Program

RSCOMBI

For use with Windows 95/98/ME/NT 4.0/2000

Generating of LS Groups and LS Combinations

User Manual

Version: August 2001

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1. Introduction

1.1 About RSCOMBI for Windows

Whether you are a first time RSCOMBI user or already have experience with previous versions, the practical oriented development makes it possible for anyone to start the program and find their way around. Much of RSCOMBI's user-friendliness comes from the cooperative work with customers and business partners. Their valuable tips have contributed enormously to improvements in this version of RSCOMBI for Windows.

RSCOMBI for Windows is fully integrated into RSTAB 5 for Windows.

While working with RSCOMBI, the [F1] key can be used to open the online help system.

We wish you much success with RSTAB and RSCOMBI.

DLUBAL ENGINEERING SOFTWARE

1.2 The RSCOMBI Team

The following people contributed to the development of RSCOMBI for Windows:

- Program Coordinators: Dipl.-Ing. Georg Dlubal Dipl.-Ing. Peter Achter Ing. Pavel Bartos
- Programmers: RNDR. Zdenek Kosek Mirza Hadzic Dr.-Ing. Jaroslav Lain
- Program Testing: Dipl.-Ing. Georg Dlubal Dipl.-Ing. Peter Achter Dipl.-Ing. (FH) Walter Rustler
- Manual and Help System: Jana Rustler Dipl.-Ing. (FH) Walter Rustler

2. Installing RSCOMBI

2.1 System Requirements

To use RSCOMBI, we recommend the following minimum system requirements:

- Windows 95 / 98 / NT 4.0 / 2000 Operating System
- 200 MHz Processor
- 64 MB Memory
- CD ROM and 3.5" disk drive for installation
- 2 GB total hard disk capacity with 200 MB reserved for installation
- 4 MB Graphic card and monitor with a resolution of 1024 x 768 pixels

With the exception of the operating system, no product recommendations are made. RSCOMBI and RSTAB basically run on all systems that fulfill the system requirements. Your computer does not need to have "Intel Inside", and it is also unnecessary to have an expensive 3D graphic card. Because RSCOMBI and RSTAB are generally used for extensive calculations, the phrase "more is better" holds true.

2.2 Installation Process

Licensed RSCOMBI users should follow the installation instructions in the RSTAB manual. RSCOMBI will be automatically installed. If there is an authorization failure message when starting the RSCOMBI module from RSTAB, the program will run as a limited but functional demo version.

3. Working with RSCOMBI

3.1 Starting RSCOMBI

RSCOMBI can either be started from the Additional Modules \rightarrow Others \rightarrow RSCOMBI menu or by selecting it from Additional Modules in the Position or Project Navigator on the left side of the screen.



Starting RSCOMBI via the Menu or the Navigator

3.2 Masks

Input to define types of load systems and the output for numerical results can be done with masks.

RSCOMBI disposes of its own Navigator with all available masks shown to the left. The masks can be opened through the RSCOMBI Navigator or the *Masks* menu. Page backward or forward through the list with the [F2] and [F3] keys or with the [<<] and [>>] buttons at the bottom of each mask. [OK] saves the input and results before leaving RSCOMBI. [Cancel] ends RSCOMBI without saving any work done. The [Help] button or the [F1] key will activate the online help system.

File and Help menus can be found in the title bar at the top . Refer to Chapter 3.3 for the explanation of their functions.



After starting RSCOMBI, the mask 1.1 General Data opens.

File Extras Help RSCOMBI1 I.I. General Data General Data Generation of General Data C. LS Groups (2nd Order Analysis) LS Group: 1 [1100] Load Systems C. LS Combinations LS Group: 1 [1100] According to Code ECE: 2, 3.4 or 5 Edit New Delete Generation parameters Concentration of the generated LS Groups or LS Combinations in one "Either/Or" LS Combinations Assign Imperfection Load System to each LS Group V Automatic generated combinations Visit S Combinations Contents Imperfection Load System to each LS Group Or in LS Combinations Imperfection Load System to each LS Group Imperfection Combinations Imperfection Load Imperfection Combinations Imperfection Load Imperfection Combinations Imperfection Load Imperfection Combinations Imperfection Combinations Imperfection Combinations Imperfection Combinations Imperfection Combinatio	RSCOMBI - [rstab3]	×
RSC0MBI1 I.1 General Data General Data General Data C LS Groups (2nd Order Analysis) LS Group: 1 (1100) Load Systems C LS Combinations LS Combination: 1 (1100) According to Code EC2.3.4 or 5 Edit New Delete Generation parameters Generation of the generated LS Groups or LS Combinations in one "Either/Dr" LS Combination Assign Imperfection Load System to each LS Group Sign of the second of System or System to each LS Group V Automatic generated combinations Imperfection Load System to each LS Group Imperfection Load System to each LS Group Imperfection Load System to each LS Group Model of LS Combinations Imperfection Load Combinations Imperfection Load System to each LS Group Imperfection Load System to each LS Group Model of automatic generated combinations Imperfection Load System to each LS Group Imperfection System Sys	File Extras Help	
Imput Data Generation of First number of generated Generat Data Image: Combination image: Combimate: Combination image: Combinatic: Combination image:	RSCOMBI1	1.1 General Data
Generating Check OK Cancel Help	⊟- Input Data General Data Load Systems	Generation of First number of generated © LS Groups (2nd Order Analysis) LS Group: 1 C LS Combinations LS Combination: 1 According to Code EC2, 3, 4 or 5 Edit EC 2, 3, 4 or 5 Edit New Delete Generation parameters Assign Imperfection Load System to each LS Group S Groups or LS Combination: Assign Imperfection Load System to each LS Group S or LS Combination: Imperfection Load System to each LS Group Imperfection based on RSTAB results Imperfection Imperfections Imperfection Imperfection Imperfection based on RSTAB results Imperfection Imperfections Imperfection Imperfection Imperfection based Imperfection Imperfection Imperfection based Imperfection Imperfection Imperfection Imperfection based Imperfection Imperfection Imperfection Imperfection Imperfection based Imperfection Imperfection Imperfection Imperfection Imperfection Imperfection based Imperfection I
	Generating Check	

Mask 1.1 General Data

Select an existing RSCOMBI case with the help of the list box. At the lower part of the window you can add *Comments* for each RSCOMBI case. The [Check] button is available to run a consistency check.

Generation of: Decide whether LS Groups or LS Combinations should be generated.

First number of generated LS Group or *LS Combination* sets the initial number of the newly generated LS Groups or LS Combinations.

According to Code: Select one of the codes in the drop down list box. Depending on the type of the load system (Permanent (Dead), Variable (Live), etc.), for each code, partial safety factors are defined Use the *Edit*, *New* and *Delete* buttons to change existing partial safety factors for existing codes or to define new codes.

Advanced Settings allows you to check the following options:

Concentration of the generated LS Groups or LS Combinations in an "Either/Or" LS Combination: Here the user simply decides whether the generated load system groups and/or LS combinations should be combined once more among each other. The "Either/Or" combination will create an envelope of all max/min results and list only the extreme result values including the origin of the vaule (ie from which LS, LG or LC the result is coming from).

Assign Imperfection Load System to each LS Group: One of the defined *imperfection* load systems in mask 1.2 will be assigned to each load system group. This option eliminates combinations without imperfection load systems and therefore reduces the number of resulting LS Groups or LS Combinations.

Automatic Generation based on RSTAB Results:

Creating every possible combination may result in so many combinations that analysis time and documentation are increased. However, many of the theoretically possible combinations are non-governing. RSCOMBI can therefore analyze RSTAB results and take into account only those LS Combinations containing the governing internal forces. Either existing or automatically created combinations may form the basis of this analysis. In each RSTAB LS Combination the participating Load Systems or LS Groups are known and this information will be evaluated by RSCOMBI. Of LS Combination ... evaluates the LS Combination selected from the drop down list box.

Of automatic generated combinations... first creates nominal load combinations, calculates these in RSTAB and then evaluates the results. Since the partial safety factors are not taken into account in the automatically generated combinations the most unfavorable combination might not be found in every case. However in many situations it will be the only way to reduce the immense number of theoretically possible LS Combinations.

Comments: Detailed notes can be entered here.

3.2.2 Mask 1.2 Combination Criteria

In this mask, decide which and how the load systems from RSTAB should be combined. The basic idea behind RSCOMBI is that it is possible to make any conceivable combination of individual load systems. To keep the amount of data to a minimum you can make refinements. At the beginning you will find all Load Systems in a list including the LS No, Load System Description and the Load System Type. The Load System Type is a criterion for the possible LS Groups or LS Combinations. Permanent Load Systems (self weight, dead load) will be always included with a fixed partial safety factor in the resulting combinations or groups. Variable Load Systems (snow, wind, live loads) may or may not be included. If only one variable load system is included there is a higher partial safety factor. If there are two or more variable loads included the partial safety factor is lower. Both factors may be defined in the code settings in mask 1.1. Exceptional Load Systems (earthquake) are assigned with a particular fixed safety factor and at the same time the safety factor of the other load systems in the combination or group are reduced to 1.0. Relieving permanent load systems use a fixed factor as determined in the Code in mask 1.1. Relieving variable load systems actually create two load groups or load combinations: a) one with the safety factor 0.9x [factor set in the Code] and b) one with the safety factor 0.9x [factor set in the Code] but permanent loads only with factor 1.0. All other load systems are generated in the normal way. Imperfection loads also have a fixed safety factor as stated in the Code in mask 1.1. More complicated combination features may be set up in the Advanced dialog of the Edit Code dialog in mask 1.1.

In the *Group* column use the *as 1 LS* sub column to determine which load systems should always occur together. To do this just enter an unique and identical text or number in this sub column for all the desired load systems. This feature helps you to link two load systems and at the end they are practically treated as one load system. Use the *Alternative* sub column to mark the load systems that cannot occur at the same time. A typical example for this is *wind from left* and *wind from right* – they obviously cannot occur at the same time in different directions.

COMBI1	1.2 Lo	ad S	ystems				
- Input Data	=	Α	В	C	D	E	F
General Data	No	LS- No	Load System- Description	Load System- Type	as 1 LS	oup Alternative	Comments
· Load Systems	1	1	Self Weight 💽	Permanent			
	2	2	Snow	⊻ariable			
	3	3	Wind in X	⊻ariable	×	Wind	
	4	4	Wind in Y	⊻ariable	У	Wind	
	5	5	Imperfection load in X	Imperfection	×	Imper	
	6	6	Imperfection load in Y	Imperfection	У	Imper	
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
					-		

Mask 1.2 Combination Criteria

3.2.3 Mask 2.1 Possible LS Groups and/or LS Combinations

Depending on whether LS groups or LS combinations are generated, RSCOMBI automatically shows the 2.1 Possible LS Groups and/or LS Combinations mask.

RSCOMBI - [Frame]			x
<u>F</u> ile Extras <u>H</u> elp			
RSCOMBI1	2.1 Pc	ossible LS Gr	oups
Lanut Data		A	в
General Data	No	Adopt in RSTAB	Combinations Criterion
Load Systems	1	X	1.35*LS1 + 1.35*LS2 + 1.35*LS3 + 0.9*LS4 + LS5
	2	X	LS1 + 1.35*LS2 + 1.35*LS3 + 0.9*LS4 + LS5
SCOMBI / [Frame] Elle Extas Help RSCOMBI1 Construction Combinations Criterion General Data Combinations Criterion General Data Combinations Criterion Constitute B Adopt Combinations Criterion Constitute Second Colspan="2">Combinations Criterion Combinations Criterion Load Systems B Adopt Combinations Criterion Combin the State State	1.35*LS1 + 1.35*LS2 + 1.35*LS3 + LS5		
	1.35*LS1 + 1.35*LS2 + 0.9*LS4 + LS5		
	×	LS1 + 1.35*LS3 + 0.9*LS4 + LS5	
	X	1.35*LS1 + 1.35*LS3 + 0.9*LS4 + LS5	
	1.35*LS1 + 1.5*LS2 + LS5		
	1.35*LS1 + 1.5*LS3 + LS5		
		Extras	
	11	×	LS1+LS4+LS5
	12	×	1.35*LS1 + LS5
			₩ith Factors
			<< >>> <u>D</u> K Cancel <u>H</u> elp

Mask 2.1 Possible LS Groups

In this final mask you may choose which combination or group should be adopted in RSTAB. Just select the box in column A. In column B you will see the *Combinations Criterion* with the load systems and the safety factors. The safety factors may be hidden, if the *With Factors* check box is deselected in the right bottom corner. If you click on the [OK] button, RSCOMBI will enquire whether or not the selected LS groups or LS Combinations should be exported to RSTAB.

Example:

A simple moment resisting frame is to withstand 5 load systems, Self Weight, Snow, Wind, Wind relieving and Imperfection. RSCOMBI must find the governing LS groups for these load systems. The relieving wind load system would lead to smaller moments in the right-hand frame corner. Therefore it may not be included in all load groups. However for further design of the connection in the right-hand frame corner you might also want to find the maximal positive moment there. Also for the foundation design the relieving (uplifting) wind load must be taken into account. RSCOMBI must thus ensure finding both results in the created LS Groups or LS Combinations. This means, that the wind load systems must be analyzed both individually as well as together. Additionally a load system of type "relieving variable" will create two load groups or combinations from an identical set of load systems. The first one treats the relieving load like a regular variable load, but reduces the safety factor entered in the code by 0.9. The second combination additionally puts the self weight safety factor to 1.00. Both together ensure that the maximal uplifting load and the maximal "gravitational" load is applied to the structure.



LS1: Self Weight - Permanent



LS2: Snow - Variable





LS3: Wind - Variable



LS4: Wind relieving – Variable



LS5: Imperfection Drift in X – Imperfection

The following masks show the input in RSCOMBI for this example and for Eurocode combinations.

RSCOMBI - [rstab3] File Extras Help	×
RSCOMBI - [rstab3] File Extras Help RSCOMBI1 General Data Load Systems	In Second Se
Generating Check	

Mask 1.1 General Data

Edit Norm			×
Norm Name EC 2, 3, 4 or 5	Norm Descripti EuroCode 1	on	
Combination factors f	or 10		
Permanent:	1.35	Imperfection:	1.00
Variable for - one Load System: - several Load System	1.50 ns: 1.35	Relieving Permanent: Relieving Variable:	1.00 1.00
Exceptional:	1.00	Advanced	l
Faktor for reduction of Gamma_M: 1.10	ıf stiffness ——		
	<u>0</u> K	Cancel	Help

Edit Code Dialog with safety factors settings

A B C D F Imput Data General Data I.2 Load System Load System Group Comments Imput Data Imput Data Imput Data Imput Data General Data General Data C D E F Imput Data Imput Data Imput Data Imput Data General Data Comments Comments Imput Data Imput Data <th>×</th>		×						
<u>F</u> ile Extras <u>H</u> elp								
RSCOMBI1	1.2 Lo	ad S	ystems					
,		Α	В	С	D	E	F	_ ▲
General Data		LS-	Load System-	Load System-	Gr	oup	Comments	
Lood Sustema	No	No	Description	Туре	as 1 LS	Alternative		
Eddu Systems	1	1	Self Weight	<u>P</u> ermanent				_
A B C D E F General Data General Data Comments General Data Comments Comments Comments Load Systems 1 Self Weight Permanent Comments Comments Comments 3 Wind Yariable Comments Comments Comments Comments 3 Wind Yariable Comments Comments Comments Comments 4 4 Wind relieving Relieving Variable Comments Comments Comments 5 5 Imperfection Imperfection Imperfection Comments Comments 9 - <td< td=""><td></td><td></td></td<>								
	<u>V</u> ariable							
	5	5	Imperfection	Imperfection				
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
□ Input Data General Data △ △ △ ↓ <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							-
1								
Generating Check	Actu	ial	<< >>		<u>0</u> K	Cance	el <u>H</u> elp	

Mask 1.2 Loads

RSCOMBI1 🔻	2.1 P	ossible LS Gr	oups
		A	В
General Data		Adopt	
- Load Sustems	NO	IN HSTAB	L'ombinations L'interion
- Results	2	X	1.351251 + 1.351252 + 1.351253 + 0.91254 + 255
Possible LS Groups	2		L51 + 1.30°L52 + 1.30°L53 + 0.3°L54 + L50 1 36×101 - 1 36×102 - 1 36×102 - 106
 Extras Help SCOMBI1 Input Data General Data Load Systems Results Possible LS Groups 			1.30°L31 + 1.30°L32 + 1.30°L33 + L30 1.36×101 - 1.35×102 - 0.0×104 - 1.05
	- 4		1.33 L31 + 1.33 L32 + 0.3 L34 + L33
	6		LS1 + 1.35 LS2 + 0.5 LS4 + LS5
	7		1.35*LS1 + 1.35*LS3 + 0.9*LS4 + LS5
	8		1.35*LS1 + 1.5*LS2 + LS5
	9		1.35*LS1 + 1.5*LS3 + LS5
	10	×	1.35*LS1 + LS4 + LS5
	11	×	LS1 + LS4 + LS5
	12	×	1.35*LS1 + LS5
I I •	1		With Fact
·			

Possible Load Combinations

3.3 Menus

The menus contain the necessary functions to work with RSCOMBI cases and results. Activate a menu by clicking on a menu title or simultaneously pressing the [Alt] key and the underlined letter in the menu title. Activate functions within the menus the same way. [Alt+D]

•

<u>0</u>K

3.3.1 File

...lets you work with RSCOMBI cases.



Menu - File

New [Strg+N]

...lets you create a new RSCOMBI case.

New RS	COMBI-Cas	e		×
<u>No —</u> 2	Description	nations		⊡
	<u>0</u> K	Cancel	<u>H</u> elp	

New RSCOMBI Case

Assign to each *New RSCOMBI Case* a *No.* and *Description*. Click on the [Downward Arrow] for a list of all existing descriptions. You may use one of these descriptions. [OK] creates the new case.

Rename

...lets rename the Description and select a different No. for an existing RSCOMBI Case.

Rename	RSCOMBI	Case		×
<u>N</u> o 1	Description			•
	<u>0</u> K	Cancel	<u>H</u> elp	

RSCOMBI – Rename Case

It is important to assign a number not already in use.

Delete

...shows all existing RSCOMBI cases in a list.



Delete Cases

<u>0</u>K

[Alt+H]

Delete a case(s) by clicking on the description and then on [OK].

3.3.2 Extras

Here you have access to further settings under Options

Calculation Details	×
LS-Combination Details	LS-Group Details
Calculate the max/min Values of	Divide Results by LG-Factor
□ N	Consider Tension Force Effect
□ V-2 □ M-3	C (1) C (1) C (1)
□ V-3 □ M-T	
Square Addition	2nd Urder Analysis Stiffness reduction factor Gamma_M: 1.100
	OK Cancel <u>H</u> elp

Options

These settings allow you to control which results will be analyzed from RSTAB. You can define for example that RSCOMBI should evaluate only the M-2 moments. RSCOMBI finds then in the RSTAB results the locations of all max or min M-2 moments and the participating load systems. These might differ from the max/min axial forces N or shear forces V. However, it's most likely that the load cases with the maximal bending moment will lead to the maximal stresses so it is a good recommendation to evaluate the bending moments. All the other settings are detailed settings for the new LS combinations or LS groups as described in the RSTAB manual.

3.3.3 Help

... opens the online help system.



Help System in RSTAB and RSCOMBI

4.1 Relieving and Exceptional load systems

COMBI1 - All possible 🖉 💌	1.2 Lo	ad S	ystems					
- Input Data		A	В	С	D	E	F	
General Data Load Systems	No	LS- No	Load System- Description	Load System- Type	Gr as1LS	oup Alternative	Comments	
Load Systems	1	1	Self Weight	Permanent				
Results	2	2	Wind	⊻ariable				
Possible LS Groups	3	3	Wind relieving	Relieving Variable				
	4	4	Uplift load	Relieving Permanent				
	5	5	Imperfection	Imperfection				
	6	6	Earthquake	Exceptional				
	7							
	8							
	9							
	10							1
	11							Ī
	12							
⊢ Results I Possible LS Groups	13							
	14							
	15							Ī
	16							
	17							
	18							
	19							
	20							-
	21							
	22							-
•								

Compilation of All Possible Load System types

This example will illustrate how particular load system types may influence the safety factors in a combination. All assumptions are based on the code settings in mask 1.1.

Edit Norm	×
Norm Name Norm Description	on
Combination factors for Permanent: 1.35 Variable for - one Load System: 1.50 - several Load Systems: 1.35	Imperfection: 1.00 Relieving Permanent: 1.00 Relieving Variable: 1.00
Exceptional: 1.00	Advanced
Faktor for reduction of stiffness Gamma_M: 1.10	
<u>0</u> K	Cancel <u>H</u> elp

Edit Code: Settings for load system types

- Permanent load systems: This load system appears in each created LS group/LS combinations. It will generally be applied with 1.35. However, a combination with a relieving variable load system creates an exception. Then the LS Self Weight – permanent is applied additionally with a safety factor of 1.00. So, one LS group must be created using 1.00 x LS1 and another using 1.35 x LS1.

- Variable load systems: When several variable load systems are combined in an LS group or combination, they will be applied with a safety factor of 1.35. If only one variable occurs, a factor of 1.50 is used.
- Exceptional load systems: this load system type deals with a safety factor of 1.00 in a combination or group. All other load systems combined as unusual will also use the factor 1.00.
- Imperfection load systems: Safety factor = 1.00
- Relieving permanent load systems: Partial Safety coefficient = 1.00
- Relieving load systems: This type of load system is combined like a regular variable load system and uses safety factors of 1.50 or 1.35. Additionally, all combinations with a relieving variable load system are recreated, but all permanent load systems in this combination are applied with the factor 1.00 (instead of 1.35).

In consideration of the above, RSCOMBI provides the following results:

RSCOMBI - [Frame]							
<u>Eile Extras Help</u>							
RSCOMBI1 · All possible 🔽 2.1 Possible LS Groups							
E: Input Data		A	В				
General Data	NI-	Adopt					
Load Systems	110	IN RSTAB	Lombinations Litterion				
- Results	2		L51+L52+L53+L54+L55+L56				
Possible LS Groups	2		L 32 + L 33 + L 30 + L 30 1 3E×1 01 , 1 3E×1 02 , 0 0×1 02 , 1 04 , 1 0E				
	4		1.33 231 1.35 232 1.3 233 1 24 1 25				
	5		151+152+154+155+156				
	6	X	LS3+LS5+LS6				
	7	X	LS1 + LS3 + LS4 + LS5 + LS6				
	8	X	1.35*LS1 + 1.5*LS2 + LS4 + LS5				
	9	×	1.35*LS1 + LS3 + LS4 + LS5				
	10	×	LS1 + LS3 + LS4 + LS5				
	11	×	LS1 + LS4 + LS5 + LS6				
	12	×	1.35*LS1 + LS4 + LS5				
			With Factors				

Results in Mask 2.1 Possible LS Groups

When the imperfections are assigned to each load system in the 1.1 General Data mask, they appear with both load systems (LS 1-Permanent and LS 5-Imperfection) in each load system group.

LS groups that contain load system 3 (Wind relieving) must consider load system 1 with both the factor 1.00 and 1.35.

All load system groups that contain an exceptional load system may only be combined with the factor 1.00.

4.2 Group as 1 LS / Alternative



Mask 1.1 General Data

SCOMBI1 - All possible 🛛 💌	1.2 Lo	ad S	ystems				
		Α	В	C	D	E	F
- General Data	No	LS- No	Load System- Description	Load System- Type	Gro as 1 LS	oup Alternative	Comments
Load Systems	1	1	Self Weight	<u>P</u> ermanent			
- Hesults	2	2	Wind in x	⊻ariable	×	Wind	
Possible LS Groups	3	3	Wind in y	⊻ariable	у	Wind	
	4	4	Wind relieving in x	Relieving Variable	×		
	5	5	Wind relieving in y	R <u>e</u> lieving Variable	у		
	6	6	Snow	⊻ariable			
7		7	Imperfection in x	Imperfection	×		
	8	8	Imperfection in y	Imperfection	У		
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
↓				- 1			

Input in Mask 1.2 Load Systems

RSCOMBI - [Frame 2-2]			×			
<u>F</u> ile Extras <u>H</u> elp						
RSCOMBI1 - All possible 2.1 Possible LS Groups						
Lanut Data		A	в			
General Data		Adopt				
L oad Sustems	No	in RSTAB				
- Results	2	X	1.35°LS1 + 1.35°LS2 + 0.3°LS4 + 1.35°LS5 + LS7			
Possible LS Groups	2		L51 + 1.35°L52 + 0.3°L54 + 1.35°L56 + L57			
	4					
	5		1.33 231 + 1.33 23 + 0.3 233 + 1.33 230 + 230			
	6	X	1.35*1.51 + 1.35*1.52 + 0.9*1.54 + 1.57			
	7	X	1.35*LS1 + 1.35*LS3 + 0.9*LS5 + LS8			
	8	X	LS1 + 1.35*LS3 + 0.9*LS5 + LS8			
			With Factors			
			< >> <u>D</u> K Cancel <u>H</u> elp			

Results in Mask 2.1 Possible LS Groups

Interpretation of the results:

- Load System 1 is defined as permanent and therefore appears in each LS Group.
- When the imperfections are assigned for each LS group in mask 1.1, they will appear in each LS group.
- LS 2 and LS 4 and LS7 will always be combined together since they are marked with identical text in the "As 1 LS" column. The same applies to LS 3, LS 5 and LS 8.
- Since LS 4 and LS 5 are defined as relieving variable, an LS group containing one of these load systems must be created containing all permanent load systems with a safety factor of 1.35 and also with all permanent loads with a safety factor of 1.00.
- LS 2 and LS 3 are grouped as "Alternative". Therefore they may never occur in one LS group or LS combination together. The same applies to all load systems that are linked to LS 2 and LS 3. This option is the most effective way in reducing reduce the number of LS groups or LS combinations required.

Appendix: Literature Reference

- [1] J. Lindner, J. Scheer Beuth Kommentare H. Schmidt Erläuterungen zur DIN 18800 Teil 1 bis 4
- [2] ÖNORM B4300-1
- [3] CSN 730035