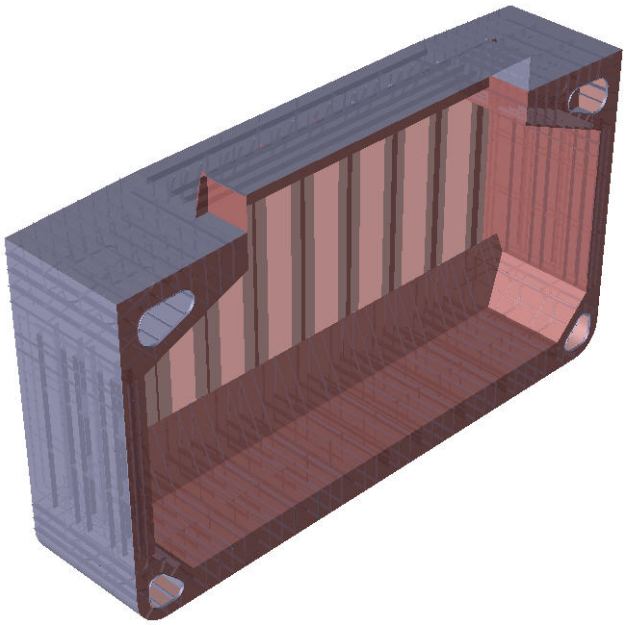
SESAM™
USER MANUAL

GENIE VOL. V
CODE CHECKING OF PANELS
COMMON STRUCTURAL RULES FOR BULK CARRIERS



Concept design and analysis
of marine structures

DET NORSKE VERITAS

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Sesam™
User Manual
GeniE Vol. V

Code checking of panels

Concept design and analysis
of marine structures

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Valid from program version 4.0

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GeniE User Manual
Code checking of panels version 4.0
Table of Contents

1. INTRODUCTION – CODE CHECKING OF PANELS

This is the user manual for the part of GeniE dedicated to code checking of panels on ship structures according to IACS Common Structural Rules for Bulk Carriers (CSR Bulk).

This user manual assumes that the user has knowledge in the use of GeniE as covered by the GeniE User Manual Volume I and II – the main user manual and the one describing how to run analysis..

This manual describes how to create a capacity model (or code checking model), how to perform the code checking as well as how to report the results.

Chapter 2 gives an overview while Chapter 3 contains a more detailed description on the code checking.

1.1 How to read this manual

Read Chapter 2 "*Panel Code checking features of GeniE"* to get an overview on code checking features of GeniE (what you can do).

Read Chapter 3 "*How to do panel code checking"* to learn how to set up a capacity model, perform the code checks and how to report the results.

A command from the menu list (also referred to as the pulldown menu) is written like this: ***Insert***|***Plate***|***Dialog***. The name of a tool button is written like this: **Basic plate**. A function buttons is referred to like this: **F1**.

GeniE comes with a context sensitive menu. You invoke this menu by pushing your right mouse button when the mouse is located above a selected object. In this manual this operation is termed **RMB**. The commands on the context sensitive menu are written like this: *Join Panels*.

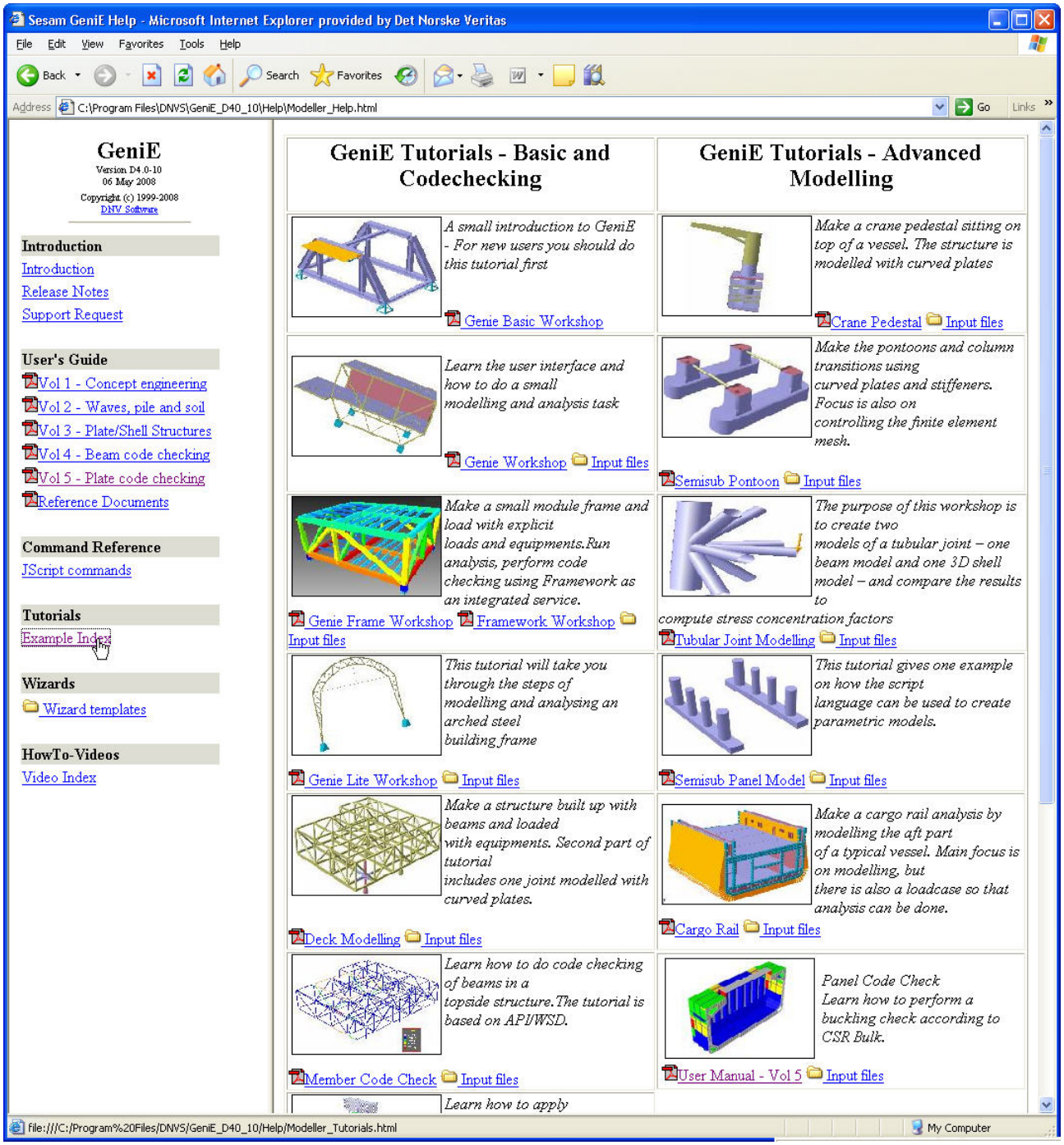
Viewing this manual assumes the usage of Adobe Acrobat Reader version 8.0 or higher. You may use older versions, but then you don't have access to important features like e.g. free text search and bookmarks (table of content + hyperlinks).

It is particularly noted that this User Manual documents all capabilities of GeniE. If you do not have access to the program extension "*Code checking of plates (CCPL)*" there are several items in this manual you do not have access to in your program. These features are blanked out in your program version.

1.2 Learning from tutorials for code checking

GeniE comes with an on-line help system (***Help***|***Help Topics*** or **F1**). Its purpose is to provide easy access to release notes, limitations, tutorials, wizards and this user manual. In addition it contains a detailed documentation of all available commands in the journalling system (based on J-script). There are also videos showing how to do certain operations, these are best viewed using resolution 1280x1024.

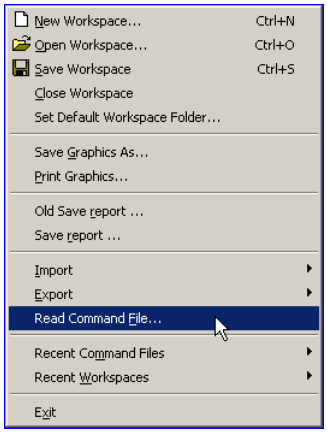
The easiest way to find the tutorials is from GeniE's help page. For panel code checking the most relevant tutorial is called *Panel Code Check.*

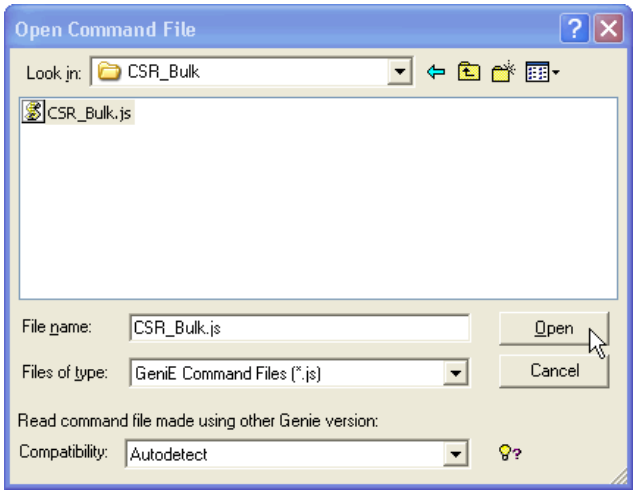


The most efficient way to work with the tutorials is to make a print-out of the tutorials, start GeniE, create a new workspace (command ***File|New workspace***) and follow the steps in the tutorial. Each tutorial comes with a pre-defined journal file (command file) – you find these from the help page as shown above under "Input Files". If you want to use these files the steps are as follows:

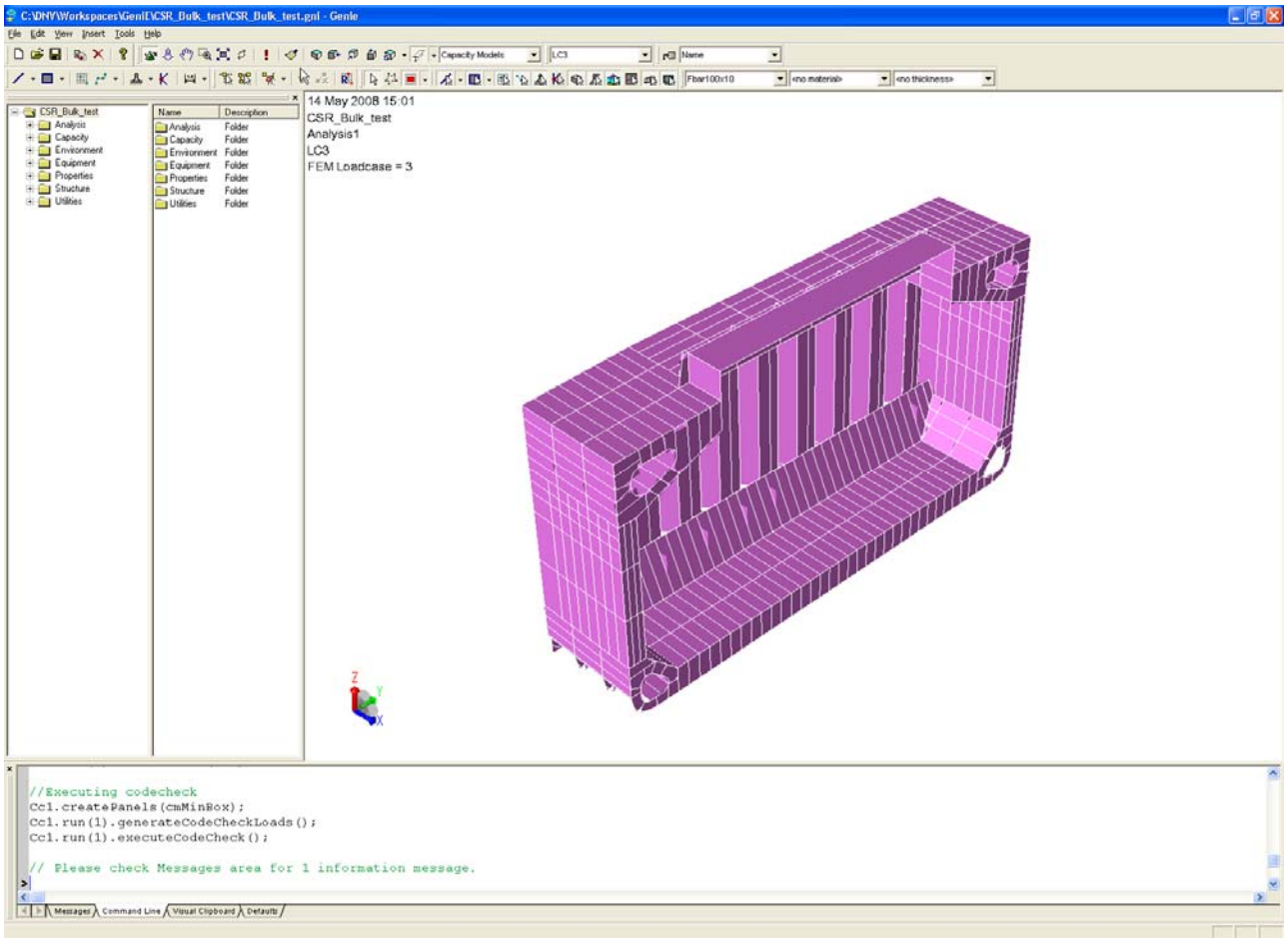
1. Create a new workspace ***File|New Workspace|<name>***
   (Keep the default settings for tolerant modelling and database units)
2. Read in the journal file from ***File|Read Command File***|<browse until you find the desired input file>
3. Save your model by ***File|Save***
4. You have now created the same model as in the tutorial you selected.

In the example below the <name> has been set to *CSR_Bulk_test* and the imported file is for the tutorial "CSR_Bulk".





The sequence above creates the following view in GeniE (the colour background has been set to white and the view is set to “Capacity Models”:



You may also read in a journal file by using drag-and-drop. Simply select a journal file from your browser and drop it into the command line window.

1.3 Acronyms frequently used in the User Manual

Acronym	Explanation
RMB	Right Mouse Button
LMB	Left Mouse Button
GUI	Graphical User Interface
DOF	Degree Of Freedom
CLI	Command Line Interface
FEM file	SESAM Input Interface File
IACS	International Association of Class Societies
CSR Bulk	Common Structural Rules for Bulk Carriers

2. PANEL CODE CHECKING FEATURES OF GENIE

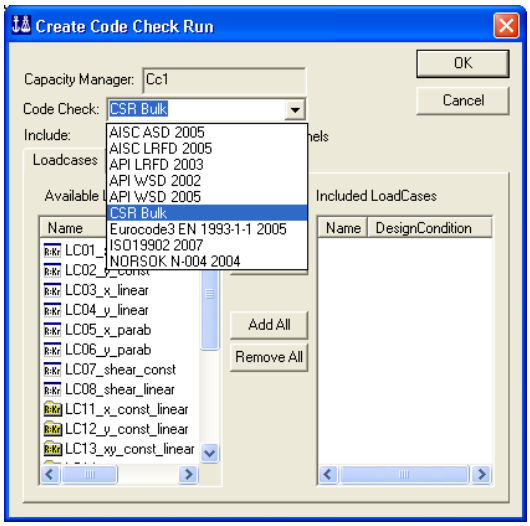
Code checking of panels based on the results from a linear structural analysis can be done in GeniE. The features include checks against allowable stress levels and buckling.

You should be familiar with the relevant rules and procedure of the type of code checking you want to do as this user manual is not intended to cover such. This manual describes how to use Genie to do a panel code check.

2.1 Panel code checking standards

GeniE supports the following panel code checking standards:

- *CSR Bulk*
  Common Structural Rules for Bulk Carriers, IACS, January 2006



2.2 Available code checks

The table below shows the type of check that may be performed for each code of practice and the section type that may be processed.

Code of practice	Check
CSR Bulk	Panel Yield
	Panel Buckling

2.3 Code checking procedure

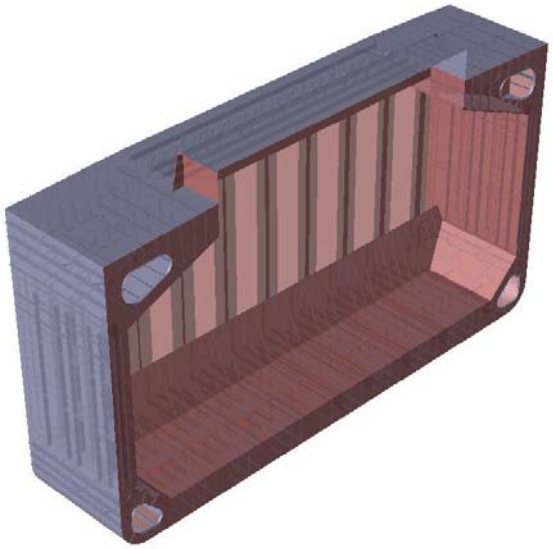
A typical procedure adopted for a panel code check analysis may be as follows:

- Modelling of material, thickness, structure, loads and boundary conditions. For CSR Bulk analysis compartments are generated in Genie. Compartment loads, external sea pressure and corrosion additions are provided from Nauticus Hull.
- Run the finite element analysis.
- Define relevant load combinations if they were not part of the above analysis.
- Create a capacity manager(s). You decide which analysis you want to base the code checking on. You may have several capacity managers – each capacity manager may have one set of panels. These may be selected from the whole structure or from named sets
- Define the panels.
- Create a code check run. The purpose of this task is to decide which code of practice to use, which loadcases to include and to specify other global factors.
- Compute the code checking forces. These are computed at pre-defined positions.
- Perform the code check and investigate the results graphically or from the browser.
- If necessary modify thickness, materials or other code checking parameters and re-run.
- Make a report using the report generator and include pictures to it. The granularity of the report depends on how much details you want to add to it. There are several filters you can use to decide the content.

The above procedural steps from creating the capacity manager are illustrated in the following.

2.3.1 Reference model

A reference model has been created. It is a small slice from the three cargo hold model from the CSR Bulk tutorial. The purpose of this tutorial is to create a capacity model to do panel check. The reference model has one analysis activity and a few simple loadcases.



2.3.2 Loadcases

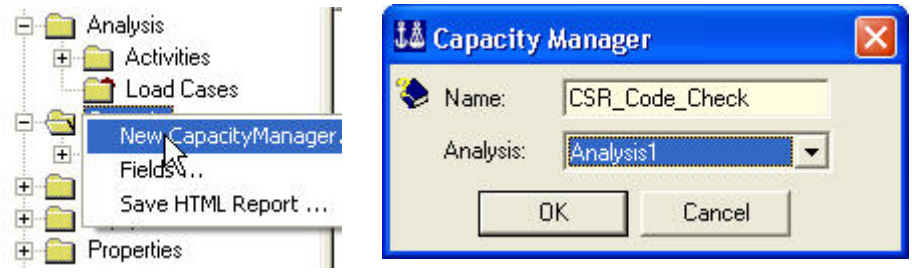
The reference model has a number of basic loadcases (manually applied) and load combinations.

2.3.3 Create a capacity manager

The purpose of a capacity manager is to decide which analysis results to use in the code checking. You may have several capacity managers if you want to use

- various analysis results
- different selection of capacity panels

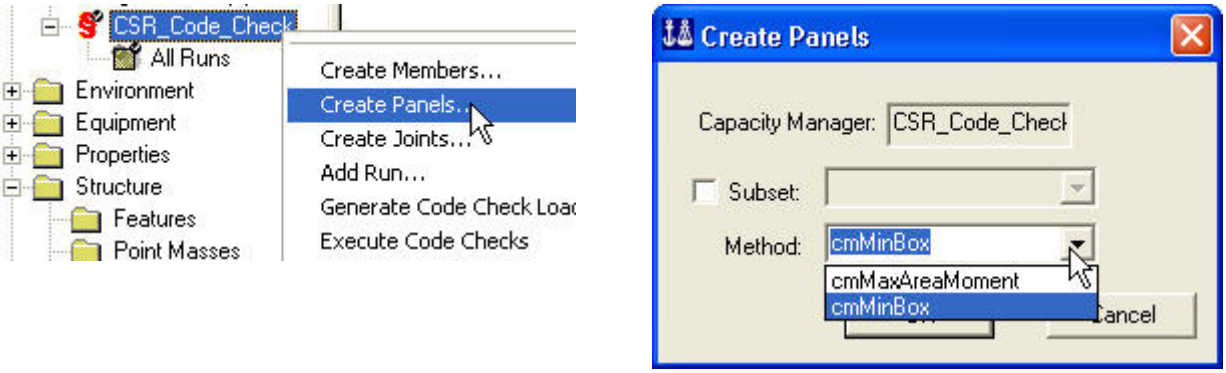
A capacity manager is created from the browser, and in this case it is given the name “CSR_Code_Check”.



2.3.4 Create capacity panels

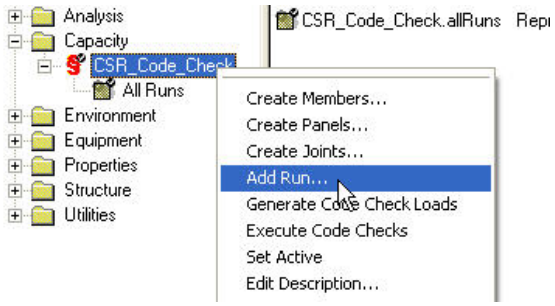
We now need to define the panels. In a code check the panels are normally not the same as the concept model, hence it is necessary to define the capacity panels by splitting the concept plates.

The capacity panels can be visualised by using the view setting Capacity Model

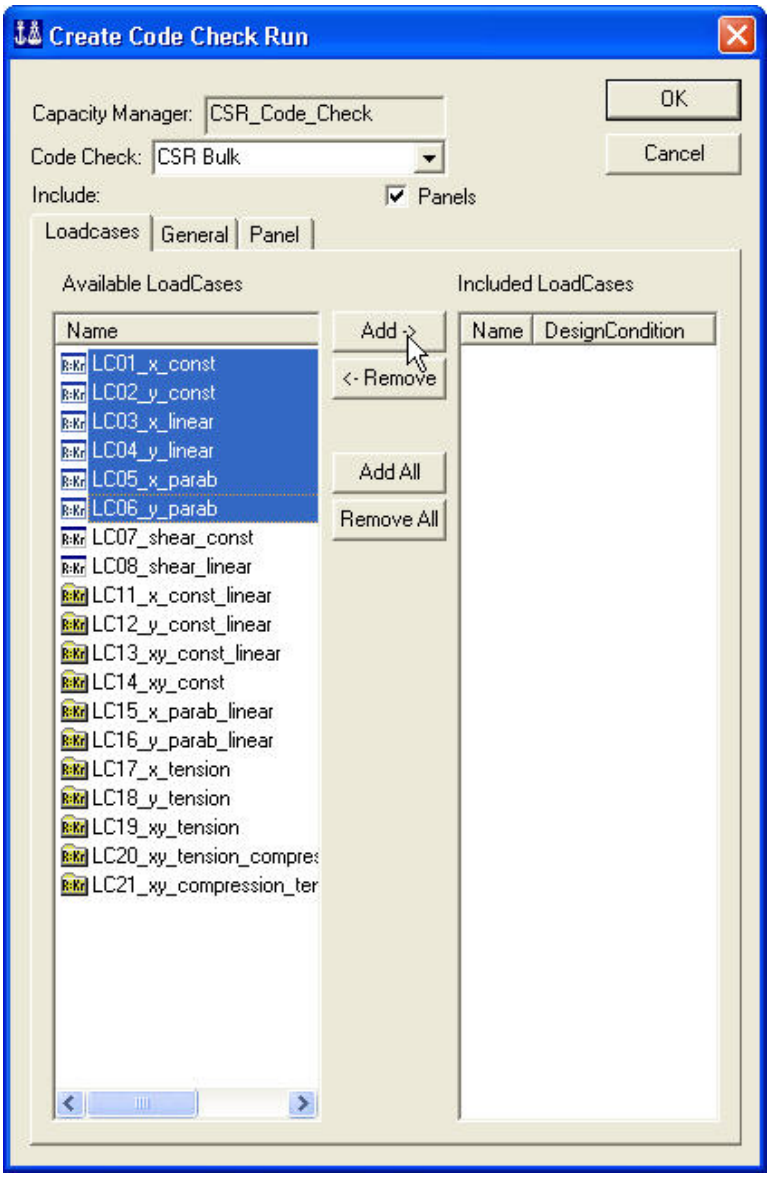


2.3.5 Create a CSR Bulk code check run

When you define a code check run you decide which code of practice to use. We here select the the CSR Bulk code check.



You need to select which LoadCases you want to include in your run. This is done by selecting the LoadCases and clicking Add/Add All.



2.3.6 Modifying the General settings in the CSR Bulk code check run

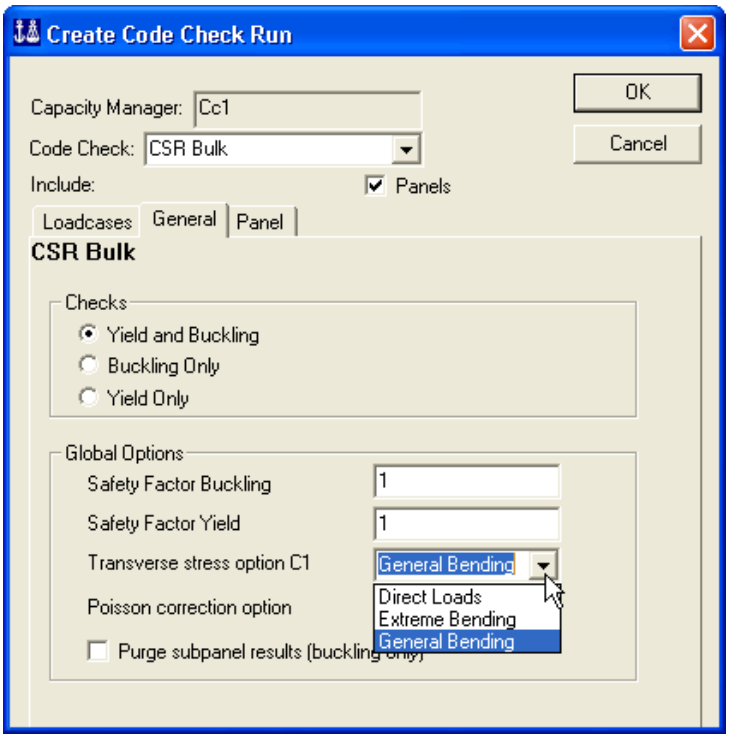
There are several general settings you can alter for the run. Normally you would not alter the settings, but sometimes it may be useful. Splitting yield and buckling into separate runs makes it simpler to evaluate results.

Checks:

Yield and Buckling - For checking both for yield and buckling. This is set as default.

Buckling Only - For checking for buckling only.

Yield Only - For checking for yield only



Often you would check for both buckling and yield in the same run, but split if you want to assess yield and buckling results separately.

Global Options:

Safety Factor Buckling and Safety Factor Yield - You can set the safety factors larger than 1 if you want the construction to have a lower allowed usage rate. A higher safety factor gives a "safer" structure.

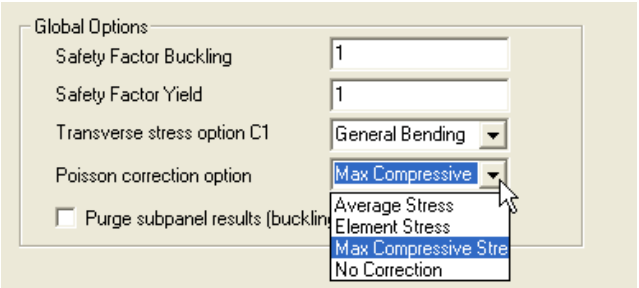
Transverse stress option C1

See CSR Bulk rules, chapter 6.3, table 2 for an explanation. Three alternatives are available:

- Direct Loads
- Extreme Bending
- General Bending – This is default.

Poisson correction option

Four alternatives are available:



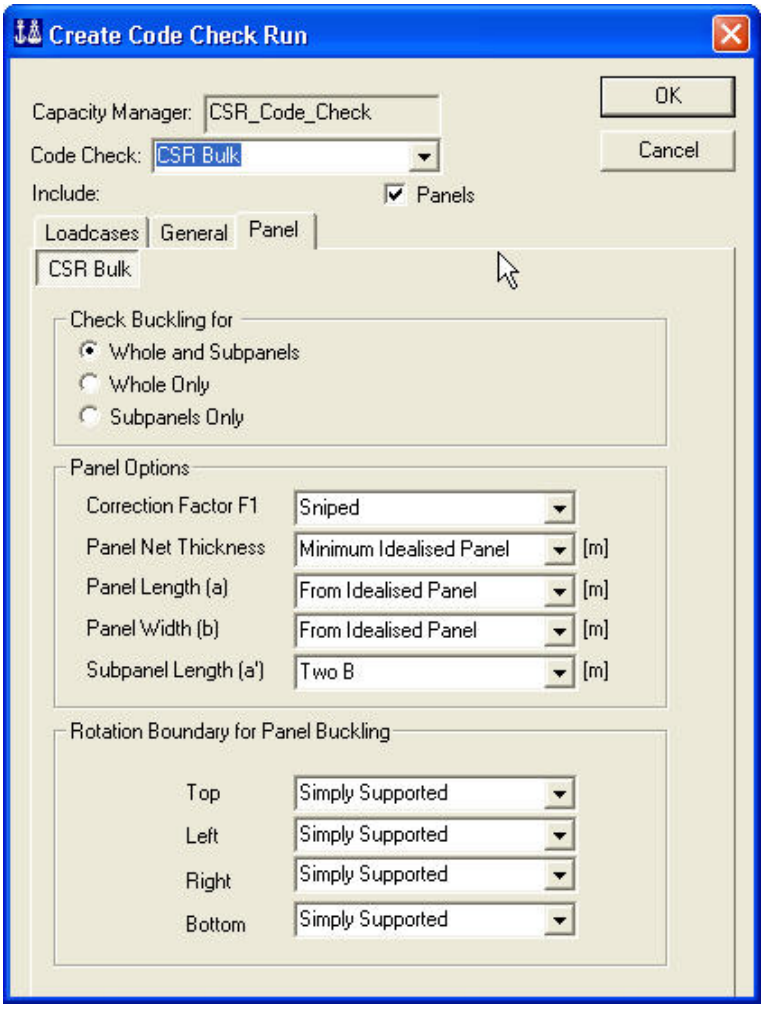
- Average Stress – Uses the average X-stress and average Y-stress as input to the Poisson correction for the whole panel.
- Mac Compressive Stress – Uses the max compressive X-stress and max compressive Y-stress as input to the Poisson correction for the whole panel. - This is default.
- Element Stress – Performs the Poisson correction element by element.
- No Correction – This option is primary available for parameter studies. It will give higher usage factors than when the Poisson correction is applied for bi-axial compression.

Purge subpanel results (buckling only)

With this option checked, Genie will still perform buckling check for all subpanels, but will only store results for the one with the highest usage factor.

2.3.7 Modifying the Panel settings in the CSR Bulk code check run

There are several panel settings you can alter for the run. Normally you would not alter the settings, but sometimes it may be useful.



Check Buckling for:

Whole and Subpanels – For checking buckling both on the panels and on the subpanels. All panels that are long compared to the breadth (aspect ratio greater than 3) are split into subpanels.

Whole only – for checking buckling only on whole panels, not taking subpanels into consideration.

Subpanels only – for checking buckling only on subpanels.

Panel Options:

Correction Factor F1 – Correction factor for boundary condition of stiffeners on the longer side of panels as described in chapter 6.3 in the CSR Bulk rules.

Panel Net Thickness – you can manually insert a net thickness or use the default net thickness.

Panel Length (a) – Length of elementary plate panel

Panel Width (b) – Breadth of elementary plate panel

Subpanel Length (a') – Length of subpanel. One panel can consist of several subpanels if its length is long compared to its breadth. Default subpanel length is 2 x b.

Rotation Boundary for Panel Buckling:

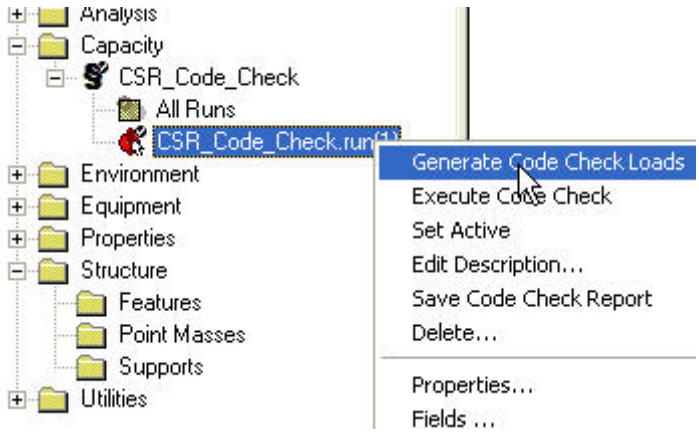
Normally, all edges are assumed simply supported, you can however override this by freeing or clamping some of the edges. See CSR Bulk rules, chapter 6.3 table 2 for details.

The CSR Bulk code check run is now available in the browser – the browser will be used when looking at the code checking results later.

2.3.8 Compute code checking forces

The finite element analysis will compute the element stresses within each finite element. For the code checking it is necessary to compute the forces for the idealised panels. The code checking positions are automatically determined by GeniE. Whenever the concept model has been updated, and the finite element analysis has been reexecuted, the code checking forces must be recomputed.

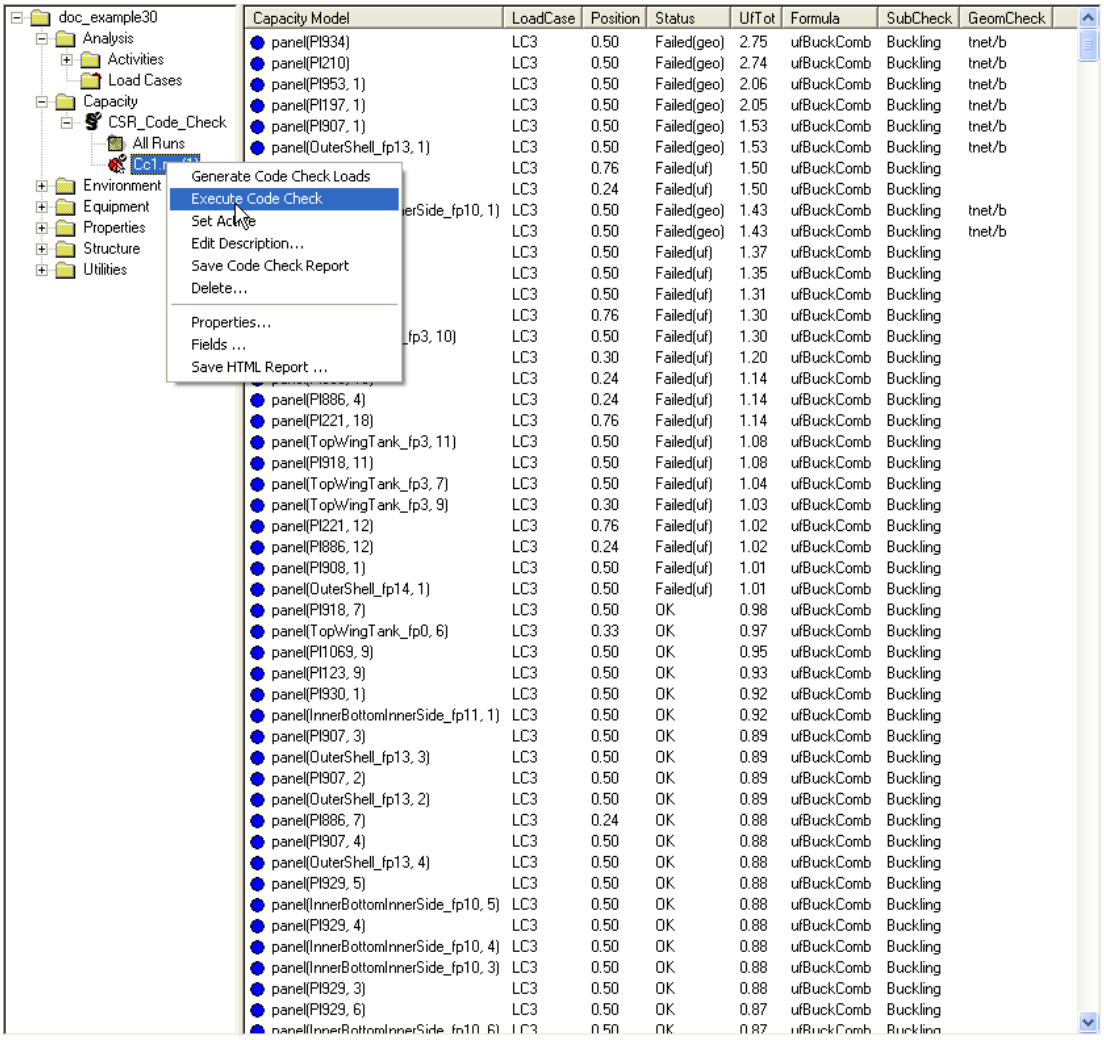
The code checking forces are computed by selecting an individual run or a capacity manager in the browser. Click RMB and select *Generate Code Check Loads.*



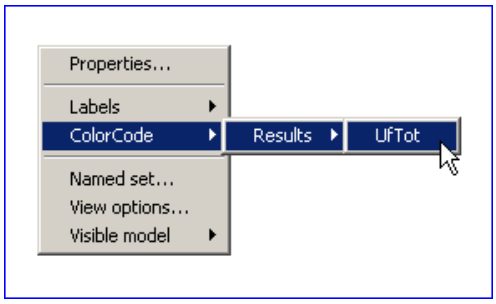
2.3.9 Perform the code check

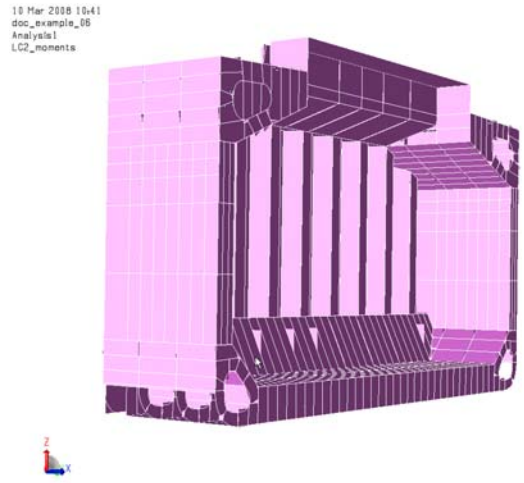
The code checks for panels can now be done from the browser (remember to specify which code check run is active). Below is shown how to start the code check and the associated results in the browser and a colour coded view.

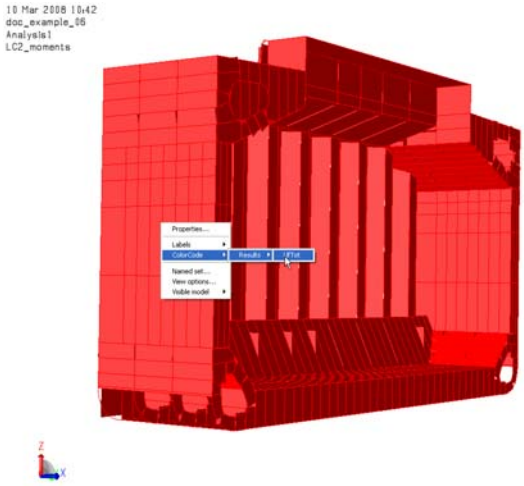
If you have several code check runs, you may compute the forces and execute the code checks for all your runs from the “All Runs” folder.



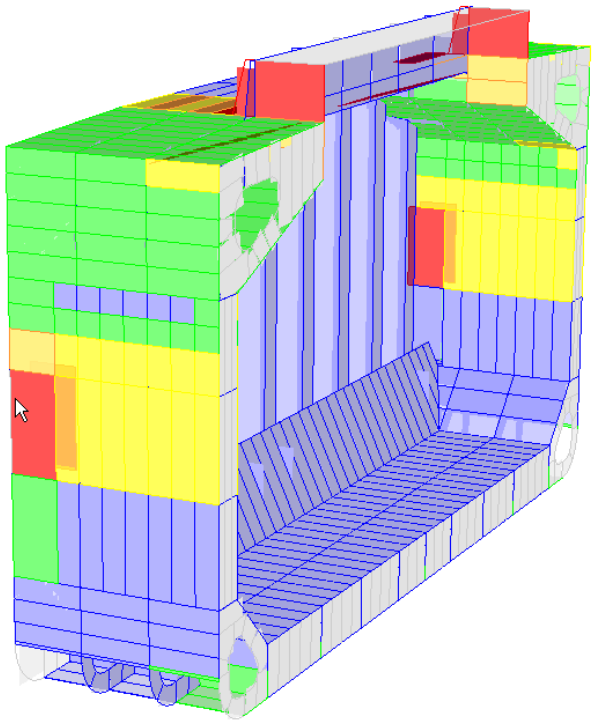
To make a colour coded view of the utilisation factors, simply select all capacity panels in the capacity view, RMB and select *ColorCode|Results|UfTot*.





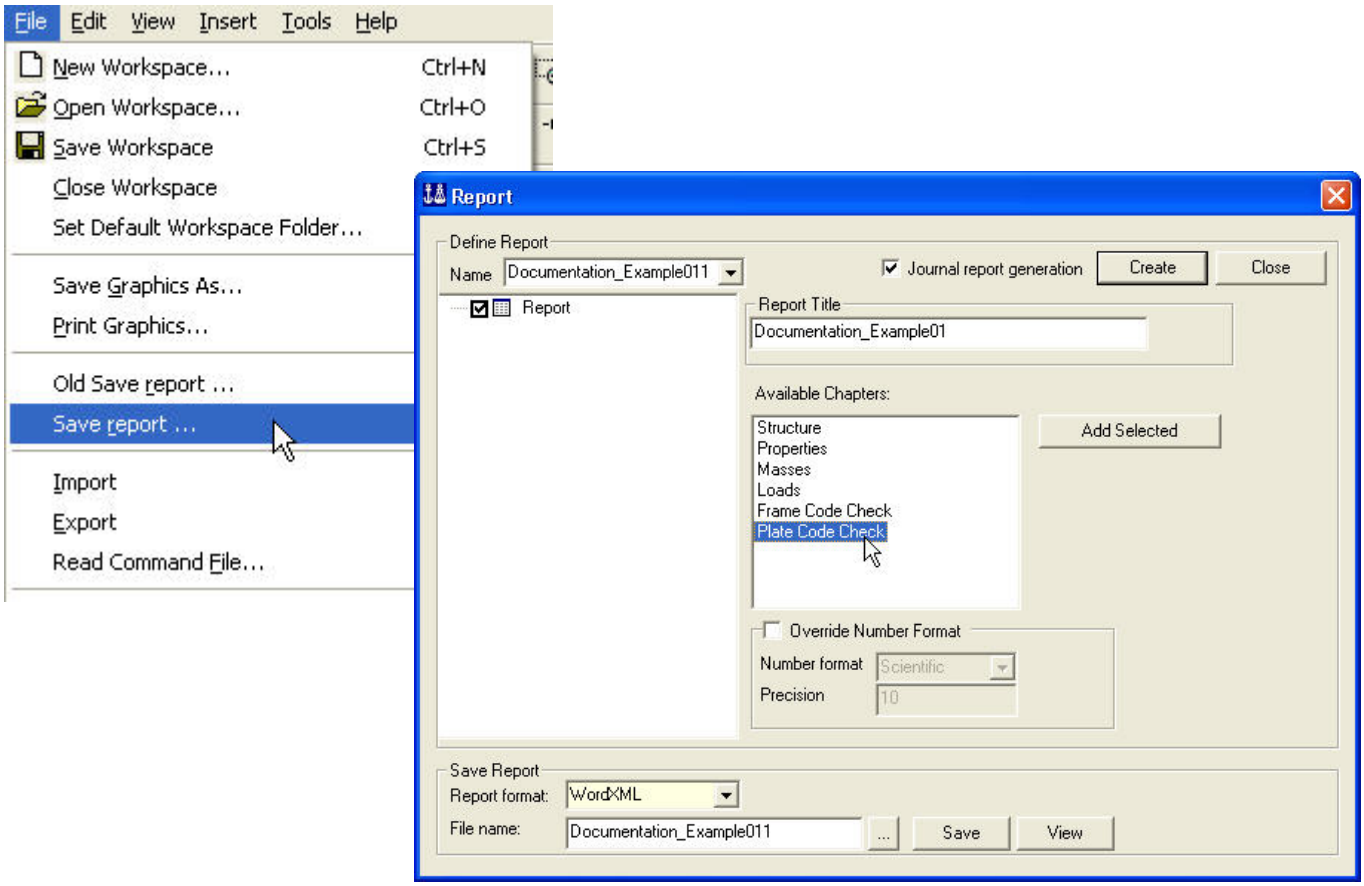


On the illustration below, the transparency levels are set higher for panels with low usage factor. This makes it easier to see the problem areas.



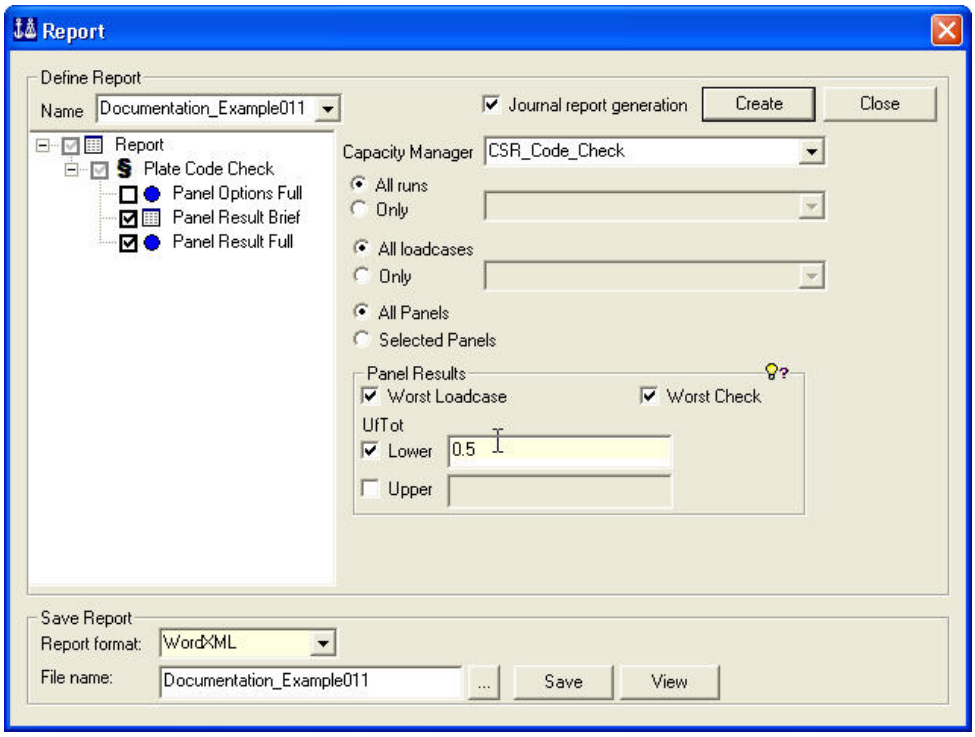
2.3.10 Making a code checking report

The report generator comes with templates to easily generate reports for viewing in text format (typically by using MS Notepad), html format (typically from an internet browser), spreadsheet (MS Excel) or formatted report (MS Word).You may use filters to limit the amount of data that is reported. Furthermore, your report settings may be saved so that you easily can recreate the same report in another code checking run.



When you have added the Chapter “Plate Code Check” to your report it is possible to use the filters to specify the content you want.

This example uses the default report settings except for the limit of 0.5 for the lower utilisation factor.



A typical page of a report when viewing it in MS Word is shown to the right.

1 CSR_Code_Check : Plate Code Check

Description : Capacity Manager

1.1 CSR_Code_Check.run(1) : Plate Code Check

Description : CSR Bulk - Buckling and Yield Check

General options

Code	CSR Bulk
Check Buckling	true
Check Yield	true
Safety Factor Buckling	1
Safety Factor Yield	1
Transverse Stress Option	General Bending

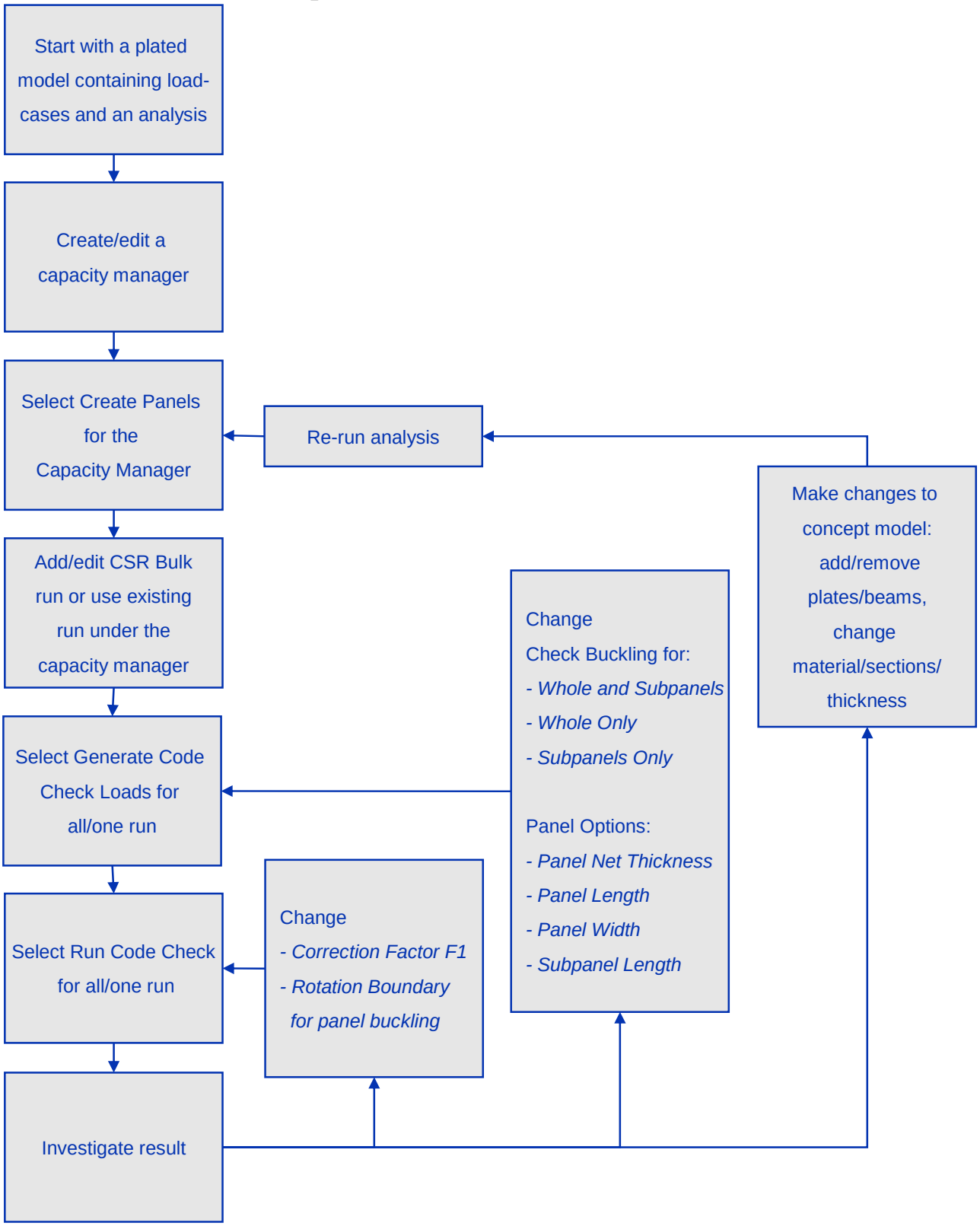
1.1.1 CSR_Code_Check.run(1) : Panel Result Brief

CSR_Code_Check.run(1) : Panel Result Brief

- Sorted by UfTot (Descending)
- Filtered by Limit : (UfTot >= 0.5)
- Run : CSR_Code_Check.run(1)
- Worst LoadCase per Panel
- All SubChecks per Panel
- Worst Position along Panel

Panel	Loadcase	Position	Status	UfTot	Formula	GeomCheck	SubCheck	Run
Pl1	LC02_y_const	0.50	Failed(uf)	2.54	ufTotalFEM	Geom OK	CSR Bulk Panel Buckling	CSR_Code_Check.run(1)
Pl1	LC02_y_const	0.50	OK	0.68	ufVonMises	Geom OK	CSR Bulk Panel Yield	CSR_Code_Check.run(1)

2.4 The work flow of a panel code check



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3. HOW TO DO PANEL CODE CHECKING

This Chapter will guide you through the steps which are necessary to do code panel code checking. A reference case will be used; the slice of a bulk ship that was introduced earlier in this user documentation.

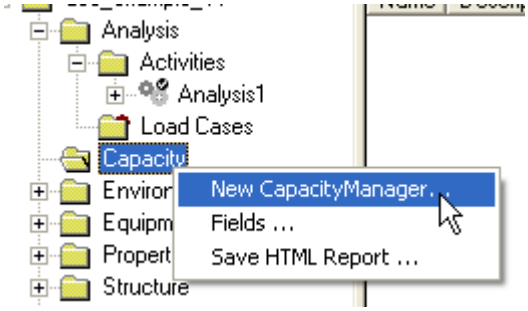
The following procedure may be used when performing code checks; each is described in detail except for the four first steps (please consult the User Manual Vol. I for guidance).

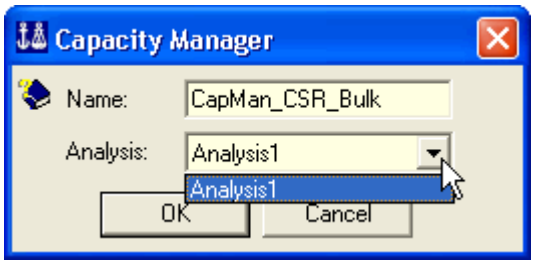
- Make a plate model. Beams may be included. A “real world” model will typically contain both beams and plates.
- Run the finite element analysis
- Define relevant load combinations if they were not part of the above analysis.
- Create a capacity manager
- Define the panels
- Create a code check run
- Assign specific settings to individual panels
- Compute the code checking forces
- Perform the code check and investigate the results graphically or from the browser.
- If necessary modify plate thickness, materials or other code checking parameters and re-run.
- Make a report

3.1 Create a capacity manager

The purpose of a capacity manager is to decide which analysis results to use in the code checking. It is possible to have several analysis activities in GeniE where you can have different loadcases as well as analyse subsets of your model. To be able to do code checking you need to define multiple capacity managers referring to the different analysis in question.

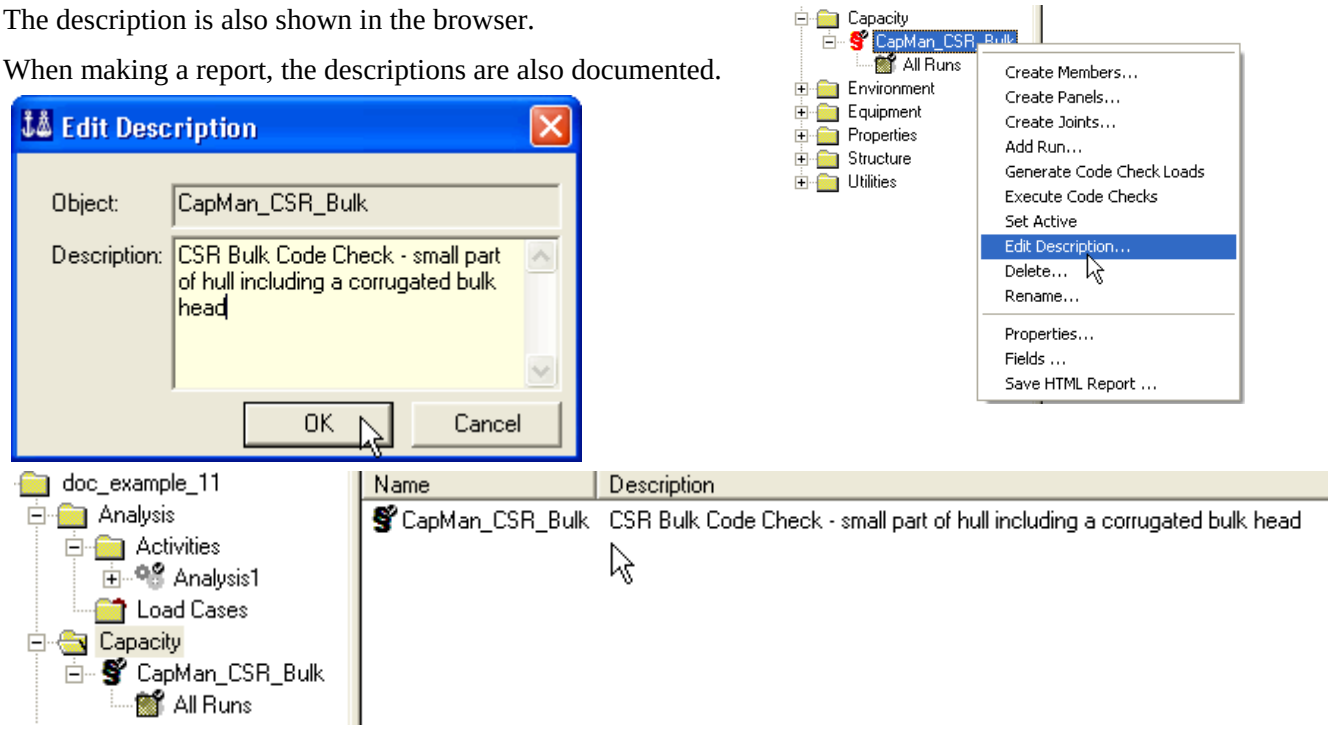
In this case we have one analysis, and one capacity manager is created from the browser.





You may add additional description to the capacity manager.
The description is also shown in the browser.

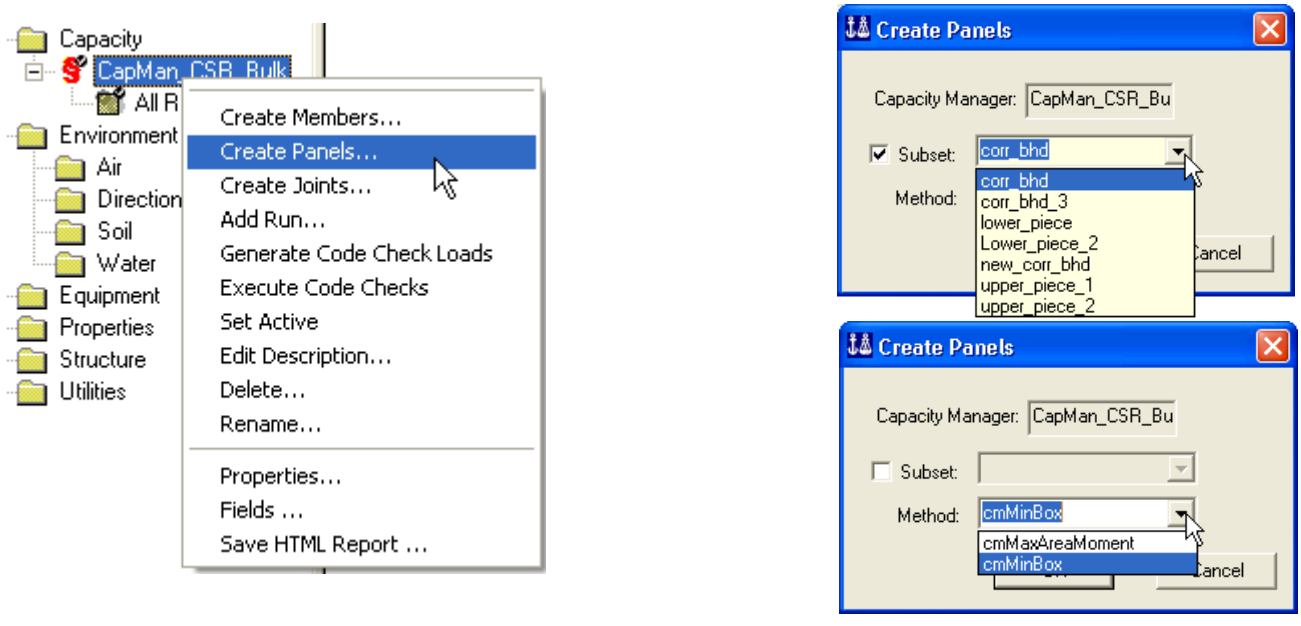
When making a report, the descriptions are also documented.



3.2 Define panels

When modelling a concept model it is possible to make continuous plates that span several beams. This means that the concept model is different from a panel capacity model which spans between two beams only. It is therefore necessary to split up the concept model into a elementary panel capacity models.

When the model is split or kept, the default buckling lengths are set since they are the same as the length or the breadth of a capacity panel.



If you are working on a large bulk carrier model it is necessary to divide the model into smaller subsets and create panels for one subset at a time. This can be done by checking the *Subset* check button and choose a subset from the subset list.

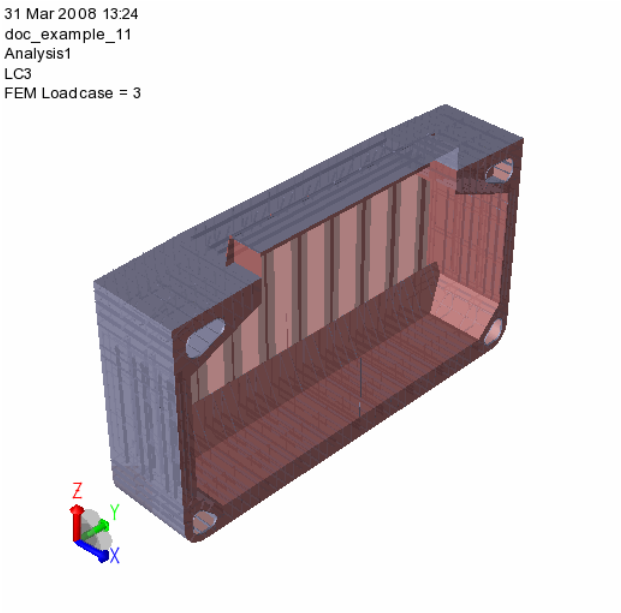
When creating panels there are two choices available:

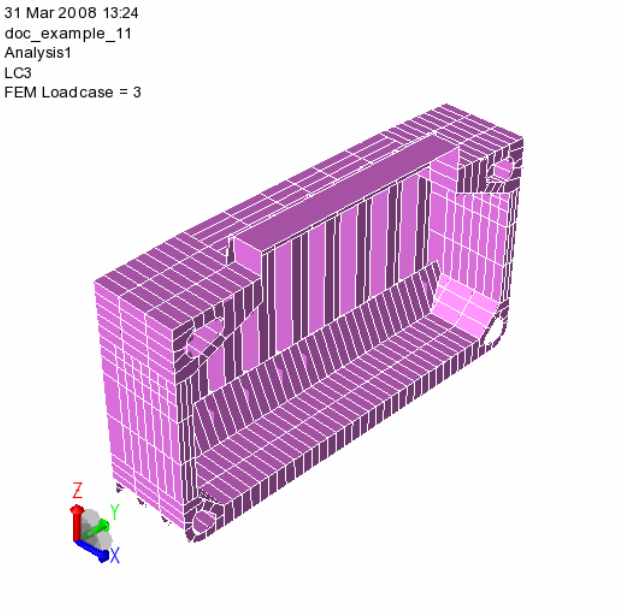
- cmMinBox: finds the smallest idealised rectangular panel possible enclosing the possibly non-rectangular structural region.
- cmMaxAreaMoment: Is an alternative algorithm.

It most cases cmMinBox can be used and it is therefore set as default.

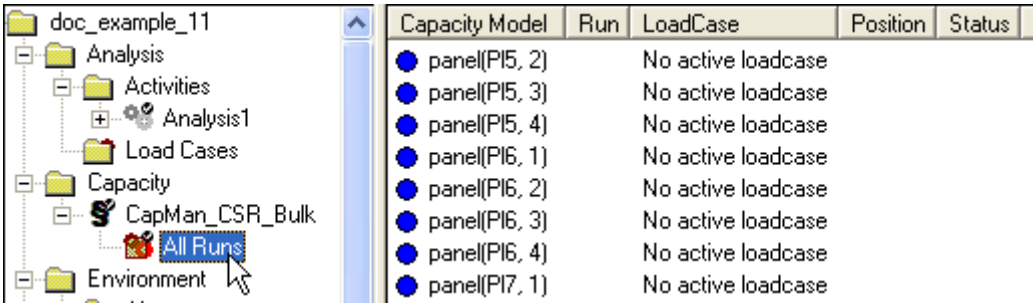
The naming convention of capacity panels refer to the plates. If Plate *Pl20* is split into two capacity members they are denoted *panel(Pl20,1)* and *panel(Pl20,2)*.

The pictures show the concept model and the capacity members.





The browser lists each capacity member. If you have several capacity managers you need to specify which manager is active (select a manager, RMB and choose *Set Active*). In this case "CapMan_CSR_Bulk" is the only capacity manager and it is set to active.

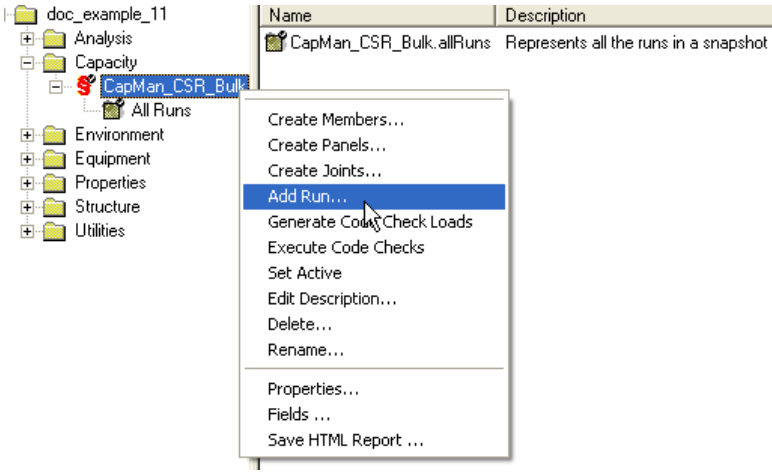


3.3 Create a code check run

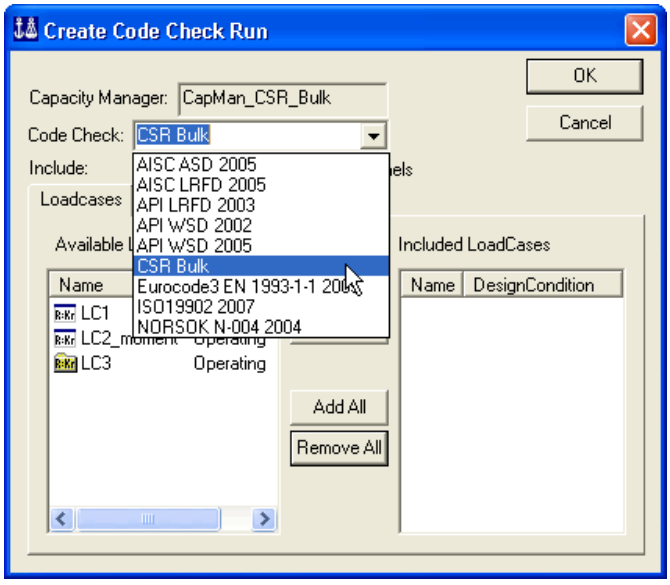
During the definition of code check runs you decide

- which code of practice to use
- which loadcases to use
- global code checking parameters (i.e. those who apply to the entire capacity model) – for example buckling lengths or safety factors

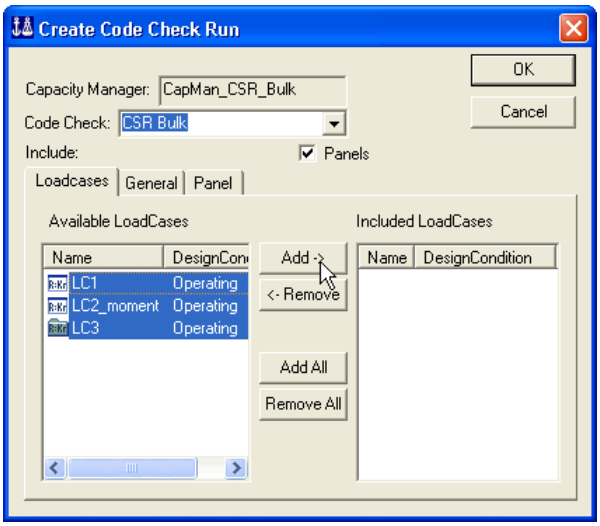
The code check run is defined from the browser.

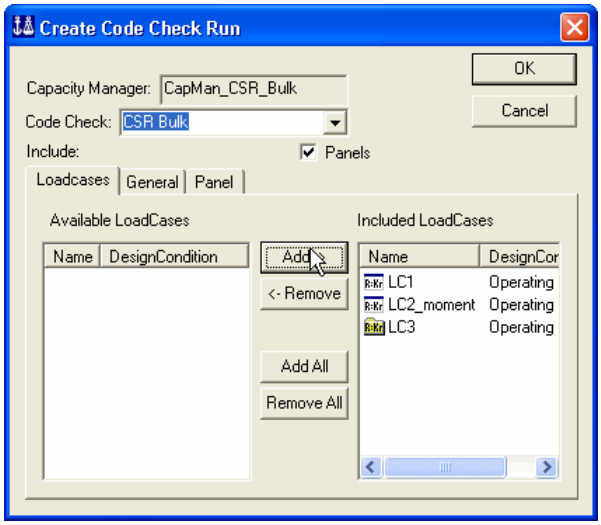


In the example to the right the code check CSR Bulk has been selected.

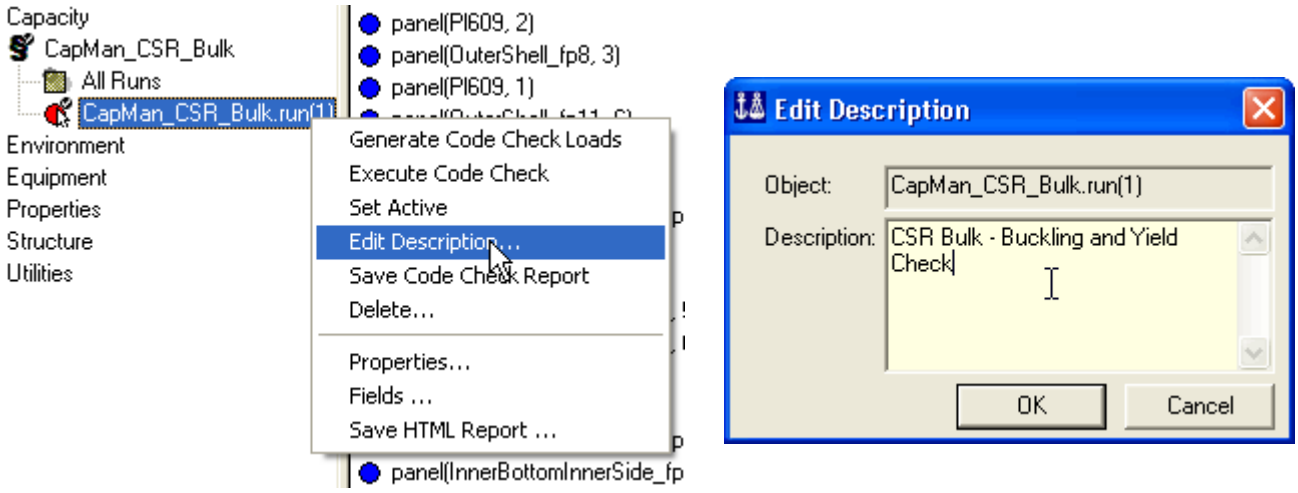


Furthermore, all the loadcases have been added to the code check run.





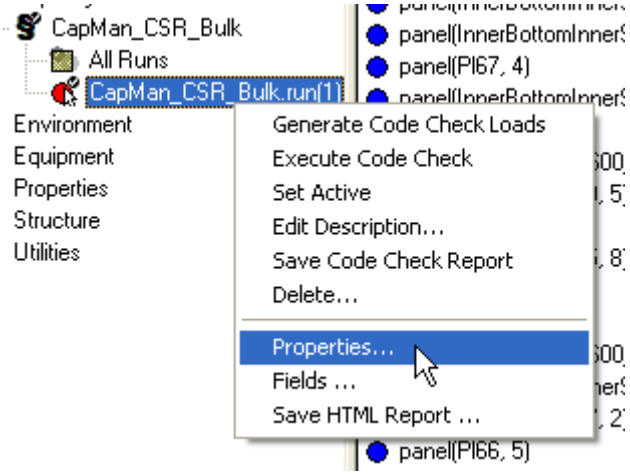
You may modify the code check run from the browser and define additional information to the run.



The same procedure may be used to create another code check run. You then have to specify which one is active from the browser.

3.3.1 Define global general code checking parameters

You specify and modify the general code checking parameters when you define the code check run, or you may modify at a later stage. To modify, select *Properties* as shown on the picture to the right.

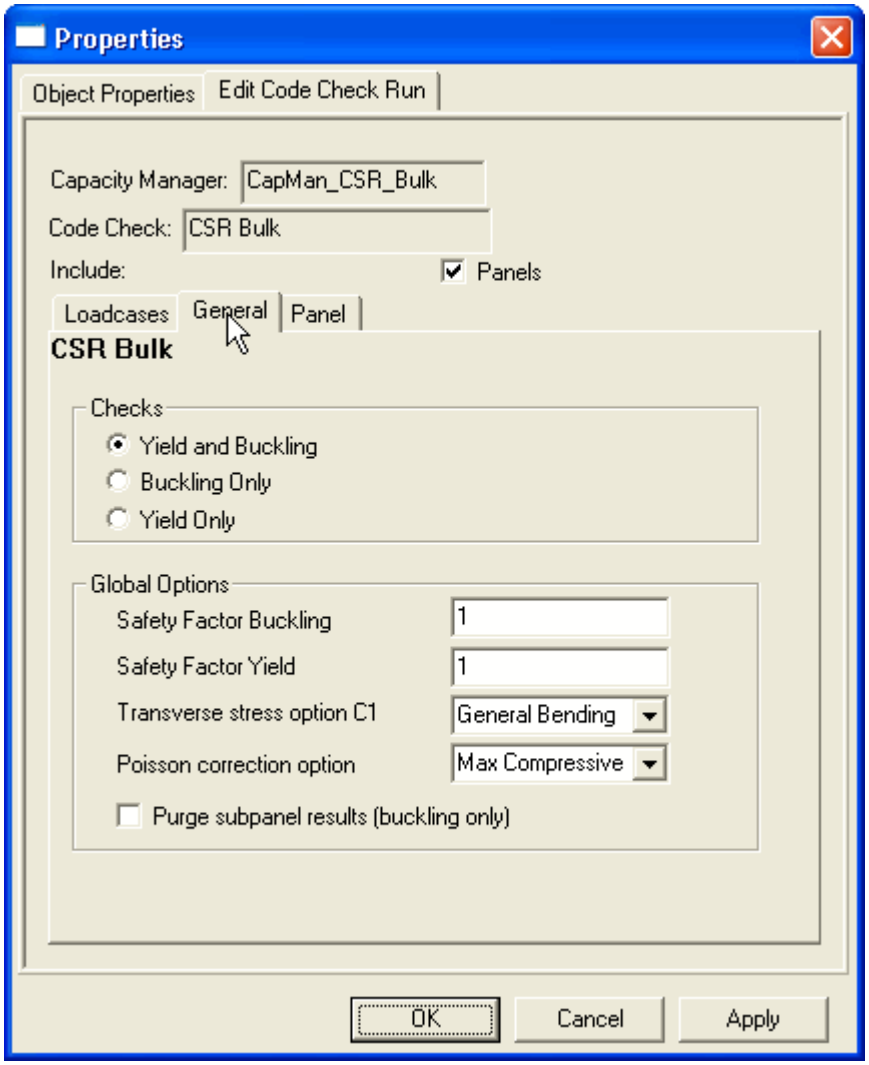


For a further description of parameters shown herein, please consult the relevant codes of practices.

The general code checking parameters are global, i.e. they apply to all capacity panels.

3.3.1.1 General parameters CSR Bulk

The general parameters for the offshore code check CSR Bulk are shown to the right. The parameters are explained in chapter 2.3.6.

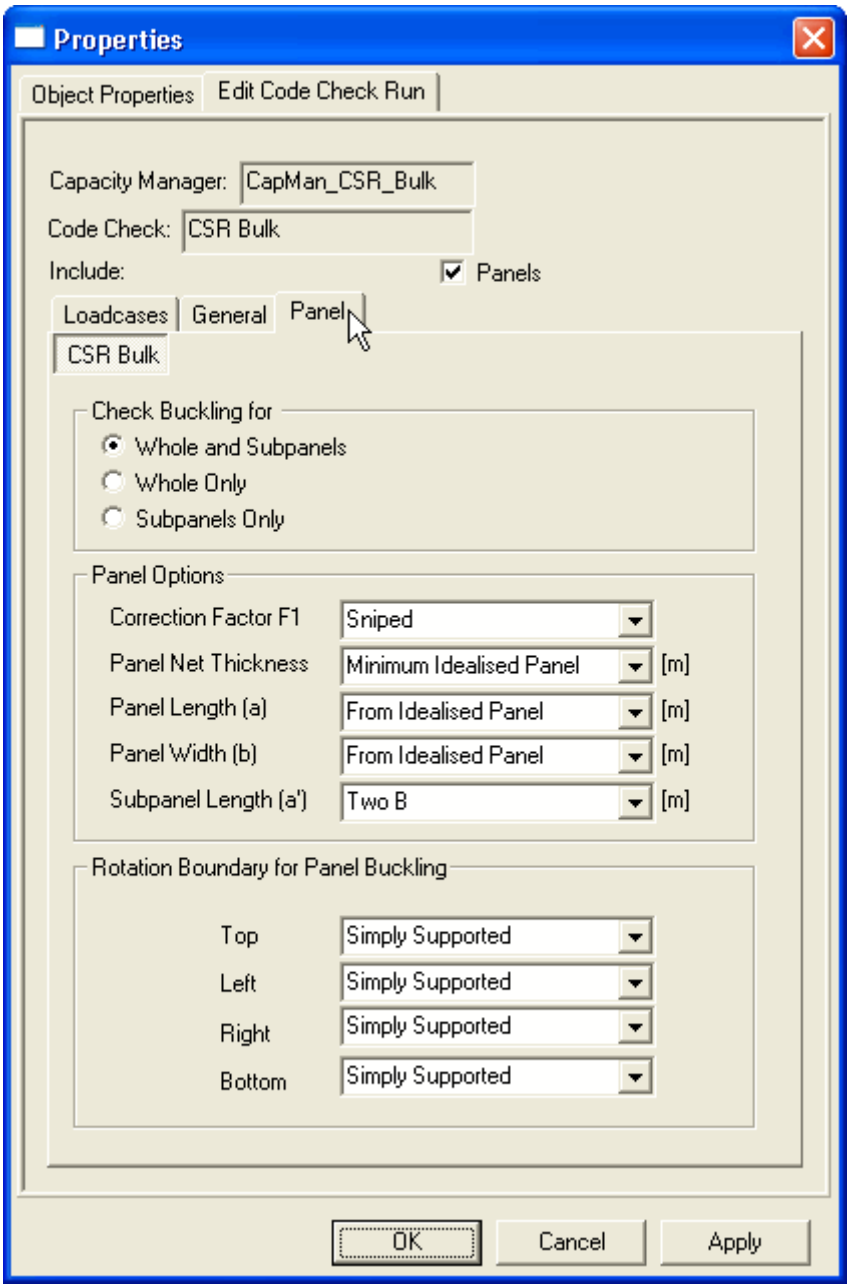


3.3.2 Define global panel parameters

The global panel parameters (those who apply to the all capacity panels) may be changed from default values when you define the code check run or later. The default values are shown in the following for the CSR Bulk code check alternative.

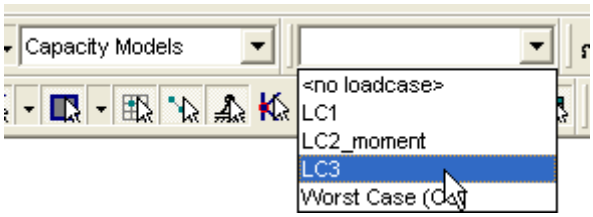
3.3.2.1 Panel parameters CSR Bulk

The default member data for panels are shown to the right. The parameters are explained in chapter 2.3.7.

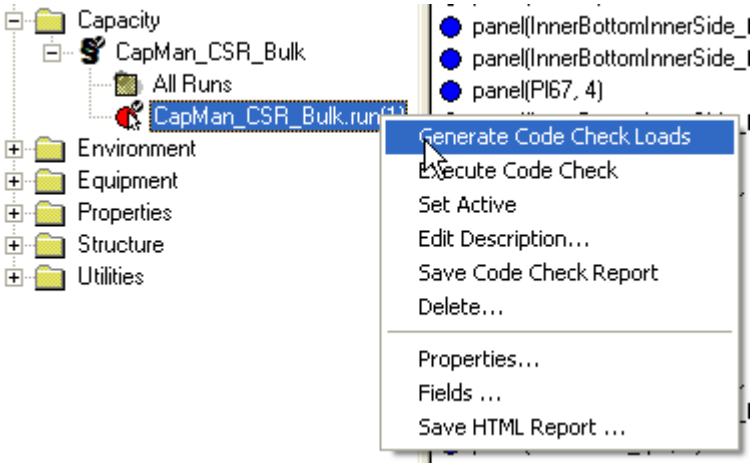


3.4 Perform the code check

To do the code check, we first have to select a loadcase that is included in our run. To do this, select the loadcase from the combo box on top of the screen, like shown to the right.



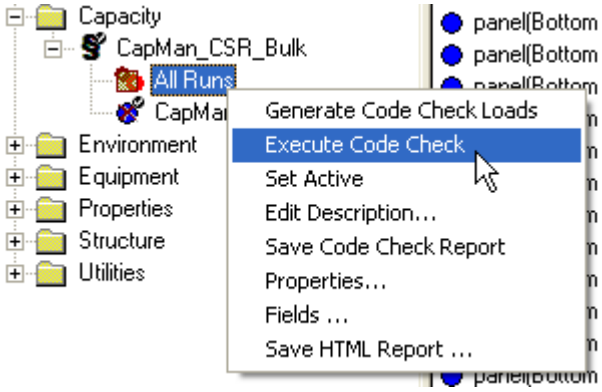
We then have to generate the code check loads. This can be done for one run individually, or for all the runs at the same time. To generate code check loads for all the runs, click **RMB** at *All Runs* and select *Generate Code Check Loads.* To generate code check loads for one individual run, click **RMB** on the run of interest, and select *Generate Code Check Loads.* This is shown in the illustration to the right.



The code check is executed by using the command Execute Code Check.

Like for the *Generate Code Check Loads*, the *Execute Code Check*, can be carried out for all the runs at once or for only one run.

In the illustration to the right it is shown how to execute code check for all runs at once.

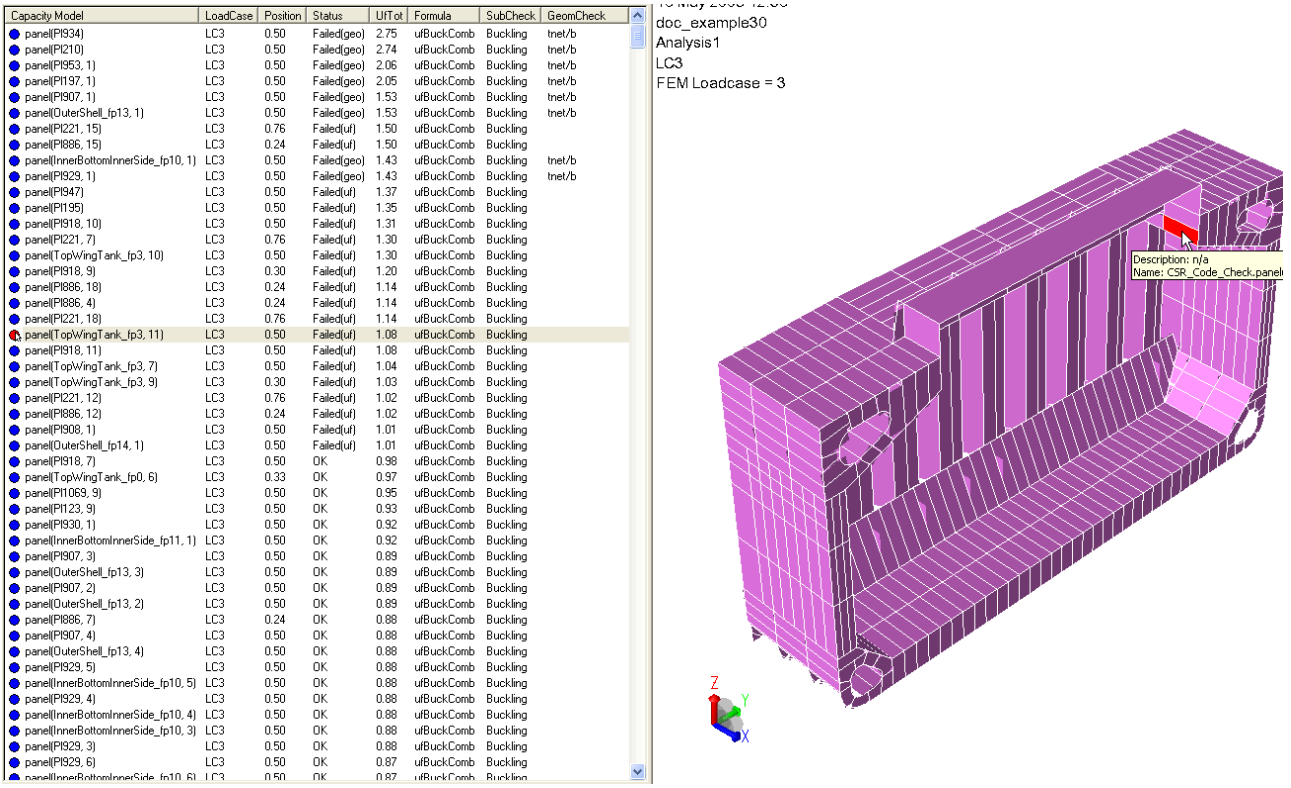


When the code check has been performed the browser includes results from the code check. The example below show a typical browser view for a panel check.

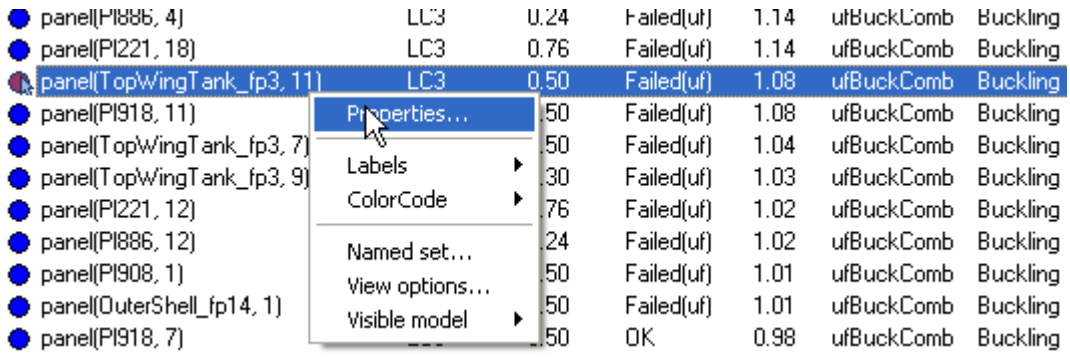
panel(Bottomgirder12800_fp0, 6)	LC3	0.50	OK	0.55	ufVonMises	Yield	
panel(Pl890, 6)	LC3	0.50	OK	0.55	ufVonMises	Yield	
panel(Pl906, 1)	LC3	0.50	Failed(geo)	0.54	ufBuckComb	Buckling	tnet/b
panel(OuterShell_fp12, 1)	LC3	0.50	Failed(geo)	0.54	ufBuckComb	Buckling	tnet/b
panel(TopWingTank_fp2, 3)	LC3	0.50	OK	0.54	ufBuckComb	Buckling	
panel(Pl903, 6)	LC3	0.50	OK	0.54	ufVonMises	Yield	
panel(Pl917, 3)	LC3	0.50	OK	0.54	ufBuckComb	Buckling	
panel(Pl914, 5)	LC3	0.50	OK	0.54	ufBuckComb	Buckling	

3.5 Local code checking parameters

This Section describes how to modify the parameters for individually capacity panels. To do this, you select one ore more panels either in the browser or in the capacity models graphic view. Then click **RMB** and select ***Properties***. You can then modify the code checking parameters as described in the previous Chapter.



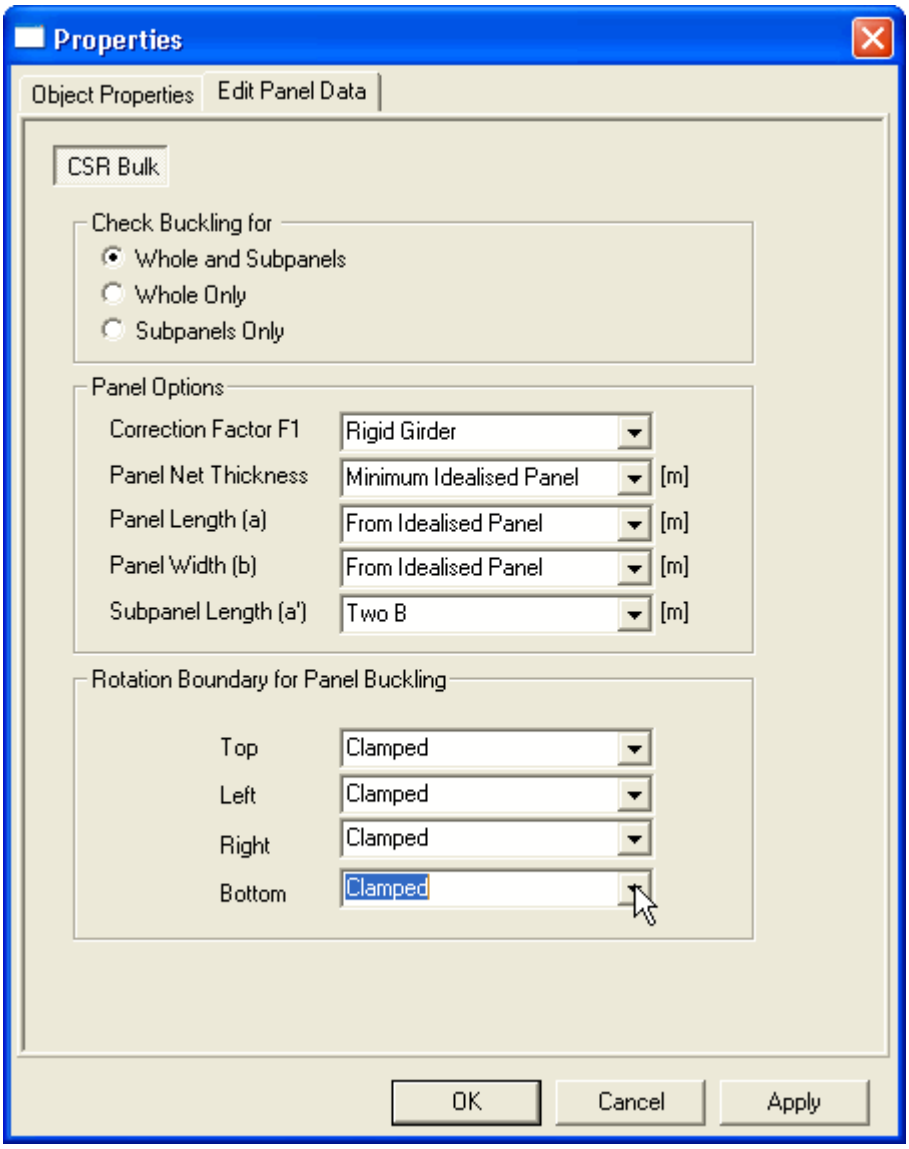
This opens the Properties dialog.



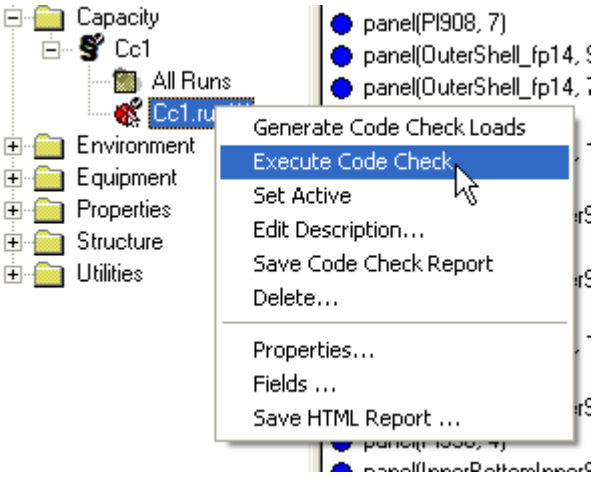
Under the Edit Panel Data tab we can change the panel's properties.

The correction factor F1 is changed from *Sniped* to *Rigid Girder*. The rotation boundaries for panel buckling is changed from *Simply Supported* to *Clamped* for all boundaries.

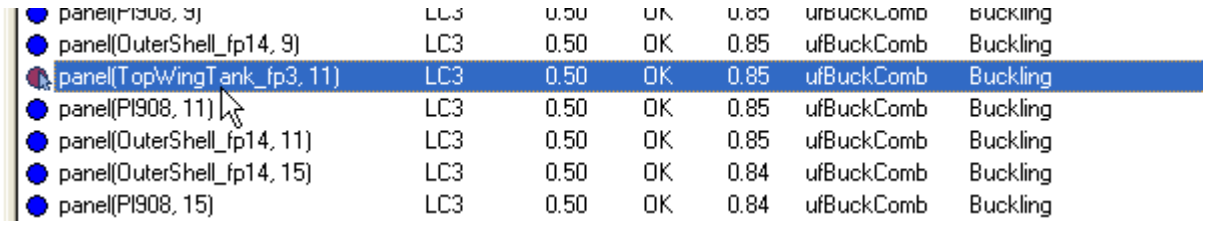
After closing the Properties dialog by clicking ***OK***, we can observe that there are no results available for the panel.



panel(Pl886, 4)	LC3	0.24	Failed(uf)	1.14	ufBuckComb	Buckling
panel(Pl221, 18)	LC3	0.76	Failed(uf)	1.14	ufBuckComb	Buckling
panel(TopWingTank_fp3, 11)	No results					
panel(Pl918, 11)	LC3	0.50	Failed(uf)	1.08	ufBuckComb	Buckling
panel(TopWingTank_fp3, 7)	LC3	0.50	Failed(uf)	1.04	ufBuckComb	Buckling
panel(TopWingTank_fp3, 9)	LC3	0.30	Failed(uf)	1.03	ufBuckComb	Buckling
panel(Pl221, 12)	LC3	0.76	Failed(uf)	1.02	ufBuckComb	Buckling



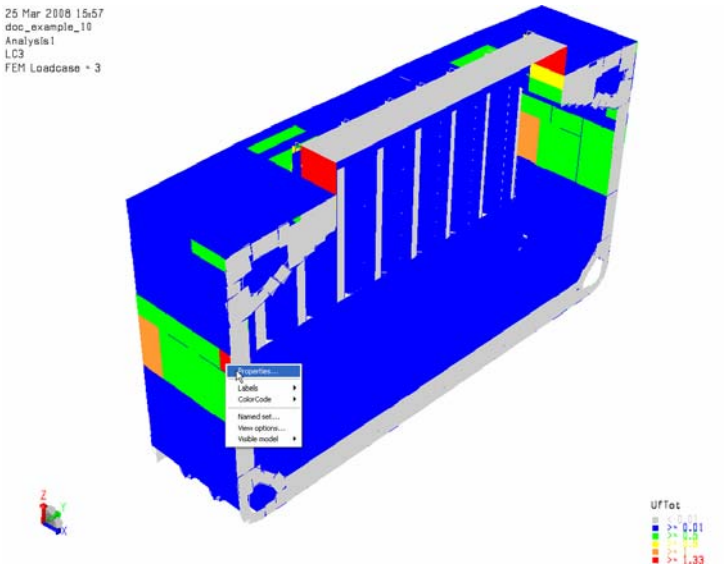
To see the new result after having made the changes, we have to select ***Execute Code Check*** for our run.



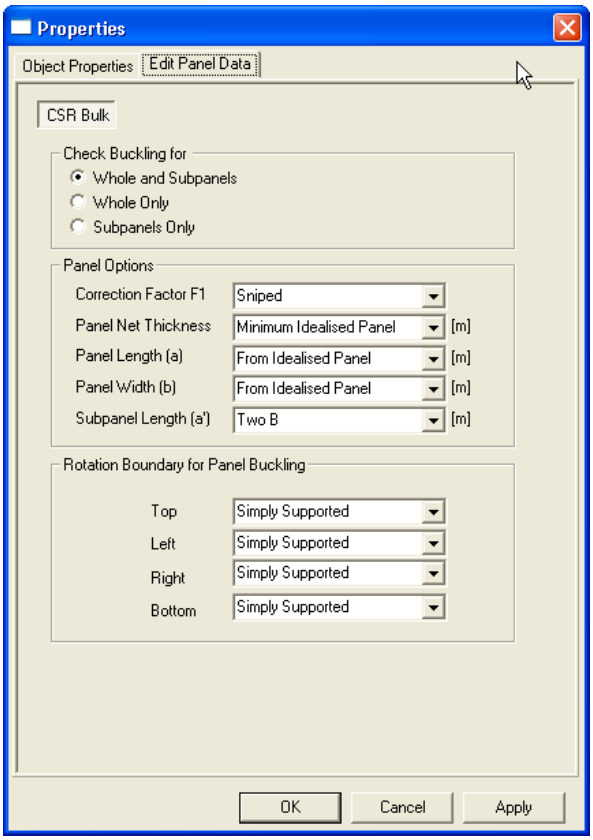
The new result for the panel is now available. Note that Uftot for the panel is different because of the changes we made in the panel's properties.

3.6 The properties of a panel

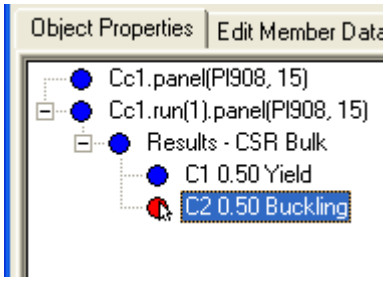
We are watching the capacity model color coded with respect to the Uftot. We select one panel by **LMB**, click **RMB** and select ***Properties***.



A dialog appears and we select ***Object Properties*** to have a look at the properties for the selected panel.



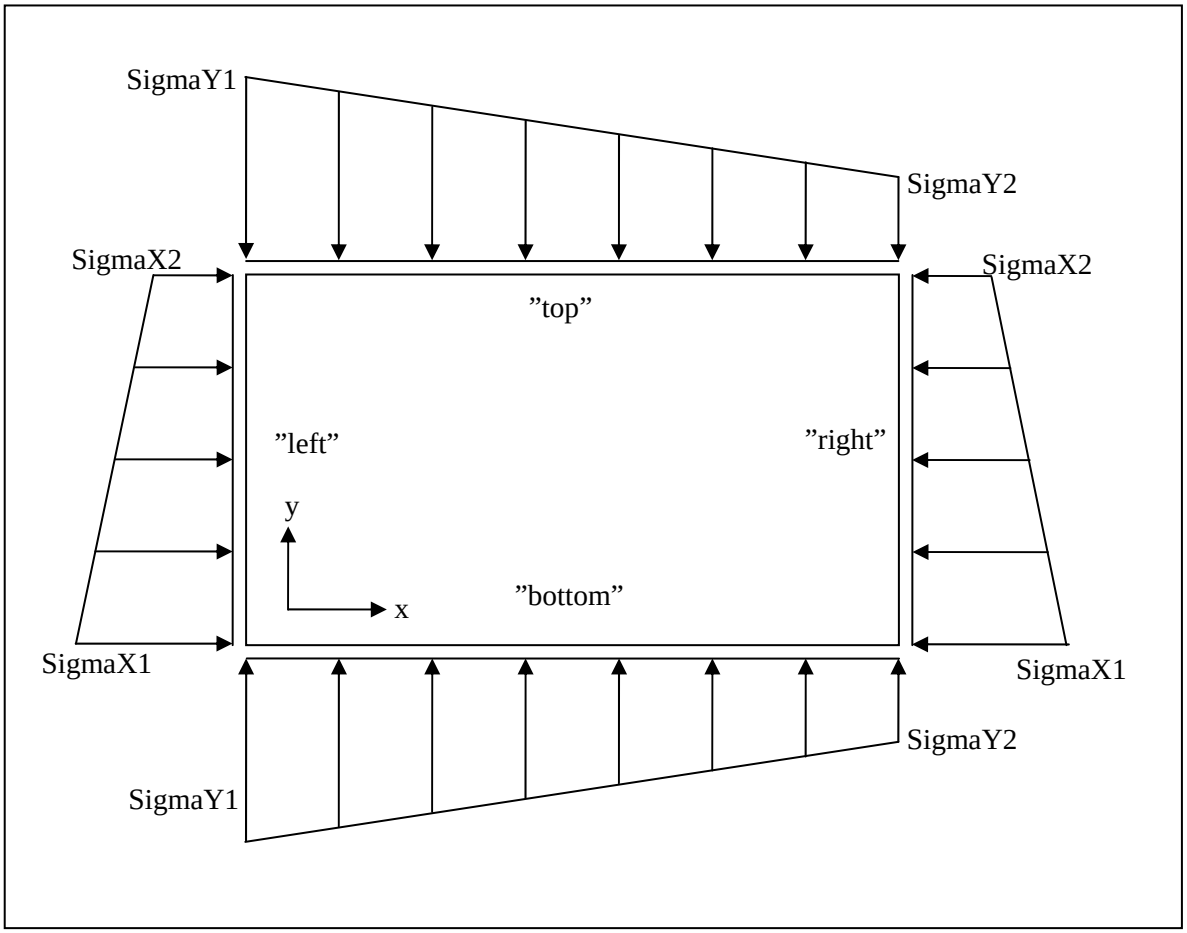
We then select ***Buckling*** to have a look at the buckling results.



A lot of information concerning the panel is available. The different concepts are explained below.

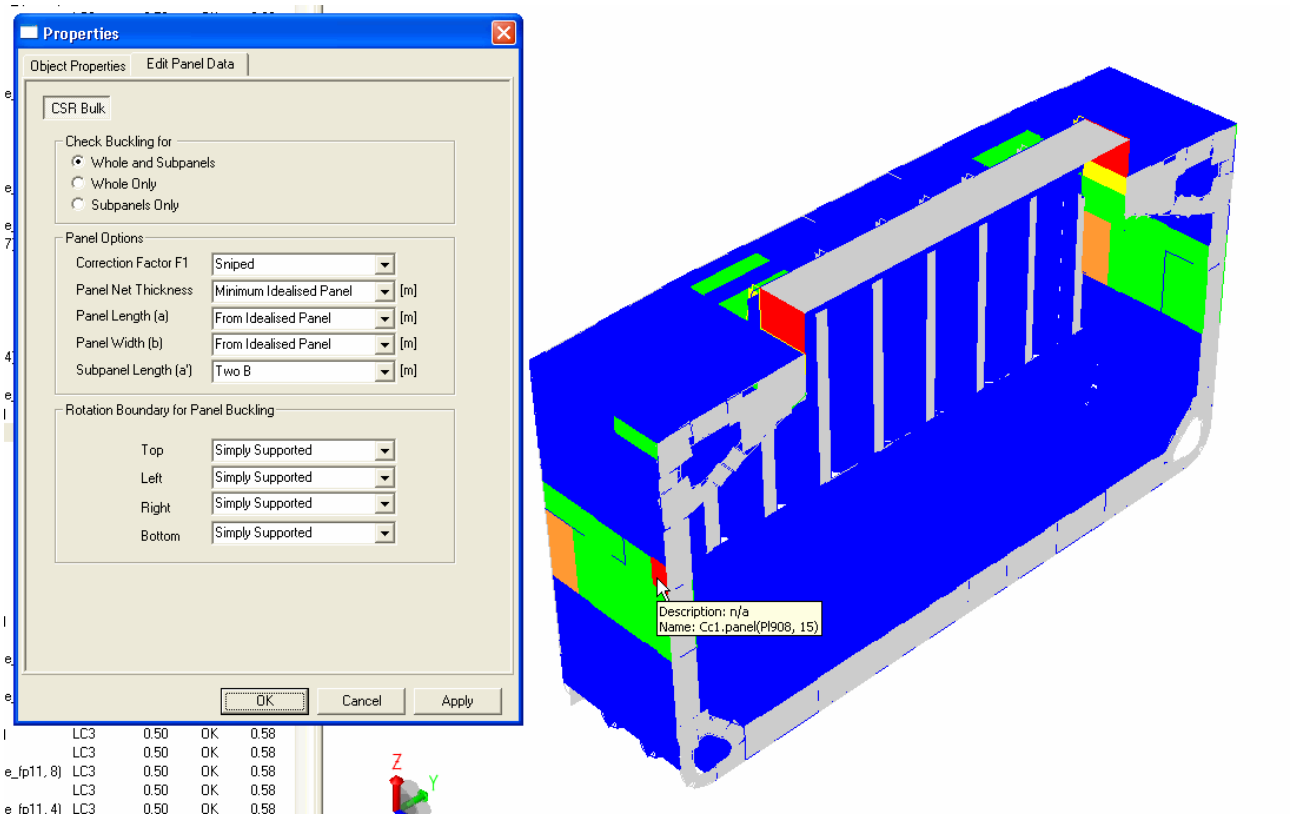
Name	Description
Panel	TopWingTank_fp3, 11
LoadCase	LC3
Position	0.50
Status	OK
UfTot	0.85
Formula	ufBuckComb
GeomCheck	Geom OK
SubCheck	Buckling
Run	CSR_Code_Check.run(1)
a [m]	2.39981
b [m]	0.900071
t_net [m]	0.015
Fy [Pa]	3.55e+008
da [m]	0
db [m]	0
SigmaX1 [Pa]	-2.85515e+008
SigmaX2 [Pa]	-2.29542e+008
SigmaY1 [Pa]	0
SigmaY2 [Pa]	0
TauXY [Pa]	-595027
ufBuckComb	0.847
ufBuckSigmaX	0.847
ufBuckSigmaY	0.000
ufBuckTau	0.000
ufBuckInter	0.000
a/b	2.666244984
tnet/b	0.01666534692
Kx	7.091110229
kapx	0.8903189301
Ky	1
kapy	1
Ktau	10.22373772
kaptau	1

Panel	The name of the panel
Loadcase	The name of the loadcase
Position	Centroid of panel or subpanel. 0.50 is on the middle of whole panel.
Status	Status of a panel is either: *OK*, *Failed (Uf)* or *Failed (geo)*
UfTot	Utilisation factor
Formula	The formula that is governing
GeomCheck	Shows whether the panel's geometry is consistent with regards to the code check
SubCheck	Which subcheck is governing
Run	The name of the run
a	The length of the panel (longest side)
b	The breadth of the panel (shortest side)
t_net	The net thickness of the panel used in capacity check
Fy	Yield strength of material
da	Length of cut out in panel (longest side), if any
db	Breadth of cut out in panel (shortest side), if any
SigmaX1	Stress in X direction along short side, *see illustration*
SigmaX2	Stress in X direction along short side, *see illustration*
SigmaY1	Stress in Y direction along long side, *see illustration*
SigmaY2	Stress in Y direction along long side, *see illustration*
TauXY	Shear stress in panel
ufBuckComb	Combined buckling Uf (i.e. bi-axial stress plus shear)
ufSigmaX	Contribution to Uf from stress in X direction
ufSigmaY	Contribution to Uf from stress in Y direction
ufTau	Contribution to Uf from shear stress
ufInterXY	Contribution to Uf from interaction term
a/b	Aspect ratio a/b
tnet/b	Net thickness / breadth.
Kx	Buckling factor X direction
kapx	Reduction factor X direction
Ky	Buckling factor Y direction
kapy	Reduction factor Y direction
ktau	Buckling factor shear
kaptau	Reduction factor shear


SigmaY1
SigmaY2
SigmaX2
SigmaX2
”top”
”left”
”right”
y
x
”bottom”
SigmaX1
SigmaX1
SigmaY2
SigmaY1

3.7 Edit Panel Data - Description

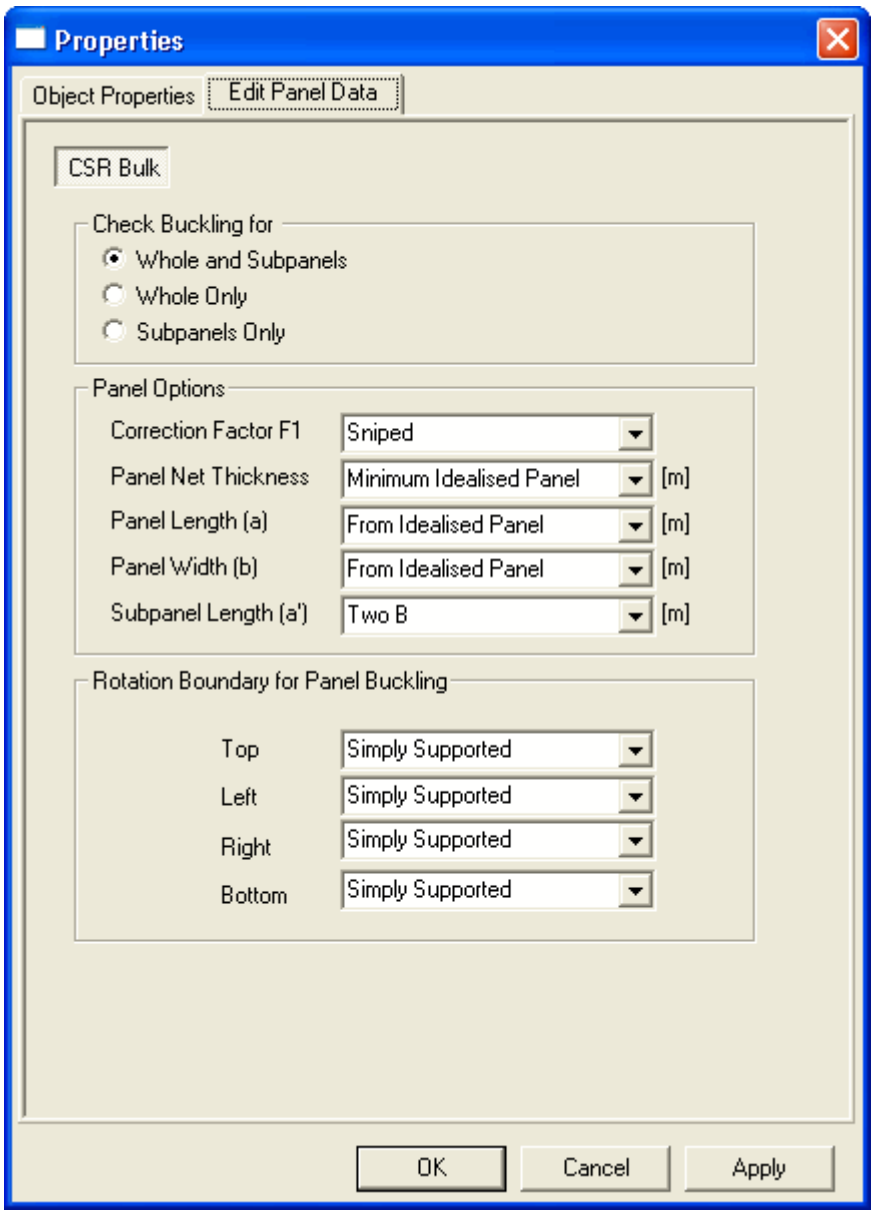
Select a panel, either in the graphics of the capacity view or by using the browser. Click **RMB** and select ***Properties.*** The dialog below shows up. Here you can change the settings for the panel.



3.7.1 Check Buckling for

- Whole and Subpanels
- Whole only
- Subpanels only

These are explained in chapter 2.3.7.

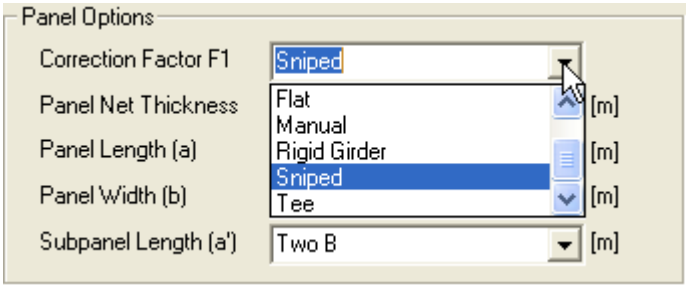


3.7.2 Panel Options

3.7.2.1 Panel Options - Correction Factor F1

The correction factor F1 is described in the CSR Bulk Rules as:

Correction factor for boundary condition of stiffeners on the longer side of elementary plate panels according to Tab 1. If the clamping is unequal on the longitudinal sides of the panel, the minimum value of the appropriate F1 parameter has to be used.



F1 values from the CSR Bulk Rules:

	F1	Edge stiffener
Stiffeners sniped at both ends	1.00	
Guidance values where both ends are effectively connected to adjacent structures	1.05	Flat bar
	1.10	Bulb section
	1.20	Angle and tee-sections
	1.30	Girders of high rigidity (e. g. bottom transverses)

The different F1 values can be chosen in the drop down menu (except the bulb section). Furthermore you can also insert a manual F1 value for your panel.

The default F1 value is *sniped*; F1 = 1.00.

If the panel has different conncetion to adjacent strcture on each side of the panel, you must manually specify the average F1 value.

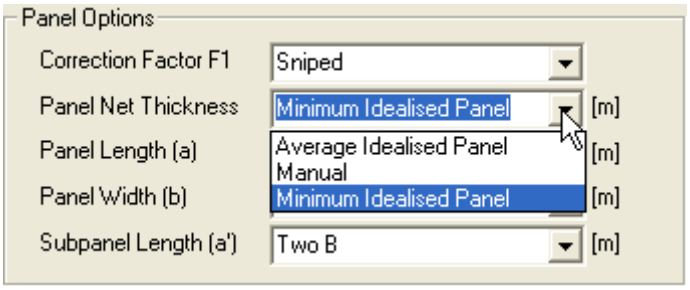
Example : The panel has a rigid girder on one side and a bulb stiffener on the other side, you must manually specify the average F1 value : F1 = 0.5*(1.3 + 1.1) = 1.2

F1 values for corrugated bulkheads

	F1	Edge stiffener
Corrugated bulkheads	1.1	Corr Web - web plate of corrugated bulkhead
	1.1	Corr Flange – flange plate of corrugated bulkhead

Note that normally the value of F1 is not significant for the usage factors for corrugated bulkheads, since the order of magnitude of SigmaY is much smaller than SigmaX.

3.7.2.2 Panel Options - Panel Net Thickness



You have three alternatives for setting the net thickness of the panel.

Average Idealised Panel

Using the weighted average net thickness within the panel.

Manual

Manually override the **net** thickness

Minimum Idealised Panel (default)

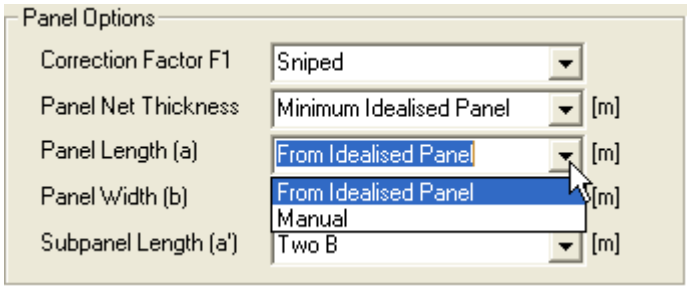
Using the smallest net thickness within the panel.

3.7.2.3 Panel Options - Panel Length (a) and Panel Width (b)

There are two options:

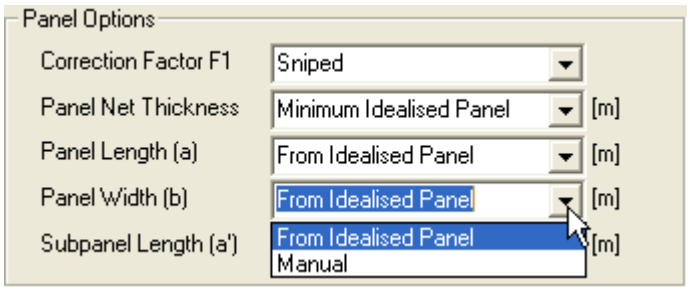
From Idealised Panel

The panel's length and width are decided from the idealised panel.



Manual

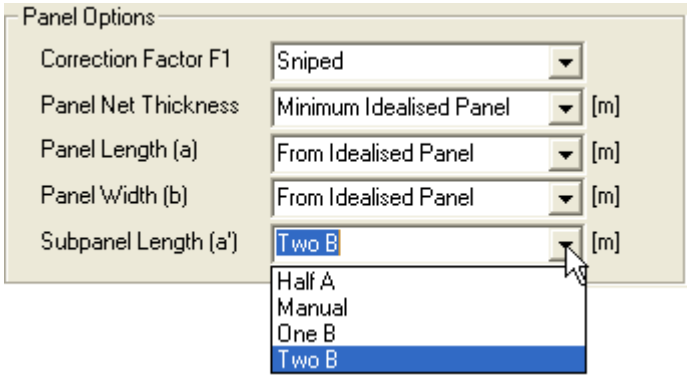
After having chosen *Manual* you can fill in your own panel width or length. You can use this option if you are not satisfied with the idealised panel.



3.7.2.4 Panel Options - Subpanel Length (a')

If a panel is long compared to its breadth, it will be divided into several subpanels.

In the alternatives here "A" is referring to the length of the "big" panel that surrounds the subpanel. B is referring to the breadth of the "big" panel.



Two B (default)

By default the subpanel length is set to *Two B*, meaning twice the breadth of the "big" panel.

This is what is suitable for buckling of long panels where shear is dominant.

Half A

Use the *Half A* option will be equivalent to inserting a buckling stiffener over the middle of the panel, without this being modelled.

One B

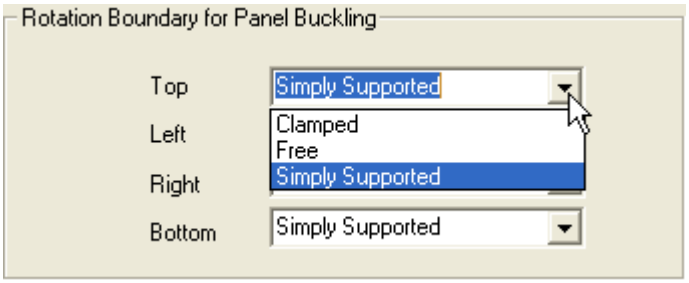
Use the *One B* option for buckling of long panels where axial force is dominant.

Manual

The subpanel length can also be manually overridden.

3.7.2.5 Rotation Boundary for Panel Buckling

The drop down menu alternatives are the same for Top, Left, Right and Bottom. Since they are all identical, only the drop down menu for Top is shown in the illustration.



The alternatives are:

Clamped

Clamping of edges should normally not be specified unless the user is secure that the edge is fully fixed against rotation.

Free

You should set the free edge option if relevant.

Simply Supported (default)

Simply supported is the default option, and it covers most cases.

3.8 Panels and subpanels

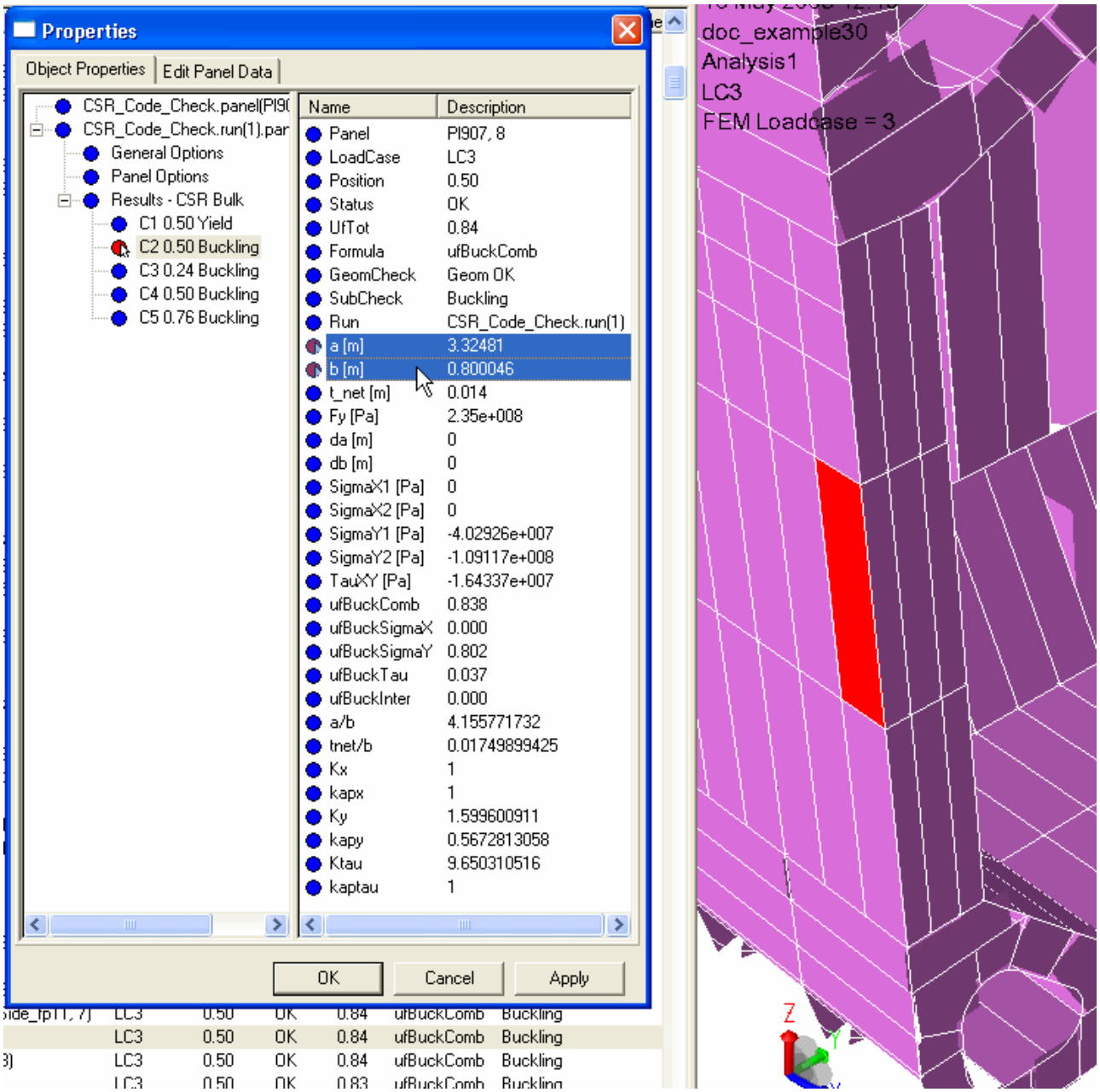
If a panel is long compared to its breadth, subpanels will be created.

Subpanels are created if

a/b >3

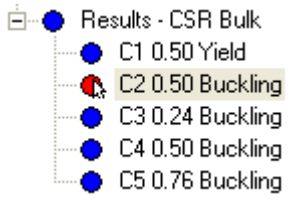
a: the panel's length

b: the panel's breadth



Here we have an example of a panel with length a, 3.32 m and breadth b, 0.8 m. The dimensions of the panel can be seen in the illustration, and the panel is highlighted in the graphics. Note that the subpanels are not visible in the graphics.

The results for the subpanels as well as the main panel can be accessed from the list in the Properties dialog:



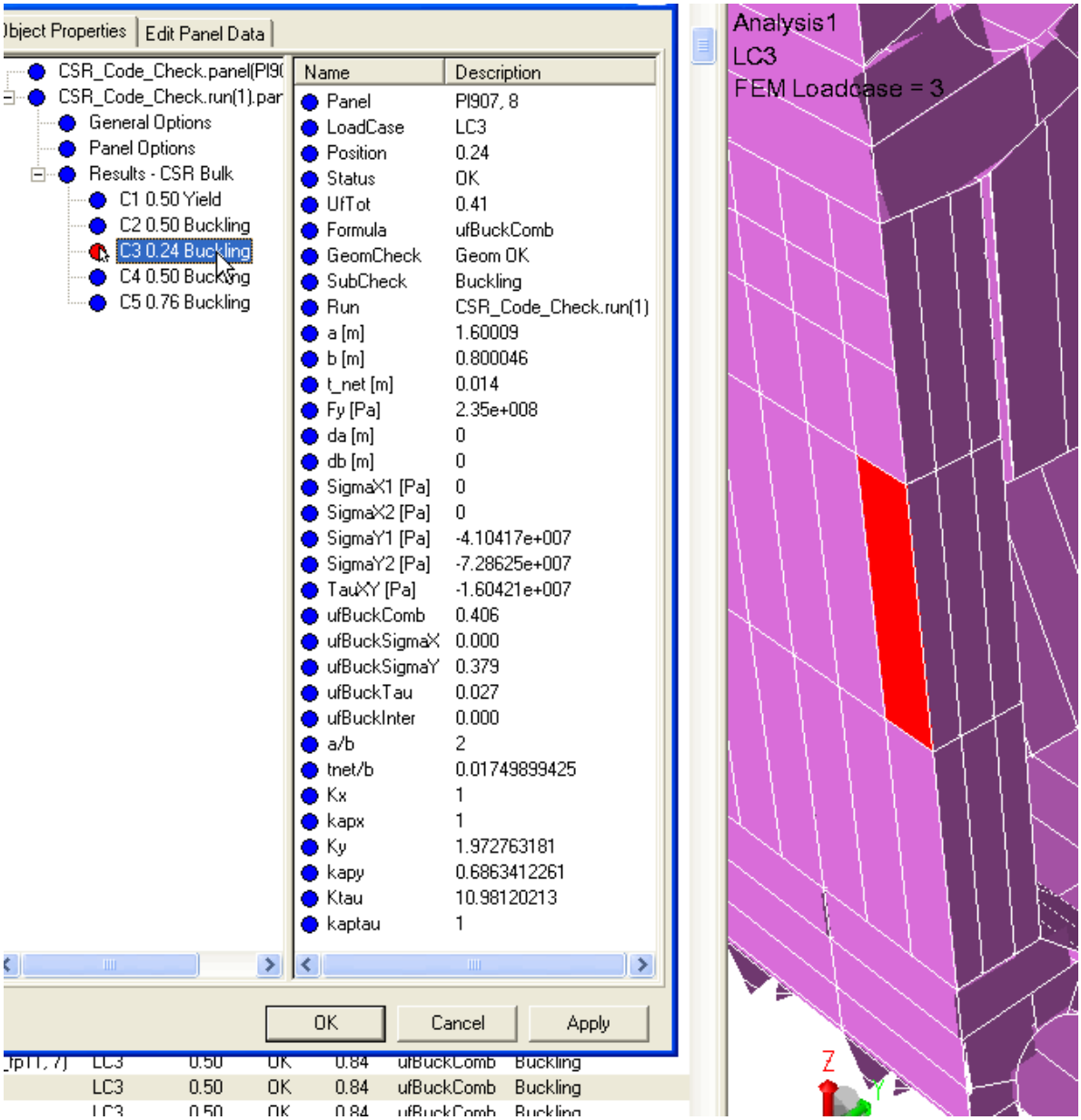
C1 0.50 Yield – This shows the yield results

C2 0.50 Buckling – This shows the results for the entire large panel. The number 0.50 indicates that the results are calculated at the middle of the panel.

C3 0.24 Buckling – This shows the results for the first (out of three) subpanels. The results are calculated at the middle of the subpanel, which in this case is located at 0.24 times the length of the main panel.

C4 0.50 Buckling – Shows the results for the second subpanel.

C5 0.76 Buckling – Shows the results for the third subpanel.



Here we have selected the first subpanel with its center at 0.24 times the length of the main panel.

a is here the length of the subpanel which is twice the breadth of the main panel by default, it can be changed by the user.

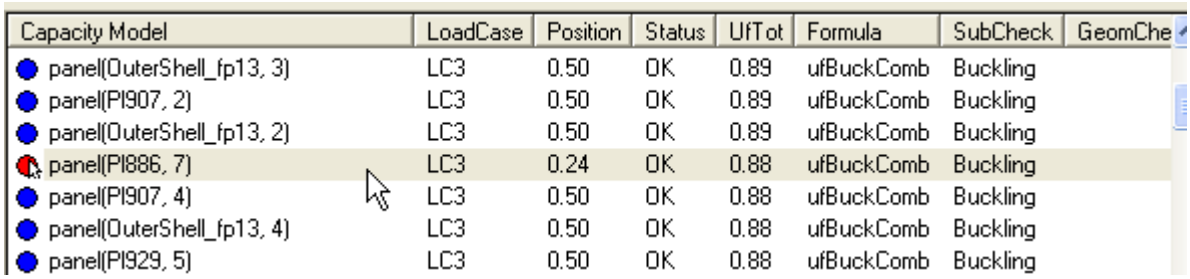
b is here the breadth of the subpanel which is the same as the breadth of the main panel.

If you try to add the lengths of the three subpanels together you see that the total length of the three subpanels are larger than the total length of the main panel. This means that the subpanels overlap each other.

There is never more than five subpanels. This means that for a very narrow main panel there will be a gap between the subpanels. If this is a problem, you can change the length of the subpanels as shown in 3.7.2.4.

Note that the Uftot for this subpanel is smaller than the Uftot for the main panel. In the browser list the largest Uftot is displayed. This is sometimes the Uftot for the main panel and sometimes the Uftot for one of the subpanels.

Below is an example from the browser where the largest Uftot appeared in a subpanel, *Position* is different from 0.50.



Capacity Model	LoadCase	Position	Status	UfTot	Formula	SubCheck	GeomChe
panel(OuterShell_fp13, 3)	LC3	0.50	OK	0.89	ufBuckComb	Buckling	
panel(Pl907, 2)	LC3	0.50	OK	0.89	ufBuckComb	Buckling	
panel(OuterShell_fp13, 2)	LC3	0.50	OK	0.89	ufBuckComb	Buckling	
panel(Pl886, 7)	LC3	0.24	OK	0.88	ufBuckComb	Buckling	
panel(Pl907, 4)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(OuterShell_fp13, 4)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(Pl929, 5)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	

3.9 Investigate the results

There are four ways of investigating code checking results:

- From the browser
- Graphically
- From object property
- A report

The three first alternatives are described in this Chapter while Chapter 3.11 “Make a report” shows how to make a default report or how to customize a report.

3.9.1 From the browser

The default view is set up so that it sorts on the highest utilisation factor (UfTot). The results shown are dependent on which load case you have set to active.

1 – If status is Failed(uf), the panel has a usage factor above 1.0 for yield and/or buckling. If buckling gives the highest Uftot, subcheck will be flagged as Buckling.

2 – If status is Failed(geo), the panels fail to satisfy the geometric requirements for the CSR Bulk Panel Buckling code check. The geometry check *tnet/b* failed. This means that the thickness of the panels are too low. To fix this you can increase the thickness in the actual plates, or insert additional stiffeners.

3 – If a panels has a Uftot based on the yield check that is larger than the Uftot based on the buckling check, the Subcheck will be flagged as Yield-

In addition the relative position for the worst code check result for each capacity panel is shown.

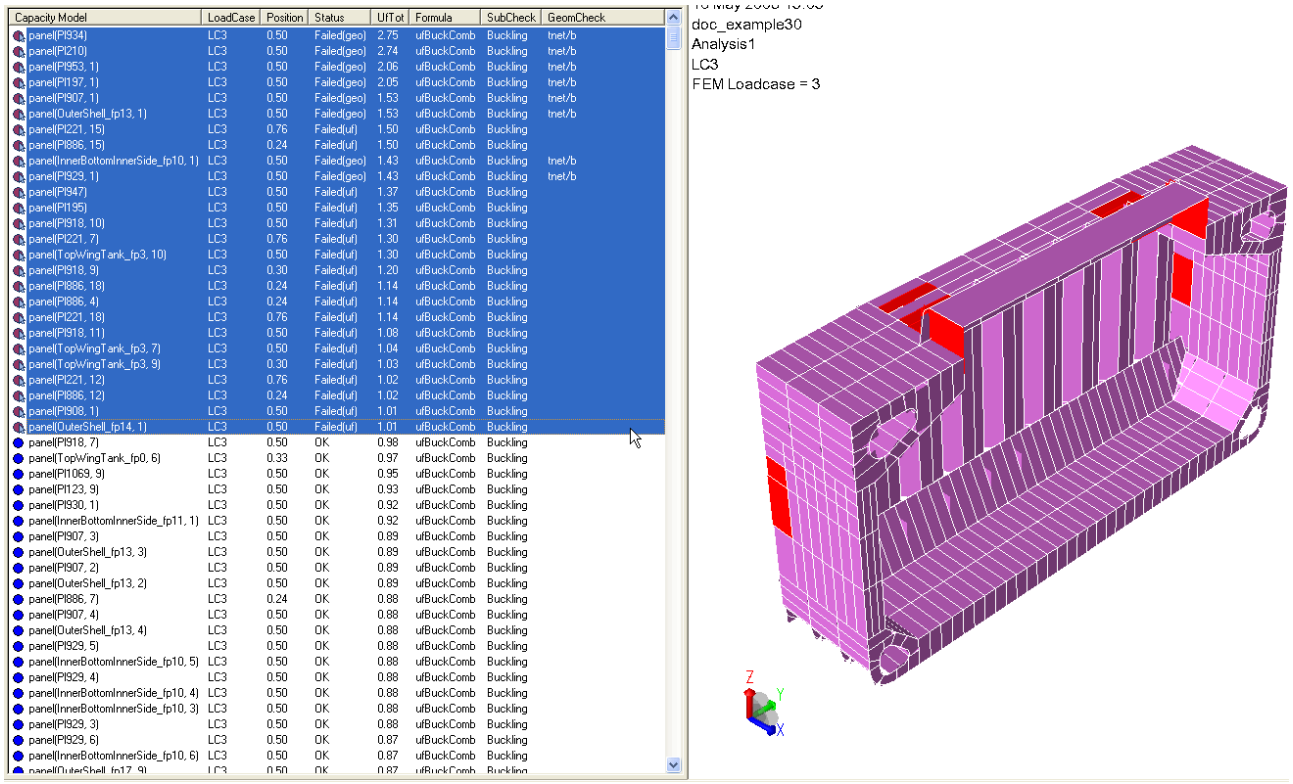
If you specify the option Worst Case (CC) from the loadcase pulldown list, the browser will find the worst condition for each code checking position and report it.

The “Formula” column identifies which formula was used to do the code checking. This is a reference to the relevant formula as listed in the various codes of practice supported by GeniE.

The column for “SubCheck” lists which type of code check that has been performed, i.e. a CSR Bulk Panel Buckling check or a CSR Bulk Panel Yield check. In our case, since we have carried out both code checks, it lists which check that gave the highest Uftot.

You may sort each column in the browser by clicking on the column header.

If you select some of the capacity panels with a high utilisation factor it is easy to see graphically where they are located.



Capacity Model	LoadCase	Position	Status	UfTot	Formula	SubCheck	GeomCheck
panel(PI934)	LC3	0.50	Failed(geo)	2.75	ufBuckComb	Buckling	tnet/b
panel(PI210)	LC3	0.50	Failed(geo)	2.74	ufBuckComb	Buckling	tnet/b
panel(PI953, 1)	LC3	0.50	Failed(geo)	2.06	ufBuckComb	Buckling	tnet/b
panel(PI197, 1)	LC3	0.50	Failed(geo)	2.05	ufBuckComb	Buckling	tnet/b
panel(PI907, 1)	LC3	0.50	Failed(geo)	1.53	ufBuckComb	Buckling	tnet/b
panel(OuterShell_fp13, 1)	LC3	0.50	Failed(geo)	1.53	ufBuckComb	Buckling	tnet/b
panel(PI221, 15)	LC3	0.76	Failed(uf)	1.50	ufBuckComb	Buckling	
panel(PI886, 15)	LC3	0.24	Failed(uf)	1.50	ufBuckComb	Buckling	
panel(InnerBottomInnerSide_fp10, 1)	LC3	0.50	Failed(geo)	1.43	ufBuckComb	Buckling	tnet/b
panel(PI929, 1)	LC3	0.50	Failed(geo)	1.43	ufBuckComb	Buckling	tnet/b
panel(PI947)	LC3	0.50	Failed(uf)	1.37	ufBuckComb	Buckling	
panel(PI195)	LC3	0.50	Failed(uf)	1.35	ufBuckComb	Buckling	
panel(PI918, 10)	LC3	0.50	Failed(uf)	1.31	ufBuckComb	Buckling	
panel(PI221, 7)	LC3	0.76	Failed(uf)	1.30	ufBuckComb	Buckling	
panel(TopWingTank_fp3, 10)	LC3	0.50	Failed(uf)	1.30	ufBuckComb	Buckling	
panel(PI918, 9)	LC3	0.30	Failed(uf)	1.20	ufBuckComb	Buckling	
panel(PI886, 18)	LC3	0.24	Failed(uf)	1.14	ufBuckComb	Buckling	
panel(PI886, 4)	LC3	0.24	Failed(uf)	1.14	ufBuckComb	Buckling	
panel(PI221, 18)	LC3	0.76	Failed(uf)	1.14	ufBuckComb	Buckling	
panel(PI918, 11)	LC3	0.50	Failed(uf)	1.08	ufBuckComb	Buckling	
panel(TopWingTank_fp3, 7)	LC3	0.50	Failed(uf)	1.04	ufBuckComb	Buckling	
panel(TopWingTank_fp3, 9)	LC3	0.30	Failed(uf)	1.03	ufBuckComb	Buckling	
panel(PI221, 12)	LC3	0.76	Failed(uf)	1.02	ufBuckComb	Buckling	
panel(PI886, 12)	LC3	0.24	Failed(uf)	1.02	ufBuckComb	Buckling	
panel(PI908, 1)	LC3	0.50	Failed(uf)	1.01	ufBuckComb	Buckling	
panel(OuterShell_fp14, 1)	LC3	0.50	Failed(uf)	1.01	ufBuckComb	Buckling	
panel(PI918, 7)	LC3	0.50	OK	0.98	ufBuckComb	Buckling	
panel(TopWingTank_fp0, 6)	LC3	0.33	OK	0.97	ufBuckComb	Buckling	
panel(PI1069, 9)	LC3	0.50	OK	0.95	ufBuckComb	Buckling	
panel(PI123, 9)	LC3	0.50	OK	0.93	ufBuckComb	Buckling	
panel(PI930, 1)	LC3	0.50	OK	0.92	ufBuckComb	Buckling	
panel(InnerBottomInnerSide_fp11, 1)	LC3	0.50	OK	0.92	ufBuckComb	Buckling	
panel(PI907, 3)	LC3	0.50	OK	0.89	ufBuckComb	Buckling	
panel(OuterShell_fp13, 3)	LC3	0.50	OK	0.89	ufBuckComb	Buckling	
panel(PI907, 2)	LC3	0.50	OK	0.89	ufBuckComb	Buckling	
panel(OuterShell_fp13, 2)	LC3	0.50	OK	0.89	ufBuckComb	Buckling	
panel(PI886, 7)	LC3	0.24	OK	0.88	ufBuckComb	Buckling	
panel(PI907, 4)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(OuterShell_fp13, 4)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(PI929, 5)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(InnerBottomInnerSide_fp10, 5)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(PI929, 4)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(InnerBottomInnerSide_fp10, 4)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(InnerBottomInnerSide_fp10, 3)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(PI929, 3)	LC3	0.50	OK	0.88	ufBuckComb	Buckling	
panel(PI929, 6)	LC3	0.50	OK	0.87	ufBuckComb	Buckling	
panel(InnerBottomInnerSide_fp10, 6)	LC3	0.50	OK	0.87	ufBuckComb	Buckling	

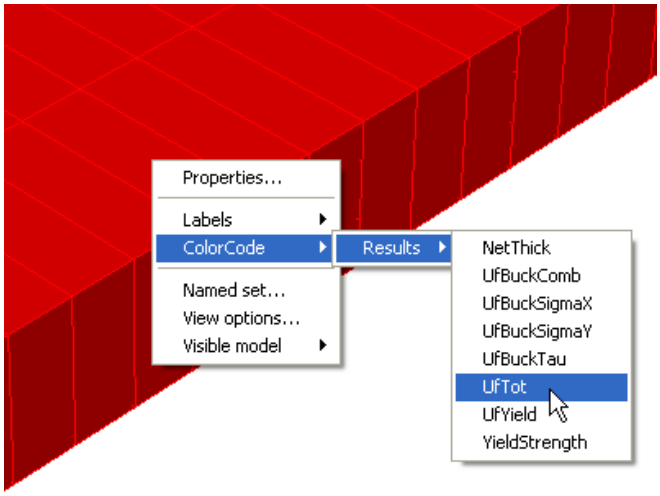
3.9.2 From the graphic window.

You may select and visualise parts of the capacity model similar to how you do this for other objects like beams, plates, loads etc.

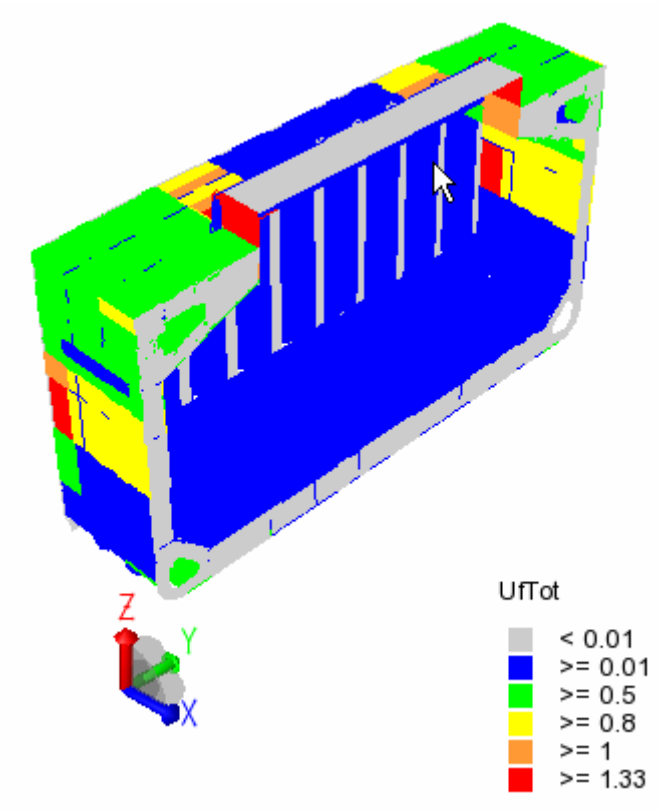
Graphic presentation of results depends on the load case that is selected. You may also select the Worst Case (CC) to display the worst results for all load cases part of the code check.

In the following there are examples on how to present results. Not all are shown herein, but all relevant commands are shown.

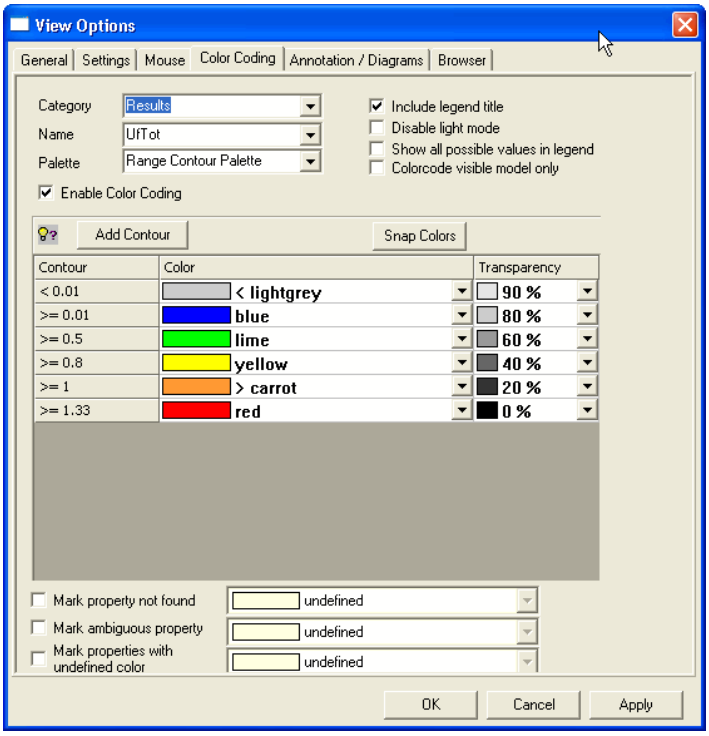
Color coding of utilisation factors from code check.



Select all the panels, click **RMB**, select *ColorCode|Result|Uftot.*

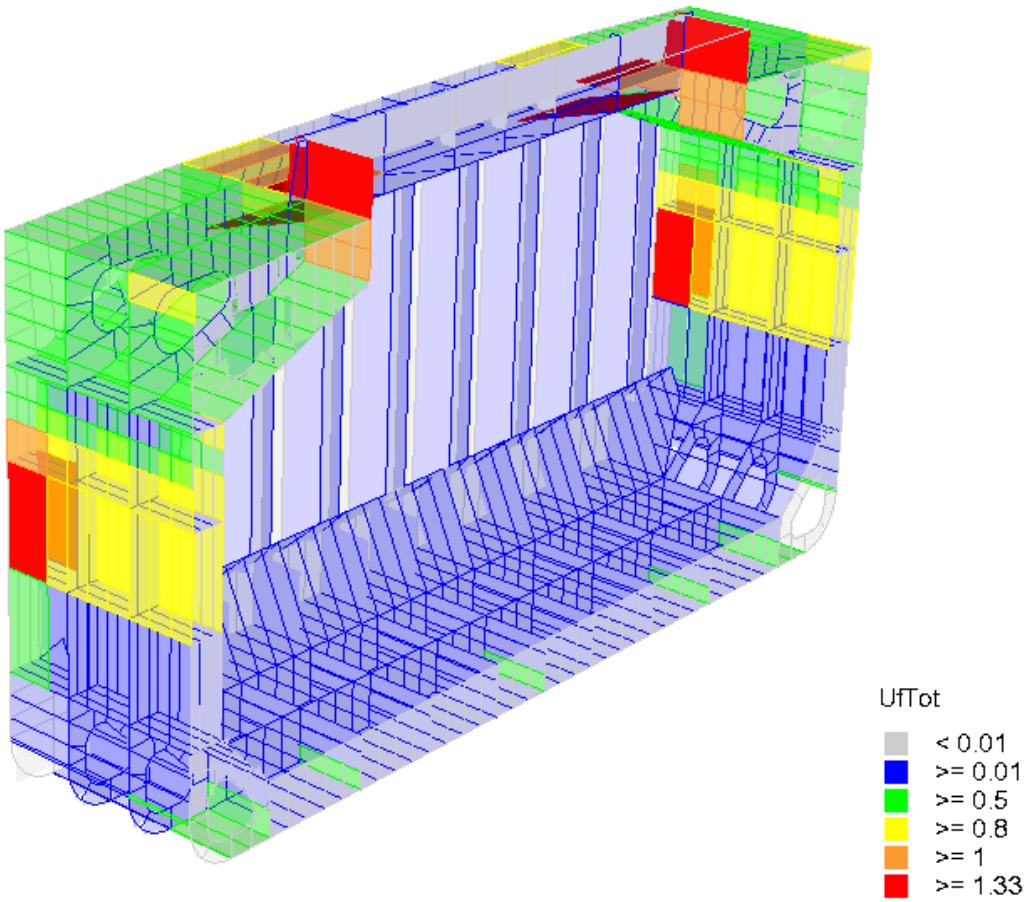


As you can see, you also have the option of color coding other information regarding the model. Feel free to try the others as well.



The color coding is based on default thresholds. You may customise these settings (both the colours, the threshold values, the number of thresholds and the transparency of each colour) from the command *View*|*Options*|*Color* Coding.

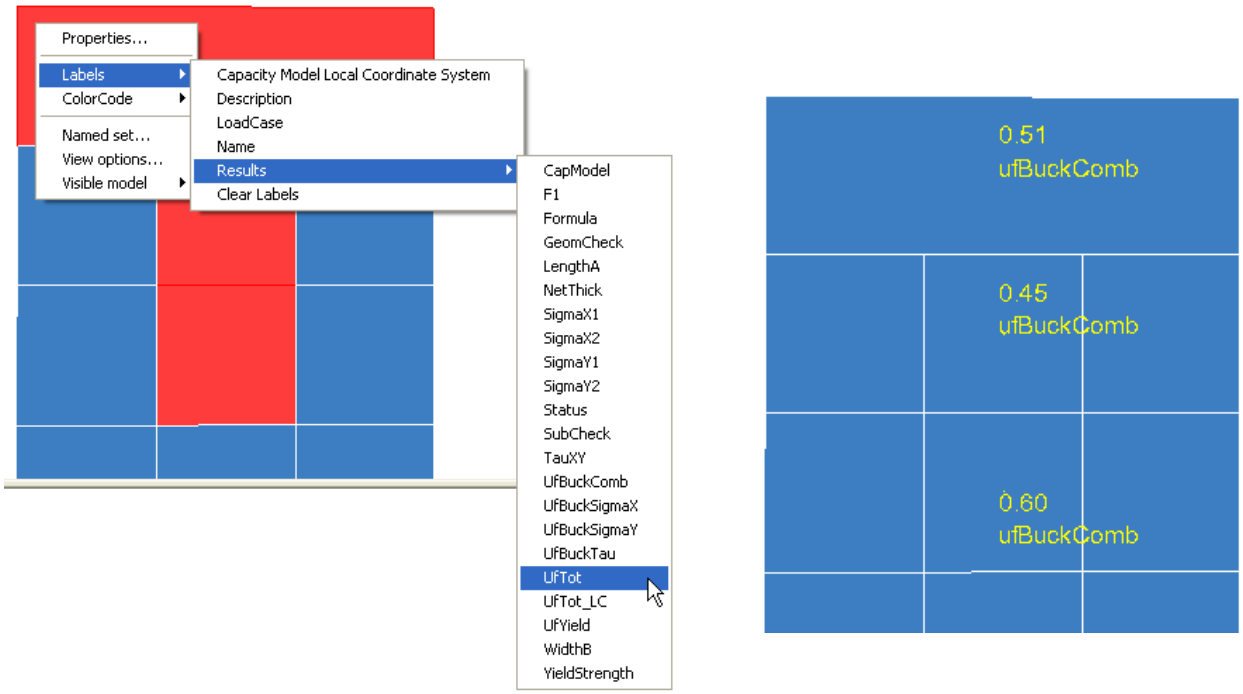
Below is an example of a colour coded model with transparencies set as seen in the illustration to the right. Note that the *Disable light mode* checkbutton also has been unchecked



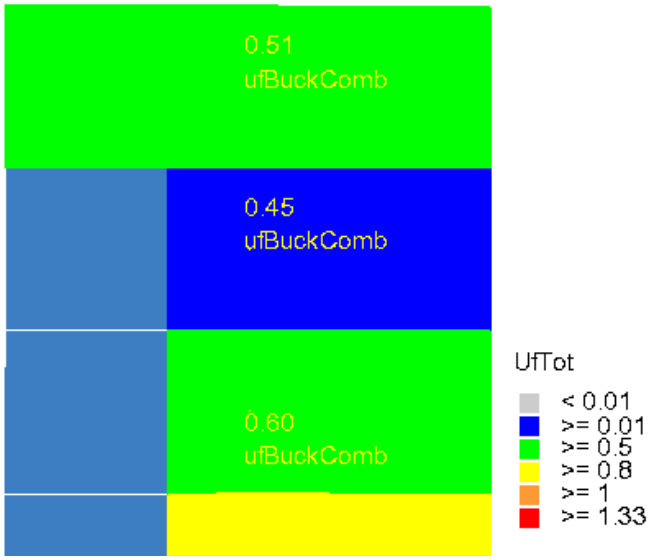
Labelling results from CSR Bulk code check.

To add a label to an object (a capacity panel in this case) you need to select the object and right click to see the available labelling options. You may add labels as shown in the picture below. It is also possible to have several labels on the same object; the example below shows the utilisation factor as well as the formula used during the code checking.

The label UfTot shows the utilisation factor.



It is also possible to do colour coding of utilisation factors and add labels. In the example below, colour coding has been added.



From object property

The previous ways of documenting the results are primarily meant to give you an overview on whether the code checks are within satisfactory levels or not. If a panel fails it is necessary to investigate the code checking results more detailed to decide how to strengthen the panel. Detailed code checking results may be found from the object browser or from a printed report. Both options are explained in the following.

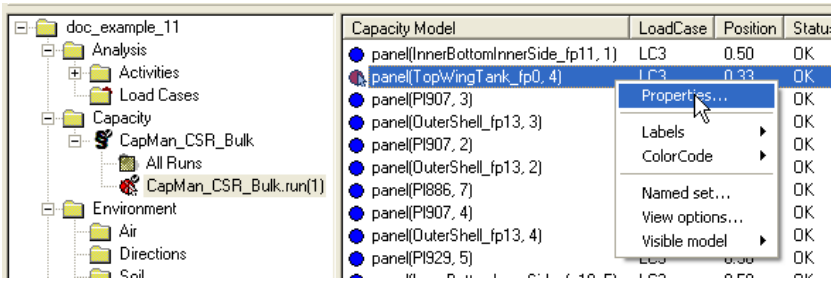
It may also be that you need to re-distribute the forces in the structure to improve the code checking results. To understand the moment and force distribution you may use the features for visualising these in a 3 dimensional view (Tools|Analysis|Presentation).

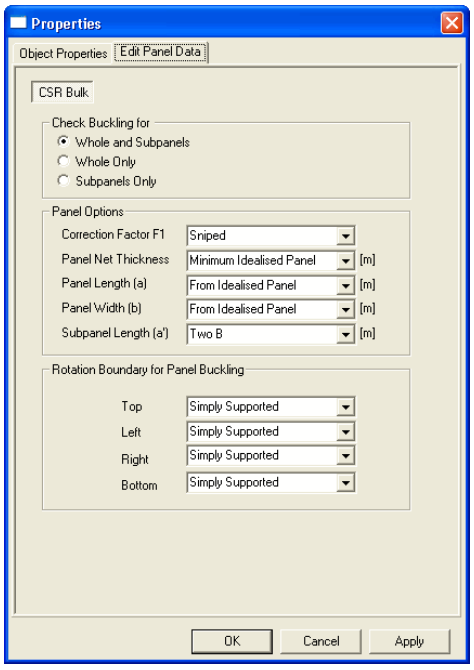
3.9.2.1 Detailed results for panel check.

To access detailed results from the object property you select the panel – either from browser or graphically - you want to investigate, RMB and select *Properties*.

The panel data are listed as shown to the right.

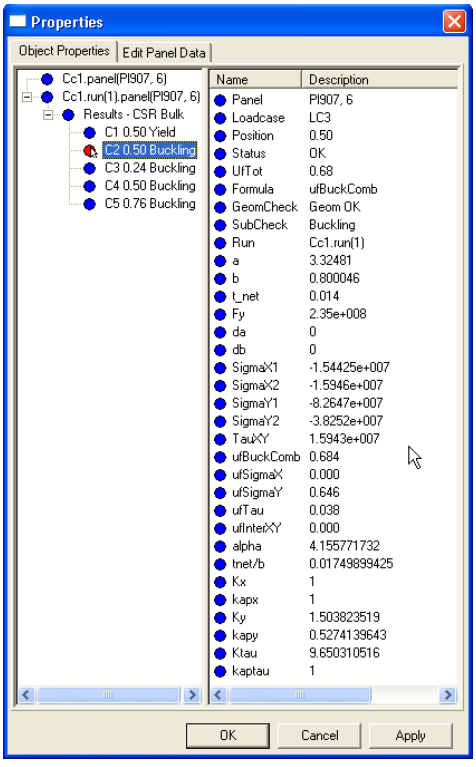
You may also modify panel data for later use.

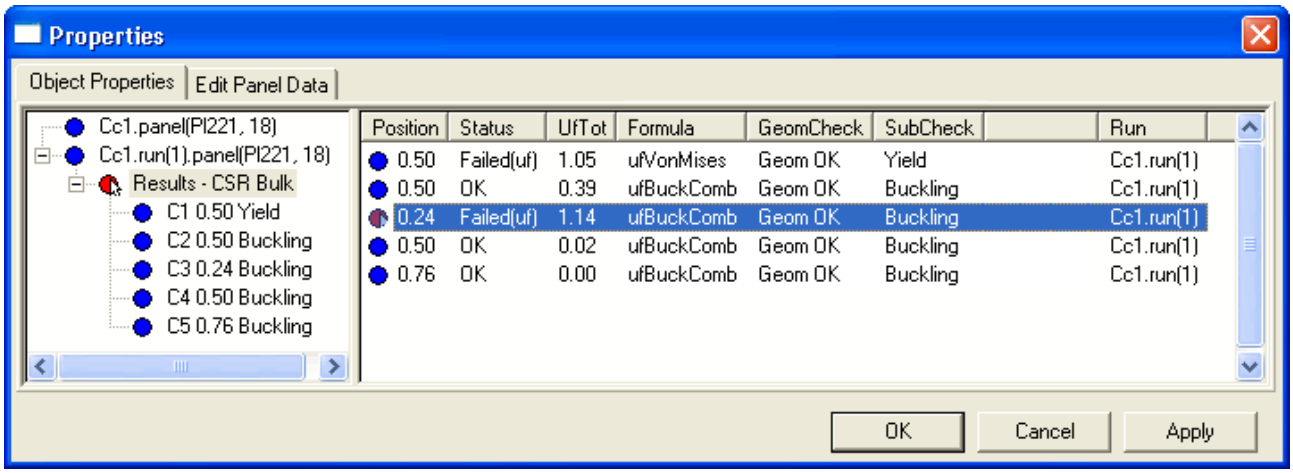




Panel properties - options.

The Options folder for the Object Properties lists which options have been assigned to the capacity panel. In this case default values have been used. The options to use are described in the previous *Chapter 3.3.2 Define global panel parameters* and *Chapter 3.5 Local code checking parameters.*



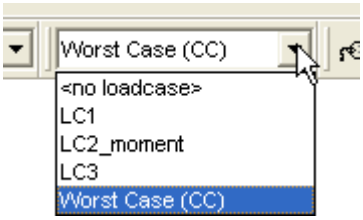


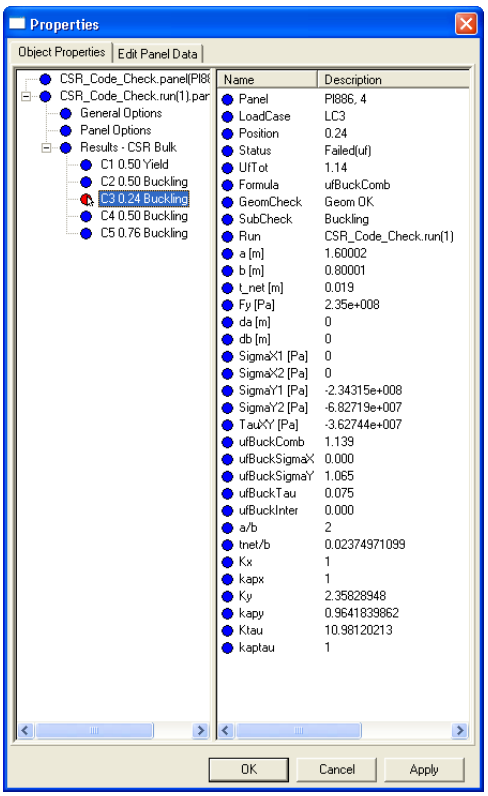
Panel properties – code checking, Uftot.

There are two ways of investigating the code checking forces. The alternative to the right gives the worst forces and moments at each code checking position determined by the program.

The other option is to investigate the forces and moments per position. In this case the worst load case name is also listed.

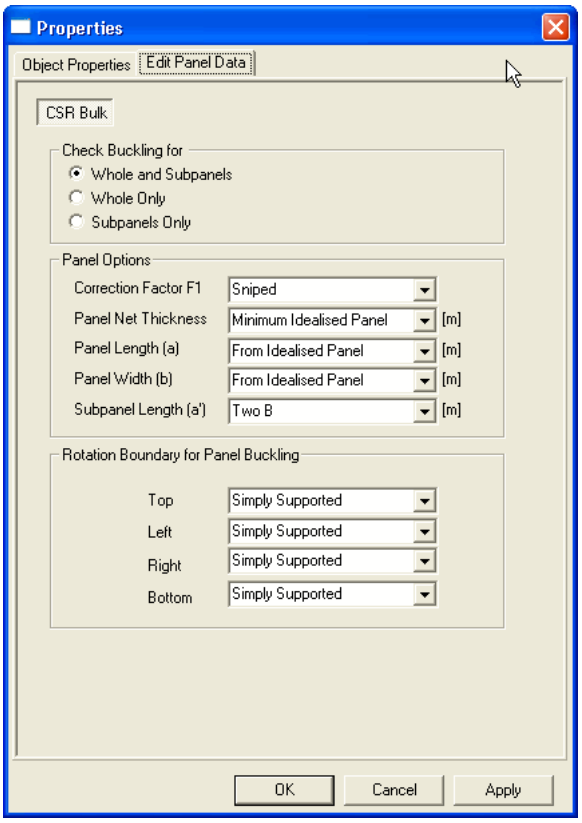
Notice that the load case shown depends on whether you have set a specific load case to active or used the option *Worst Case (CC)*.





3.10 Modify and re-run code check

There are three levels of modifying a code check run:



1) Only *Execute Code Check* needs to be done:

Correction factor F1

Rotation boundaries

These are parameters that belong to the capacity model and a re-run of the code check does not require new code checking forces

2) *Generate Code Check Loads* needs to be done (and *Execute Code Check*):

Check Buckling for:

Whole and Subpanels

Whole Only

Subpanels Only

Panel Options:

Panel net thickness

Panel length

Panel Width

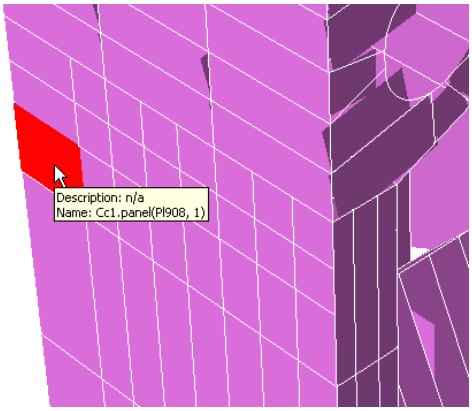
Subpanel Length

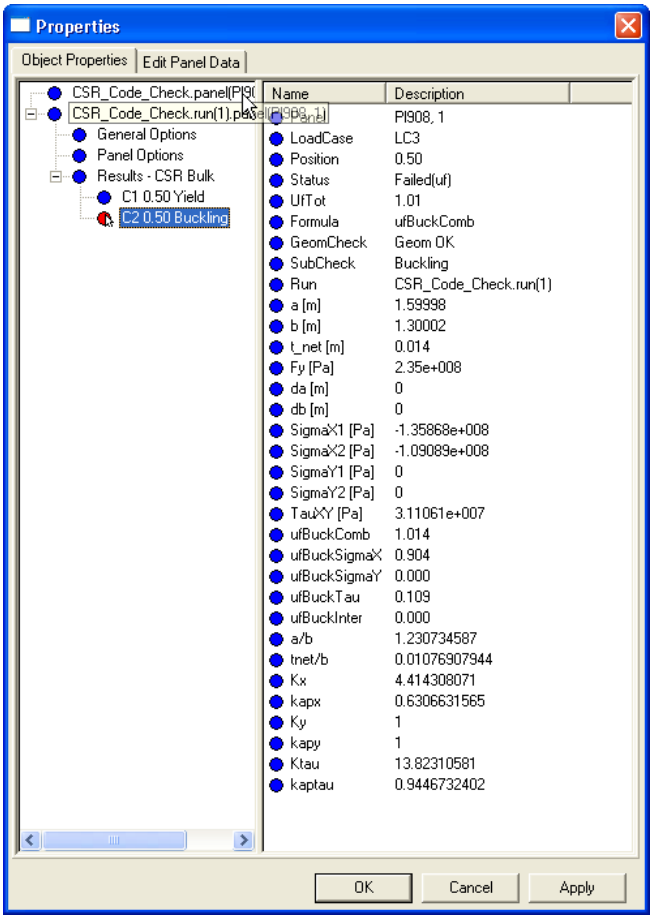
The properties above can be changed without re-running the analysis. Please notice that the code checking result is based on a non-consistent stiffness or load matrix.

3) Entire Analysis needs to be re-run (and *Generate Code Check Loads* and *Execute Code Check*):

Change thickness or material properties or adding/removing additional structural panels using a consistent and updated load and stiffness matrix. This option requires a full re-run of the analysis and the code check steps.

Each of these options are described in the following using the reference model, focus is on panel(Pl908,1). The Uftot for the panel is 1.01.



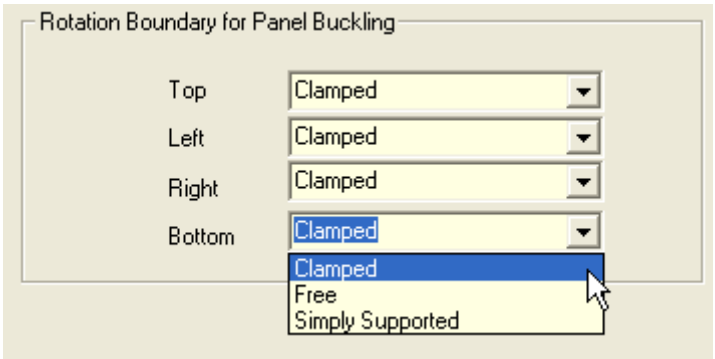


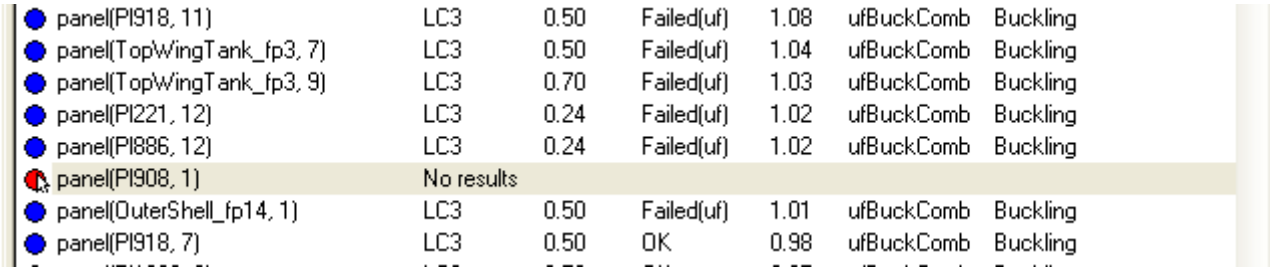
3.10.1 Change code checking parameters only (1)

Modify the rotation boundaries of panel(Pl908,1) from browser or GUI (select the member, RMB and choose *Properties*).

Change all the rotation boundaries from simply supported to clamped.

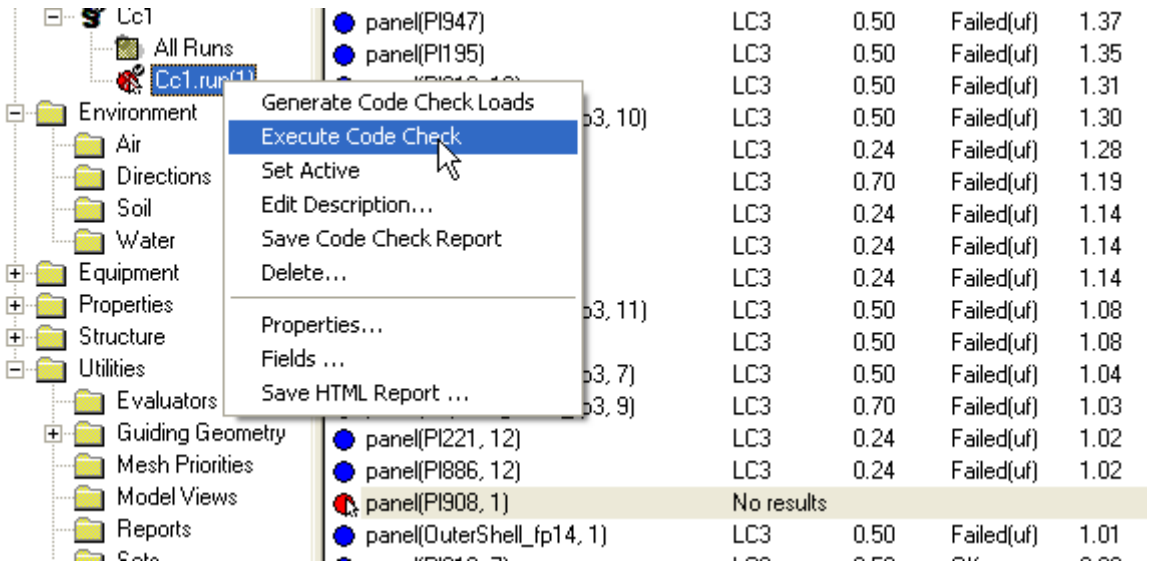
The browser is now updated since panel(Pl908,1) has no results since the panel data has been modified.



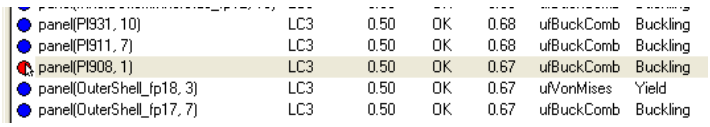


panel(Pl918, 11)	LC3	0.50	Failed(uf)	1.08	ufBuckComb	Buckling
panel(TopWingTank_fp3, 7)	LC3	0.50	Failed(uf)	1.04	ufBuckComb	Buckling
panel(TopWingTank_fp3, 9)	LC3	0.70	Failed(uf)	1.03	ufBuckComb	Buckling
panel(Pl221, 12)	LC3	0.24	Failed(uf)	1.02	ufBuckComb	Buckling
panel(Pl886, 12)	LC3	0.24	Failed(uf)	1.02	ufBuckComb	Buckling
panel(Pl908, 1)	No results					
panel(OuterShell_fp14, 1)	LC3	0.50	Failed(uf)	1.01	ufBuckComb	Buckling
panel(Pl918, 7)	LC3	0.50	OK	0.98	ufBuckComb	Buckling

To generate new code check results you need to re-run the code check. Select the actual run, RMB and choose *Execute Code Check.*



New results are now computed and the may be investigated as explained in the previous Chapter.



panel(Pl931, 10)	LC3	0.50	OK	0.68	ufBuckComb	Buckling
panel(Pl911, 7)	LC3	0.50	OK	0.68	ufBuckComb	Buckling
panel(Pl908, 1)	LC3	0.50	OK	0.67	ufBuckComb	Buckling
panel(OuterShell_fp18, 3)	LC3	0.50	OK	0.67	ufVonMises	Yield
panel(OuterShell_fp17, 7)	LC3	0.50	OK	0.67	ufBuckComb	Buckling

As can be seen the utilisation factor has changed from 1.01 to 0.67.

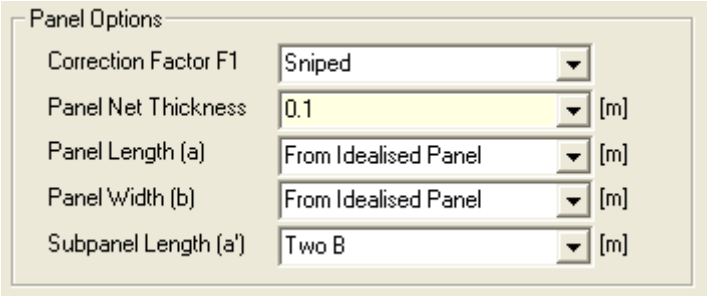
3.10.2 Modify structural data without re-running analysis (2)

When you do modifications to the structural model (typically section or material data) without re-running the whole analysis it is required to re-generate the capacity members and code checking forces prior to executing the code check.

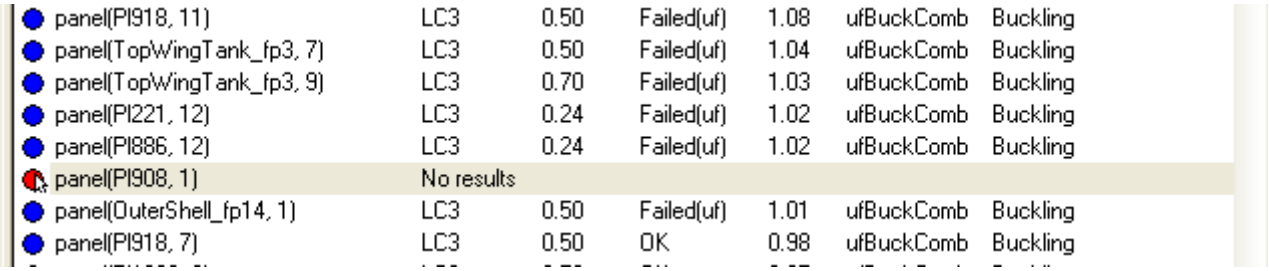
Notice also that if you have added local modifications to a capacity member these need to be re-applied. All global settings are kept.

The following example shows how to change the panel net thickness and compute a new utilisation factor without re-running analysis. We are starting with our panel(Pl908,1) again. The Uftot for the panel is 1.01.

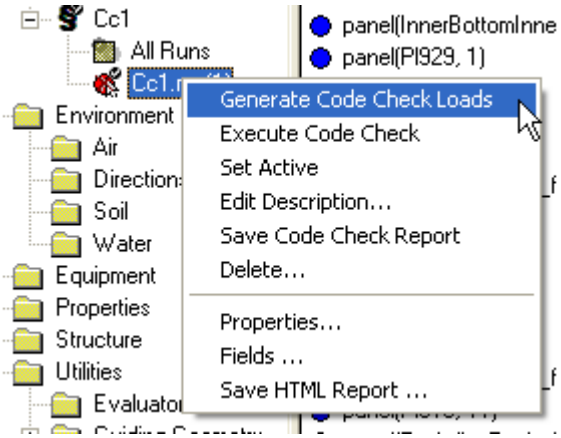
We right click the panel and select *Properties.* We change *Panel Net Thickness* to Manual and insert the value 0.1.

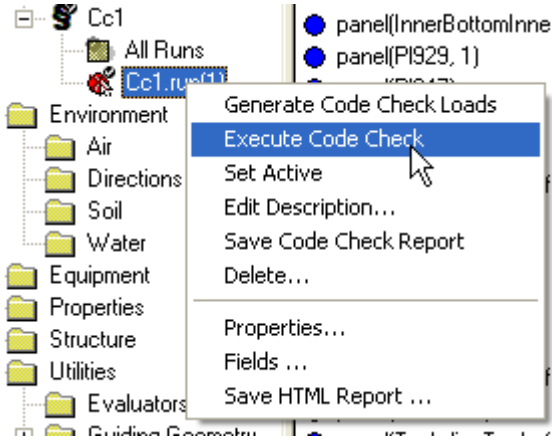


The browser is now updated since panel(Pl908,1) has no results since the panel data has been modified.

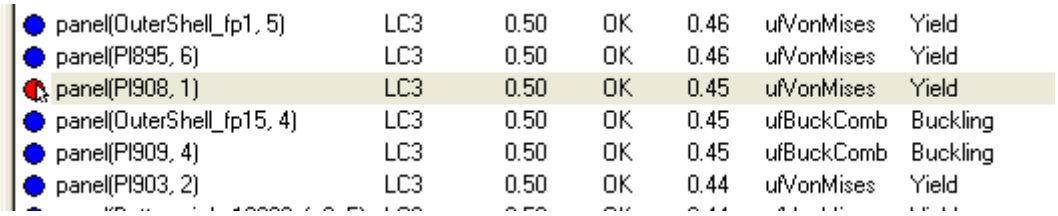


We select *Generate Code Check Loads* and then *Execute Code Check*:





As can be seen the utilisation factor has changed from 1.01 to 0.45.



3.10.3 Modify structural data and re-run analysis (3)

When you re-run analysis it is necessary to

- Create new panels of the capacity manager.
    - Global settings are kept, but local modifications must be re-applied
- Compute new code checking forces
- Run the code check

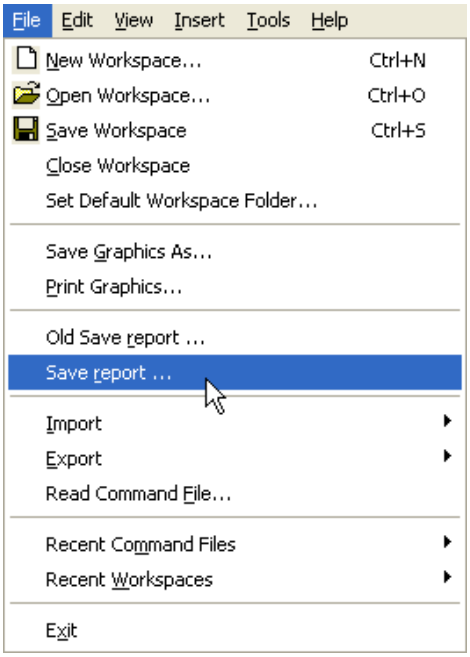
To do this you run analysis (ALT+D) and follow the steps as explained in the previous Section. New results may now be assessed.

3.11 Make a report

A customised report may be generated from the ***File|Save report***. Please notice that the report functionality in versions prior to GeniE version v3.4-27 is still available from the command ***File|Old Save report***.

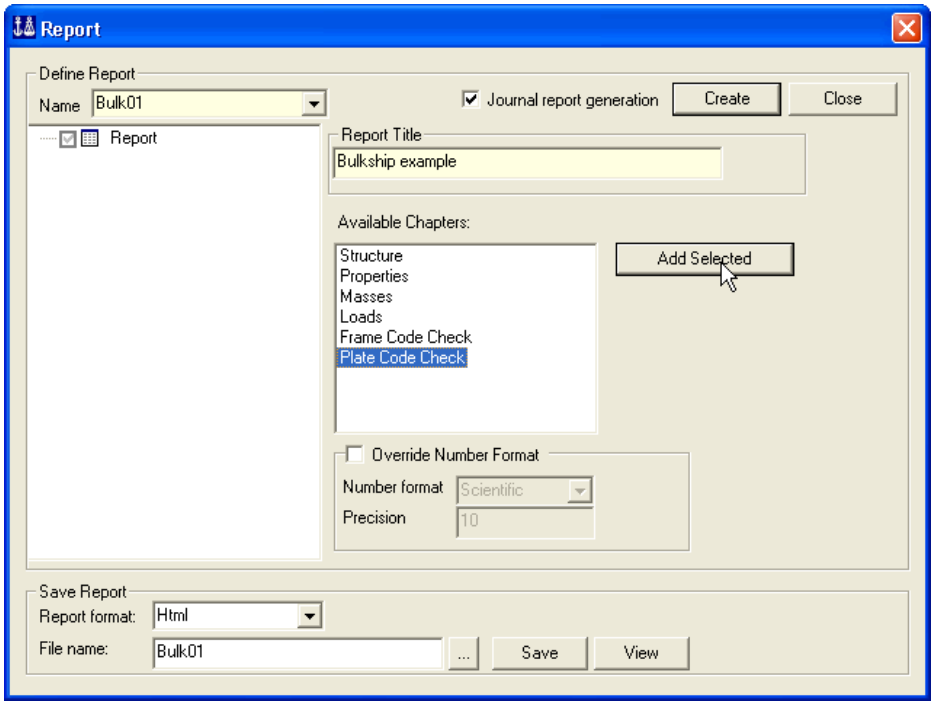
The **File|Save report** allows you to specify the content of your report as well as to decide the levels of detail in of your report.

In the following is given an example on how to make a code checking report.



To make a report of the plate code check, you select *Plate Code Check* under *Available Chapters* and click *Add Selected*.

The report name, title and file name can be changed. By default the file name is the same as the report name.

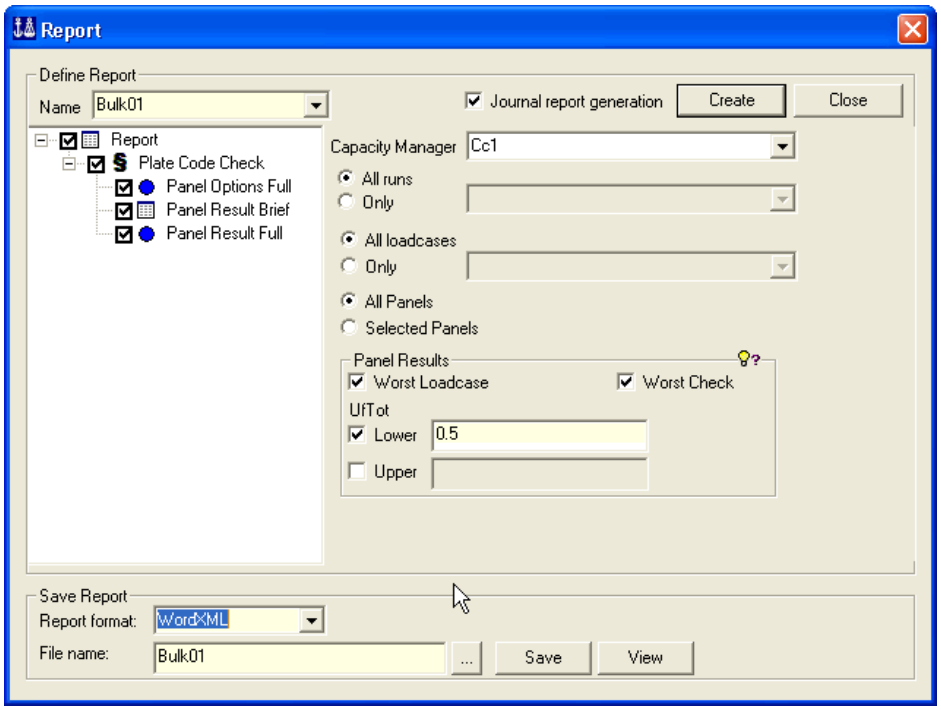


The available tables for plate code check are *Panel Options Full*, *Panel Result Brief* and *Panel Result Full*.

We have checked the *Lower* checkbox for Uftot, and typed in the value 0.5.

This means that the report will not list any panels having a Uftot at 0.5 or lower.

We have chosen the report format to be *WordXML*. Other available formats are: *HTML*, *ExcelXML* and *Text*.



After having clicked *Save*, you can have a look at the report by clicking *View*.

Below are examples of what our selected tables might look like in the report.

Panel Options Full:

Cc1.run(1) : Panel Options CSR Bulk

- Sorted by Panel (Ascending)

- Run : Cc1.run(1)
- Only panels with options modified from the Default object(s) will be listed

Panel	Code	CheckWhole	CheckSubpanel	PanelLength	PanelWidth	PanelThickness	SubpanelLength	F1	RB_Top
	RB_Bottom	RB_Left	RB_Right						
Default	CSR Bulk	true	true	From Idealised Panel	From Idealised Panel	Minimum Idealised Panel	Two B	Sniped	Simply Supported
	Simply Supported	Simply Supported	Simply Supported						
PI918, 11	CSR Bulk	true	true	From Idealised Panel	From Idealised Panel	Minimum Idealised Panel	Two B	Rigid Girder	Simply Supported
	Simply Supported	Simply Supported	Simply Supported						

Here the options are different from the defaults for only one panel, and this panel is listed in addition to the default values.

Panel Result Brief:

Cc1.run(1) : Panel Result Brief

- Sorted by UfTot (Descending)
- Filtered by Limit : (UfTot >= 0.5)
- Run : Cc1.run(1)
- Worst LoadCase per Panel
- All SubChecks per Panel
- Worst of Whole Panel and SubPanel Checks per Panel

Panel	Loadcase	Position	Status	UfTot	Formula	GeomCheck	SubCheck	Run
PI934	LC3	0.50	Failed(geo)	2.75	ufTotalFEM	tnet/b	CSR Bulk Panel Buckling	Cc1.run(1)
PI210	LC3	0.50	Failed(geo)	2.74	ufTotalFEM	tnet/b	CSR Bulk Panel Buckling	Cc1.run(1)
PI953, 1	LC3	0.50	Failed(geo)	2.07	ufTotalFEM	tnet/b	CSR Bulk Panel Buckling	Cc1.run(1)
PI197, 1	LC3	0.50	Failed(geo)	2.05	ufTotalFEM	tnet/b	CSR Bulk Panel Buckling	Cc1.run(1)
PI907, 1	LC3	0.50	Failed(geo)	1.53	ufTotalFEM	tnet/b	CSR Bulk Panel Buckling	Cc1.run(1)

Panel Result Full:

1.1.2 CSR_Code_Check.run(1) : Panel Result Full

1.1.2.1 CSR_Code_Check.run(1) : CSR Bulk Panel Buckling Result

CSR_Code_Check.run(1) : CSR Bulk Panel Buckling Result

- Sorted by Panel (Ascending)
- Then sorted by LoadCase (Ascending)
- Filtered by Limit : (UfTot >= 0.5)
- Run : CSR_Code_Check.run(1)
- Worst LoadCase per Panel
- Selected SubCheck per Panel
- Worst of Whole Panel and SubPanel Checks per Panel

Panel	LoadCase	Position	Status	UfTot	Formula	GeomCheck	SubCheck	Run
	a [m]	b [m]	t_net [m]	Fy [Pa]	da [m]	db [m]	SigmaX1 [Pa]	SigmaX2 [Pa]
	SigmaY1 [Pa]	SigmaY2 [Pa]	TauXY [Pa]	ufBuckComb	ufBuckSigmaX	ufBuckSigmaY	ufBuckTau	ufBuckInter
	a/b	tnet/b	Kx	kapx	Ky	kapy	Ktau	kaptau
Bottomgirder0_fp0, 9	LC3	0.76	OK	0.18	ufBuckComb	Geom OK	Buckling	CSR_Code_Check.run(1)
	1.15012	0.575062	0.013	3.15e+008	0	0	1.04901e+008	1.26932e+008
	-1.26361e+007	3.26827e+007	3.28332e+007	0.184	0.135	0.002	0.033	0.015
	2	0.02260624617	1	1	19.21361732	1	10.98120213	1
Bottomgirder9600_fp0, 7	LC3	0.76	OK	0.18	ufBuckComb	Geom OK	Buckling	CSR_Code_Check.run(1)
	1.15012	0.575062	0.011	3.15e+008	0	0	1.03885e+008	1.26119e+008
	-1.24038e+007	3.24593e+007	3.34317e+007	0.183	0.133	0.002	0.034	0.014

4. APPLICATION TO CSR BULK

When performing rule check according to CSR Bulk, capacity checks should be performed for the region around the middle hold of the 3 hold model.

It is recommened to split the check into runs for different sets of structure categories :

Then it will be more easy to set the control parameters that differs for different category. This applies to the subpanel types to be checked and to different F1 values.

	Yield check	**Buckling checks to be performed**		
Part of ship		**Whole panel**	**2 b * b subpanels**	**b x b subpanels**
General	X	X	X (if a/b > 3)	
Corr bhd –web	X	X		X
Corr bhd – flange	X	X	X	
Side shell	X	X	X	X

The generic stress algorithm is extended to be used also for Corrugated bulkhead and Side shell.

This check will use interpolated / averaged stresses for the b x b or for the 2b x b subpanel regions.

For the **corrugated bulkheads – flange plate**, the axial stress case is most important and the b x b subpanel must be checked.

For the **corrugated bulkheads – web plate**, the shear stress case is most important and the 2b x b subpanel must be checked.

For the **side shell**, it will be required to set up an extra buckling run with subpanel size b x b, since it is not possible to do the b x b and 2b x b subpanels in the same run.