

How to Use Software

Program installation: See separate document

Program registration: See separate document

Bellows Master II, Bellows Master II En and RecBel

The two programs BMII and BMII EN are nearly identical. The difference is which standards are included. RecBel is very similar and as a result many settings and similar are the same.

Before using the program they have to be installed and registered. After the registration programs give warning about two databases not set up. This is not an error but intentional. How to set up the databases is included into the installation document.

After the program has the databases set up it can be used but it is far better to do some settings first.

Set company logo

All three programs use the same Company file so if you have all of them the setting needs to be done only one time by any one of the programs.

Program can have unlimited number of company logos. Most need only one but a consulting company may have very many. Set up is via program Menu Setup - Companies. When the entry form opens click key F1. In the help file there is an image. Click each entry field (white areas) and read the details.

Recommended logo size is given in the help file. Program is designed for rectangular logo. If you logo is different shape use some image program and allow white space where required to get rectangular shape. Logo file must be in BMP format.

Unfortunately Paintbrush, which is part of Windows doesn't work here. There can be other programs with the similar problem. If the logo vanishes when you click "Post" (Save) button the image program is not suitable. BM II installation includes Frequently Asked Questions (FAQ) document. Solution to this issue is described there and the same details are given here:

There is a known issue concerning the creation of company logos for printing purpose. Logo files saved using some versions of Windows Paint program are not compatible with the graphical module used in Bellows Master II and other programs using Company.adb. If you experience problem that after entering your logo file into Bellows Master II it vanishes e.g. will not print or show your logo file is in wrong format. The solution is to open the logo file (*.bmp) in and other program and use "SaveAs" command. One program tested to give correct result (File format) is freely available IrfanView (<http://www.irfanview.com/>).

The easiest way is to open the BMP logo file in IrfanView and then use menu Edit - Copy. When this is done and you have the company logo entry form open simply do the following steps:

- Click small button with + sign
- Enter short company code
- Enter company name
- Click 2nd button on top to paste the logo
- Click the Post button with a Tick image

Done

Entry form is for a database. Database programs work differently to programs like Excel and MS Word. One big problem is the use of many buttons in the bottom. Saving is called Posting etc. Each button is described in the help file. Just click each button in the help file image and there is description.

Program Defaults

Using the program is much easier if tabs that are not used are hidden and some of the entries are done automatically. Program defaults are in Menu Setup - Defaults.

Defaults form has two Tabs "Entries" and "Other". Go into any of the entry fields and press key F1. Images open and by further click on the image explanation is given. Please read additional details on each entry from the help file.

Note that the "Calculated By" drop down list is empty until you have entered name or names on the main program.

Couple recommendations:

- Consider entering calculation prefix. In the long run it is handy

- Select “Show working spring rates”
- Select print EJMA latest (BMII)
- Hide all tabs you do not use on a daily bases
- Note “Clear display on new calc”

All of the settings can be changed at any time - even in a middle of a calculation.

When completed click OK button and all entries are written into the registry. Clicking Cancel doesn't change entry entries in the Registry.

RecBel has less settings than BMII. To get additional details click any of the default entries and then press key F1. Help file opens showing two images. Using mouse click fields in the images an most of them have detailed information what they are for.

The First Design

RecBel is similar to BMII and BMII EN so the following steps are largely valid for it also. For more program specific information use F1 key to open the help file.

Programs have many Tabs. Entries can be done in any sequence but recommended is the listed Tab sequence and entering from left top corner down and next column from top.

- Contract
- Dimensions
- Design Parameters
- Material

Calculate

If the design is reinforced there are additional entries. Collar and end reinforcing is a complicated issue. Please read the help file information carefully. In case of EN 13445-3 design the gusset impact on the end ring is critical detail. Full stress calculation of the ring is not part of the design code but the program is substantially extended over and above the standard. Please read the help file.

To understand what are the entries just press key F1 and read the content of the help for that entry.

To do the calculation press the button or alternatively use Menu Calculate and select the correct

calculation. Most of the time program is able to do the required calculation using the button but not always.

You may get a list of warnings and errors. Warnings are to help you. Errors prevent calculations. Program tries to evaluate the entries and prevent wrong data entries but some issues cannot be eliminated. Simply fix your entries and calculate. After the first successful calculation, even if the stresses are too high, save the calculation. This allows opening the entries at a later stage. Program doesn't save results, only entries.

Program has Calculation number and revision number. Use the system. Calculation number is automatically generated and revision number is set by the user. There is no practical limit how many calculation can be saved. If you do pressure test calculation the recommended method is to set the program not to clear entries on new calculation (in program Defaults), open the main calculation, click new calculation, change entries for pressure calculation and save. This way proper calculation revision control is possible.

Calculation results are shown on the applicable Tab. Those results that are not acceptable are marked and error messages are in the bottom in the memo field.

Evaluate the results. If acceptable it doesn't mean that it is the best design. Maybe it is possible to reduce number of convolutions or layers = cheaper to make. Or maybe reduction in convolution height is possible. Lower convolution units are easier to make to look good and their fatigue properties are actually better than high convolution types. Maybe not in number of cycles but in uniformity.

By pressing F1 key on any result field help file opens. Most of them have either a link or a formula. Formula has hot spots on each parameter. Click the parameter and you get an explanation or a second formula. This is a quick way to drill down to a formula to see which change can be used to improve the design.

Safe final design and any number of iterations.

Printing

Program has printed reports. To print them there is a button with a printer icon, next to it is an arrow button with triangular down and Menu File - Print. The main button prints standard unreinforced reports but it will not print automatically for instance reinforced design report. For

those items you need to use the other two options.

There is a possibility to make PDF out of the print report directly from the program. When the preview of the print report is shown there is a typical Save button. Click that and new form opens. First change "Save as type:" in the bottom to PDF. Enter name into "File name:" and then navigate to folder (directory) where you wish to save the report and click button "Save".

In addition to the formal report there is a possibility to print full listing of parameters used by the program. You get this from Menu Utilities - Show Variables. Original purpose of this listing was to be able to verify the correctness of the calculations. This print can be confusing and normally should not be given to a customer.

Hidden features

There are "hidden" features. For instance double clicking on the pitch entry will give theoretical U shaped Pitch. Remaining hidden features are described in the help file.

Typical entry issues

One of the bigger entry mistakes is entering the movements wrongly. If the axial movement is 5 /-5 you have to enter both values and not only one of them. Same applies to lateral and angular movements also. Sequence of the entries is also critical. Additional details are in the help file.

Designers seem to use too low Weld Factor. Most of the time 1 or 0.85 are the correct values. Standards require specific non destructive testing and as a result the weld factor is 1. EN codes do not use weld factor but the program may consider it. See help file for the status. For EN calculations to use any other value than 1 is really exceptional.

WARNING: It seems that most NDT technicians use wrong acceptance criterial for element welds. They have to use the criteria for the element and not the one for the remaining parts.

Elements are most of the time thin. Unnecessary radiographic testing is often specified or performed. Read the design standard recommendations. If the test is performed it requires most of the time special equipment, which may not be available at all.

Smaller Programs

Smaller programs include programs like FlangeTool, PinMaster etc. Programs do not have help files. They do have ReadMe files and tips on the entry and result fields. In addition User Manuals are available on the Support Page on www.jat.co.za.

All of the programs have reports. Reports have possibility to include company logo. This logo is named PrintLogo.bmp. It is rectangular and the max/recommended size is in the ReadMe files.

Between the programs there is minor inconsistency from where the program looks for the logo file. Simply perform Windows' search for the file and replace them all.

All reports can be saved to PDF file, see above how to do this.

Most of the design calculations should be done with the "Allowable" option. Pressure test calculation is automatically done using Yield option.

Program Specific Warnings

The following warnings are not mistakes in the programs. They are either limitations of analytical calculation methods or engineering issues that the designer have to consider.

FlangeTool:

Program doesn't calculate deflection. In some cases it is not the stress but amount of deflection that dictates the design. The most common case is the outer rod plates in an axial inline pressure balanced expansion joint. In many designs these plates bend too much. Designer has to verify this by other means.

Where weld on lugs are used it is critical to understand that the program assumes full penetration weld between the lug and the round flange. Program calculates the flange thickness. In some cases thinner lugs can be used but then the designer must do an additional manual calculation. Program was designed for one piece oval flanges. Lug design was added for the benefit of the users but it has to be used responsibly. If this is not done the lugs come off with very serious consequences.

Program designers received regularly comments that the calculated flanges are too thick. Maybe in some rare cases. Program uses analytical formula. FEA performed has proven the results to be correct. Flanges with bolts in general are a design challenge. Standard flanges that have been in use for a very many years may fail for instance ASME flange calculation. To use thinner flanges than those calculated the designer must have really good justification.

PinMaster:

Engineers have not been able to agree if pin design should consider bending or not. EN design standard states that it shall be included. Program developers recommend that the pin bending is considered. Pin calculation is somewhat conservative but having under sized pin rejected after a unit is made is a financial disaster.

BracketMaster:

The key issue is not related to program but to creep. Weld on bracket on a high temperature line is very problematic. Weld between the bracket and pipe will have thermal stresses and at the end there is a failure. Designer must consider this and consider using for instance floating ring design.

Reinforcing pad is no good on high temperature lines. Facility to use pads is not included into the program.

GimbalMaster:

GimbalMaster doesn't evaluate instability of the ring between the pins. Designer needs to verify this where it can be an issue. Generally only solid large diameter rings are the problem.

RodMaster:

Calculated rod diameter has an issue is that it is often far smaller than recommended diameter due to stability reasons. EJMA has recommended diameter on this bases. Program has this recommendation shown by pressing the button. If the calculated diameter is more than the recommendation then the calculated diameter has to be used or rod material changed.

All programs:

No standard or engineering program is a design manual. Standards and programs are there to assist the designer. Designer has to use his/her knowledge and experience to reach safe, good economical design. There are many designs that comply with the design standards and have acceptable calculation results but fail on startup or after short use.