. The upper table section defines the limit deformations of *Members*, the lower table section the deformations of *Sets of Members*. Except for this difference, both tables offer you the same input options. Therefore, they are described together in the following.

To modify the units and decimal places of lengths and deformations, select **Units and Decimal Places** in the module's **Settings** menu (see chapter Figure 6.5, page 17).

A1 - Deformation Analysis	▼ 1.2.1 Lin	nit Deformation - Members							
nput Data		A	В	С	D	E	F	G	
- General Data		Deformation Analysis	Deformation	Direc-	Limit Def	omation	Refer. Length		
Limit Deformation	No.	for Members No.	in Reference to	tion	L/w [·]	w [mm]	L [m]	Comment	
	1	2,11,12,21,22	Deformed Member Ends	R	300.00	20.00	6.00		
	2	31,32	Deformed Member Ends	R	300.00	10.00	3.00	ceiling joist	
	3	81,83	Deformed Member Ends	R	300.00	21.82	6.55		
	4	82	Deformed Member Ends	R	300.00	23.65	7.09		
	5	113-116	Undeformed System	Z	300.00	16.67	5.00		
	6								
	7								
	8								
	9 1.2.2 Lin	hit Deformation - Sets of M	embers			-		6	
	9 1.2.2 Lin	hit Deformation - Sets of M Deformation Analysis	embers B Deformation	C Direc-	D Limit Def	E	F Refer, Length	G	
	9 1.2.2 Lin No.	hit Deformation - Sets of M A Deformation Analysis for Sets of Members No.	embers B Deformation in Reference to	C Direc- tion	D Limit Def	E omation w [mm]	F Refer. Length L [m]	G	
	9 1.2.2 Lin No.	A Deformation - Sets of M Deformation Analysis for Sets of Members No.	embers B Deformation in Reference to Undeformed System	C Direc- tion X	D Limit Def L/w [-] 300.00	E ormation w [mm] 20.00	F Refer. Length L [m] 6.00	G Comment column	
	9 1.2.2 Lin No.	A Deformation - Sets of M Deformation Analysis for Sets of Members No. 1 2,3	embers B Deformation in Reference to Undeformed System Deformed Member Ends	C Direc- tion X Z	D Limit Def L/w [·] 300.00 300.00	E omation w [mm] 20.00 41.83	F Refer. Length L [m] 6.00 12.55	G Comment column	
	9 1.2.2 Lin No. 1 2 3	A     Deformation - Sets of M     Deformation Analysis     for Sets of Members No.     1     2.3     4	embers B Deformation in Reference to Undeformed System Qeformed Member Ends Undeformed System	C Direc- tion X Z R	D Limit Def L/w [-] 300.00 300.00 300.00	E ormation w [mm] 20.00 41.83 21.82	F Refer. Length L [m] 6.00 12.55 6.55	G Comment column	
	9 1.2.2 Lin No. 1 2 3 4	A     Deformation - Sets of M     Deformation Analysis     for Sets of Members No.     1     2.3     4     5	Embers Deformation in Reference to Undeformed System Undeformed System Undeformed System	C Direc- tion X Z R R	D Limit Def L/w [-] 300.00 300.00 300.00 300.00	E ormation w [mm] 20.00 41.83 21.82 23.65	F Refer. Length L [m] 6.00 12.55 6.55 7.09	G Comment column	
	9 1.2.2 Lin No. 1 2 3 4 5	it Deformation - Sets of M Deformation Analysis for Sets of Members No. 1 2.3 4 5	B Deformation in Reference to Undeformed System Undeformed System Undeformed System	C Direc- tion X Z R R R	D Limit Def L/w [-] 300.00 300.00 300.00 300.00	E ormation w [mm] 20.00 41.83 21.82 23.65	F Refer. Length L [m] 6.00 12.55 6.55 7.09	G Comment column	
	9 1.2.2 Lin No. 1 2 3 4 5 6	A     Deformation - Sets of M     Deformation Analysis     for Sets of Members No.     1     2.3     4     5	embers B Deformation in Reference to Undeformed System Undeformed System Undeformed System	C Direc- tion X Z R R R	D Limit Def L/w [-] 300.00 300.00 300.00 300.00	E ormation w [mm] 20.00 41.83 21.82 23.65	F Refer. Length L [m] 6.00 12.55 6.55 7.09	G Comment column	
	9 1.2.2 Lin No. 1 2 3 4 5 6 7	Init Deformation - Sets of M Deformation Analysis for Sets of Members No. 1 2,3 4 5 5	Embers Deformation in Reference to Undeformed System Undeformed System Undeformed System	C Direc- tion X Z R R R	D Limit Def L/w [·] 300.00 300.00 300.00 300.00	E omation w [mm] 20.00 41.83 21.82 23.65	F Refer. Length L [m] 6.00 12.55 6.55 7.09	G Comment column	
	9 1.2.2 Lin No. 1 2 3 4 5 6 7 7 8	it Deformation - Sets of M Deformation Analysis for Sets of Members No. 1 2,3 4 5	embers B Deformation in Reference to Undeformed System Undeformed System Undeformed System	C Direc- tion X <u>Z</u> <u>R</u> <u>R</u>	D Limit Def L/w [·] 300.00 300.00 300.00 300.00	E ormation w [mm] 20.00 41.83 21.82 23.65	F Refer. Length L [m] 6.00 12.55 6.55 7.09	G Comment column	
	9 1.2.2 Lin No. 1 2 3 4 5 6 7 7 8 9	A     Deformation - Sets of M     Deformation Analysis     for Sets of Members No.     1     2,3     4     5	embers B Deformation in Reference to Undeformed System Undeformed System Undeformed System	C Direc- tion X Z R R R	D Limt Def ∠/w [-] 300.00 300.00 300.00	E ormation w [mm] 20.00 41.83 21.82 23.65	F Refer. Length L [m] 6.00 12.55 6.55 7.09	G Comment column	

Figure 2.2: Table 1.2 Limit Deformation

#### Deformation Analysis for Members / Sets of Members No.

In this table column, you specify the numbers of the members or sets of members that are relevant for the design. Enter the members and sets of members directly into the table or use the [Pick] button to select them graphically in the RFEM work window. When you select the objects graphically, RF-DEFORM summarizes all objects with identical lengths row by row (column F).

3





Dlubal

When you select sets of members, please note the following:

- The sets of members must have already been defined in RFEM.
- Only sets of members of the type *Continuous Members* can be designed. It is not possible to analyze groups of members.

### **Deformation in Reference to**

This table column determines if the results of the deformation analysis are set in relation to the *Undeformed System* or an imaginary connection line between member start and member end in the deformed system, thus to the *Deformed Member Ends*.

It is possible to specify the reference by using the list: Place the pointer in the corresponding field of the table column, and then click the button  $[\Psi]$  or use the function key [F7]. The list shown on the left opens, offering you both options.

### Direction

In table column C, you define the direction of the deformation that you want to design. Again, you can use the list of the active table row to select the direction.

Symbol	Direction
х	Global axis X
Y	Global axis Y
Z	Global axis Z
x	Local member axis x (longitudinal axis)
у	Local member axis y ("strong" axis)
z	Local member axis z ("weak" axis)
R	Resultant force of the deformation
u	Strong local member axis u of unsymmetrical section
v	Weak local member axis v of unsymmetrical section

Table 2.1: Direction of deformation

### Limit Deformation L/w and w

In table column D, you enter the value of the allowable limit deformation L/w directly. The ratio of length and deformation is preset with 300. If you modify the value, the deformation w indicated in table column E will be updated automatically when you confirm the table cell.

If a table row contains members or continuous members that are different in length, RF-DEFORM cannot display the limit deformation w as a result of L/w by a single value. In this case, the table field w remains empty.

However, it is possible to enter the allowable deformation w directly in column E. Then, RF-DEFORM will determine the ratio L/w automatically using this specification.



Deformed Member Ends





### Refer. Length L

The lengths to which the limit deformation refers are preset, based on the lengths of the members and sets of members defined in RFEM. The values indicated in table column F cannot be modified.

In case a table row contains members or sets of members of different lengths, RF-DEFORM displays the maximum and the minimum length in this column.

### Comment

You can describe each table row by a comment for a clear management of data.



## 3. Calculation

To start the calculation, click the [Calculation] button that is available in both input tables.

Calculation Check

Before you start the calculation, it is recommended to [Check] the input data by using the button shown on the left.

No Error	RF-DEFORM Information No. 1242 © Found!
	QK



RF-DEFORM searches for the results of the load cases, load groups and load combinations that you want to design. If they cannot be found, the RFEM calculation starts to determine the design relevant deformations. In this determination process, the calculation parameters preset in RFEM are applied.

You can start the calculation of RF-DEFORM results also out of the RFEM user interface. All add-on modules are listed in the dialog box *To Calculate* like load cases or load groups. To open the dialog box in RFEM,

select To Calculate on the Calculate menu.

lot Calculated					Selected for Calcula	tion	
Program / Module	No.	Description	4		Program / Module	No.	Description
RFEM	LC2	Snow			RF-DEFORM	CA1	Deformation Analysis
RFEM	LC3	Wind in +X					
RFEM	LC4	Wind on Beam in +Y					
RFEM	LC5	Wind on Beam in -Y					
RFEM	LC6	Wind lifting		>			
RFEM	LC7	Load - Floor					
RFEM	LC8	Imperfections in X					
RFEM	LC9	Imperfections in -Y	Ξ				
RFEM	LC10	Imperfections in Y					
RFEM	LG5	Egw+Wind lifting+Imp					
RFEM	C01	Extreme design values					
RF-STEEL EC3	CA1	Design according to Eurocode 3					
			-				
							1
Show Additional	Module	S					

Figure 3.2: RFEM dialog box To Calculate

If the RF-DEFORM design cases are missing in the *Not Calculated* list, tick the check box *Show Additional Modules* below the list.



To transfer the selected RF-DEFORM cases to the list on the right, use the button [▶]. Start the calculation by using the [Calculate] button.

Subsequently, you can observe the calculation process in a separate dialog box.

3



## 4. Results

Immediately after the calculation, table 2.1 *Deformation Analysis* - *Governing Members / Sets of Members* appears, which is also subdivided into two parts. The individual designs are listed in the two results tables 2.1 and 2.2 that can be selected by means of the RF-DEFORM navigator. You can also use the two buttons shown on the left or the function keys [F2] and [F3] to select the previous or subsequent table.

Click [OK] to save the results and quit the add-on module RF-DEFORM.

## 4.1 Deformation Analysis -Governing Members/Sets of Members

CA1 - Deformation Analysis 🛛 👻	2.1.1 De	formation	n Analysis	s - Governing Members						
Input Data		A	В	С	D	E	F	G	H	
- General Data		Member	Load		Ref. Length	Direc-	Deformation	Relative [-]	Deformation /	Absolute (r
- Limit Deformation	No.	No.	Case	Cross-section Description	L [m]	tion	Exist L/w	Limit L/w	Exist w	Limit w
Deformation Analysis	1	2	CO2+	IPE 300	6.00	Z	-	300.00	0.04	20
- Governing Members/Sets of Me	2	32	CO2-	IPE 300	3.00	R	537.70	300.00	5.58	10
All Members/Sets of Members	3	81	CO2-	HE-A 160	6.55	R	1013.68	300.00	6.46	21
	4	82	CO2-	HE-A 160	7.09	R	789.88	300.00	8.98	23
	5	114	CO2+	QRO 80x4	5.00	Z	1459.95	300.00	3.42	16
	2.1.2 De	formatior A	Analysis	s - Governing Sets of Members C	D	E	F	G	H	
	2.1.2 De	formatior A Set	Analysis B Load	s - Governing Sets of Members C	D Ref. Length	E Direc-	F	G Relative [-]	H Deformation /	L I Absolute [
	2.1.2 De No.	formatior A Set No.	Analysis B Load Case	s - Governing Sets of Members C Cross-section Description	D Ref. Length L [m]	E Direc- tion	F Deformation Exist L/w	G Relative [-] Limit L/w	H Deformation / Exist w	Absolute (r Limit v
	2.1.2 De No.	formation A Set No. 1	Analysis B Load Case CO2+	s - Governing Sets of Members C Cross-section Description HE-A 200	D Ref. Length L [m] 6.00	E Direc- tion X	F Deformation Exist L/w 228.02	G Relative [-] Limit L/w 300.00	H Deformation / Exist w 26.31	Absolute (r Limit v 20
	2.1.2 De No.	formation A Set No. 1 2	Analysis B Load Case CO2+ CO2+	s - Governing Sets of Members C Cross-section Description HE-A 200 IPE 400/IPE 300,	D Ref. Length L [m] 6.00 12.55	E Direc- tion X Z	F Deformation Exist L/w 228.02 239.53	G Relative [-] Limit L/w 300.00 300.00	H Deformation A Exist w 26.31 52.38	Absolute [r Limit v 20 41
	2.1.2 De No.	formation A Set No. 1 2 4	Analysis B Load Case CO2+ CO2+ CO2+ CO2+	s - Governing Sets of Members C Cross-section Description HE-A 200 IPE 400/IPE 300, HE-A 140	D Ref. Length L [m] 6.00 12.55 6.55	E Direc- tion X Z R	F Deformation Exist L/w 228.02 239.53 403.68	G Relative [-] Limit L/w 300.00 300.00 300.00	H Deformation A Exist w 26.31 52.38 16.22	Limit v 20 41 21
	2.1.2 De No. 1 2 3 4	formation A Set No. 1 2 4 5	B Load Case CO2+ CO2+ CO2+ CO2+ CO2+	s - Governing Sets of Members C Cross-section Description HE-A 200 IPE 400/IPE 300, HE-A 140 HE-A 140	D Ref. Length L [m] 6.00 12.55 6.55 7.09	E Direc- tion X Z R R	F Deformation Exist L/w 228.02 239.53 403.68 293.95	G Relative [-] Limit L/w 300.00 300.00 300.00 300.00	H Deformation / Exist w 26.31 52.38 16.22 24.13	Absolute (r Limit v 20 41 21 23

Figure 4.1: Table 2.1 Deformation Analysis - Governing Members/Sets of Members

This two-part table shows the maximum deformation ratios resulting from the governing loads. The results are sorted by members and sets of members.

### Member / Set No.

For each input row of table 1.2, RF-DEFORM displays the number of the member or set of members that has the smallest ratio of *Exist L/w* in relation to *Limit L/w*.

### Load Case

Table column B shows the action whose loads produce the most unfavorable deformation ratio.

### **Cross-section Description**

The cross-section descriptions of the governing members or sets of members are indicated so that it is easier to check the corresponding data.



### Ref. Length L

This column shows you the values from table column F of table 1.2.

### Direction

The direction of the deformation to be designed is specified in table column C of table 1.2. The settings are displayed again so that you can check the entries.

### **Deformation Relative L/w**

Table columns F and G show respectively the ratios *Exist L/w* and *Limit L/w*. The value of the allowed limit deformation L/w is determined in column D of table 1.2.

If *Exist L/w* < *Limit L/w*, the design fails and the corresponding values are highlighted in red.

### **Deformation Absolute w**

The two final table columns inform you about the absolute values of the existing and the allowable deformations. In this way, you can compare the maximum deformations *Exist w* directly with the limit deformations *Limit w*.

### 4.2 Deformation Analysis -All Members/Sets of Members

.A1 • Deformation Analysis 🛛 🔻 🛛	2.2.1 De	formation	Analysis	- All Members						
nnut Data		A	В	С	D	E	F	G	H	
- General Data		Member	Load		Ref. Length	Direc-	Deformation	Relative [-]	Deformation A	osolute (mm)
- Limit Deformation	No.	No.	Case	Cross-section Description	L [m]	tion	Exist L/w	Limit L/w	Exist w	Limit w
Deformation Analysis	1	2	CO2+	IPE 300	6.00	Z	-	300.00	0.04	20.00
- Governing Members/Sets of Me	1	11	CO2+	IPE 300	6.00	Z	-	300.00	0.03	20.00
All Members/Sets of Members	1	12	CO2+	IPE 300	6.00	Z	-	300.00	0.03	20.00
	1	21	CO2+	IPE 300	6.00	Z	-	300.00	0.03	20.00
	1	22	CO2+	IPE 300	6.00	Z	-	300.00	0.03	20.00
	2	31	CO2+	IPE 300	3.00	R	1632.43	300.00	1.84	10.00
	2	32	CO2-	IPE 300	3.00	R	537.70	300.00	5.58	10.00
	3	81	CO2-	HE-A 160	6.55	R	1013.68	300.00	6.46	21.82
	3	83	CO2-	HE-A 160	6.55	R	1031.59	300.00	6.35	21.82
	4	82	CO2-	HE-A 160	7.09	R	789.88	300.00	8.98	23.65
	5	113	CO2+	QRO 80x4	5.00	Z	1769.69	300.00	2.83	16.67
	2.2.2 De	formation	Analysis	- All Sets of Members						
		A	В	C	D	E	F	G	H	
		Set	Load		Ref. Leng	th Dire	c- Deformat	ion Relative [·	<ul> <li>Deformatio</li> </ul>	n Absolute
	No.	No.	Case	Cross-section Description	L [m]	tio	n Exist L/w	/ Limit L/v	v Exist w	Limit
	1,	1	CO2+	HE-A 200	6	00 X	228.0	300.0	00 26.3	1 2
	2	2	CO2+	IPE 400/IPE 300,	12	55 Z	239.5	53 300.0	00 52.3	8 4
	2	3	CO2+	IPE 400/IPE 300,	12	55 Z	329.6	67 300.	00 38.0	6 4
		4	CO2+	LIE & 140	6	55 R	403.6	68 300.	00 16.2	2 2
	3	4		HE-A 140				200/	00 24 1	3 2
	3	5	CO2+	HE-A 140	7	09 R	293.9	300.0		
	3 4	5	CO2+	HE-A 140 HE-A 140	7.	09 R	293.9	10 300.0		
	3 4	5	CO2+	HE-A 140	7	09 R	293.5	300.1		
	3 4	5	C02+	HE-A 140 HE-A 140	7.	09 R	293.5	300.1		
	4	5	C02+	HE-A 140 HE-A 140	7	09 R	293.5	300.1		
	3 4	5	C02+	HE-A 140 HE-A 140	7.	09 R	293.5	5 300.1		

Figure 4.2: Table 2.2 Deformation Analysis - All Members/Sets of Members

This table is also subdivided into two parts listing the results for each individual member and set of members that has been selected in table 1.2 for the deformation analysis.

Details on the table columns can be found in the previous chapter 4.1.



## 5. Printout

The creation of printouts is similar to the procedure in RFEM. First, the program generates a printout report for the RF-DEFORM results. Graphics and descriptions can be added. In addition, you can use the print preview to specify the results of the deformation analysis that will finally appear in the printout.

5

When your structure is quite extensive, it is advisable to split the data into several small reports. If you create a separate report for RF-DEFORM, the printout report will be generated relatively quickly.

The printout report is described in detail in the RFEM manual. In particular, chapter 11.1.3.4 *Selecting Data of Add-on Modules* on page 338 provides information concerning the selection of input and output data in add-on modules.

All general selection options are available in order to print the design cases as well as input and results data of RF-DEFORM.

Program / Modules	Global Selection Input Data Results	
RF-STEEL EC3	Display	
RF-DEFORM	Deformation Analysis	No. Selection (e.g. 1-5,20) hbers: All   Sets: All   Sets: 31,33,42-45,66  Sets: All   Se
	2.2.1 All Members Mem     2.2.2 All Sets of Members	bers: 31,33,42:45,66
Display		
Display		
Display ☐ Cover Sheet		
Display Cover Sheet Cover Sheet Contents Info Pictures	Global Selection	
Display Cover Sheet Cover Sheet Contents Info Pictures	Global Selection	





## 6. General Functions

This chapter describes some menu functions as well as export options for the results of the deformation analysis.

## 6.1 **RF-DEFORM Design Cases**

Members and sets of members can be arranged in groups for separate design cases. In this way, you can for example define particular specifications for the limit deformations to apply them to structural component groups.

### Create a new RF-DEFORM case

To create a new design case,

select New Case on the File menu in the RF-DEFORM add-on module.

The following dialog box appears.

ew KF-L	DEFORM-Case	<b>X</b>
No.	Description	
2	Serviceability	•

Figure 6.1: Dialog box New RF-DEFORM-Case

In this dialog box, enter a *No*. (which is not yet assigned) and a *Description* for the new design case. When you click [OK], table 1.1 *General Data* opens where you can enter the new data.

### **Rename an RF-DEFORM case**

To change the description of a design case subsequently,

select Rename Case on the File menu in the RF-DEFORM add-on module.

The dialog box Rename RF-DEFORM-Case appears.

No.	Description
2	New Description
2	New Description

Figure 6.2: Dialog box Rename RF-DEFORM-Case



### Copy an RF-DEFORM case

To copy the input data of the current design case,

select Copy Case on the File menu in the RF-DEFORM add-on module.

The dialog box *Copy RF-DEFORM-Case* appears where you can specify the number and description of the new case.

Copy RF-	DEFORM-Case	×
Copy fro	om Case	
CA2 - I	New Description	•
New Ca	se	
No.:	Description:	
3	Copy of case 2	•
2		OK Cancel

Figure 6.3: Dialog box Copy RF-DEFORM-Case

#### **Delete an RF-DEFORM case**

To delete a design case,

select **Delete Case** on the **File** menu in the RF-DEFORM add-on module.

In the dialog box *Delete Cases*, you can select a design case in the *Available Cases* list to delete it by clicking [OK].

Availat	ole Cases				
No.	Description				
1	Deformation Analysis				
2	New Description				
3	Copy of case 2	-			
2	OK Can	cel			

Figure 6.4: Dialog box Delete Cases



### 6.2 Units and Decimal Places

The units and decimal places for RFEM and all add-on modules are managed in one global dialog box. In the add-on module RF-DEFORM, you can use the menu to define the units. To open the corresponding dialog box,

select Units and Decimal Places on the Settings menu.

The following dialog box opens, which you already know from RFEM. The add-on module RF-DEFORM is preset.

Units and Decimal Places	-2	٢
Program / Module  Program / Module  RF-EL-PL  RF-CD-T  PLATE-BUCKLING  RF-ASD  CRANEWAY  RF-CONCRETE Surfac  RF-CONCRETE Surfac  RF-CONCRETE Colum  RF-TIMBER  RF-TIMBER  RF-TIMBER  RF-TIMBER  RF-DOVEL  RF-CONNECT  RF-FRAME-JOINT  RF-DOWEL  RF-RAME-JOINT  RF-DOWEL  RF-HSS  RF-STABILITY  RF-DOWEL  RF-HSS  RF-STABILITY  RF-DOWEL  RF-MP  RF-SOILIN  RF-COLUMN  RF-LAMINATE  RF-TOWER Structure	RF-DEFORM  Input and Output Data Unit Dec, Places Lengths: m • 3 • 2 •	
P	ОК Сапсе	

Figure 6.5: Dialog box Units and Decimal Places

**F** (2)

The settings can be saved as user profile to reuse them in other structures. The functions are described in the RFEM manual, chapter 12.6.2, page 453.

### 6.3 Export of Results

The results of the deformation analysis can be provided for other programs. Several options are available.

### Clipboard

To copy cells selected in the RF-DEFORM results tables to the clipboard, use the keyboard keys [Ctrl]+[C]. To insert the cells, for example in a word processing program, press [Ctrl]+[V]. The headers of the table columns won't be transferred.

### **Printout Report**

The RF-DEFORM data can be printed into the global printout report (cf. chapter 5, page 14) to export them subsequently. In the printout report,

select Export to RTF File or BauText on the File menu.

The function is described in detail in the RFEM manual, chapter 11.1.11, page 350.



### Excel / OpenOffice

RF-DEFORM provides a function for the direct data export to MS Excel and OpenOffice.org Calc. To open the corresponding dialog box,

select Export Tables on the File menu in the RF-DEFORM add-on module.

The following export dialog box appears.

Microsoft Excel     OpenOffice.org Calc     CSV
OpenOffice.org Calc           CSV           ook
pok
ook
neet
Details

Figure 6.6: Dialog box Export - MS Excel

When you have selected the relevant parameters, start the export by clicking [OK]. Excel or OpenOffice will be started automatically. It is not necessary to run the programs in the background.

X	9	- 01 - 1	Ŧ		She	et1 - Micros	oft Exce	1			· □ <mark>- </mark>	X
Fi	le	Home	Insert	Page Layou	ut Form	ulas Dat	a R	eview V	iew Add-	Ins 🗠	() – Ø	
Pas Clipt	te 🖋	Calibr	i Z <u>U</u> ▼  Font		E E E Sov	Text	%	Styles	Haran Sert ▼ Delete ▼ Format ▼ Cells	Σ × A ▼ ZI Sort Filter Edit	& Find & Select +	
	G	61	• (	f <sub>x</sub>	Deforma	ation Relati	ve [-]					
	А	В	С	D		E	F	G	Н	1	J	
1		Member	Load			Ref. Length	Direc-	Deformatio	n Relative [-]	Deformation /	Absolute (mm	1]
2	No.	No.	Case	Cross-section I	Description	L [m]	tion	Exist L/w	Limit L/w	Exist w	Limit w	
3	1	2	CO2+	IPE 300		6,00	z	-	300,00	0,04	20,00	0
4	1	11	CO2+	IPE 300		6,00	z	-	300,00	0,03	20,00	0
5	1	12	CO2+	IPE 300		6,00	z	-	300,00	0,03	20,00	0
6	1	21	CO2+	IPE 300		6,00	z	-	300,00	0,03	20,00	0
7	1	22	CO2+	IPE 300		6,00	z	-	300,00	0,03	20,00	0
8	2	31	CO2+	IPE 300		3,00	R	1632,43	300,00	1,84	10,00	0
9	2	32	CO2-	IPE 300		3,00	R	537,70	300,00	5,58	10,00	0
10	з	81	CO2-	HE-A 160		6,55	R	1013,68	300,00	6,46	21,82	2
11	з	83	CO2-	HE-A 160		6,55	R	1031,59	300,00	6,35	21,82	2
12	4	82	CO2-	HE-A 160		7,09	R	789,88	300,00	8,98	23,65	5
13	5	113	CO2+	QRO 80x4		5,00	z	1769,70	300,00	2,83	16,67	7
14	5	114	CO2+	QRO 80x4		5,00	z	1459,96	300,00	3,42	16,67	7
15	5	115	CO2+	QRO 80x4		5,00	z	1818,69	300,00	2,75	16,67	7
16	5	116	CO2+	QRO 80x4		5,00	z	3419,80	300,00	1,46	16,67	7
4 4	► FL	2.2.1	Deform	ation Analysi	s - Al 🦯 🕻	2.2.2 Deform	nation A				► 1	ſ

Figure 6.7: Result in Excel



## **A** Index

4	٢	•	
1	L		

•
Calculation11
Check11
Comment
Cross-section description 12
D
Decimal places8, 17
Deformation9, 13
Deformation analysis
Deformed member ends9
Design case15, 16
Direction9, 13
E
Excel 18
Export of results17
G
General data7
I
Installation5
L
Limit deformation8, 9
Load case7, 12
Load combination7
Load group7
Μ
Member8, 12

### Ν

Navigator7
0
OpenOffice18
Р
Printout report14
Q
Quit RF-DEFORM7
R
Reference length10, 13
Reference of deformation9
Resultant force of deformation9
Results tables12
RF-DEFORM case11, 15
S
Selecting tables7
Selection for printout14
Set of members8, 12
Start program6
Start RF-DEFORM6
т
Tables7
U
Undeformed system9
Units8, 17
User profile17