

New Generation Intact Stability Criteria: general structure



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Introduction

- IMO is going to develop new generation intact stability criteria by 2012 for allowing the use of first-principle tools .
- These will cover
 - Harmonic resonance under dead ship condition,
 - Manoeuvring-related problems such a broaching-to,
 - Stability variation problems such as parametric rolling.
- It was agreed that the new criteria should consist of vulnerability criteria and performance-based criteria, i.e. direct stability assessment.

Introduction

- The vulnerability criteria could be split into two levels.
- New criteria should be based on physics for allowing its application to unconventional vessels.
- New criteria should be supplemented with operational guidance, which is also based on physics.
- New criteria for cargo and passenger ships would be mandatory through the SOLAS and ICLL after transition periods.
- Criteria for special ships would be developed with similar methodologies as non-mandatory ones.

TOR of ISCG

- The intersessional correspondence group on intact stability (ISCG) was established at SLF 51 (July 2008) and was instructed to collect draft criteria and sample calculation results from Member States and NGOs.
- Its TOR are:
 - to identify a sample of ships relevant to the failure modes described in the Framework for the new generation intact stability;
 - to collect and make available to the correspondence group all the relevant data of the ships;
 - to collect in the mid-term March 2009 the results concerning the application of procedures for checking vulnerability;

TOR of ISCG

- to collect in the mid-term June 2009 the results concerning the application of procedures for direct assessment of intact stability;
- on the basis of these results, coordinate the development of preliminary specifications for the quality of the procedures and for the quantities considered relevant for the formulation of new generation intact stability criteria; and
- submit a report to SLF 52.

Submitted proposals on Dead Ship Condition

- ITALY
 - 1st level vulnerability criteria: weather criterion with the wave steepness table from MSC.1/Circ. 1200.
 - 2nd level vulnerability criteria: calculation of capsizing probability index in irregular beam wind and waves using equivalent linear restoring arm with the North Atlantic wave statistics.
 - Direct procedure: CFD or 6 DOF code.

Submitted proposals on Dead Ship Condition

- JAPAN

1st level vulnerability criteria: weather criterion with the wave steepness table from MSC.1/Circ. 1200.

2nd level vulnerability criteria: updated weather criterion with new estimation formulae for roll damping, effective wave slope coefficient and with adjusted wind velocity.

Direct procedure: calculation of total stability failure rate in irregular beam wind and waves using piece-wise linear restoring arm with the North Atlantic wave statistics.

Submitted proposals on Broaching

- JAPAN

1st level vulnerability criteria: still water $F_n < 0.3$ as MSC.1/Circ. 1228 requests as the surf-riding threshold.

2nd level vulnerability criteria: calculation of surf-riding threshold in regular dead following waves in the light of bifurcation theory. In addition, calculation of wave-induced and rudder-induced yaw moment during surf-riding.

Direct procedure: calculation of total stability failure rate in irregular stern quartering waves using the combination of deterministic analysis with a time-domain code and probabilistic theory of local wave height and wavelength together with the North Atlantic wave statistics.

Submitted proposals on Pure loss of stability

- USA

1st level vulnerability criteria: tbd.

2nd level vulnerability criteria: calculation of time duration of negative GM in regular or irregular following waves.

Direct procedure: tbd

Submitted proposals on Parametric rolling

- JAPAN

1st level vulnerability criteria: tbd.

2nd level vulnerability criteria: tbd.

Direct procedure: calculation of total or partial stability failure rate in irregular following or head waves as ensemble average of many realisations using a time domain simulation code with the North Atlantic wave statistics.

Specification for new criteria (option A)

- 1st level vulnerability criteria:
Simple criteria as current IS Code has. If a GZ curve in still water is given, no computer is needed.
- 2nd level vulnerability criteria:
Calculation using offset data other than a GZ in still water is allowed but probability is not explicitly used. Spread-sheet calculation should be sufficient.
- Direct procedure:
Calculation of probability (or rate) of stability failure in the North Atlantic or operational area can be included. Use of computer program cannot be prohibited. Calculation using discretisation of time and space, such as CFD, should be avoided because of difficulty of V&V.

Specification for new criteria (option B)

- 1st level vulnerability criteria:
Simple criteria as current IS Code has. If a GZ curve in still water is given, no computer is needed.
- 2nd level vulnerability criteria:
Calculation of probability (or rate) of stability failure in the North Atlantic or operational area can be included. Use of computer program cannot be prohibited. Calculation using discretisation of time and space, such as CFD, should be avoided because of difficulty of V&V.
- Direct procedure:
Calculation using discretisation of time and space, such as CFD can be used because of difficulty of V&V. Model experiment in a seakeeping basin can be used as well.