

Preparation of section properties for 2D anti-symmetric analysis of ship with structural discontinuities

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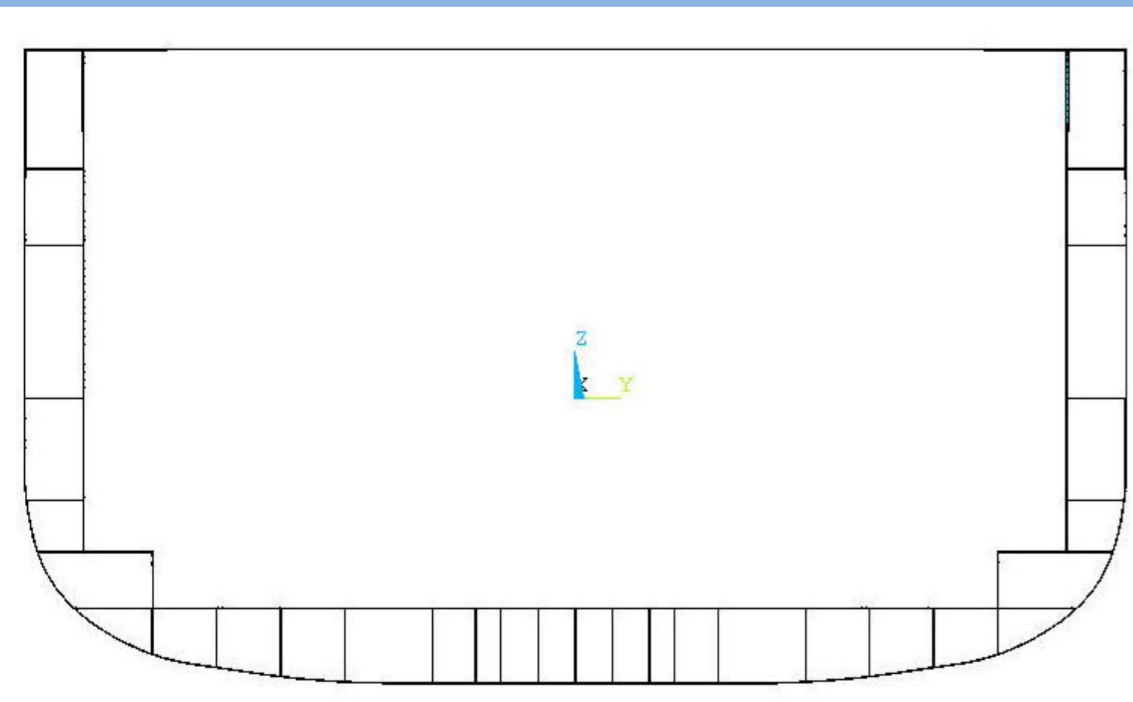
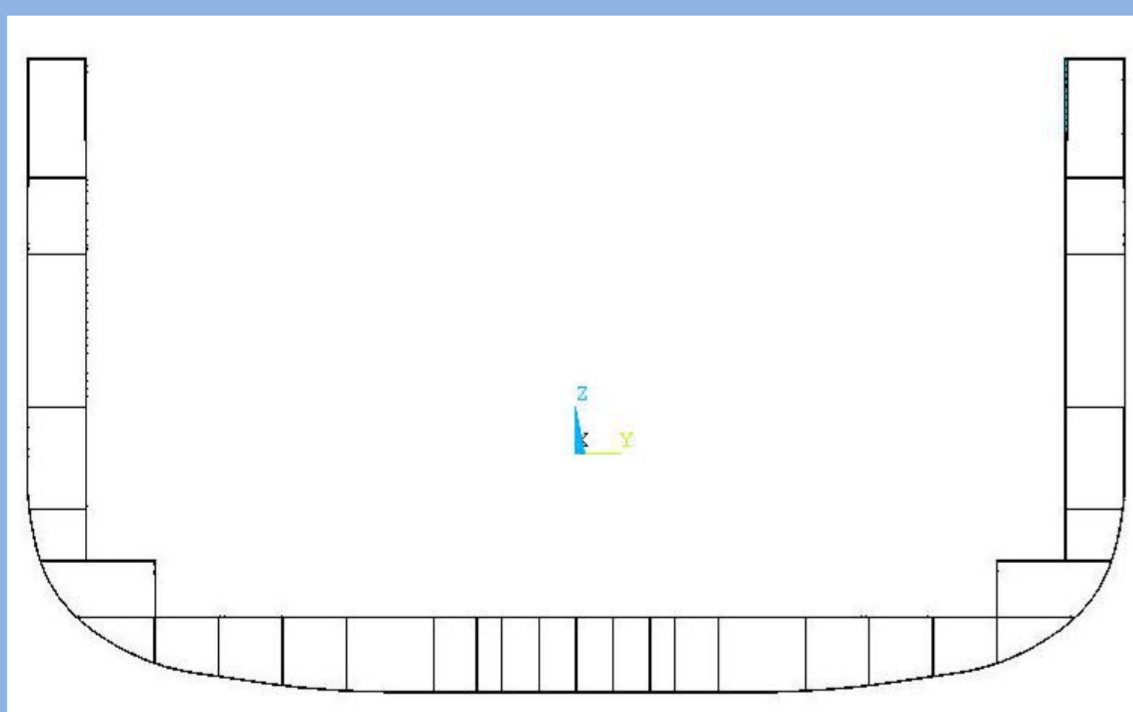
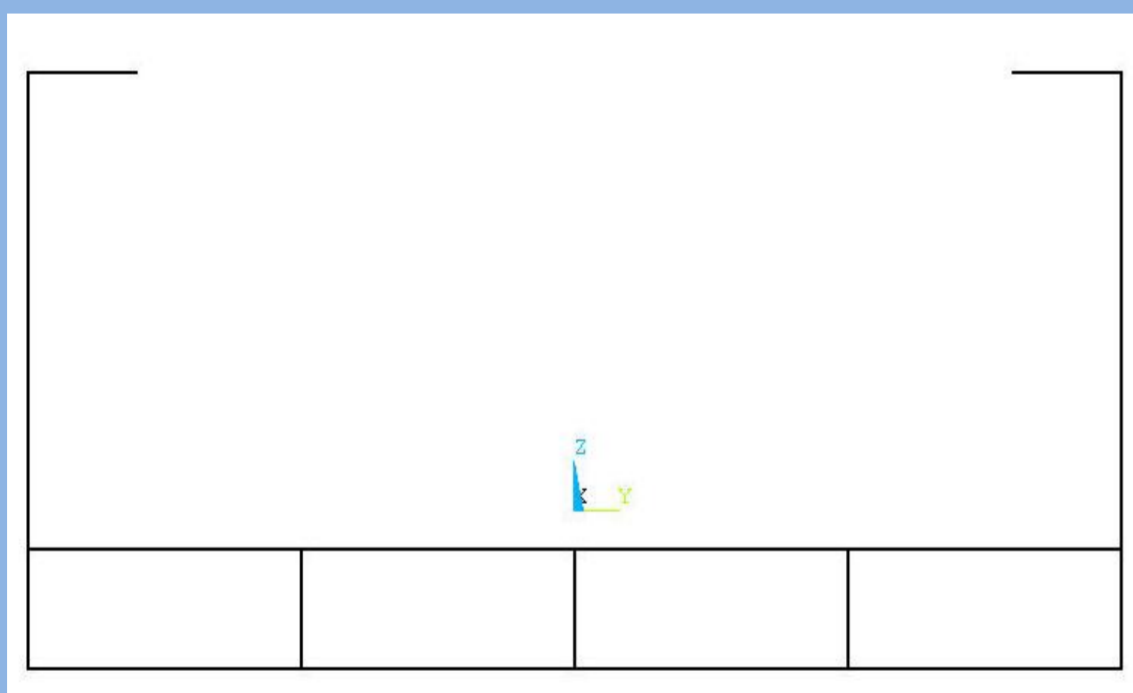
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Background

- Ships with large openings, containerships in particular, are congenitally weak against twist force from wave. The constrained warping of cross-section, which incur at the structural discontinuity of ship hull, will produce additional stresses to those induced by bending, shear and torsion. More concerned as bigger container ship is designed.
- Comparison of prediction of 2D and 3D hydro-elasticity programmes has been and will be helpful to calibrate one with the other during the development of these programmes in addition to the comparison with experiment test.
- Simplification is inevitable when creating a 2D or 3D FE model from a real ship structure for hydro-elasticity analysis. The torsion character of 3D model may be different to 2D model of the same ship after simplification.
- The input data of 2D anti-symmetric hydro-elasticity programme can be categorised into four groups in the view of availability.
 - The data, for example, mass distribution, section rotation inertia, second moment of area and shear area etc, can be produced by common commercial software related.
 - The data, for example, second sectorial moment of inertia and shear centre, can be produced by a few of commercial software.
 - The data, for example, warping rotational moment of inertia and shear moment, can be produced by only one software as we know. Unfortunately, this software does not work reliably at this stage.
 - The data, for example, bending-warping coupling moment of inertia and warping stiffness factor at structural discontinuity, there is no commercial software available as we know to produce these data.

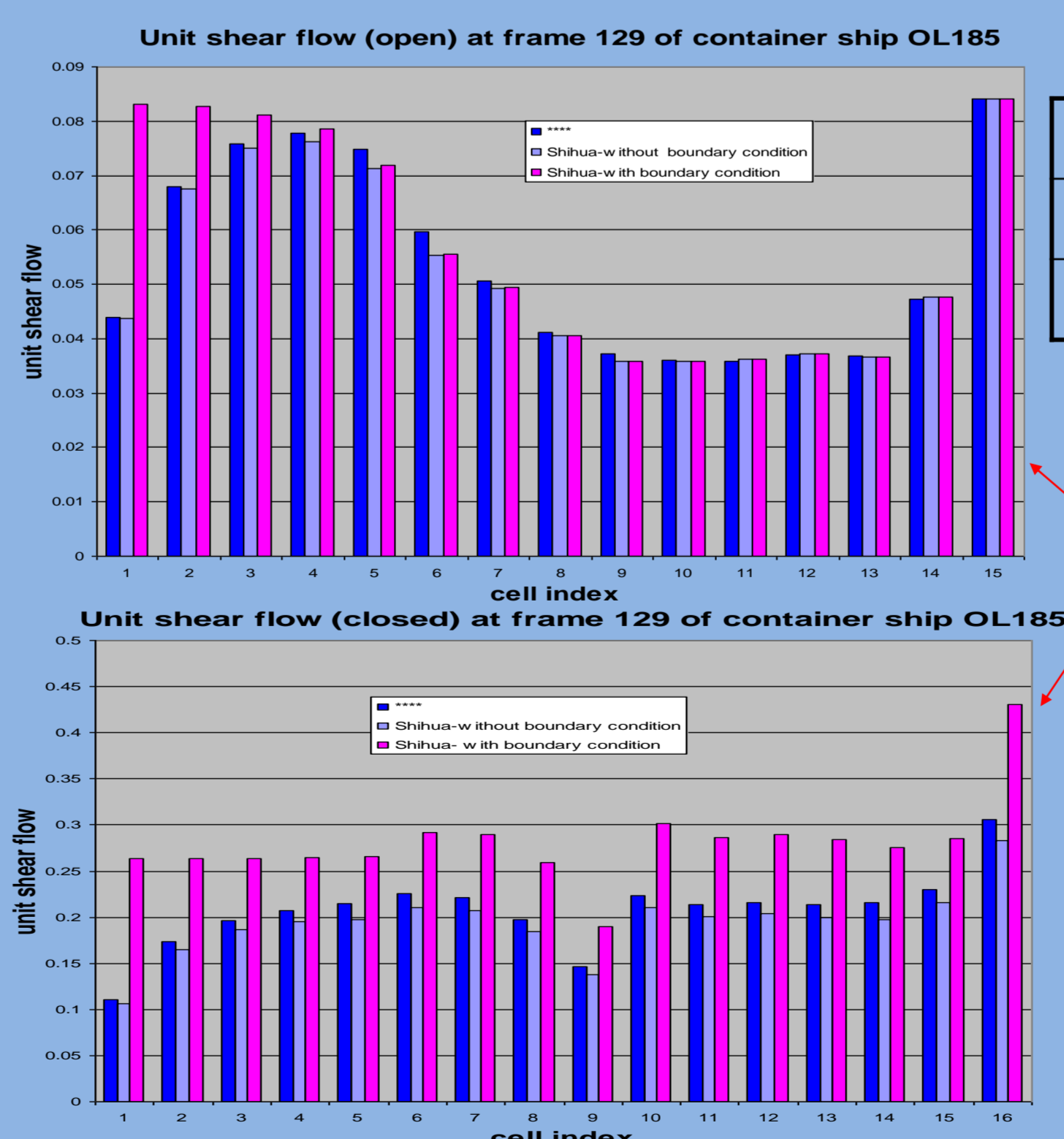
Aims

- Using the data extracted from commercial software of ship design, RulesCalc, for example to develop a software to produce all of the mechanical properties necessary for analysis of 2D beamlike structure with structural discontinuity.
- Using the data of 3D FE model to develop a software to produce all of the mechanical properties necessary for analysis of 2D beamlike structure with structural discontinuity.



	Cz	Iz	Sz	J	Iww
ANSYS	2.659	75.11	-1.984	2.931	1029.75
Shihua	2.657	75.17	-1.986	2.927	1029.00

Cz ---- centroid z; Iz ---- second moment of area about vertical axis;
Sz ---- vertical position of shear centre; J ---- constant of St Venant torsion;
Iww ---- second sectorial moment of inertia.



	Sz	J	Iww
ANSYS	-10.191	22.349	111339.0
Shihua	-10.192	21.385	108376.8

When half of symmetric cross section is used to calculate the Bredt's shear flow of close cells the symmetric boundary conditions must be imposed to the members at central line.

	Sz	J	Iww
ANSYS	4.10	812.2	30376.0
Shihua	4.35	795.7	28695.6

Acknowledgement

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