MF Wind Uplift

Winduplift calculation for flat roofs

Copyright

Markus Friedrich Datentechnik
Inh. Lisa Römer
Bahnhofstr. 74
15732 Eichwalde bei Berlin

Telephone:	030-6670 235 - 0
Telefax:	030-6670 235 - 24
Internet:	www.friedrich-datentechnik.de
E-Mail:	service@friedrich-datentechnik.de

Contents

Introduction

Preface

Dear User,

thank you for deciding in favour of MF WIND UPLIFT. You have chosen a tool that has been developed in close cooperation with leading representatives of the roofing industry and which has become a standard in the fields of wind uplift calculation for flat roofs.

MF WIND UPLIFT has been developed especially for application engineers of flat roof technology. Profound basic knowledge of flow dynamics of the wind and its impact on flat roof sealings is imperative in order to benefit from this program.

Taking this into account, you will be in a position to make quick and reliable decisions on the optimal mechanical fixing for any flat roof. Wind uplift calculations within different frameworks of standards will be easy and quick, as you will have an individual set of independently modifiable parameters for each standard.

Limitation

However, you have to be aware of the following:

MF WIND UPLIFT cannot replace the expertise of an application engineer!

While calculating wind uplift you will have a certain margin for interpretation, which increases with every special feature of the flat roof that is not specified in the standard. Non rectangular building outline, parapets, fire walls in the area, inner courts, neighbouring buildings, "When is a building exposed?", "When are fasteners not distributed regularly?", "May green roofs be counted as additional ballast?", "Does additional ballast have to have venting properties?" ...

In particular, questions of physically effective lengths of buildings at the corners of non-rectangular buildings are always a challenge for the users of MF WIND UPLIFT.

However, you always have to consider that parameters not prompted by the program are the sole responsibility of the user!

Please note

You must update the master data on a regularly basis via the menu "extras" > "actualize data by internet".

DISCLAIMER

The program is only designed to produce individual calculations according to the standards available. These standards in no way represent reality, they merely display models derived thereof. Physically correct calculations are impossible! The difference between reality and model is, to a great extent, compensated by safety factors and conservative approaches. Numerous effects, however, at least on smaller surfaces, may lead to undersized wind load propositions. Even wind tunnel tests cannot guarantee absolute safety.
In other words, every building has its special features that cannot be adequately described with a restricted number of parameters.

Programming has been done to the best of my knowledge with the use of publicly accessible documentation, especially the respective standards. However, they only give simplified models (see above) and generally do not reflect the state of scientific development (see internal pressure consideration and dynamic wind pressure profile DIN 1055 part 4 in the issues until 1986...)!

You have also to consider that with current tools it is impossible to develop totally error-free programs. This holds true for the programming of MF WIND UPLIFT itself, as well as for the necessary Microsoft program libraries (Microsoft Foundation Classes), the development tool (Microsoft Visual C++ Version 6.0), which generates the program code, the operation system, MS Windows, your hardware including the BIOS, the processor with integrated microcode (Pentium floating point bug) and other system components.

For these reasons we rule out any liability for the use of this program.

You may only use the program if you accept this disclaimer!

On standards

For the calculation of effective forces on roof sealings there are currently "at hand" several standards and rules. Currently (July 2004) there are no universally valid standards and all of them have their own characteristic features.

In Germany, the standard of first priority at the moment is DIN 1055 part 4 from August 1986. DIN 1055 part 4, although being legally effective as it is included in the Land building regulations, does also contain errors! In particular, consideration of façade openings is definitely wrong and must not be used as described in the standard. At least as questionable are the area details for pitched roofs.

The pre-standard DIN 1055 part 40 would make sense as regards physical parameters and is almost state of the art (reference wind velocity, internal pressure as a function of windward and leeward openings, wind zones...). There are, however, legal difficulties, because it has not been published yet and has meanwhile been overtaken by the European harmonization of standards.

Counterpart to the pre-standard in the beginning was Eurocode 1 part 2-4, also known as ENV 1991 parts 2-4. Physically it is state of the art and it has been developed very carefully, thus providing detailed solutions for a wide variety of applications. Nevertheless, it still is not approved by DIN and DIBT and not included in the Land building regulations, so it should only be used with reservation.

Meanwhile the new DIN ENV 1055 part 4 is available.

As an addition to these standards Suisse SIA 160 and Austrian ÖNorm B 4014-3 are included. Other standards will be supplemented on request or demand.

Installation

Scope of delivery

Prior to installation, please check delivery for completeness. In the case of missing or defective parts we shall replace them immediately. The complete package contains the following components:

- this manual
- supplements to the manual
- licence agreement
- 1 CD

Software requirements

As an operating system you will need WINDOWS 95, WINDOWS 98, WINDOWS ME, WINDOWS NT Version 3.51 or higher, Windows 2000, Windows XP or any other compatible operating system. Preferable is the use of WINDOWS 98 or higher, since this has been the basis for test runs.

Hardware requirements

The hardware requirements for MF WIND UPLIFT are the same as for WINDOWS 95. You have to use a 100% compatible IBM PC or AT. For operating convenience, we recommend a computer with a Pentium processor, min. 16 MB RAM, hard disk 240 MB or more and a mouse.

You may use any printing device supported by WINDOWS. We recommend, however, only ink jet or laser printers, as the program uses their graphic features.

Installing MF WIND UPLIFT

MF WIND UPLIFT is installed according to the WINDOWS routine with "setup.exe". Start the installation by inserting the CD-ROM, which normally starts automatically.

Now simply follow the installation instructions. Normally you only have to answer any question by clicking **YES**, **CONTINUE** or **CANCEL**. The program will be installed on your hard disk C: in the directory C:\MF_WINDSOG and in WINDOWS will be created a program group MF WIND UPLIFT. Experienced WINDOWS users may change these defaults according to their needs.

The installation routine will create a directory MF_WINDSOG on the target drive, which will contain all program components and the subdirectory PROJEKT (projects, created with the program) for data filing.

Quick Start

Starting the program

During installation a program group MF WIND UPLIFT will be created in the start menu or within the program manager.

Normally you will start the program from the WINDOWS start menu. Therefore, in the **START** menu select **PROGRAM** and then **MF WIND UPLIFT**.

First steps

This introduction is meant to give you an overall understanding of the program functions. Experience shows that this is best done by "Learning by Doing". Start your program and follow the instructions.

Basic settings

Prior to doing the first calculations, you should enter essential master data. These values will be given as defaults for every project. They can be individually adapted according to your project requirements.

First in the menu **MASTER DATA** select **PERSONALISATION**. This data is pure text information for the cover page and the roof drawing.

In the upper line enter your company name and, if necessary, the name of your branch or department. In the lower you may enter your name, your telephone number etc.

The next menu item is **COVER PAGE**, by which you can enable or disable components of the cover page. After initial installation all options are selected and marked with a tick. You may disable not-needed options by clicking with your mouse.
For printing the cover page on your company letter head you can leave a margin at the top of the page. By clicking the button "**...**" you may insert your company logo in the upper margin, which should be at least 3 cm high.

The third item of the master data menu is **Page number...** for indicating the page number of the first page of the printout. Type 2 if you want to have an individual cover page for your calculation to be page number 1.

The following item **MEMBRANES+FASTENERS** is essential. A dialog box will appear for input of up to 80 membrane/fastener combinations. These values, along with the parameters of the building, are the basic calculation data.
Click **new** to open the dialog box for membranes and fasteners. On the first page (tab **Fastener**) enter the technical data of the fastener and on the second page (tab **Membrane**) the data of the respective roofing membranes.
Attention: membrane widths must be in descending order of size!
After data input, the values are permanently saved with **OK**. and will be listed in the membrane/fastener combination list under the name you indicate in the name field in the lower right corner.

Repeat the data input for **MEMBRANES+FASTENERS** until all relevant membrane and fastener combinations are available.

If you want to learn how to use this program, no further changes are necessary. However, if you wish you may go through the whole **MASTER DATA** menu item by item to adjust the program to your personal needs and the requirements of your company and its products.
If you have questions concerning individual menu items/dialog boxes, please refer to the respective chapter of the manual for detailed information.

Calculating wind uplift

A wind uplift calculation with all the necessary data and variations in MF WIND UPLIFT is called a project. Therefore, the first step is the creation of a project. From the **FILE** menu select **NEW**. A dialog box for both the client's address and the name of the building project will appear.

The next dialog box is for the input of physical and geometrical data of the building. You may assign up to 57 corners of the building, with the numbering going from left to right and a line feed after every third corner.

First, manually draw an imaginary building and define the lower left corner as number 1. Now number all corners anti-clockwise and indicate the length of every edge of the building.

Now you have to transfer this building to the input box for corners. Start with the first corner and enter three values. The first value defines the length of the corresponding vertical edge of the building, the second one indicates the horizontal edge length.

Note:	It is often sufficient to indicate the lengths of the building's edges which meet at the corner. The program, however, will always interpret these lengths as physically effective edge lengths, which may be bigger or smaller than the actual edge lengths!
Example:	small building overhangs or recesses.
Rule of thumb:	The physically effective lengths should coincide with the effective length of the expected wind turbulence.

The third value represents the actual edge length after the corner. This value is used in the drawing, the total of all these length values is used for area and perimeter calculation.

This trisection is necessary because of the aforementioned difference between the physically effective length of the building and the actual edge length. A specific illustrating case for this are (in most cases) inner corners. The physically effective lengths are 0, making an input unnecessary. You have to define, however, the edge of the building in order to create a roof drawing. Inner corners must be marked by ticking the respective box.

Enter all corners and edges of the building sketch and finish input by clicking the **OK** button in the lower right corner.

Next select your membrane/fastener combination. Make your selection from the name list by clicking with your mouse and confirm your choice by clicking **OK**.

The next dialog box is **TECHNICAL DATA** and contains the most important data for the building. First enter the physically relevant height of the building.

The roofage and the perimeter have already been calculated and entered by the program. If the net area value differs from the calculated values, you may now change it manually in order to be able to calculate the correct material requirements. You may also do this separately for corners, perimeter and inner areas later in the **OPTIMISATION** menu, **DEDUCTIBLE AREAS**.

The value for **LINES** has to be entered manually. It represents all perimeters where the roofing membrane is fixed with fasteners and not with PVC-coated metal sheets. Normally this is the roof perimeter, other superstructures or outlets of the building, roof lights and light panels, expansion joints, major pitch changes…

Finally, you should check and, if necessary, alter the remaining fields. You may, for example, enter additional ballast values , mark the building as open or enclosed, select the type of substrate by mouse click etc.

Note: Not all values will be effective with all standards. Please note the headings of the surrounding frames. Missing entries will not be interpreted or will result in worst case, assuming the highest loads possible.

As substrate select **CORRUGATED STEEL DECK**. As regards the pre-standard DIN 1055 part 40 and the EUROCODE you have to indicate the wind zone, for EUROCODE also the terrain category (**1** = open sea, large lakes and coastal regions, **2** = sparsely populated agricultural area, **3** = industrial areas, suburbs and villages, **4** = large cities with average building heights over 15 m) and, if necessary, building openings and parapet heights. For the moment the remaining fields are of no importance.

Close the box by clicking **OK**. Another dialog box will appear for entering the distance between corrugations. Enter a realistic value and click **OK**.

You will be prompted to save the entered data. Confirm with **YES** and enter the project name in the file selection box.

The program now calculates the wind uplift according to the standard and fixing method selected in the **MASTER DATA** menu, **INITIAL CALCULATION**. For an overview of the program facilities skip this step and select **COMPARISON** from the menu **CALCULATION**.

Two tables will appear with listings for all standards of the fastener quantity for corners, perimeters and the inner area as well as of the total quantity of fasteners needed including perimeter fixing.

Note: Calculations of the upper table assume equal wind uplift at all corners and perimeters. For this, worst case values of all corners are used.
Calculations of the lower table consider all corners and perimeters separately, thus bringing about better values for non-rectangular structures.

In the next step you can select the standard you want to use and the preferred fixing method from the **CALCULATION** menu. The results will be displayed immediately in two tables.

The upper table shows the minimum quantity of fasteners on a solid substrate with maximum fastener load , the lower table considers all relevant marginal values for real calculation. Especially for fixing through the seam on corrugated steel decks you will have higher quantities of fasteners, because there is only a limited latitude for the membrane width and the grid on the corrugations. Also, the minimum fastener quantity, the maximum line distance, the minimum fastener distance etc. have their impact on the calculation.

If **FIXING THROUGH THE SEAM** was selected in **FIXING METHOD**, the distance between corrugations and, if necessary, the minimum fastener distance and the membrane width will be included in the calculation. The program will then define the largest possible membrane for corners, perimeters and the inner areas with the maximum fastener distance.

If no reliable fixing is possible, because even the smallest membrane is too wide, you will get an error message on top of the lower table. In addition, the lower table will appear in red.

At the start just try different standards and fixing methods and try to interpret them to get accustomed to the form of display.

In the following, I shall deal exclusively with fixing through the seam. Since field and linear fixing almost automatically result in optimised fastener loads, optimisation is only necessary in special cases (e. g. linear fixing on timber decks with line distances in accordance with rafter width).

Optimisation of membrane width

The next step is the optimisation of the fastener distribution on the selected corrugated steel deck. You may do this optimisation within one project separately for each standard. A final comparison of all standards with the respective optimisation can be displayed with **COMPARISON** from the **CALCULATION** menu.

First change to the **OPTIMISATION** menu and select **MEMBRANE WIDTH,** then **CORNER AREA**. A dialog box for membrane width selection and, if necessary, for selection of additional fixing through the middle or in the third of the membrane width for this width will appear. The buttons marked with a "**g**" stand for a whole membrane with fixing through the seam, "**m**" means additional fixing through the middle of the membrane and "**d**" additional fixing in the third of the membrane width. The buttons "**f**" stand for free membrane width, *i. e.* the calculation is based on a membrane width that perfectly fits when the fastener load is equal to the design load. Click several options for **membrane width – corner area, perimeter area** and **inner area** to find the best compromise between membrane width (as few widths as possible) and fastener load (as high as possible). You will find the fastener load as percentage to the right of the selected membrane width. Repeat these steps for different membrane/fastener combinations, if available.

For the moment we shall skip optimisation with fastener patterns and turn to another standard. Therefore, select another standard from the **CALCULATION** menu and repeat the membrane width optimisation for this standard. The formerly entered values will have been deleted, since every standard can be optimised separately. Repeat the optimisation for different standards.

If the fixing does not quite match the distance between corrugations, you may reduce the **SAFETY FACTOR** in the **OPTIMISATION** menu. You do this, however, at your own risk! The safety factors for every standard are assigned to a roof area (corner, perimeter, inner). Reduction to a safety factor 1.43 in DIN 1055 part 4 of 1986 can be justified by considering partial safety factors.

Finally change to the **VIEW** menu to display **COVER PAGE** to **ROOF DRAWING** with your mouse. You may check the results on your screen using the vertical scroll bar or the page up/page down keys to get an overview.

If everything is as you want it to be, you may change to the **FILE** menu and select **PRINT** to get a hardcopy of your project.

As soon as you feel accustomed to the handling of the program and you have understood all calculation variations, you should once again check all master data and enter all default values. In particular, setting all relevant membrane/fastener combinations will save you plenty of time in your everyday work.

Basic principals

Basic physical principals

In principal all standards are calculated according to the following formula:

$$W = q * cp * SF$$

where

W is the uplifting force or, to be more precise, a pressure (force per area), or in this case a suction (negative pressure). If we divide this by the design load per fastener, we get the quantity of fasteners per m².

q is the dynamic wind pressure which primarily depends on the roof location (elevation, position). The pressure occurs because the wind blowing against the building is retained and therefore puts pressure on the building. Since the building is stationary, the wind has to flow around the building and also up and over the roof top. Because of the Bernoulli-effect, this angular overflow leads to a vacuum which sucks up the sealing.
The Bernoulli-effect is based on the fact that the pressure within a flowing medium (here: wind) is less than within a corresponding static medium (here: air beneath the roofing membrane).
Behind the roof edge the wind may get swirled and form a roll, enhancing the suction effect on the sealing.
This effect is still intensified in the case of flows over corners, since here along the roof edges two acutely conical vortexes (delta-wing-vortex) with a high rotating speed from the corner will emerge. These vortexes create particularly high wind suction forces in corners.

cp is the load coefficient (corresponding to the cw-value of a car), which is primarily dependent on the geometry of the building. For example, the cp values of long rectangular building are higher than those of square shaped buildings. The cp value consists of several components: cpe is for the shape of the building, cpi for the internal pressure coefficient, ce(z) for different additional impact factors like wind zone, terrain roughness etc. (Eurocode only).
Due to the aforementioned wind rolls, the corner, perimeter and inner areas of the roof have different load coefficients.

SF stands for safety factor. The safety factor compensates for the fact that real buildings do not have the same characteristics as cube-shaped models in the wind tunnel. The safety factor compensates for the difference between reality and the physical ideal. The safety factor does not compensate any faults in application and must not be confused with the safety factor by which the maximum design load of fasteners is divided in wind tunnel tests! The default value for SF is 1.5.

The dynamic wind pressure is identical for equally high buildings at similar locations, as is the safety factor as a constant value. Thus, the impact of the building is expressed through load coefficients which are decisively dependent on the length of the edge of the blown-against corners (cpe) and the façade openings (cpi).

The internal pressure coefficient cpi occurs only with buildings with opening façades and air-permeable roofs (corrugated steel decks, timber decks) and is normally the same for the whole building. On the basis of various publications, it is partially reduced from 0.8 to 0.6 in perimeter and corner areas. Areas that are divided by internal walls or intermediate ceilings will not be considered by MF WIND UPLIFT.

Still remaining and important are the external load coefficients. I use the plural, as for every corner there may be a different load coefficient. Thus, we have already come to the critical point: whether it is necessary to examine every corner individually and hence have different fixing methods for each and every corner or perimeter?

Calculation methods

In the case of rectangular buildings, calculation for MF WIND UPLIFT is quite easy, as, due to the identical geometry of the building, we have identical cpe values for each corner. L-shaped buildings, however, already make us think about whether to use one (worst case) solution for all corners.

MF WIND UPLIFT offers a very flexible solution to this problem. First enter the physically effective lengths of the building for each corner and the actual edge length joining this corner. The program will calculate all cpe values and then will allow individual calculation of the corners or assign the highest cpe value to all corners (**OPTIMISATION** menu, **CORNER/PERIMETER CALCULATION**).

The first method is called worst case calculation, the second one individual corner calculation. The advantage of the first method is a considerable simplification of the installation specification, the second offers a minimized fastener quantity.

Individual corner calculation does not mean smaller corner areas or perimeter widths, which are only dependant on the physically effective lengths. You will only have reduced forces due to smaller load coefficients, so you have to apply less fasteners on the same area.

Please note that the program includes the safety factor into the emerging forces at a very early stage. This may make it more difficult to define the mere forces, but for the sake of a clear program structure this is the most appropriate point.

Optimisation strategy

When all relevant data for a building have been entered, MF WIND UPLIFT will give a fixing proposal for corner, perimeter and inner areas.

During initial calculation, MF WIND UPLIFT tries to find the optimal, i. e. the largest possible membrane width for every roof area by using the following strategy. All optimisations made consequently by the user will overwrite the results produced by the program.

Process scheme for automatic optimisation of fixing through the seam:

1. select first or next roof area
2. select largest membrane width and use fixing through the seam
3. if fixing is sufficient go back to 1 or finish
4. repeat: select smaller membrane width if available and use fixing through the seam
5. if fixing is sufficient go back to 1 or finish
6. select largest membrane width and use seam and additional fixing through the middle of the membrane
7. if fixing is sufficient go back to 1 or finish
8. repeat: select smaller membrane width if available and use seam and additional fixing through the middle of the membrane
9. if fixing is sufficient go back to 1 or finish
10. select largest membrane width and use seam and additional fixing in third of the membrane width
11. if fixing is sufficient go back to 1 or finish
12. repeat: select smaller membrane width if available and use seam and additional fixing in third of the membrane width
13. if fixing is sufficient go back to 1 or finish
14. if no solution can be found, display error message

In some cases, this strategy may lead to an exaggerated total quantity of fasteners. It can be reduced to the necessary minimum by use of a pattern.

Note: Since this optimisation strategy always produces a regular distribution of fasteners, all fasteners within one area (corner, perimeter, inner) cover the same impact area. Thus, at least theoretically, all fasteners are exposed to the same force. That is why the higher design load for fasteners in the membrane centre will not be considered!

As a first optimisation, you can manually select the appropriate membrane width (**OPTIMISATION** menu, **MEMBRANE WIDTH**). For every roof area you can select a membrane width and the appropriate fixing method (seam, seam and additional fixing through the middle of the membrane, seam and additional fixing in third of the membrane width, free membrane width). As this procedure has been discussed in detail in the chapter Quick start, we now go immediately over to the next step of optimisation, i. e. patterns.

Patterns

MF WIND UPLIFT does automatic calculations with a completely regular distribution of fasteners, i.e. always the same number of fasteners is used with seam, additional fixing through the middle or in third of the membrane width. For corrugated steel decks this means one fastener per corrugation or on every second or third corrugation. This guarantees simple and reliable application. It may, however, in some cases lead to an unnecessarily high use of fasteners.

With the use of patterns, it is possible to minimize the quantity of fasteners necessary. Therefore, you have to define the fixing scheme manually. Please follow a regular distribution, which assigns equal impact areas (= working surface of the wind) to each fastener.
Regular in this sense to us means only 2 out of 3 fixing
(- x x - x x - x x, x with fastener, - no fastener).

Nonregular distribution of membrane fasteners is a special fixing method. The decision to use it is the sole responsibility of the applicator. In this case you have to ensure that no single fastener will have to bear improperly high loads. The program does not check the impact area per fastener, even if you use increased design loads at the membrane centre.

Example:	- the calculated wind load is 2.5 kN/m²
	- membrane width = 1.1 m minus 10 cm overlap
	- design load per fastener = 0.4 kN at the seam,
	0.5 kN at the membrane centre
	- distance between corrugations = 250 mm

Result:	- at the seam 1 fastener per corrugation = 4 fasteners/m² = 1.6 kN
	- at the membrane centre fixing on every second corrugation =
	2 fasteners/m² = 1.0 kN

At first glance this means appropriate fixing with an overall load of 2.6 kN per m². As a matter of fact, however, the fasteners at the membrane centre have to take the load of a larger area than those at the seam. Since this impact area is definitely relatively larger than the increased design load at the membrane centre, such fastener distribution is not permissible!

A solution may be an offset 2 out of 3 fixing:

```
seam:             x x - x x - x x - x x ...
membrane centre:  - x x - x x - x x - x ...
seam:             x x - x x - x x - x x ...
membrane centre:  - x x - x x - x x - x ...
```

The load capacity at the seam per m² is 3 * 0.4 kN = 1.2 kN, at the membrane centre 3 * 0.5 kN = 1.5 kN. In total (2.7 kN/m²), this would be greater than before with an unchanged quantity of fasteners/m² and is less critical, because you have an even area distribution per fastener.

The only critical point is the increased load for the seam fasteners that have to take forces from a larger impact area. Since all impact areas have the same size (1m² / 6), the load per fastener is 2.5 kN / 6 = 0.4167 kN. As this load is still higher than the design load of the seam fasteners, the problem is still unsolved. Once again:

MF WIND UPLIFT DOES NOT RECOGNIZE THIS ERROR!

Tips and tricks

Transferring the configuration

After complete setup of the program, *i. e.* after you have entered all data in the **MASTER DATA** menu and particularly all membrane/fastener combinations, you may want to transfer these data to colleagues or consultants.

MF WIND UPLIFT will save all data to the file WINDSOG.INI in the directory \MF_Windsog\System. Just copy this file to the same directory on the computer of your colleague or consultant.

Sending a fax

As MF WIND UPLIFT is a genuine Windows software it can also send Windows-typical faxes. Sending a fax with Windows means printing the file to a fax machine. In other words, your fax software appears like a printer and can be selected just like your standard printing device.

To send a fax please:
1.) select the elements to be printed from the **VIEW** menu
2.) select **PRINT** from the **FILE** menu
3.) select **SETUP** from the printer dialog
4.) select your fax software in the pull-down list
   NAME from the dialog printer setup
5.) finish printer setup with **OK** and start fax transfer by clicking **OK** in the print dialog
   Follow the instructions of your fax software (Enter telephone number …)

Exporting to a word processing program

Projects created with MF WIND UPLIFT can be transferred to word processing programs like WORD for WINDOWS, WORDPERFECT, LOTUS WORD PRO in RTF format (Rich-Text-Format). To do this, select **EXPORT**, then **RTF-FORMAT** from the **FILE** menu.

Only screen contents will be sent. Before exporting you have to activate all items to be displayed in the **VIEW** menu.

Exporting a drawing to CAD software

MF WIND UPLIFT can generate drawings with corner and perimeter areas for every roof. These drawings may be exported using **EXPORT**, then **DRAWING IN DXF-FORMAT** from the **FILE** menu. You may also choose file formats for AutoCAD and AUTOSKETCH.. Normally other CAD software is able to read these formats.

Exporting a drawing to graphics processing programs

If you want to transfer the MF WIND UPLIFT drawings to graphics processing programs (COREL DRAW, MICROGRAFX DRAW...) instead of CAD software, we recommend export in WMF format (Windows Meta File). Select **SEND**, then **WMF**-**FORMAT** from the **FILE** menu and select the directory for saving the WMF file.

Calculating buildings without corners

In general MF WIND UPLIFT needs at least one corner to define the basic parameters for a wind uplift calculation from its length-to-width ratio and width-to-height ratio. If a roof area is completely surrounded by other areas, however, you do not have any corners, e. g. area B in an ABC layout.

Solution: Enter the physically effective lengths of the ABC layout together with the actual lengths of the building in the dialog box **INDIVIDUAL CORNERS** and then hide all four corners in the **OPTIMISATION** menu with **HIDE CORNERS**. Additionally, you may reduce the two unnecessary perimeters on the roof area B to 0 with **INTERNAL PERIMETER AREA** from the **OPTIMISATION** menu**.**

Menu

The FILE menu

NEW

creates a new project. A project means a building and contains information about the client's address, the building project, technical data (height, length, width, perimeter of the building, perimeter fixing, design loads, roofing membranes, additional ballast…) as well as the precise geometrical data you will need for your calculations.

After selection, the program will prompt you to enter all these values. After this, the file selection box will appear, and you have to enter a new project name in the field **FILE NAME**. With clicking **OK,** project data will be saved, the project will be calculated and released for further processing.

You may call up and change these data at any time in the **PROJECT** menu.

OPEN

allows you to open saved projects for new calculation.

You have to select the project to be loaded from the file selection box with your mouse and click **OK**. You may also enter the file name with your keyboard. The extension ".PRJ" is not compulsory.

CLOSE

saves the entered and, perhaps altered data under the current project name to your hard disk and exits project processing.

SAVE

saves the current status of the project.

The project remains loaded for further processing. This allows you to save successful optimisation and further processing or refinement without risk of data loss.

SAVE AS

saves the current project under a new name. The new project becomes the current project.

The file selection box will appear to specify a new unique name. Type a new name in the field **FILE NAME** and confirm this action by clicking **OK**.

This function is normally used for making copies of existing projects, which is particularly convenient for projects with several individual roof areas which have to be dealt with separately.

PRINTER SETUP

allows the selection of a printer and its configuration.
Since this box is a standard WINDOWS function, which furthermore is complemented by different printer installations, please see the WINDOWS or the printer manual for operation information.
Your fax software will also appear as a printer under Windows and may also be setup with this dialog.

PRINT

is used to send the project data, as well as the wind uplift calculation results, to the printer. In the dialog box the default printer is selected. Start printing by clicking **OK**.

All components that you have selected in the **VIEW** menu will be printed, unless you have not changed the page selection, which indicates the range of pages to be printed.

If you want to, you may change the selected printer port and the respective printer by clicking **SETUP** (see **PRINTER SETUP**).

PRINT PREVIEW

gives a full-screen display of the ready-to-print document. You may scroll forwards and backwards through the document, change the size (**ZOOM**) and start printing.

EXPORT

will display the following five submenus.

DRAWINGS IN DXF FORMAT

allows you to save the roof drawing in DXF format. The generated file will have the name of the project with an extension "DXF".
The DXF format is from Autodesk, the manufacturer of AUTOCAD and AUTOSKETCH, and can be imported and processed by most CAD software.
In the dialog box you may enter parameters for the size of the output area, crosshatches and dimensioning.
To avoid incompatibility of versions or different CAD software, there are different export options for AUTOCAD or AUTOSKETCH.

DRAWINGS IN WMF FORMAT

Allows you to save the roof drawing in WMF-Format. The generated file will have the name of the project with an extension "WMF".
After calling up the menu option, a file selection box will appear for entering the path and, if necessary, changing the file name.
You will be prompted to indicate the drawing size, with reasonable default values already given. If the drawing is not imported into the target software, you may zoom it to fit.

DRAWINGS TO CLIPBOARD

Allows you to export the roof drawing to the WINDOWS clipboard. From there the drawing may be inserted into any WINDOWS compatible program with the respective function (in most cases in the **EDIT** menu, **PASTE**).
You will be prompted to indicate the drawing size, with reasonable default values already given. If the drawing is not imported into the target software, you may zoom it to fit. Processing of the temporarily stored drawing is done only by WINDOWS. WINDOWS keeps the drawing in the clipboard until new data is copied to the clipboard or WINDOWS is shut down.

ASCII FORMAT

allows the export of text to an ASCII file. ASCII files are pure text files and are the smallest common denominator for all text formats, thus making it possible to load and process them in any word processing program. Please note that this smallest common denominator is so small that any formatting features (font type, font size) will be lost with export. Output of roof and corner drawings in ASCII format is not possible either.

After selecting this option, a dialog box will appear where you can select the target (file or clipboard), type of table output (forming columns by tabs or spaces) and conversion of umlauts for DOS or Windows applications. Additionally, you may indicate whether you want the individual paragraphs to have a border line.

If you have selected **FILE** as target, then after setup, a file selection box will appear for entering the file name for the new ASCII file and the path where it is to be saved.

If you have selected **CLIPBOARD**, you may import the files into any Windows application which is able to load texts through the Windows clipboard. Normally you use **PASTE** from the menu **EDIT**. You do not have to keep MF WIND UPLIFT running in order to import from the clipboard.

RTF FORMAT

allows you to export all window contents, *i. e.* text and graphics, to an RTF file. RTF stands for Rich-Text-Format. This format can be imported and processed by almost all standard word processing programs. Contrary to ASCII files, all text attributes (font type, borders...) and graphics will be preserved. MS WinWord at least gives the same results as the printout of MF WIND UPLIFT.

After selecting the option, a dialog box will appear for entering the target file name and the respective target directory.

SEND AS E-MAIL

will load the standard Windows e-mail client (usually Microsoft Outlook) and attaches the current project to the e-mail. Beforehand, you will be prompted to select the output format for the attachment. Select the original MF WIND UPLIFT format or rich-text-format for transfer to word processing programs (MS Word etc.), since both formats allow for a transfer of the complete project. By selecting options DXF and DWG you will transfer only the application scheme to AutoCAD or to another CAD software.

QUICK ACCESS TO PROJECTS

is a list at the lower part of the **FILE** menu with the four last-processed projects. Clicking the file name instantly opens the respective project, similar to the command **OPEN** with subsequent selection of the file name.

EXIT

shuts down the program and returns you to WINDOWS.
If there are still open project files, the program will prompt you to save every file separately.

The MASTER DATA menu

NOTE: You will only see the **MASTER DATA** menu as long as no project has been loaded. To display this menu, you have to close all projects with **CLOSE** from the **FILE** menu.

The options **PERSONALISATION, COVER PAGE, DYNAMIC WIND PRESSURE DIN 1055 T4, FONT** and **FILLING** not only affect new projects but also existing projects, as soon as these projects are loaded. In general, this is also true for the **MINIMUM PERIMETER WIDTH,** except for manually changed values.

The other values will be taken over into new projects, where they can be altered and will be saved with the project. Thus, later changes of **MEMBRANE+FASTENER, SAFETY FACTOR** and **INTERNAL PRESSURE COEFFICIENTS DIN** will have no impact on already existing projects.

PERSONALISATION

allows you to enter your company's name, your department and your name. These two lines will be printed on the cover page of the printout as well as in the legend of the roof drawing for origin indication.
However, you will have to set the corresponding ticks in the following **COVER PAGE** menu.

COVER PAGE

is for setup of the cover page, i. e. the first page of the printout.
Click all boxes of the dialog box that appear to mark the features that will be printed on the cover page. The tick indicates that this field will be printed on the cover page. Missing ticks mean the field will not be printed.

By entering an upper margin, you may shift the print down to print on your letter head. In this case you may not select all features for the cover page, as space may be not sufficient on a DIN A4 sheet.

PAGE NUMBER

you will need this, if the first page to be printed with MF WIND UPLIFT is not the first page of the complete printout. This is normally the case if you collect the printout in a file with a separate cover page or if you have an extra company cover page. Enter the page number for the first page to be printed. The following pages will be numbered in ascending order.

MEMBRANE + FASTENER

Let´s enter membrane/fastener combinations. After selection of a listed item, a dialog box will appear for you to enter the fastener and membrane values, as well as the name of this combination. The name you enter in the field **NAME:** in the lower right corner will be displayed in the list when this menu item is selected again.

On the left-hand side of the dialog box for membrane/fastener combinations, you may define the type of fastener.

You may enter the following values:

- maximum possible design load for corner, perimeter and inner areas of the roof (if different fasteners are used) for fixing through the seam and fixing through the middle of the membrane.
  Note: The program will only consider the design load in the central membrane area under the following conditions:
  1.) fixing through the seam with manual pattern definition for membrane centre
  2.) seam-field fixing
  Explanation: The increased design load is only to be considered if the respective fasteners undergo an increased load, which is only the case if the respective fasteners are subject to an increased area impact.
- minimum quantity and the name of the applicable types of fasteners
- a factor for twin fasteners (in % of the additional force-bearing capacity of the second fastener in comparison to a single fastener)
- distance between fasteners for perimeter fixing. No input sets fasteners for perimeter fixing to the distance between corrugations of the steel deck or to the minimum distance for homogenous substrates.
- fastener distance with linear fixing on homogenous substrate. On corrugated steel decks this value is replaced by the distance between corrugations.
- minimum distance between fasteners and standard distance for linear fixing.
- maximum distance between two fixing lines for linear fixing.

Individual values for every roof area make it possible to use different fasteners for every corner and/or perimeter and/or inner area of the roof.

On the right hand side of the dialog box for membrane/fastener combinations, you may enter the available membrane widths and the respective overlap.

ATTENTION: Membrane widths are indicated in meters, whereas (seam) overlap is given in centimetres!
The membrane width must be in descending order of size.

You may alter these values according to your project with **MEMBRANE AND FASTENER** from the **PROJECT** menu.

MEMBRANE + ADHESIVE

allows you to define membrane/adhesive combinations including all technical specifications.

On the left hand side, you may enter the exact membrane name, the available membrane widths and the necessary overlap for bonding.

On the right hand side enter the trade name of the adhesive in the field **ADHESIVE NAME** and the listing of the membrane/adhesive combination in the field **NAME**: By selecting this listing while creating or processing a project, you will have access to the completely preconfigured membrane/adhesive combinations.

The actual configuration of the membrane/adhesive combination is done with the help of the two buttons **ACCORDING TO HEIGHT** and **ACCORDING TO WIND UPLIFT**. These buttons represent two principally different approaches for the calculation of bonded superstructures.

The first method is selected with the **ACCORDING TO HEIGHT** button and produces an installation specification according to the height of the building.
Clicking **ACCORDING TO HEIGHT** calls up a listed dialog box. Click **NEW** to enter a membrane/adhesive combination. Enter the height of the building in the field **VALID FOR HEIGHTS UP TO ... M**, which shall be applied for the following installation specification. Typical values are derived from DIN 1055 T4, e.g. 8 m and 20 m.
In the second step you define the roof area, for which the installation specification is valid. You will find four buttons **CORNER**, **PERIMETER O** (for external perimeter, Eurocode only), **PERIMETER I** (for internal perimeter or perimeter area) and **INNER** at the lower part of the box. The selected roof area will be marked with an (X).

In the field **MATERIAL REQUIREMENTS** enter the quantity of required adhesive for the selected roof area. For self-adhesive membranes set 0.
Further down you will find a text field for entering an installation specification, which may, for instance, have the following wording:

```
4 stripes FolioBit PU-adhesive per m with strip width >= 1 cm continuous
application
```

Enter all data on required materials and installation specifications for all roof areas and click **OK**. A list box will appear where you can enter installation specifications for additional building heights by clicking **NEW** or return to the membrane/adhesive dialog box by clicking **OK**.

The second method for entering installation specifications is accessed by clicking **ACCORDING TO WIND UPLIFT**. Here you may enter installation specifications depending on the wind load and not on the building height. Follow the instructions given for installation specifications **ACCORDING TO WIND UPLIFT**.

SAFETY FACTOR

corresponds to the safety factor as postulated in the flat roof directives (chapter 8.1, item 2) and DIN 1055 part 4 (chapter 3, par. 3.3).
It is a multiplying factor for the corresponding calculated dynamic wind pressure. Since, beginning with the dynamic wind pressure calculation, all formulae in all standards are linear it is as a matter of fact a multiplying factor for the quantity of fasteners .
The default values may be altered for individual calculation methods (standards) depending on your project. This value has no influence on the 3-6-9, 4-6-8 and 4-8-12 rules and is only taken into account for EUROCODE after selecting the respective option **EUROCODE** from the **MASTER DATA** menu.
In the case of calculations with partial safety factors (DIN 1055 part 4 only) the value may be set to 1.43 (see DIN 1055 part 4, chapter 3, par. 3.3).

MINIMUM PERIMETER WIDTH

for setting a perimeter width that must be the minimum value, even if a lower value can be justified by calculation.

For EUROCODE this value refers to the internal perimeter.

DYNAMIC WIND PRESSURE DIN 1055 T4

for selecting a method of dynamic wind pressure calculation

- according to the step function as described in table 1 (DIN 1055 part 4, August 1986)
- according to the comments "on section 5: characteristic wind load " (continuous curve with (z) = v (10m) * $(z / 10)^{0,11}$, where v (10m) = 34,6 m/s and z = height)
- or with the more convenient of the two methods.

INTERNAL PRESSURE COEFFICIENT

for setting up default load coefficients of DIN-1055- and SIA 160 for internal pressure of open buildings. The default for all values is 0.8. If necessary you may enter other values, e. g. 0.6 for corner and perimeter area.
If the box **ACCORDING TO EUROCODE** is ticked, the internal pressure in calculations according to DIN 1055 part 4 and SIA 160 will be calculated in accordance with the terms of EUROCODE.
You have to define the façade openings in the dialog box **TECHNICAL DATA**.

LARGE CORNERS AT ROOF PITCHES > 8° (DIN 1055 T4)

In DIN 1055 for roof pitches over 8° there are only small square corner areas (see page 16, table 11 bottom, referring to table 12).
This option is to define constrained "large corners", which are typical for flat roofs, on rectangular buildings (b/a > 1,5).
If ticked you will get large corners, otherwise the program will follow the DIN standard.

CORNER ANGLE SETTINGS

Corners in a building with an angle of 170° can hardly be called corners. With such an obtuse angle you will certainly not find the characteristic two acutely conical vortexes that would account for a corner formation with increased load coefficients. Very acute angles are not normally treated like right angles either, because the wind will blow mainly along the building and only a small part is redirected towards the roof.

You may define separately for acute and obtuse angles, at what stage a corner is a corner under wind technical considerations.

INSTALLATION SPECIFICATION COMMENTS

In order not to have to type the same installation specification for every project, you may enter standard installation specifications here. Comments are entered separately for different supporting decks.

These comments will be automatically integrated into any new project. You may change comments in existing projects at any time by using **INSTALLATION SPECIFICATION COMMENTS**.

INITIAL CALCULATION

for setting the standard and the preferred fixing method the program uses for calculation after a new project has been created and the necessary project data has been entered.
If there are no favourite standards, you may select **COMPARISON** as initial calculation by enabling the first option.
This selection may be changed at any time during calculation.

VIEW

for indicating the pages, you want to be displayed on your screen during initial calculation. In other words, the ticked options will be displayed when creating a new project.

You may change the settings at any time in the **VIEW** menu.

USER SETTINGS

On the second page of the printout you normally find the user settings, *i.e.* all the marginal conditions used for calculation. This also includes values which you may prefer to be confidential, in particular, for instance, the assumed design load per fastener and the minimum quantity of fasteners.

Here you may indicate the marginal conditions to be included in your printout. Ticked parameters will be displayed.

INDIVIDUAL CALCULATION

The individual calculation consists of two tables: the upper one is the purely physical calculation, the lower one contains the transfer to membrane widths and substrate with consideration of additional marginal conditions, such as minimum quantity of fasteners/m², maximum fixing profile distances, minimum fastener distance etc.

Similar to the user preferences, you may find some parameters you do not wish to disclose to your customer. Here you can define which parameters will be displayed.

FONT

allows you to choose a font type for the screen and the printer.
You may select any of the installed fonts on your computer.
You may also select different fonts for text and the roof drawing using the two submenus:
TEXT and **DRAWING.**

For displaying in columns, you should choose a fixed font, as only they ensure numbers and tables are printed in columns. For the roof drawing it is better to choose a true type font to ensure correct vertical printing (for dimensioning).

NOTE: Both fonts should have the same size!

Our tip: COURIER NEW in 14 pts for texts
                  ARIAL in 14 pts for the roof drawing.

FILLING

allows you to set the crosshatches of corner and perimeter areas in the roof drawing. These settings will be used as defaults for the roof drawing and for export in DXF format.

The listings depend on your version of WINDOWS and characterize the type of crosshatches.

You may change and save these settings depending on your project (**VIEW** menu, **SETTINGS DRAWING**).

ZOOM FACTOR

offers a preselection for the size of the screen display. Select a percentage which ensures a clear and comprehensible presentation.
Find your favourite settings by loading a project and adjusting the settings with **ZOOM FACTOR** from the **VIEW** menu. Enter this value in the **MASTER DATA** menu. It will be used automatically in future calculations.

TIP: You do not have to choose a setting from the table, manual settings are also possible. At a screen resolution of 800x600 a setting of 125 is recommended.

The PROJECT menu

NOTE 1: You will only see the **PROJECT** menu when a project is opened.

NOTE 2: Changes to the options **SELECT MEMBRANE/FASTENER COMBINATION, MEMBRANE AND FASTENER**, **SELECT MEMBRANE/ADHESIVE COMBINATION, MEMBRANE AND ADHESIVE, TECHNICAL DATA, INDIVIDUAL CORNERS, CORRUGATED STEEL DECK, CP-INNER AREA, CP-COEFFICIENTS, INTERNAL PRESSURE COEFFICIENTS** and **PARAPET HEIGHTS** will completely reset all optimisation.

In other words: The selection of membrane width and patterns will be deleted, the project is reset to default!

Explanation: Calculation conditions may have changed.

Therefore, when selecting one of the aforementioned options without changes, do not click **OK**. Leaving the box by clicking **CANCEL** will retain all optimised settings.

CLIENT

for changing the client's address entered with a new project **NEW**.
If you do not need all the lines when entering the address, leave the upper lines blank to avoid blank lines in the printout.
This input is optional.

BUILDING PROJECT

for changing the name of the building project entered with **NEW** from the **FILE** menu.
This input is optional. It is recommended, however, to enter at least one line, as the building project will also be printed in the legend of the roof drawing.

SELECT MEMBRANE/FASTENER COMBINATION

allows you to change the applicable membrane/fastener combination. After selection of one of the listings, all calculation values including optimisation will be reset. The project will be calculated with the new membrane/fastener combination.
You may also select a combination that can be additionally defined with the option **MEMBRANE AND FASTENER**. Additionally, entered membrane/fastener combinations will only last for the lifetime of the project.

MEMBRANE AND FASTENER

allows changes to the selected membrane/fastener combination. A dialog box for changing the fastener and membrane parameters will appear.

On the left-hand side of the dialog box you can enter fastener parameters, on the right hand side, membrane parameters may be altered. Enter a name in the field at the lower right corner.
For more detailed information on the individual parameters see the chapter on the master data menu.

SELECT MEMBRANE/ADHESIVE COMBINATION

allows you to change the selected membrane/adhesive combination. After selection of one of the listings, all calculation values including optimisation will be reset. The project will be calculated with the new membrane/adhesive combination.
You may also select a combination that can be additionally defined with the option **MEMBRANE AND ADHESIVE**.

MEMBRANE AND ADHESIVE

let's you change the selected membrane/adhesive combination. A dialog box for changing the membrane widths, adhesive parameters and particularly the installation specification will appear.

These changes are valid for the current project only, master data remain unchanged.

Detailed explanations on how to enter changes are given in the paragraph on the master data menu.

INDIVIDUAL CORNERS

allows you to enter various roof designs with right-angled corners.

You may define up to 57 corners, where you have to indicate the physically effective vertical and horizontal length of the building for every corner as well as the actual length of the building's edge joining the corner. A tick in front of the values indicates inner corners.

After leaving the box by clicking **OK,** the program will calculate the area and the perimeter. These data will be automatically included in the dialog box **TECHNICAL DATA** when you first select this with **NEW** from the **FILE** menu. The length for line fixing has to be entered manually. You may change these settings at any time in **TECHNICAL DATA** to adapt them to the real building.

The program will check the settings to make sure the building contour is closed. Otherwise you will get an error message prompting you to correct the lengths.

TIP: Clicking the button **RECTANGLE** will open a quick input box for such buildings, where you have to enter only the length and the width of the building.

LARGE CORNERS AT DN > 8°

In DIN 1055 for roof pitches over 8° there are only small square corners (see page 16, table 11 bottom, referring to table 12).
This option enables you to define constrained "long corners", which are typical for flat roofs on rectangular buildings (b/a > 1,5).
If ticked, you will get long corners, otherwise the program will follow the DIN standard.

TECHNICAL DATA

for changing settings for technical details, such as building height, roof area, perimeter, line fixings, dynamic wind pressure, additional ballast, building openings, substrate etc. entered with **NEW** from the **FILE** menu.

This box has several registers. On the first register **ALL STANDARDS** you will find data that is valid for all standards. The other register contains additional information that is only considered by the respective standard.

Register ALL STANDARDS

The settings for **AREA** and **GIRTH** will be automatically calculated by the program after entering the values for **INDIVIDUAL CORNERS.** However, you may change them manually to deduct inner court, light panel or elevator shaft areas etc.

In the field **LINES** you have to enter all joint lengths, *i.e.* all roof edges, expansion joints and roof pitch changes (both double) etc., at least if no compound steel sheets are used. This value will be necessary for calculating the total quantity of fasteners (**LINES** x **DISTANCE BETWEEN LINE FIXINGS** from the **MEMBRANE AND FASTENER** dialog).

The roof pitch will be used as a calculation parameter only in DIN 1055 part 4. Otherwise the roof pitch is only used for excluding standards (DIN up to 35°, pre-standard and EUROCODE up to and including 4°).

ATTENTION:
- the roof pitch has to be entered in degrees not in percentage
- additional ballast will be calculated "as indicated"
- there will be no prompting of building opening areas as defined in EUROCODE/PRESTANDARD
- contrary to the standard, Eurocode will also be calculated for roof pitches of exactly 4°!
- a concrete ceiling may be regarded as "open" (panelled ceiling without joint flushing etc.)

Register DIN 1055 T4 PRE and EUROCODE

You may select the following settings:

- wind zone: from 1 (southern Germany) to 4 (north west German coastal region)
- terrain category from 1 (open sea + coast) to 4 (large city with an average building height > 15 m)
- building openings, where you have to enter the largest opening area which the wind can blow against at any one time, in the field **WINDWARD**. In the field **total,** you have to enter all openable areas including those already taken into account in the field **WINDWARD**.
- parapet height in meters, if it has the same height all around the building.
- absolute altitude of roof area
- friction coefficient c_{fr}. Only in the case of horizontal shearing forces. For corrugated steel decks and sandwich elements without sealing membranes select 0.04.
- service life coefficient c_{TEM} (only for short-term buildings)
- c_{ALT} (ALT = altitude, only for buildings on high mountains)
- **IMPACT AREA** should be set to area. The program will determine the size of every corner flange, every perimeter and the interior area and will calculate the correct load coefficients out of these reference areas. Corner areas always consist of two reference areas, calculation, however, is always been done with the conservative value of the smaller flange.
The setting **< 1m²** will produce the highest load coefficients, however, you may want to use it in the case of incomplete building data to be on the safe side.

Register TECHNICAL STANDARD (GERMANY)

You may set the wind zone and tick the building as residential/commercial building.

The wind zones are from 1 (southern Germany) to 4 (north west German coastal region) and correspond with the data for Eurocode.

Ticking residential/commercial building sets the maximum perimeter width to 2 m. It may be also used for closed hall-type buildings if its width is <= 30m.

Register Pre-standard

You may set the wind zone and the building openings.

The wind zones are from 1 (southern Germany) to 4 (north west German coastal region) and correspond with the data for Eurocode.

Building openings have to be entered in accordance with Eurocode, contrary to the definition of the pre-standard 40. The program will recalculate these values automatically. Enter the largest opening area which the wind can blow against at any one time in the field **WINDWARD**. In the field **total** you have to enter all openable areas including those already considered in the field **WINDWARD**.

Register SIA 160

Enter the altitude coefficient for the building location and the wind zone according to the standard definition.

Register ÖNORM

For the standard ÖNorm 4014-1, all regions and the respective cities are predefined. You may select the settings from the respective drop-down list. The corresponding absolute altitude will be displayed immediately to the right. If this value does not correspond with the location of the building, you may enter the correct value in the field under the drop-down list **Region**. Additionally, you may select a terrain category.

CORRUGATED STEEL DECK

for changing the distance between the corrugations of the steel deck. Settings are given in millimetres!

This option will only be enabled if you have enabled the substrate radio button **CORRUGATED STEEL DECK** in **TECHNICAL DATA**.

CP-INNER AREA

If no setting has been made for this option, MF WIND UPLIFT will calculate the cpe value for the inner roof area (not the cpi!) on the basis of the most unfavourable length-to-width and height-to-width ratios of all individual corners.

For small corners, especially façade overhangs, you will in most cases find a height-to-width ratio > 0,4, which will lead to a change in the cpe value for the inner area from -0,6 to -0,8 (DIN 1055 part 4, table 12, note 3, last sentence).

Since this DIN consideration is for a whole building and is not to be used for subordinate corners, the approach of MF WIND UPLIFT is often too conservative. By entering the overall length and width of the building, you will get a realistic cpe value for the inner area.

The option **FROM GIRTH** defines the length of compact buildings by calculating the overall length and width and entering the respective values in the fields of the box. Caution: For filigree and heavily partitioned buildings this method does not always produce correct results.

CP COEFFICIENTS

If a building has been examined in a wind tunnel, you may transfer the load coefficients gained during testing into the calculation here.

In cases where higher load coefficients appear to be appropriate because of previous damage, you may enter more secure values.

ATTENTION: As soon as you enter the load coefficients manually, the program will stop calculating them automatically, even if it would produce higher values!

INTERNAL PRESSURE COEFFICIENT

allows you to change the internal pressure coefficients for open buildings with ceilings made of corrugated steel, timber and other air permeable materials.

Since DIN 1055 part 4 as of August 1986 contains unreliable information on internal pressure, in the lower part you will find a box named **ACCORDING TO EUROCODE**. By enabling this function with a tick, the internal pressure will be calculated in DIN the same way as in EUROCODE. This will be based on the data for openings in the facade given in the dialog box **TECHNICAL DATA**. If these data are missing, the program will do the calculation with the aforementioned settings despite the enabling of this function.

ATTENTION: The use of **ACCORDING TO EUROCODE** is in no way legitimised by any standard or rule. The use of this calculation method (as well as of the whole program) is the sole responsibility of the user.

PARAPET HEIGHTS

is only active for calculation in EUROCODE mode. You may enter an (uplift reducing) parapet height for every perimeter.
If all roof perimeters have the same parapet height, you may indicate this in **TECHNICAL DATA** by entering one single value.

The CALCULATION menu

NOTE: You will only see the **CALCULATION** menu if at least one project is loaded.

3-6-9 RULE

calculates the roof with 3 fasteners per m² in the area, and 6 and 9 fasteners per m² in perimeter and corner areas respectively. The partition of the areas is done according to DIN 1055 part 4, table 11 No. 3, or to the directives for flat roofs (rectangular corners). Only buildings with a height of up to 20 m will be calculated!

Although the sequence of numbers has been taken from the directives for flat roofs, the 3-6-9 rule is no implementation of the latter!

NOTE: There is no minimum perimeter width of 2 m!

If you want to have a minimum perimeter width according to the directives for flat roofs you may enter a principal setting in the **MASTER DATA** menu under **MINIMUM PERIMETER WIDTH**. Specific changes for individual projects can be made with **INTERNAL PARAMETER AREA** from the **OPTIMISATION** menu.

4-6-8 RULE

in general, corresponds with the 3-6-9 rule except that 4 fasteners per m² in the area, 6 fasteners in the perimeter area and 9 fasteners in the corner area are used.

Although the sequence of numbers has been taken from DIN 18 351, the 4-6-8 rule is no implementation of DIN 18 351!

Please note that the 3-6-9, 4-6-8 and the following 4-8-12 rule will be calculated without consideration of physical parameters (dynamic wind pressure, cp-values)!

4-8-12 RULE

in general, corresponds with the 4-6-8 rule except that 4 fasteners per m² in the area, 8 fasteners in the perimeter area and 12 fasteners in the corner area are used.

TECHNICAL STANDARD Sep. ´97

performs calculations in accordance with the "instructions for load calculation" published as a supplement to the technical standard for German roofing companies in September 1997.

DIN 1055 PART 4, LARGE CORNER

defines the quantity of fasteners for the area, the perimeter and the corner as well as the total quantity of fasteners on the basis of the data from DIN 1055 part 4 for wind loads, depending on the size of the building. Corners are formed in rectangles (see 3-6-9- rule). Perimeter widths are not restricted to 2 m. If necessary, you can do this manually with **INTERNAL PERIMETER AREA** from the **OPTIMISATION** menu.

ATTENTION: The cp coefficient used for calculation is taken from table 13 of DIN 1055 part 4, i.e. it corresponds to the coefficient for small corners.

Large corners does not mean a pitched roof according to table 12. This option is only to facilitate easier application on site or, on small roofs, to avoid the forming of mini-corners with flange widths smaller than the smallest membrane width,.

DIN 1055 PART 4, SMALL CORNER

corresponds to DIN 1055 part 4 with large corners, the corners, however, are L-shaped (DIN 1055 part 4 table 11 No. 4).

There will be no perimeter width restriction to 2 m. You have to set this manually in the **OPTIMISATION** menu with **INTERNAL PERIMETER AREA** and **EXTERNAL PERIMETER AREA** .

DIN 1055 PART 4 CONCEPT

calculates on the basis of the "yellow print" of DIN 1055 part 4 published in March 2001. Calculations correspond largely to Eurocode 1991-2-4, on which this standard is based.

DIN 1055 PRESTANDARD 40

calculates area and pressure values according to the withdrawn DIN 1055 part 40 pre-standard. Area partition mostly corresponds to DIN 1055 part 4 with small corners. For buildings with a width-to-height ratio < 0.1, no corner areas will be formed. Internal pressure coefficients are defined on the ratio between inlet and outlet building openings, dynamic wind pressure will be calculated continuously (no step function according to the table), the wind zone will be considered for calculation.

SIA 160

calculates according to Swiss SIA 160 with additional consideration of SIA 271. Prior to calculation, set height coefficient with **OPTIONS SIA 160** from the **PROJECT** menu. The wind zone will first be taken from the **TECHNICAL DATA**, it may also be set, however, with **OPTIONS SIA 160**.

ÖNORM

is based on the ÖNorm 4014-1 from October 1st, 1993 including supplement 1. The region, as well as the nearest city, are to be selected in the box **Technical data**, from the **Project** menu.

EUROCODE

calculates according to "EUROCODE 1: Basis of design and actions on structures, part 2.4: wind actions" from May 1995. At the moment (October 1998) this is still a pre-standard (DIN ENV 1991 part 2-4).

Select the country where the building is located on the register **EUROCODE** in **Technical data** from the **Project** menu. MF WIND UPLIFT will change the internal constants to the corresponding values of the country, thus implementing the country requirements included in supplement A of the Eurocode.

FIELD FIXING

together with the following menu options **LINEAR FIXING** to **MIXED MODE,** this represents the selection of fixing methods. You can only enable one option at a time. The selection will be ticked in front of the option.

If **FIELD FIXING** is selected as fixing method, all optimisation options below the option **SAFETY FACTOR** in the **OPTIMISATION** menu are disabled. Use of these options would be pointless, since field fixing always ensures optimal load parameters.

Field fixing is characterised by regular horizontal and vertical distances between fasteners. Exception to this rule is fastening on corrugated steel decks, since in the perpendicular direction to the corrugations a whole multiple of the amount of corrugations has to be used. See lower table of the individual calculation for the corrugations on which fasteners have to be set. This will be indicated before the fastener distance on the corrugation.

Fixing on every second corrugation with a distance of 350 mm along the corrugation will be displayed as follows: `2 / 0.350m`

LINEAR FIXING

LINEAR FIXING does not stand for line fixing for taking horizontal loads. This has to be set in **TECHNICAL DATA**, option **LINES**.

LINEAR FIXING means that you put as many fasteners as possible on one line, with the distance between the lines defining the number of fasteners. Since there is normally no restriction as to the setting of the distance between the lines you will mostly have an ideal quantity of fasteners with linear fixing. Exceptions occur when the maximum distance between lines has been exceeded or the minimum quantity of fasteners has a limited impact.

With **LINEAR FIXING** in the **OPTIMISATION** menu options **DISTANCE BETWEEN CORRUGATIONS** and **DISTANCE BETWEEN LINES** will be available.

If linear fixing is done with fixing profiles, for calculations according to DIN 1055, area forming with large corners is recommended.

MF WIND UPLIFT will form linear fixing by setting a row of fasteners on the corrugation or at the minimum distance between fasteners. Then the required distance between these lines, in order for the minimum quantity of fasteners to be maintained, has to be set. It is at the sole discretion of the designer or applicator in which form these lines should be arranged and sealed.

FIXING THROUGH THE SEAM

Fixing through the seam is the most frequently used fixing method. Its characteristics have been discussed in detail in the introduction, so I shall not go into further details. Since with this form of fixing, you do not normally reach optimal fastener loads, you have special optimisation options.

MF WIND UPLIFT allows manual selection of applicable **MEMBRANE WIDTHS** and fastener patterns (**PATTERN**). Additionally, corner and perimeter areas may be formed as whole multiples of the selected membrane width (**ADJUST AREAS**). You will find all these option in the **OPTIMISATION** menu.

SEAM/FIELD FIXING

The seam/field fixing is a combination of seam and field fixing in one membrane. The program will select the widest membrane from the membrane/fastener combinations, fix it in the seam and, if necessary, place missing fasteners throughout the membrane. MF WIND UPLIFT uses, in ascending order, fixing through the middle of the membrane, in third of the membrane width, in fourth of the membrane width etc.

Contrary to fixing through the seam, there will be no information on cover strips or other additional sealings for the fasteners in the membrane (see b/s/t system).

ATTENTION: To ensure regular fastener loads, the fasteners in the membrane will be fixed at the same distance as at the seam. The design load in the membrane centre therefore is equal to the design load of the seam fasteners.

BONDING (HEIGHT)

adjusts the installation specifications for bonding which are dependent on the height of the building and entered with **MEMBRANE AND ADHESIVE** for the current project.

Although no real calculation will be done and no individual values will be produced, you will get useful information, as the corner and perimeter areas are defined and documented. Additional information includes material requirements, installation specifications etc.

Prior to selecting this menu option, you have to **SELECT MEMBRANE/ADHESIVE** from the **PROJECT** menu.

ATTENTION: MF WIND UPLIFT does not check the conditions for calculation, e. g. installation specifications that are valid for values up to 8 m will be adjusted, although the box **EXPOSED LOCATION** (**PROJECT** menu, **TECHNICAL DATA**) has been activated!

BONDING (WIND UPLIFT)

 adjusts the installation specifications for bonding which are dependent on the wind load and set with **MEMBRANE AND ADHESIVE** to the current project. The program will choose an installation specification where the maximum stripping force least exceeds the calculated wind uplift. This method will be applied individually for corner, perimeter and inner areas resulting in appropriate installation specifications for all roof areas.

Contrary to bonding depending on the height of the building, calculation is done according to the object, thus producing individual values.

Material requirements and installation specifications for corner, perimeter and inner areas will be created.

Prior to selecting this menu option, you have to **SELECT MEMBRANE/ADHESIVE** from the **PROJECT** menu.

MIXED MODE

allows the use of different fixing methods for corner, perimeter and inner roof areas. You may select the necessary fixing method for each area from the dialog box.

All fixing methods will be supported, including bonding. All values may be optimised individually for the respective areas.

WORST CASE

for selecting the standard that needs the highest quantity of fasteners. It will be displayed on the screen; the corresponding calculation method will be activated.
The worst case definition is done independently from the selected fixing method.

BEST CASE

for selecting the standard that needs the smallest quantity of fasteners. It will be displayed on the screen; the corresponding calculation method will be activated.
The best case definition is done independently from the selected fixing method.

COMPARISON

displays a quick comparison of fastener requirements for all standards including linear fixing.

Optimisations will be considered with the corresponding standard, so that **COMPARISON** has two functions:

1. Overview at the beginning of calculation

2. Final assessment after optimisation

The OPTIMISATION menu

NOTE: You will only see the **OPTIMISATION** menu if at least one project is loaded.

HIDE CORNERS

excludes corners from calculation. The areas formerly treated as corners will now be dealt with the same way as the area surrounding the respective corner, in most cases as a perimeter.

Selecting this option will open a dialog box for selecting or deselecting corners. The corners will be marked with the same number as in the dialog box **CORNERS** and as on the roof drawing. Existing corners are ticked. Clicking will delete the tick and thus deselect this corner. By clicking **DESELECT ALL** and **SELECT ALL** you may do this for the whole building.

INTERNAL PERIMETER AREA

allows the manual setting of the internal perimeter width for EUROCODE calculations, or the perimeter area for all other standards.

You should use manual input of perimeter widths for smaller perimeter widths along fire walls, wider perimeter widths at uprising details or for perimeter widths between two inner corners.

In the case of manual input of internal perimeter widths, the values may remain under the minimum perimeter width. The program will not check this and will not display any error message either!

EXTERNAL PERIMETER AREA

allows the manual setting of the width of the external perimeter, *i. e.* the perimeter between the corners joining the roof perimeters. This option is available for EUROCODE calculations only.

In the case of manual input of external perimeter widths, the values may remain under the minimum perimeter width. The program will not check this and will not display any error message either!

DEDUCTIBLE AREAS

allows you to assign areas to be deducted from the corner, perimeter or inner area, so they will not be included in the calculation of material requirements. Thus, you may exclude light panels, roof lights, superstructures and other deductible areas.

ATTENTION: The program will not know in which perimeter or corner the deductible areas are located. This option is only available if the **WORST CASE** mode is enabled.

OVERLAPPING

allows you to set the manually defined overlap areas at corners and perimeters, which may occur if the physically effective dimensions exceed the geometrical dimensions.

As a typical example you may take perimeters and corner areas at not indicated superstructures.

Since this program can not recognize overlap areas, the following steps are recommended:

1. roof calculation without overlap consideration

2. printout of the roof drawing

3. manual determination of overlap areas

4. input into this menu item

5. new, correct calculation of quantities

SAFETY FACTOR

Allows you to set a factor by which the wind load is multiplied ($W = q * cp *$ safety factor).
In general, the safety factor remains 1.5 for calculations according to DIN 1055 part 4, pre-standard 40, SIA 160 and EUROCODE.
If necessary, you may use partial safety factors according to DIN 1055 part 4, chapter 3, par. 3.3 for your calculations. If the intrinsic load is not included, you may reduce the safety factor to 1.43.

Attention: In the directives for flat roofs in section 8.1, par. 2, a safety factor of 1.5 is compulsory!

This option will not be effective with 3-6-9, 4-6-8 and 4-8-12 rule! In EUROCODE you may disable safety factors (**MASTER DATA** menu).

DISTANCE BETWEEN LINES

defines the distance between two fixing lines. By manually selecting values for corner, perimeter and inner area, you may enter line arrangements for several areas.

This option is only available if the option **LINEAR FIXING** is enabled in the menu **CALCULATION**.

DISTANCE BETWEEN FASTENERS

defines the distance between two fasteners on one fixing line. By manually selecting values for corner, perimeter and inner area you can find the continuous line arrangements for several areas by setting increasing values for distances between corner and inner area.

This option is only available if the option **LINEAR FIXING** is enabled in the menu **CALCULATION**.

DISTANCE BETWEEN CORRUGATIONS

allows the manual setting of fasteners within the lines of the linear fixing.
Normally MF WIND UPLIFT will set one fastener per corrugation for linear fixing and
will vary the line distance to ensure the necessary quantity of fasteners per m². However,
this is only possible up to the maximum line distance which is set in the **PROJECT** menu,
MEMBRANE AND FASTENER. If this distance would be surpassed at low wind loads, the
program may assign too many fasteners, which may be excluded by setting a fastener
pattern in the following dialog box.

This option is only available if the option **LINEAR FIXING** is enabled in the menu
CALCULATION.

MEMBRANE WIDTH

calls the following submenu, where you may select the membrane width for corner,
perimeter and inner area.

This option is only available if the option **FIXING THROUGH THE SEAM** is enabled in the
menu **CALCULATION**.

If the program is in individual mode, which may be selected by **CORNER/PERIMETER
CALCULATION** in the **OPTIMISATION** menu, after the selection of one of the four submenu
options, you will be prompted to indicate the corner, perimeter or inner roof area to be
optimised. Click the area to be optimised, which calls up the membrane width dialog box.

A special feature is the combination of identical areas. If you want to enable the
respective box in the lower left corner of the box, you first have to click one
corner/perimeter number. The program will then tick all identical corner/perimeter
numbers. Another click on one of the ticks will start the membrane width selection for all
ticked corners/perimeters.

CORNER AREA allows the manual selection of a membrane width to be applied in the
corner area, including the respective fixing method (Seam, fixing through the middle of
the membrane, additional fixing in third of the membrane width, free membrane width).
After the selection, the fastener load will be displayed to the right in % and the spread
sheet will be recalculated.
The option "**f**" for free membrane widths is only available if you have selected whole
membrane widths. Free membrane width means that membranes have to be put one under
the other so that the remaining useful width is the same as the optimal width calculated by
the program (enlargement of seam width). The fastener load is almost always nearly 100
%.
In the case of exceeding the permissible design load per fastener in the load field, a value
> 100 % will be displayed.
By clicking **DELETE,** all optimisations made will be reset, the program default for
membrane width will be restored.

EXTERNAL PERIMETER AREA, INTERNAL PERIMETER AREA and **INNER
AREA** produce the same results for the respective roof areas.

You may only use the option **EXTERNAL PERIMETER AREA** for EUROCODE calculations.
INTERNAL PERIMETER AREA is for perimeter areas of all other standards.

ADJUST AREAS

toggles the increase of corner and perimeter areas by whole multiples of the membrane width. Active area adjustment is indicated by a tick in front of the option and ensures simple installation, including better determination of material requirements.

If adjust mode is selected, all corner flange widths and lengths will be rounded up to a whole multiple of the membrane width used in this area. Additional fixing through the middle or in the third of the membrane width is not included.

Without a tick, *i. e.* with the adjust mode disabled, all corner flanges and perimeter widths will be formed with an accuracy of 1 cm according to the respective standard.

This option is only available if the fixing method is fixing through the seam. In the case of field or line fixing, the program assumes that only the largest membrane width possible will be applied.

TIP: For adjusted shift-free crossovers of corner flanges and perimeter widths, we recommend using identical membrane widths in corner and perimeter areas.

ATTENTION: Without area adjustment, corner and perimeter areas will be calculated smaller than they can be formed with the roofing membranes, which will lead to incorrect material requirements of membranes and fasteners!

PATTERNS

calls up the following submenu for setting the patterns for the corner, perimeter and inner areas.

You will typically find patterns on corrugated steel decks, so we shall deal with this in the following paragraphs. They may be used, however, for making use of the higher design load in the membrane centre, on homogenous substrates as well.

If individual corner/perimeter areas are selected, you may choose an individual pattern for every single corner or perimeter. In this case a selection box for selecting the necessary areas will be displayed.
If the option **APPLICATION ON IDENTICAL AREAS** is ticked, you have to select the necessary area twice, *i. e.* the first time for indicating the areas with identical wind loads, the second time for creating the pattern.

CORNER AREA allows you to manually arrange fasteners for the membrane to be installed in this corner area. The fasteners are selected and deselected by mouse click.

In patterns, you may also use twin fasteners. The load that will be taken by the second fastener is defined in the dialog box **SELECT MEMBRANE/FASTENER COMBINATION**.

The figure symbolizes a corrugated steel deck with vertical corrugations with two fasteners on each corrugation. Not-applied fasteners are marked by a white box with a black square, applied fasteners are symbolized by a cross.

Every horizontal line means a seam or, if selected, a row of fasteners for the middle or the third of the membrane.

At the bottom, for monitoring purposes, the quantity of fasteners set per m², as well as the necessary quantity, are displayed. You may only exit this box with **OK** if the minimum requirements are fulfilled.

The button **2 OUT OF 3** will automatically select the appropriate pattern and set crosses in the corresponding boxes.

After setting the values, the impact area, including the quantity of fasteners per m² will be displayed and, if the fastener quantity is valid, will be included in the total fastener quantity for corners and the overall area.

NOTE: Different design loads for seam and additional fixing through the middle of the membrane will be considered.

ATTENTION: The program will evaluate the set fasteners (in the direction of the seam) including the last set fastener!
Typical error: 1 out of 2 fixing starts with a fastener set (x - x -), where the last fastener that is not set will not be recognised as fastener. A correct pattern would be (- x - x).

ATTENTION: Values exceeding the design load on increased impact areas will not be recognised!

EXTERNAL PERIMETER AREA, INTERNAL PERIMETER AREA and **INNER AREA** produce the same results for the respective roof areas.

CORNER/PERIMETER CALCULATION

calls up a submenu containing two options **WORST CASE** and **INDIVIDUAL.**

WORST CASE is a calculation mode with following functions: the program determines the corner or perimeter area with the highest load coefficients. These worst case coefficients will then be applied to all corners and perimeters.

The advantage of this method is the simple installation specification containing not more the 3 to 4 (corner, perimeter, inner, for EUROCODE additionally external perimeter) different fixing methods. The disadvantage is an (unnecessarily) high fastener requirement.

Restriction: For rectangles, worst case and individual calculation are normally identical, because you have identical conditions on all corners and perimeters.

INDIVIDUAL allows you to determine the smallest quantity of fasteners possible.

For every corner area, an individual set of load coefficients (cp) is defined, from which the expected wind load, including corner flange width, will be calculated. Additionally, these load coefficients will be in pairs applied to a building perimeter. The less favourable of the two sets will be used to calculate the resulting perimeter wind uplift and the perimeter width.
The inner roof area is always calculated as worst case of all corner/perimeter areas.

The VIEW menu

TOOL BAR

toggles the smart icons below the menu bar.

STATUS LINE

toggles display of short information at the window bottom.

The following menu options are for screen display as well as for printout, i.e. the selected options for the screen display will also be effective for printouts.

Exception: The display options **ZOOM** in the **VIEW** menu are effective for screen display only. The printout will always fit the page.

A tick in front of the menu option indicates whether or not it is set .

COVER PAGE

includes the cover page in the display. The cover page contains information on the calculation method, the creation date, the client's address, the building project, technical data, fasteners and program status.

USER SETTINGS

displays the settings made by the user for this specific project, including the values from the master data relevant for calculation in logical arrays. This may also be values from the client.

EFFECTIVE LENGTHS

lists the settings for all corners made in **INDIVIDUAL CORNERS** in the **PROJECT** menu for the physically effective lengths of the building.

INDIVIDUAL CALCULATION

displays two tables containing the calculation results.

The upper table contains optimal values for homogenous substrates. The display of the lower table depends on the selected fixing method (field, linear or fixing through the seam).

Determination of the values as follows:

Upper table:

AREA	assigned roof area (corner, perimeter, inner)
CP	pressure coefficient, at EUROCODE (ce(z) + cpe)
CPI	internal pressure coefficient
SF	safety factor (typically 1.5 or 1.43)
ADDITIONAL BALLAST	additional ballast component deductible from uplift
F RES	resulting uplift (load/m²)
	F res = (dynamic wind pressure * pressure coefficient * safety) - additional ballast
FAST/M²	minimum quantity of fasteners in the roof area
AREA	total area of all partitions
FAST TOTAL	total quantity of fasteners needed in the roof area (area * fasteners)
TOTAL	average fastener requirement for total roof area, total roof area and total quantity of fasteners

Lower table, all fixing methods:

AREA	assigned roof area (corner, perimeter, inner)
FAST./M²	actual fastener requirement per roof area or adhesive requirement in the case of bonding
FAST TOTAL	total quantity of fasteners needed in the roof area (area * quantity of fasteners/m²)
TOTAL	average fastener requirement for total roof area and total roof area and total quantity of fasteners

Lower table – field fixing:

FIELDFIX.	- on homogenous substrate: distance between fasteners - on corrugated steel decks: distance along corrugations. If fixing on every corrugation is not necessary, a number followed by a slash determines the distance on corrugations.
Example:	`2/0.432m` means setting a fastener on every second corrugation. Along the corrugation the distance between fasteners will be 0.432 m = 432 mm.

Lower table – linear fixing:

LINE DISTANCE	shows the distance between two fastener lines. The program will always set maximum widths. The settings may be changed in the **OPTIMISATION** menu, options **DISTANCE BETWEEN CORRUGATIONS** and **DISTANCE BETWEEN LINES**.
SAFETY	remaining safety factor after optimisation. Usually the minimum safety factor will be displayed. If the maximum distance between lines is a limiting factor, the safety factor will be increased.

Lower table – fixing through the seam:

The table includes in the results: the minimum distance between fasteners, if necessary the distance between corrugations as well as all optimisations (selection of membrane width, additional fixing through the middle and/or in third of the membrane width, free membrane width, pattern) .

MEMBRANE	membrane width to be applied in the assigned roof area net membrane width = trade membrane width - overlap For additional fixing through the middle of the membrane `(1:2)` For additional fixing in third of the membrane width `(1:3)` In the case of free membrane widths, the remaining membrane width will be displayed additionally
FAST. DIST.	Distance between fasteners for installation. If patterns are used `Pattern` will be displayed
LOAD[kN]	load per fastener under installation conditions, i. e. according to membrane selection, pattern etc.
LOAD	fastener load in percent
SF	remaining safety factor after membrane selection, pattern etc.

MATERIAL REQUIREMENTS

lists the expected material requirements separately for membrane widths and fastener types or quantity of adhesive. If possible, product names and roof areas will also be indicated.

INSTALLATION SPECIFICATION

generates an installation specification for your site, where the applicator can find the membrane widths for the corner, perimeter and inner areas as well as the necessary distances between fasteners or bonding instructions.

CORNER DRAWINGS

draws all corners according to their location, including dimensioning, in a larger scale. Additionally, the perimeter widths are displayed as text.
The output of individual corners is especially recommended for complex buildings with many corners, as the roof drawing will be too small for details. For better clarity of the roof drawing, you should disable dimensioning for corners and perimeters in the menu **VIEW** with **SETTINGS DRAWING**.

ROOF DRAWING

shows a drawing of the roof area with all corner and perimeter areas. The display options will be explained in the following paragraphs.
Geometrical data is taken from **INDIVIDUAL CORNERS** settings and from the calculation results, the legend data is taken from the menus **PROJECT_BUILDING PROJECT** and **MASTER DATA_PERSONALISATION**.

SETTINGS FOR INDIVIDUAL CALCULATION

allows the selection of columns to be displayed in individual calculations. On the left hand side of the dialog box that appears, you select the columns for the upper table, on the right hand side the columns for the lower table.

By selecting **CP-VALUES** for Eurocode the two external load coefficients (cpe and ce(z)) will be either shown or hidden.

SETTINGS FOR USER SETTINGS

If you do not wish to print out the whole contents of the user settings, you may select restrictions for printout. Only ticked items will be printed.
Even though you have deselected items, the page will not show blank lines since the following sections will fill the gap.

SETTINGS DRAWING

changes the display of the roof drawing, the fastener data and the legend. The boxes have the following meaning:

DIMENSIONING_CORNER   toggles dimensioning for all corners

DIMENSIONING_EXTERNAL PERIMETER
toggles dimensioning for all external perimeters
(only for Eurocode as calculation method)

DIMENSIONING_INTERNAL PERIMETER
toggles dimensioning for all perimeters (for
Eurocode as calculation method, only internal perimeter)

BUILDING   toggles dimensioning for building lengths

CORNER NUMBERING   assigns a number to every corner according to the settings in the dialog **INDIVIDUAL CORNERS**.

LEGEND   shows or hides the legend at the bottom.

QUANTITY OF FASTENERS   shows or hides the specification of the quantity of fasteners in corner, perimeter and inner areas, displayed between legend and roof drawing

AREA COMBINATION   draws different areas with identical quantity of fasteners per m² with the same grid, so that the overall area can easily be recognised as an entity.

CLIPPING AT ROOF PERIMETER prevents drawing of perimeter areas, particularly internal perimeter areas with Eurocode, reaching into perimeter areas of adjoining roofs.

FILLING   for selecting a crosshatch type for corner and perimeter areas. See also **MASTER DATA_FILLING.**

PAGE NUMBER

Defines the first page number. All following pages will be given ascending numbers.

You will need this setting, if the first page to be printed by MF WIND UPLIFT is not the first page of the complete printout, e. g. if you put a separate cover page on top of the printout.

ZOOM FACTOR

will scale up or down the screen display, but not the printout. Large values mean large display.

The zoom factor will be saved individually for each project, so you have to adapt it individually to each project. You may enter a correct setting in the **MASTER DATA**, menu, item **ZOOM FACTOR**.

The COMMENTS menu

INSTALLATION SPECIFICATION

will open up a text input box for additional instructions to the installation specification generated by the program. After closing the dialog box with **OK,** the text will appear below the installation specification in a separate box.

In the dialog box you can use simple text editing commands but no attributes (bold, italic, underline, fonts). Line feed will be done automatically. You may, however, insert manual line feeds with the ENTER key.

You may save the text to a file by clicking **SAVE**. A dialog box for entering an appropriate file name will appear. You can also load the text under this name into other projects.

By clicking **OPEN** you can load a saved text into the box. A file selection box will appear for selecting the required text. After selecting a text file and clicking **OK,** the text will be loaded into the text box. Existing text in the box will be overwritten.

TIP: If you save a text as "VDEFAULT.TXT", it will be loaded automatically each time you create a new text.

MATERIAL REQUIREMENTS

will open up a text input box for additional instructions to the material requirements generated by the program. After closing the dialog box with **OK** the text will appear below the installation specification in a separate box.

In the dialog box you can use simple text editing commands but no attributes (bold, italic, underline, fonts). Line feed will be done automatically, you may, however, insert manual line feeds with the ENTER key.

You may save the text to a file by clicking **SAVE**. A dialog box for entering an appropriate file name will appear. You can also load the text under this name into other projects.

By clicking **OPEN** you can load a saved text into the box. A file selection box will appear for selecting the required text. After selecting a text file and clicking **OK** the text will be loaded into the text box. Existing text in the box will be overwritten.

TIP: If you save a text as "MDEFAULT.TXT" it will be loaded automatically each time you create a new text.

NOTE

opens up a text input box for notes you want to make with the project. Typically, you will note the additional information from your client or your consultant.

Notes will not be printed.

Glossary

Additional fixing in third of the membrane width

Fixing a membrane along the seam and additionally in two lines on the membrane.

Additional fixing through the middle of the membrane

Fixing a membrane along the seam and additionally along the membrane centre.

ASCII

Abbreviation for American Standard Code for Information Interchange. Character set with 255 characters. The ASCII character set defines the characters that may be used by the user. May be imported by almost any word processing program.

Clipboard

Transient memory controlled by WINDOWS which allows data exchange between programs.

Cover page

First page of a printout.

Design load

Minimum load that must be taken by a single fastener. Officially approved fasteners must be able to take a minimum load of 0,4 kN (= 400 N).

Dialog

See Dialog box

Dialog box

Input mask or message window with fixed size. Input with mouse or keyboard, normally mouse control. Closes with **OK** or **CANCEL** button.

Distance between corrugations

Distance between the corrugations of a corrugated steel deck, measured between the centres of two neighbouring corrugations.

DXF

Drawings Exchange Format. File format developed by Autodesk for CAD file exchange.

Editor

Program for entering and viewing text files.

File selection box

WINDOWS standard dialog box for entering or selecting a file name.

Fixing method

Field, linear or fixing through the seam.

Impact area

Roofing membrane surface exerting a load on a fastener.

Internal corners

If circumventing a building anti-clockwise, internal corners always turn right, external corners always turn left.

Master data

Data which is equally necessary for all calculations. Typically, this is your address, information on the membranes and the fasteners etc.

Optimisation

Determining a fixing method which will ensure a minimum of membranes with a minimum of fasteners.

Partial safety figures

Safety factor according to chapter 3, paragraph 3.3 of DIN 1055 part 4. Valid only for roofs and if loads are calculated separately for corner, perimeter and inner areas.

Pattern

Distribution of fasteners, where the fasteners on one line are not at equal distances.

Physically relevant height

Actually, effective building height for the wind. Slopes etc. will be included!

Roof drawing

Technical drawing of the horizontal projection of the roof, corner and perimeter areas including dimensioning.

Scroll bar

Grey stripe on the right side of the window to scroll the display or show the momentary position of the displayed information.
You can scroll the screen by dragging the rectangular button on the scroll bar with your mouse.

Tick box

Box within a dialog box that can be marked by mouse click.

Twin fastener

Two directly neighbouring (< 20 cm) fasteners on one corrugation.

WMF Format

WINDOWS meta file format. WINDOWS standard file format which can be imported by almost any WINDOWS graphics processing program.

Index