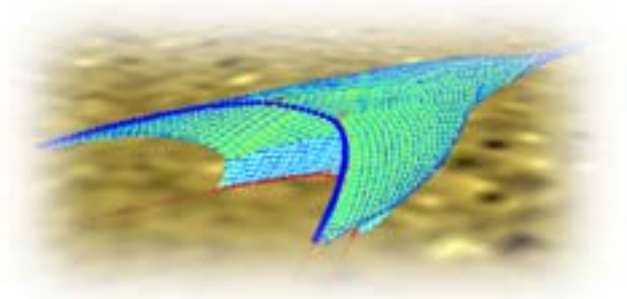
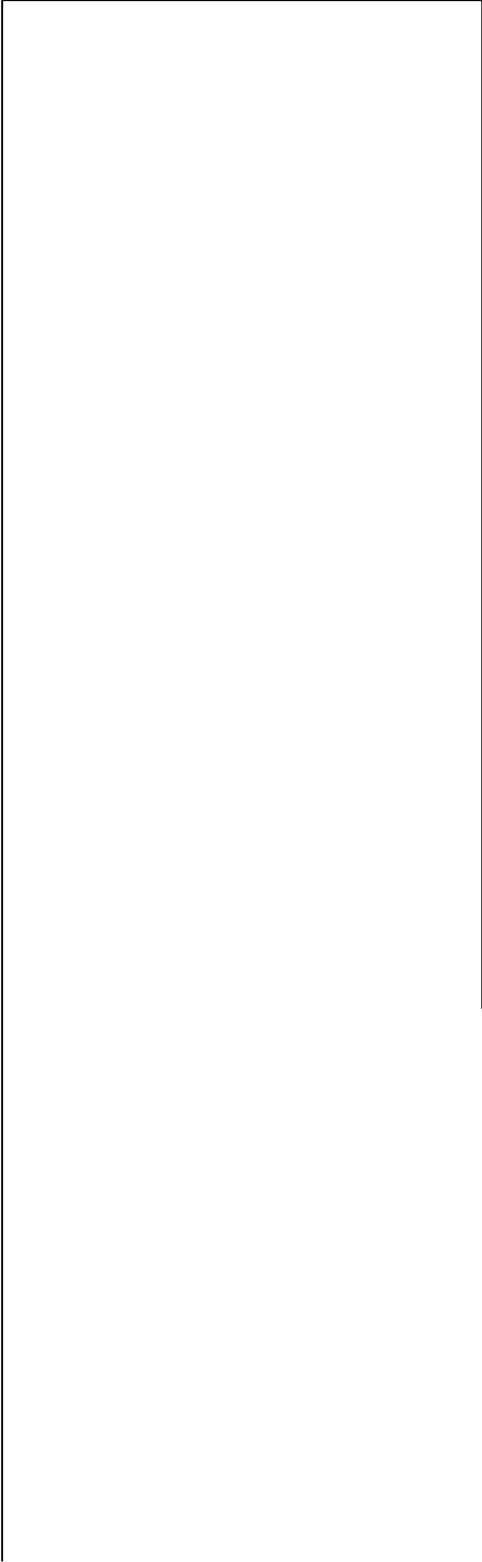


Exercises DynamiT



DynamiT

Ifremer

Training exercises
for new users

How to input the design of a
bottom trawl

This tutorial details the all the steps to input a simple 2 panels bottom trawl and its rigging. These steps can be applied to any kind of trawl made of small meshes.

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Some action to exert on the software



Something to remember

Look at the Lofoten [trawl design](#).

1.1 Preliminaries

- Calculate the overhang in number of meshes of the wings netting sections (only for DynamiT version 1.0).

The overhangs are calculated between the axis of the panel and the middle of the bases of the panel. They replace the cuttings. The overhangs (expressed in number of meshes) are positive towards the right part of the panel while they are negative towards its left.

- Investigate the twine diameters constituting the netting panel (in the manufacturers catalogues or even in the fishermen's handy guide book).

When considering double twine, one applies a fictitious diameter which is 1.5 the diameter of a twine, because the diameter value entered is used to calculate the hydrodynamic drag of the twines. Thus, the mask effects are not exactly taken into account.

1.2 Entering the drawing

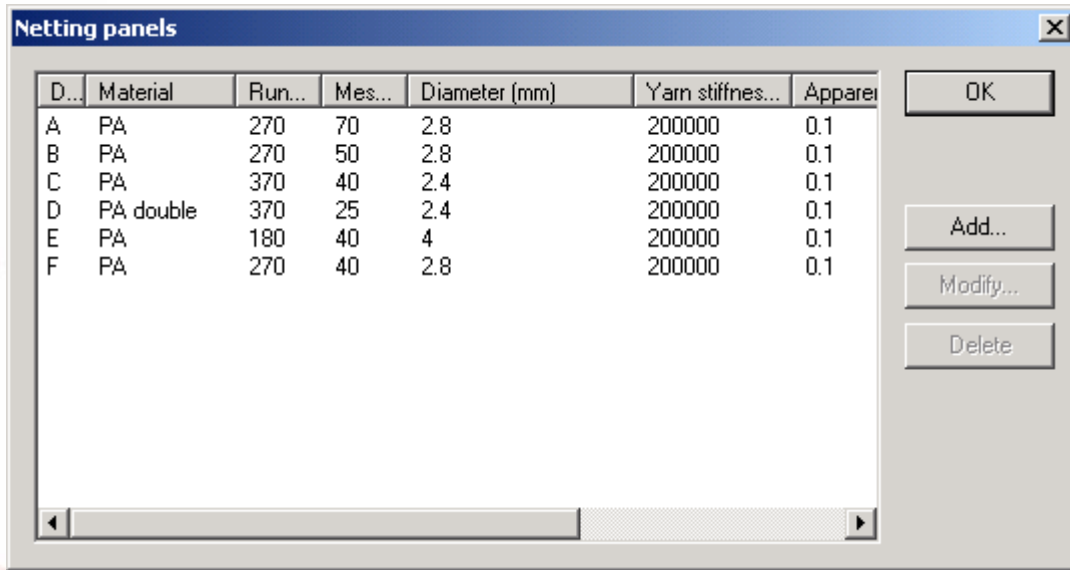
Create a new TRG file.

1.2.1 Enter all the netting panels constituting the trawl

- click right at an empty part of the window (or menu « Trawl Gear »).
- chose menu « Netting panels ».
- press key « add ».
- complete the fields.
- choose a colour for 2D and 3D display.

- It is necessary to fill in the fields « Designation » and « Material » of the « Netting panels » dialog box.
- When not sure of the meaning of a field, ask for the contextual help (F1 or “Help” key).
- Keep to the numbering of the trawl design so as to facilitate checking.
- Press TAB to proceed to the following (previous) field.

- Once a netting panel completed it can be saved in the library for later use.
- Press key OK.
- Proceed the same way for all the netting panels.
- Make sure that there is no mistake on the data table.



1.2.2 Save TRG file

- Repeat this step regularly !

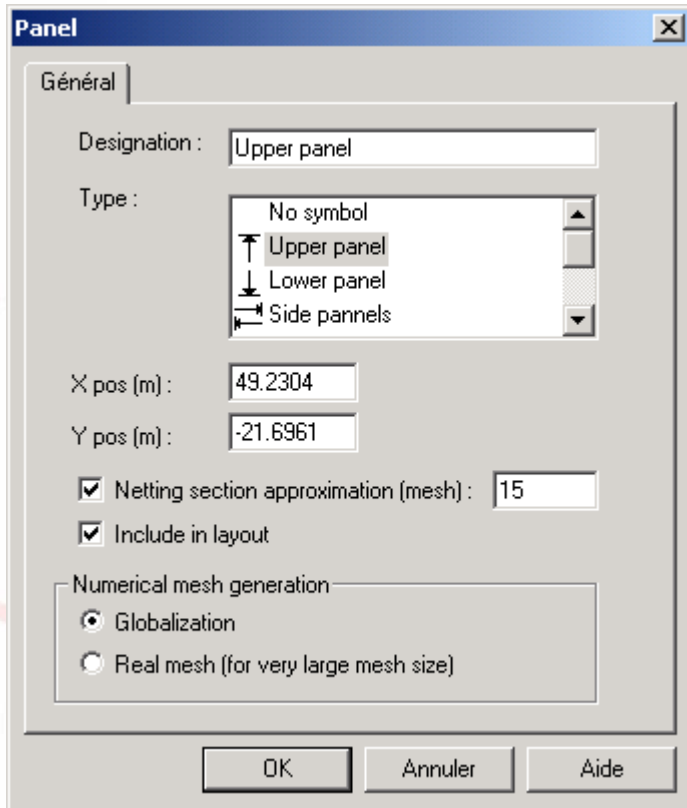
1.2.3 Define the first trawl panel

- Choose the « Netting section » tool.
- Click in the blank area at the place where the panel will come.
- Enter the name of the panel (Upper trawl to start for instance).
- Choose the panel symbol (upper, side ...)
- You can choose to do some approximations to simplify the data entering. For instance if a wing end terminates with 5 meshes that will be tied together, you will choose to replace these 5 meshes by 0. DynamiT will do this automatically if you click the option “netting section approximation and specify the minimum number of meshes to replace by 0.
- Choose to either include this panel in the trawl design drawing or to leave it out (depending on the panel you are inputting).

- The side panels are always described twice in a TRG file (if they are identical !). For them not to appear twice on the drawing click off « Include in Layout ».
- The position may be that of the default value ; it can be modified to get the panels to face each other.
- Remember that « Globalisation » is used to represent a large amount of real meshes by a small number of numerical meshes. The term « Real meshes » is thus used for the very large meshes, for instance those of pelagic trawls.

- Validate the choices.





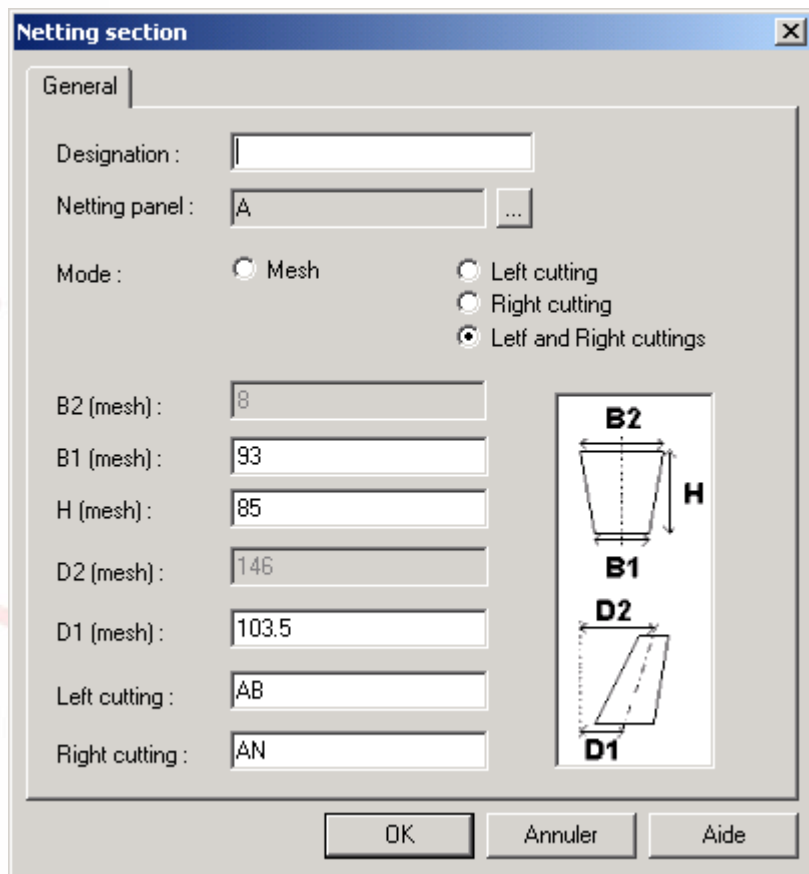
1.2.4 Define the netting sections of the panel

The « Netting section » dialog box appears.

- Choose the netting panel which constitutes this piece of netting.
- Enter the number of meshes and the possible overhangs which define **the first netting section** of this panel .
- Alternatively, you can choose to **input cuttings**. Thus you don't need to calculate overhangs. The example given on the next picture is the right wing of the upper panel. Notice that for DynamiT, cuttings going right up are positive and cuttings going left up are negative.
- Validate.
- Use the keyboard and the mouse to move around in the 2D view.



It is not necessary to complete the « designation » field.
Generally, one enters the square (or the belly), then the wing parts.



The next netting section must be placed relatively to the first that has been defined.

- Still using the « Netting Section » tool, move the cursor above the first netting section you just have defined. A black line appears which is either turned up or down or horizontal.



When you will click, the new netting section will be displayed above (line turned up), below (line turned down) or on the same plane as the netting section over which you are moving the cursor (for instance for the wing parts, horizontal line).

When clicking beyond the part (thus no line appears) a new panel is created.

- Click to add a new netting section under the first one.



- Press TAB or SHIFT TAB.
- Notice that DynamiT proposes a number of meshes by default for the bases.
- Move around by means of the keyboard direction keys or the « scroll » tool.
- Use keys zoom Z or U or the « zoom » tool.
- Use key F or the « fit » tool.

- Proceed this way to define all the trawl netting sections up to the cod-end.

Try to modify a netting section :

- Choose the « selection » tool and click on the netting section to be modified.
- Modify the number of meshes of a basis for instance.
- Validate.
- Restore the exact number of meshes.



- Try to insert a netting section : either by creating or by displacing it.
- CTRL Z allows to cancel the last displacement.

- Define the netting sections of a single wing (those of the symmetric wing will be obtained by copy once the strengthening ropes and floats set in the right place).



When a wing tip ends up by a small number of meshes (exp: 8 meshes for the upper part wings), (i) these meshes must be pinched to stick to the facts ; (ii) it is better to enter 0 meshes in DynamiT. This can be done automatically by DynamiT.



DynamiT automatically smoothes the edge of the net panels so as to avoid discontinuity in meshing (which reflects reality). Especially as regards bottom trawls, it is necessary to make sure that the netting sections entered match the trawl design by temporarily deactivating the smoothing function.

- In the « File » menu select « Properties ».
- Deactivate the option « panel border smoothing ».
- Check the relevant effect on the view of the trawl panels.
- Reactivate this option.

Alternatively, you can display the “Layout printing view”.

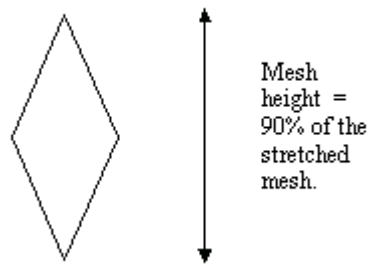
- Proceed the same way for all the parts of the lower netting panel.
- If a same part (for instance the cod-end) is found in both the netting panels, one can drag and drop, using the mouse, the part already defined onto the part being designed.

1.2.5 Entering the strengthening ropes

- Choose the « strengthening rope » tool.



Except in particular circumstances a strengthening rope must always superpose exactly on a netting section side. DynamiT offers magnetism properties which automatically draw the strengthening rope extremities to the top of the netting section. DynamiT proposes a length of strengthening rope by default, which is calculated after an opening corresponding to 90% of the meshes. In other words, this length is directly measured on the drawing.



- Click inside of the circle at the corner of a panel.
- Release the mouse button inside of the circle at the opposite corner of the panel.
- Enter the parameters of the strengthening rope.
- If you want the length of this rope to be added to the head rope / foot rope, tick “add length to layout”. This will also enable the definition of the trawl mouth for swept volume calculations.
- Place the label of each strengthening rope so as to make legibility easy :
 - Chose the « select » tool.
 - Click right on a strengthening rope.
 - Choose the position of the label.
- If necessary, adjust the size of the label policies in the menu « File / Properties ».

Strengthening rope [X]

General

Designation : Load...

Material : Store...

Add length to layout

Length (m) : Globalisation rate :

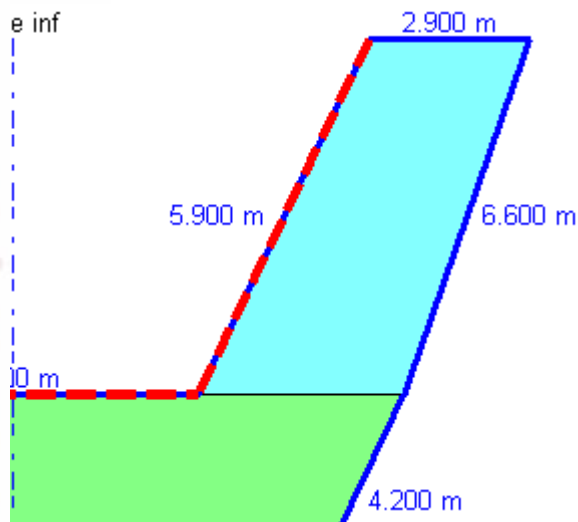
Diameter (mm) : Mass (kg) :

Mass per meter (kg/m) : Apparent mass (kg) :

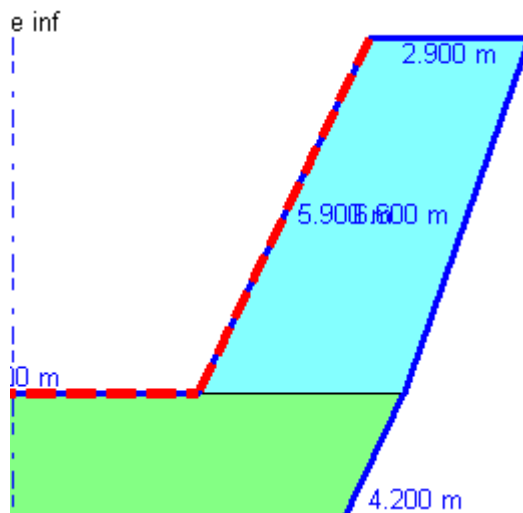
Stiffness (N) :

Apparent weight multiplier factor :

OK Annuler Aide



YES !



NO !

Notice that the square strengthening ropes cannot yet be entered.

Once all the left (for instance) strengthening ropes created, symmetrical right ropes can be copied without having to enter their parameters one more time, but we will copy ropes after floats et weight are created.

Notice that the labels are in the right place for the new strengthening ropes.



The strengthening ropes are used to impose a hanging ratio **and** to assemble the panels together. Thus, a strengthening rope is not necessary to close the cod-end.

The strengthening ropes assembled together are necessarily the same length (they also have the same characteristics owing to the fact that they will be « amalgamated » by seams).

1.2.6 Defining the floatation

It will consist of 68 floats of 4 litres each, evenly shared out along the headrope : 26 floats on each wing and 16 floats on the square.

- Choose the « distributed floats » tool.
- Add 26 floats onto the wing already defined.
- The wing can now be copied.
 - Tool « select ».
 - Contextual menu of the wing to be copied.
 - Copying.
- Create the strengthening rope of square.

- Add the floats to square.

Note that the floats that have been added are evenly distributed along the strengthening ropes ; some additional floats can be added here and there.

- Check that the floatation is correct with the strengthening rope contextual menu.



Notice several layers of different floats can be added on a single strengthening rope.

1.2.7 Defining the footrope

It will consist of a 200-kg (total mass in air) chain and 110-mm rubber rings.

- Choose the « distributed weights » tool.
- Click at the edge of the lower wing.
- Enter the volume by metre of the footrope.
- The wing can now be copied.
- Create the strengthening rope of the square.
- Add the weight to the square.

Comparative importance of the footrope parameters :

- Refer to on-line help for the detail of the parameters.

Considering a floatability multiplier coefficient of 0.3 for the rubber disks and a section of footrope of 5.90 m (thus the « number of items » will be equal to 1) :

Volume = 56l

Mass = 111 kg

Apparent weight = 71 kgf

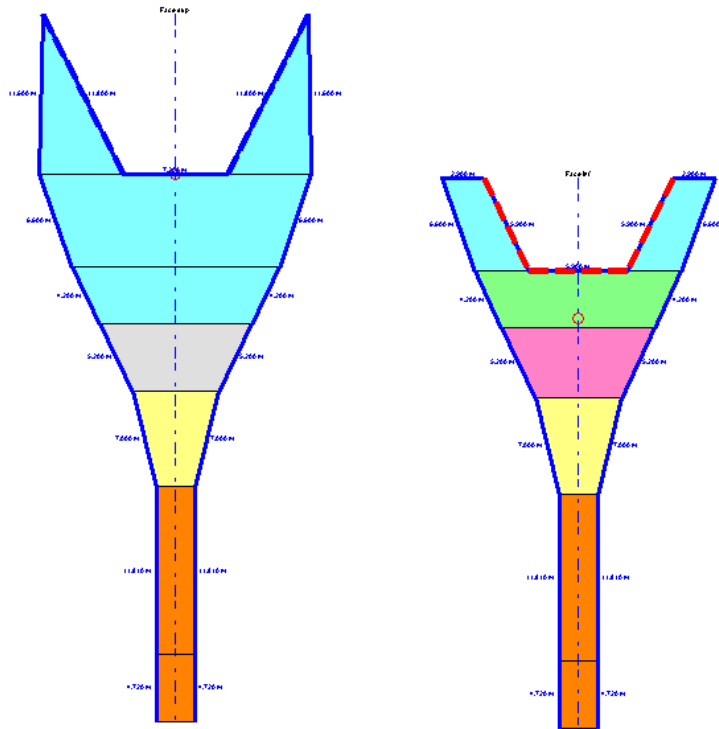
The parameters “volume” and “apparent weight” are the more important : they are used to calculate the drag and the sinking force of the footrope.

Create symmetrical ropes.

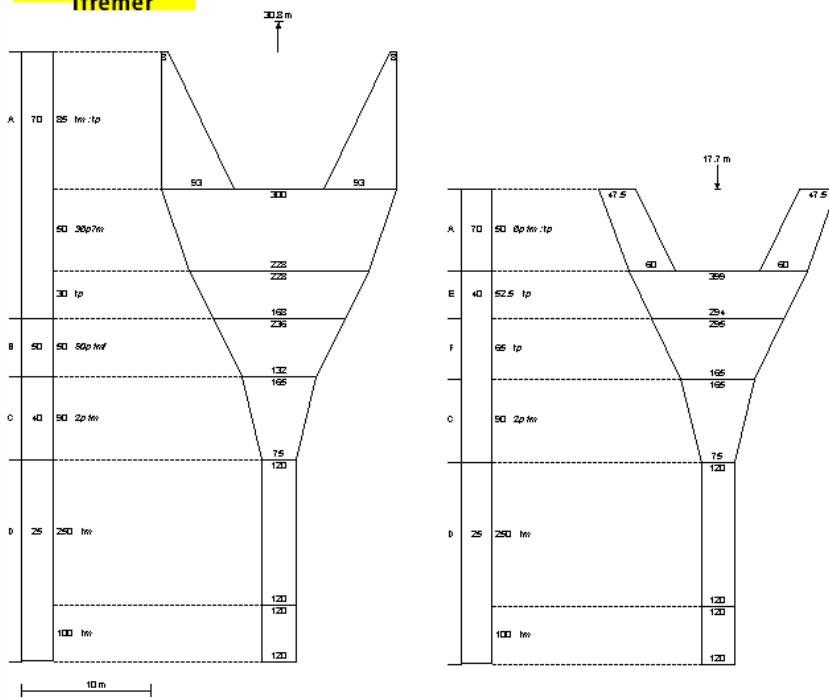
- Chose the « select » tool.
- Click right on the strengthening rope.
- Create the symmetrical strengthening rope.

Now you should get something looking like this :

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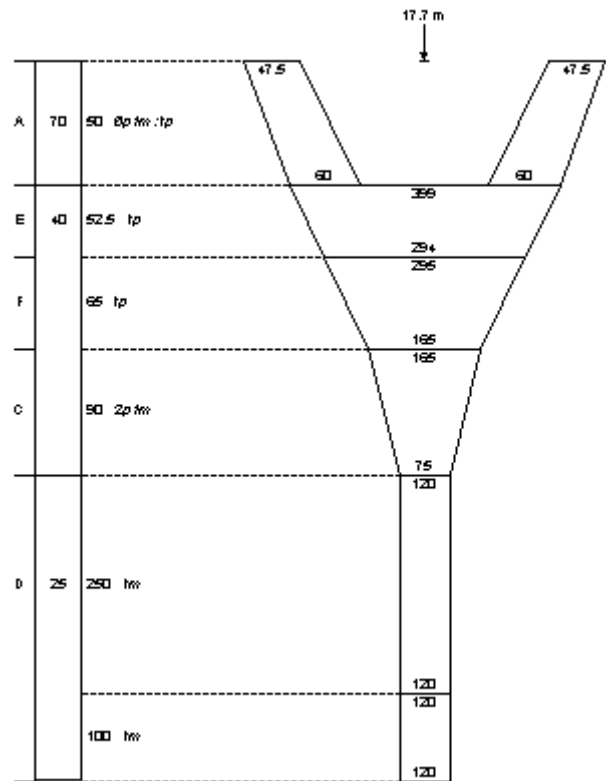
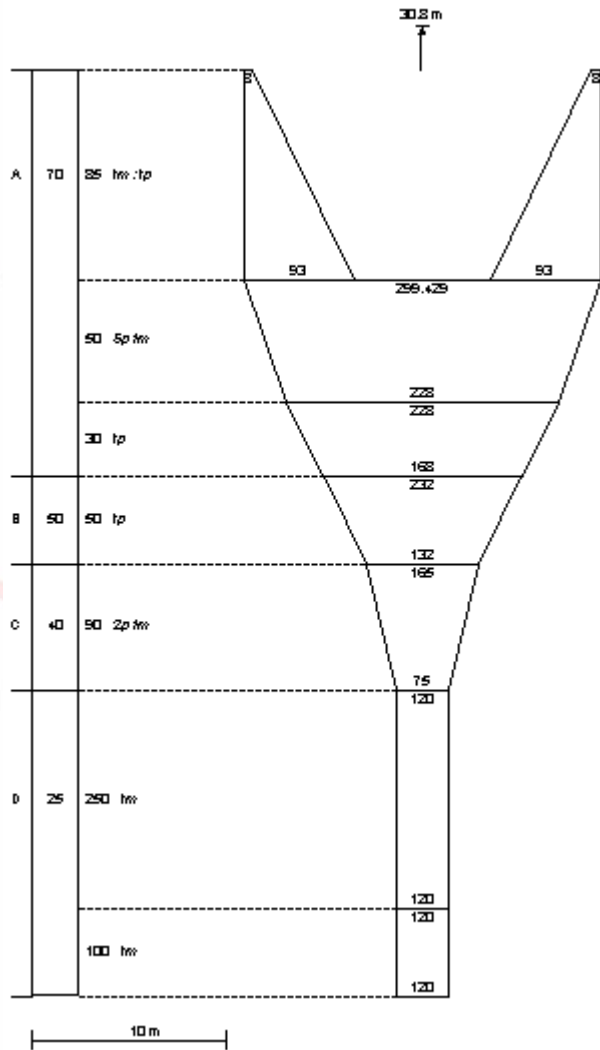


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Molding section	Surface (m ²)	Weight (kg)
Face sup	41.12	51.59
Face inf	36.78	46.62
Total	77.90	98.21

Description	Material	Runway (m/kg)	Mesh side (mm)	Diameter (mm)
A	PA	270	70	2.5
B	PA	270	50	2.5
C	PA	370	40	2.4
D	PA double	370	25	2.4
E	PA	180	40	4
F	PA	270	40	2.5



1.3 Entering the rig

1.3.1 Cables



Any combination of cables can constitute the rigging.

The port and starboard parts of the rig are distinct although being symmetric parts obtained by duplication, using the library .

- Check what is the maximum number of « rig parts » that can be built under a TRG file.
 - Menu « file / properties / usage »
- Select the « steel wire rope » tool to build the set of cables of the first part of the rig.

- Click at one end of the cable, release at the other end.

For a good legibility the rigging must be distinct from the trawl. It is more generally represented horizontally, the boat(s) on the right and the doors on the left, above the panels of the trawl.

The rig will consist of two bridles : 15 m (low) and 17 m (up) long and 18 mm diameter. The sweep lines are 50 m long and 20 mm diameter, the warps are 500 m long and 22 mm diameter.

Do not forget to add the chain at the end of the lower bridle (section “e” of the design) : 11.8 m long and 8 mm (5.8 kg/m) chain.

When defining the cables of the rig, for the first time occurs the necessity to distinguish the physical data (weight and length of the cables, etc.) from the discretization (i.e. a numerical representation of the physical data).

- Use at least 10 elements for the warps.

Notice that the stiffness default value for all cables is 1e-6 (version 1.0). **This value is two small for warps.** Such a value will lead to an abnormal warp elongation. Use 1e-7.

1.3.2 The other parts of the rigging

1.3.2.1 The trawler

- Select the « warp block position » tool.
- Click on the extremity of the warp that reaches the boat.
- Require on-line help to enter the parameters.

Note : only the athwartship plane is taken into account in the calculation.

1.3.2.2 The doors

The software does not simulate doors adjustments : the doors incidence is set by the way of the hydrodynamic coefficients.

These will be Polyvalent doors built by *Morgère*, with the following characteristics:

AA7

Dimensions : 2.75 m by 1.5 m

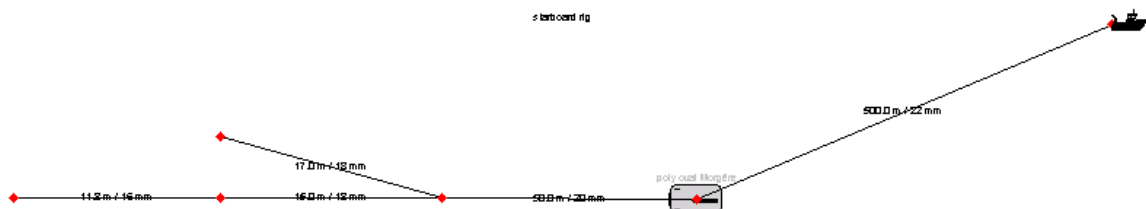
Mass : 750 kg

Lift coefficient : 1.22
Drag coefficient : 0.75
Surface : 3.5 m²

- Select the « Otter board » tool.
- Enter the parameters of the door.

To create the second part of the rigging, proceed the following way :

- Save the rig part already defined in the library :
 - Choose the « select » tool.
 - In the rig contextual menu, select « store in library ».
 - To copy this rig click right at blank area and select « load from library ».
 - Give another name to this new part of rig.
 - Modify the position by default of this new rig.
 - Modify the parameters that are no longer correct.
- If necessary, rig parts can be moved by using the « move panels » tool.



1.4 Entering the seams

The last step in entering the data regarding the trawl consists in indicating to DynamiT the way the various elements are connected together.

1.4.1 Assembling the panels together

- Change for mode « seams ».
- Select the « side seam » tool.
- Connect together the strengthening ropes that must be « melted ».



Make sure that the seam goes the right way (in fact, mind the starting point).
Mind to use the strengthening rope seam tool and not the mesh seam tool.
Use the “extended seams” in order to save time.

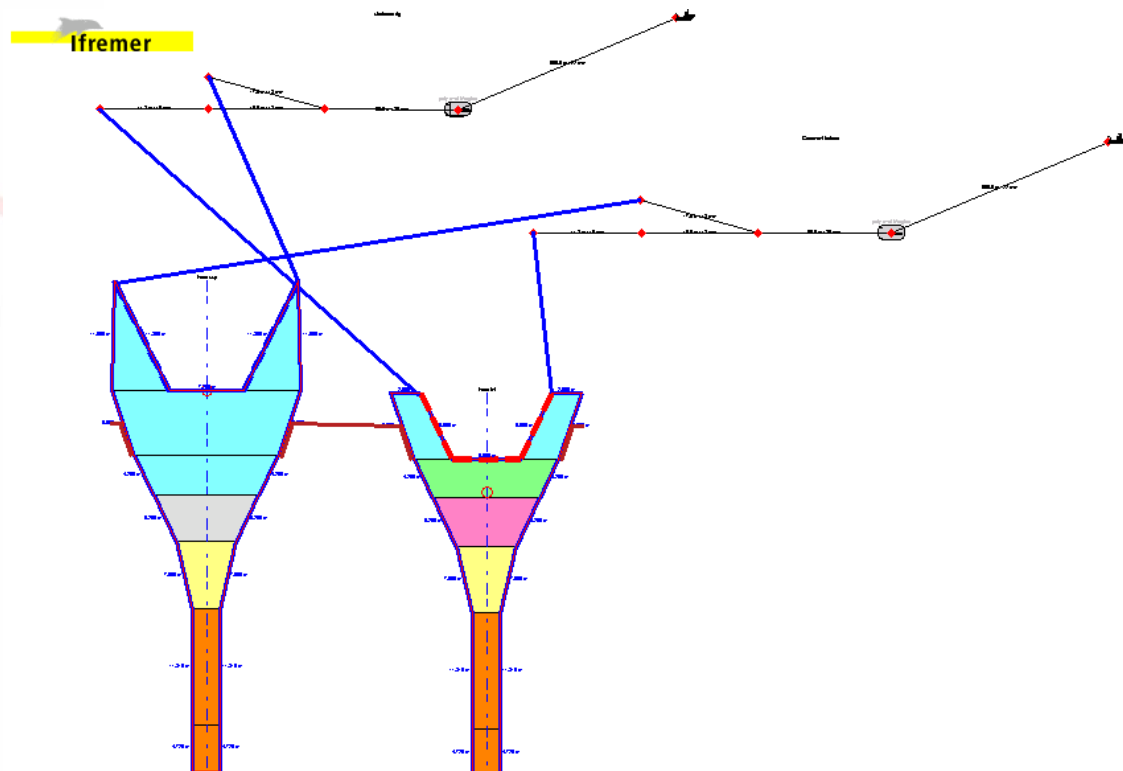
- Once the strengthening ropes connected together apply the contextual menu of the seams and select « unroll » to improve legibility.
- If needed, adjust the length of the seam symbols in menu « file / properties / unrolled ... ».

1.4.2 Connecting the net to the rig

- Select the « punctual seam » tool.
- Define the links.

Mind the symmetry of the links : if you want to connect a bridle to a wing end, make sure the connection point is the end and not another node.

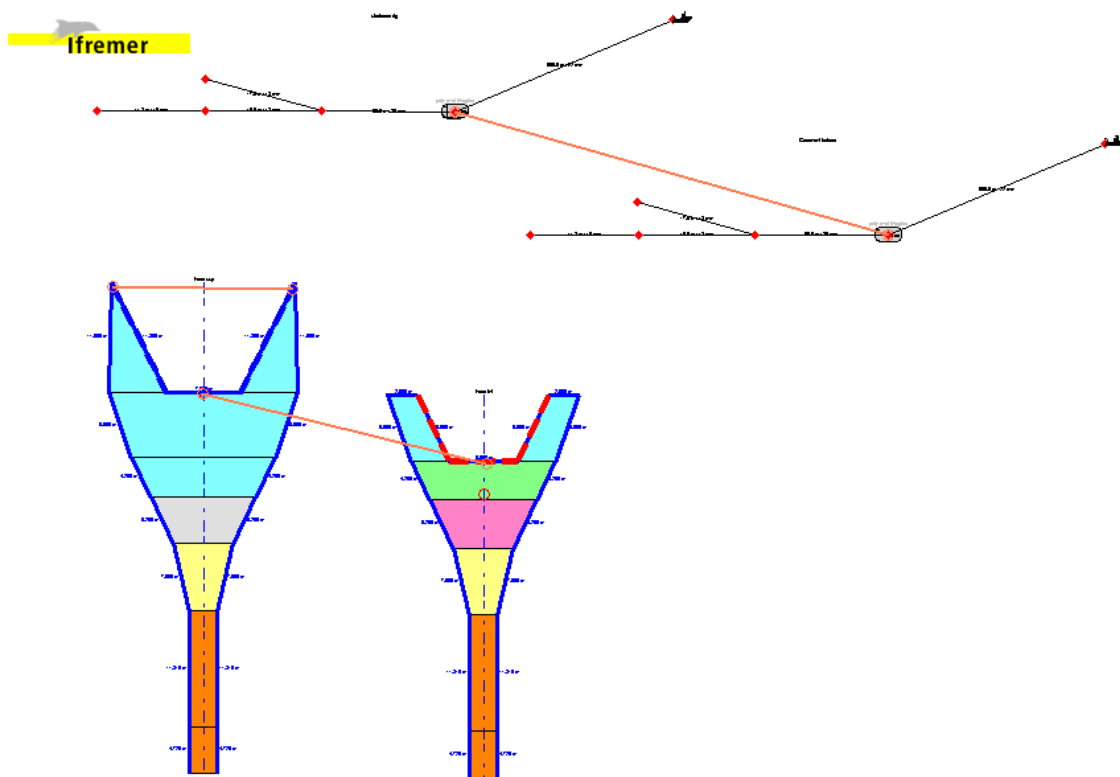
Mind the « cross » seams.

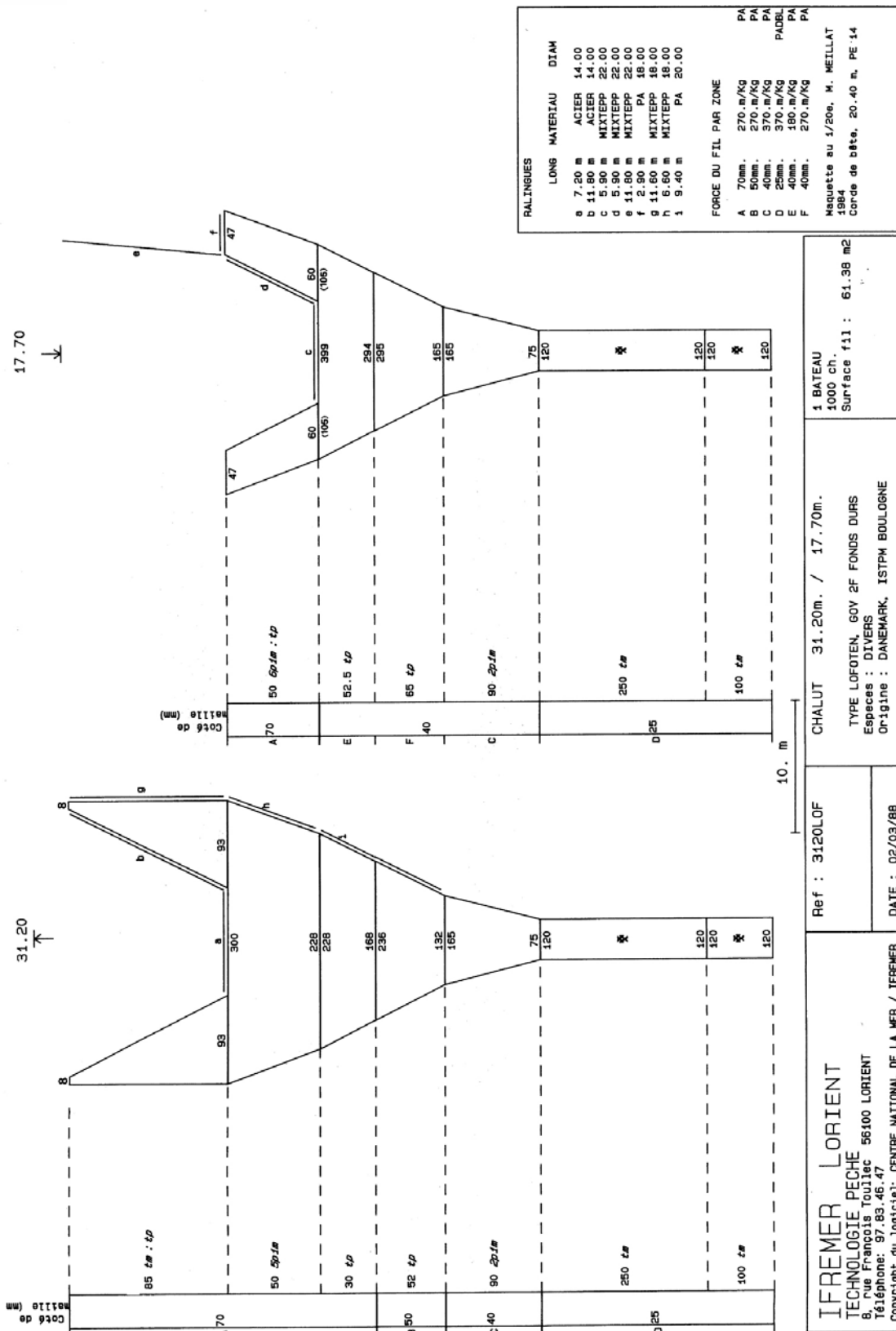


1.5 Choose which data will be displayed during the simulation

You can choose now which data will be automatically displayed during the simulation. For instance, it is convenient to follow the values of the vertical and horizontal openings and the door to door distance. These choices are defined in the Geometry mode.

- Select the « noticeable points » tool.
- In order to choose the vertical opening, click on a point of the upper panel square, and release the button on a point of the lower panel square.
- Enter “vertical opening” in the dialog box.
- Do the same for any other distance you want to measure.





Design of the Lofoten trawl