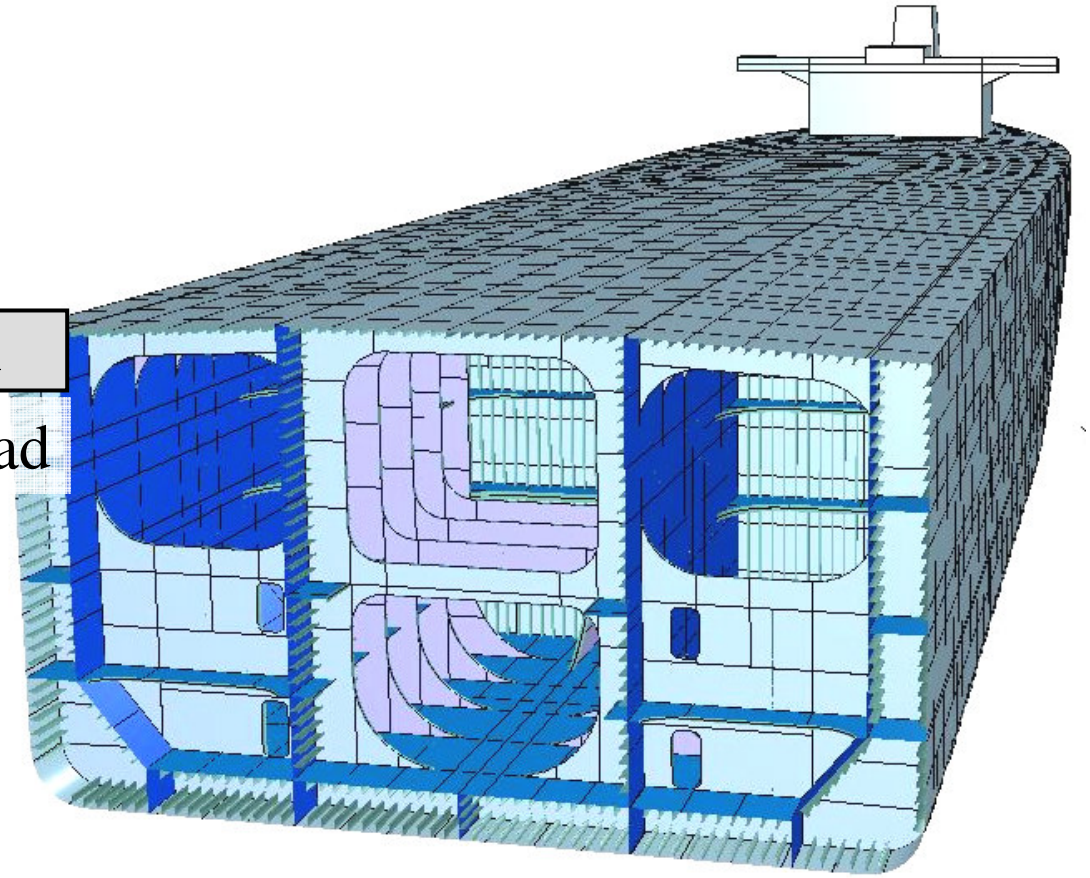
Oil Tankers

Hull Structural Breakdown - Transverse bulkhead

4. Transverse bulkhead

1. Side
2. Bottom
3. Deck
4. **Transverse bulkhead**
5. Longitudinal bulkhead
6. Webframes



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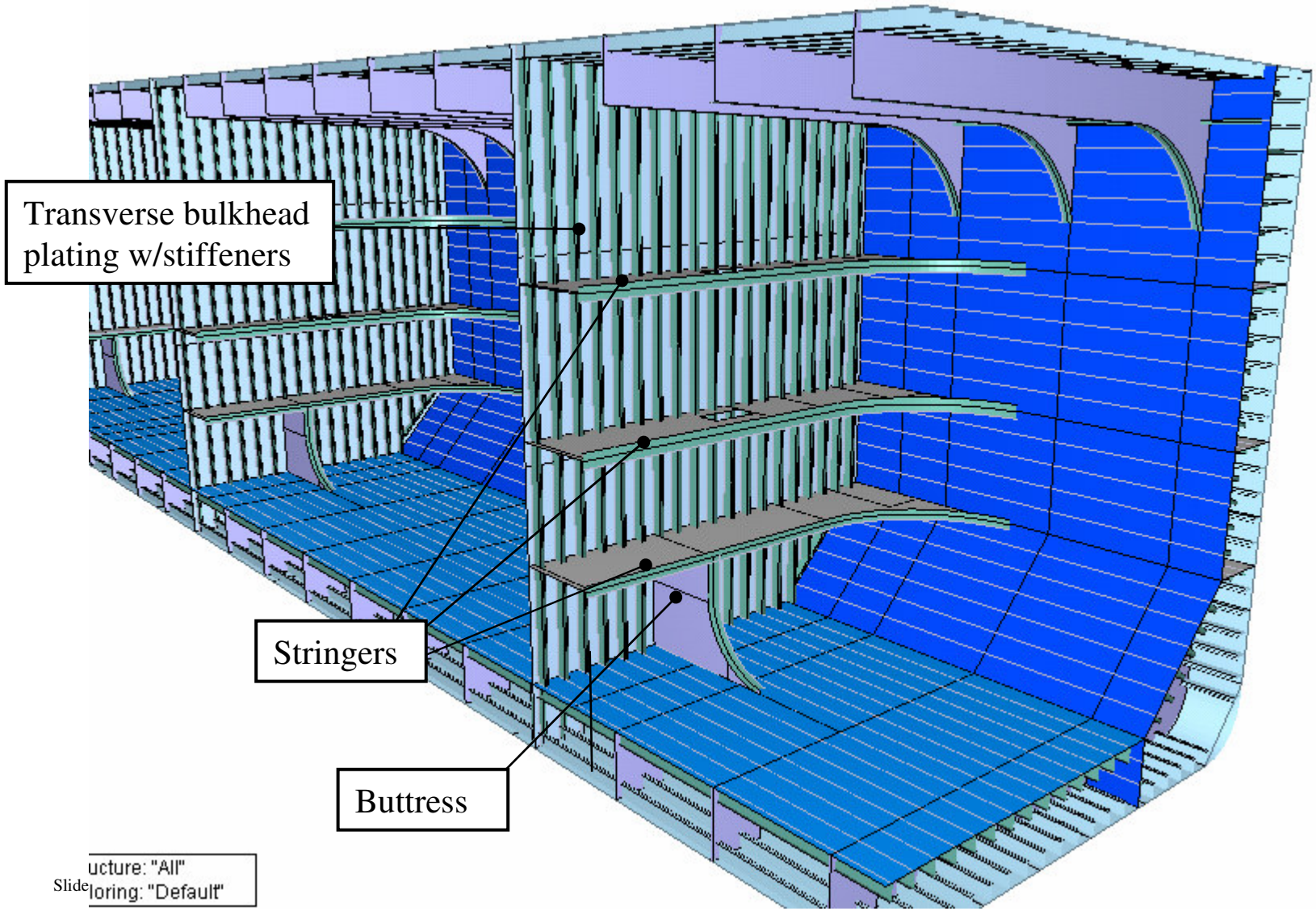
Structural build up of transverse bulkhead

4. Transverse bulkhead



Structural functions

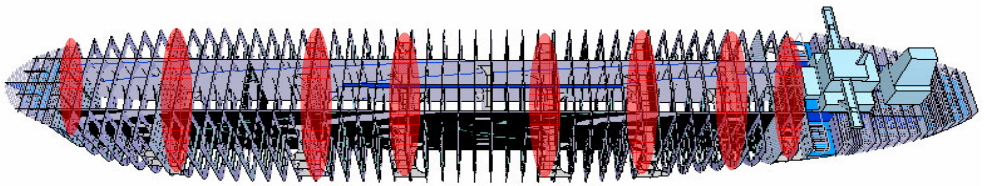
Watertight integrity

- Resist internal pressure from cargo and ballast (cargo boundary)

- Safety against collapse if water ingress (boundary for flooding)

Hull girder stiffness

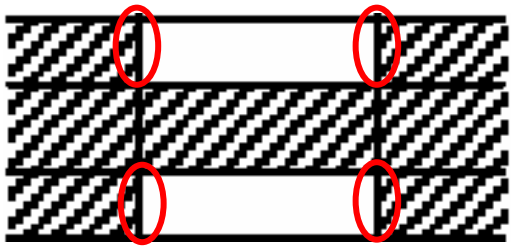
- Transverse bulkhead is an important contributor to the hull girder transverse stiffness



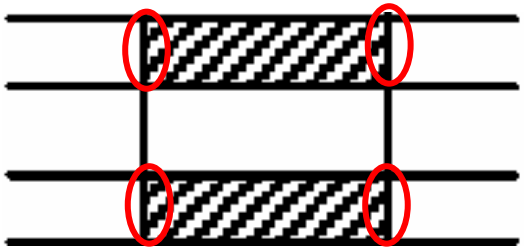
Functions of transverse bulkhead

The transverse bulkhead must withstand internal pressure loads from cargo and ballast

The distribution of cargo and ballast introduces alternate loading on sections of the transverse bulkheads (single skin tanker)



Typical fully loaded condition (single skin)



Typical ballast condition (single skin)

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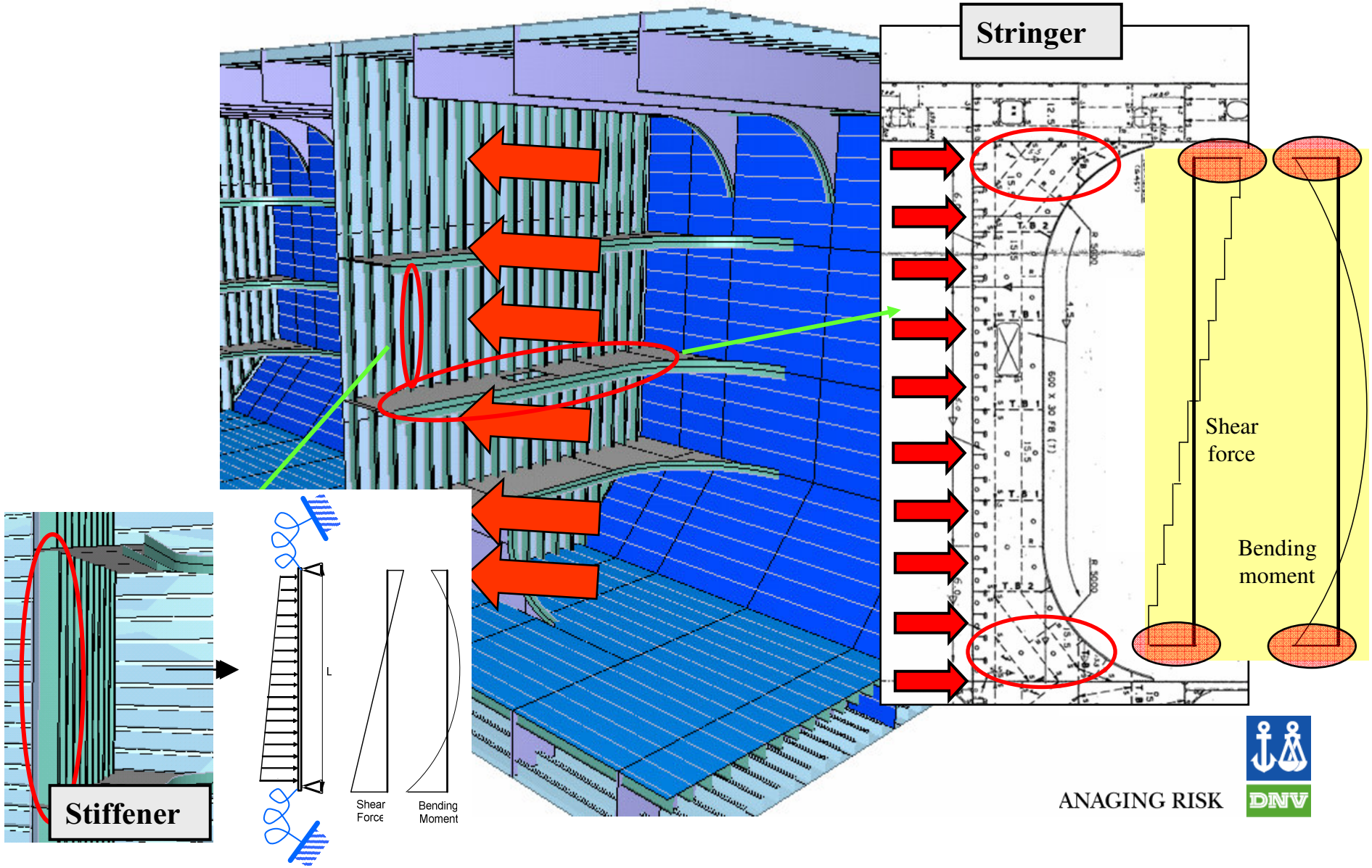
Function: tank boundary

4. Transverse bulkhead



ANAGING RISK

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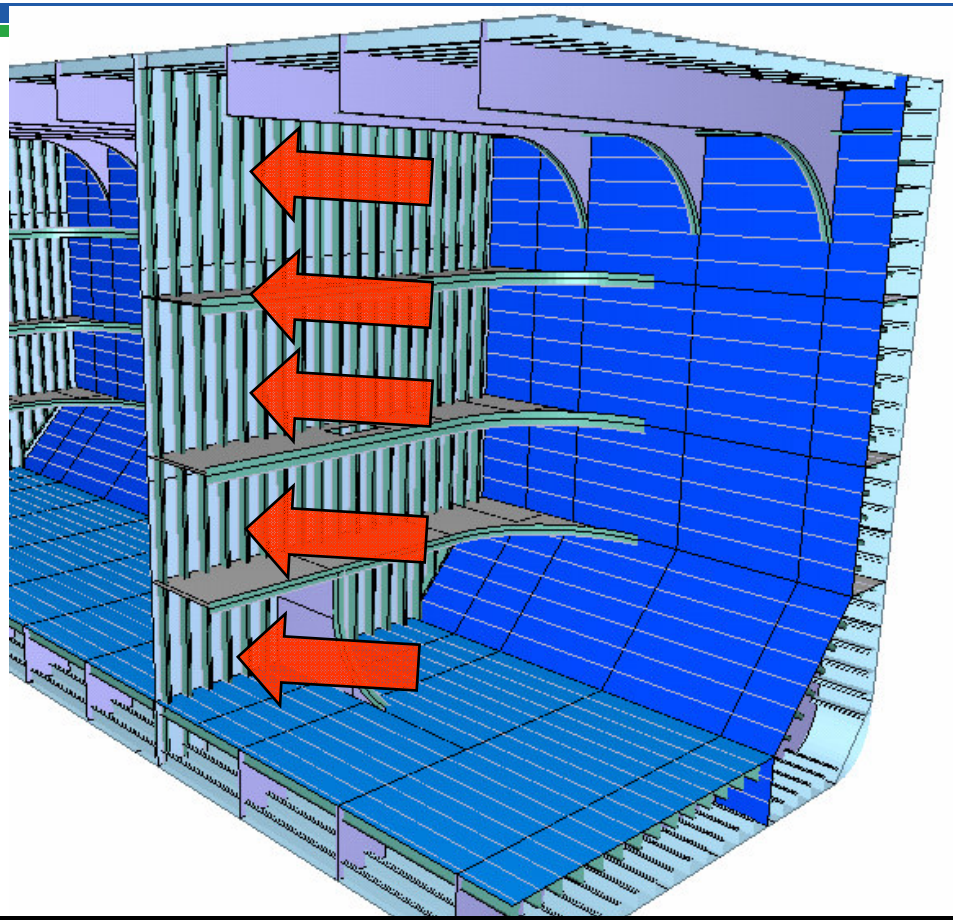
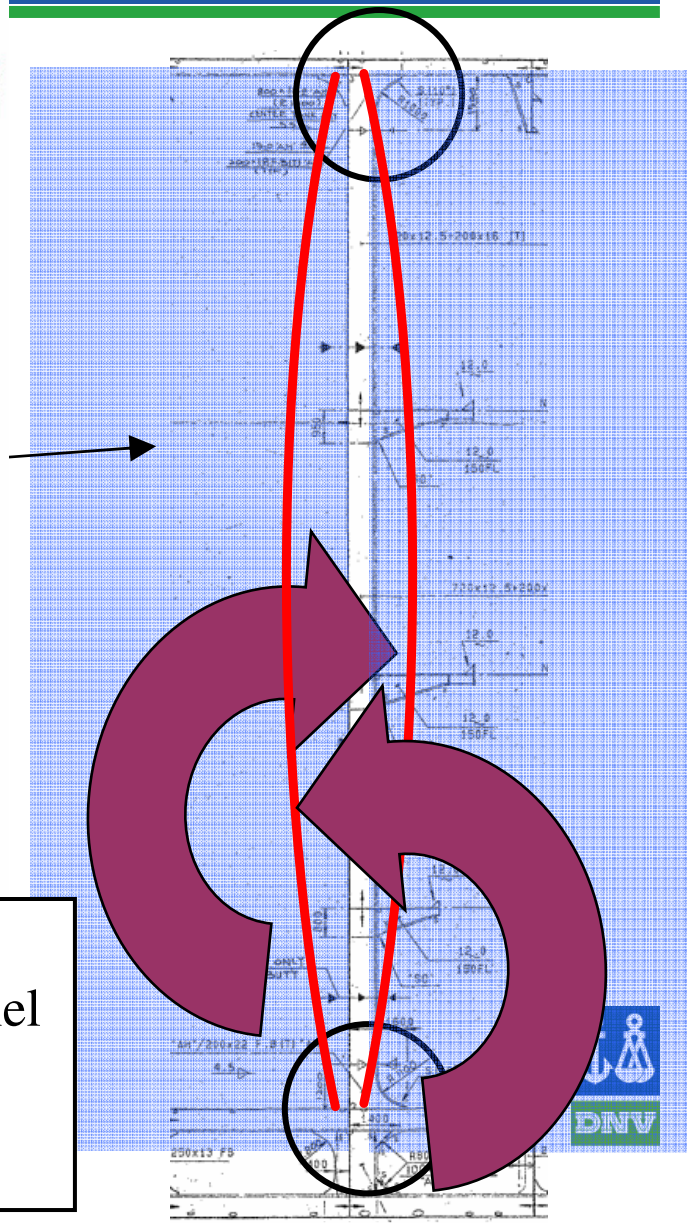
Function: tank boundary

4. Transverse bulkhead



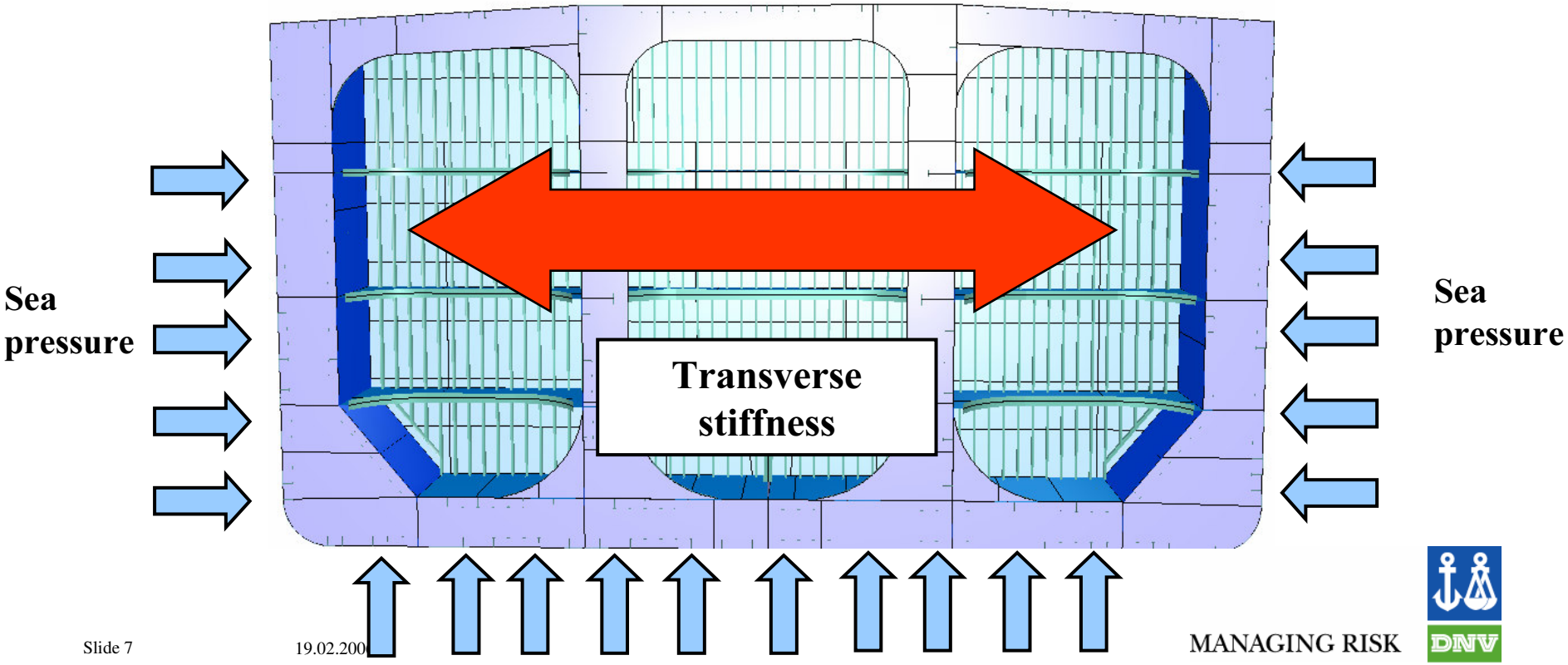


One sided loading on the transverse bulkhead introduces stresses in the transverse bulkhead as a panel

Bulkhead will flex out and high stresses occur at end connections towards deck and bottom

Function: transverse stiffness

Transverse bulkheads are an important contributor to the hull girder strength



Characteristic damages

1. Stringer toes – cracking
2. Bottom longitudinal bracket connection to transverse bulkhead - cracks
3. Cracking of transverse bulkhead stiffeners connection to stringers

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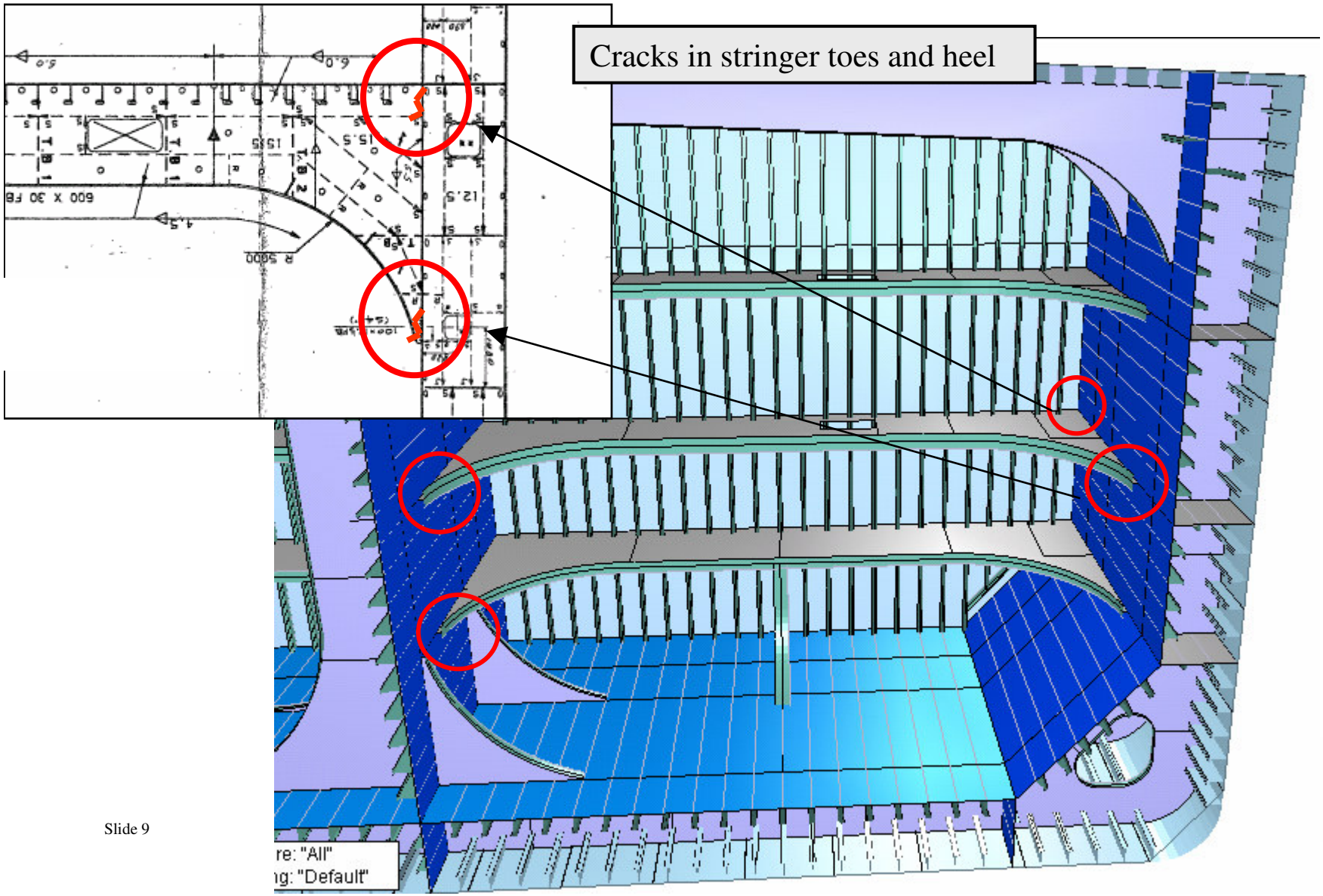
Cracking in stringer toe

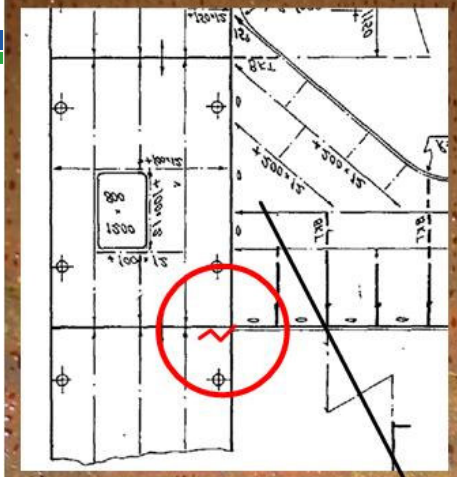
4. Transverse bulkhead



4. Transverse bulkhead

Experience Feedback

Crack in stringer connection to inner side at transverse bulkhead



Crack experienced in longitudinal bulkhead at stringer connection (2nd stringer). Important focus area during hull approval!

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Hull SiO

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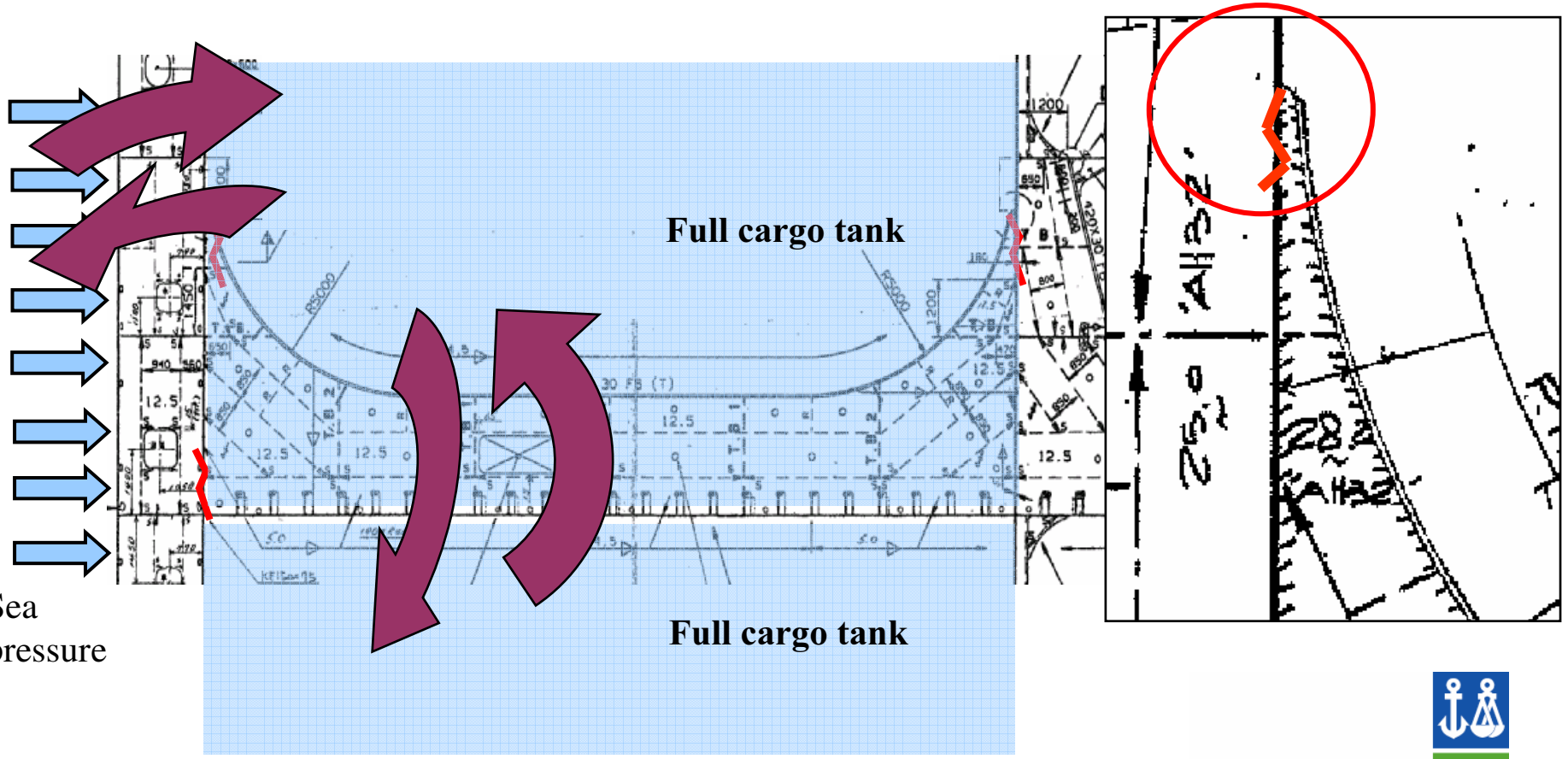
Cause for cracking in stringer toe

4. Transverse bulkhead

Compression/tension stresses from one sided loading



Very high alternating bending stresses in stringer toe

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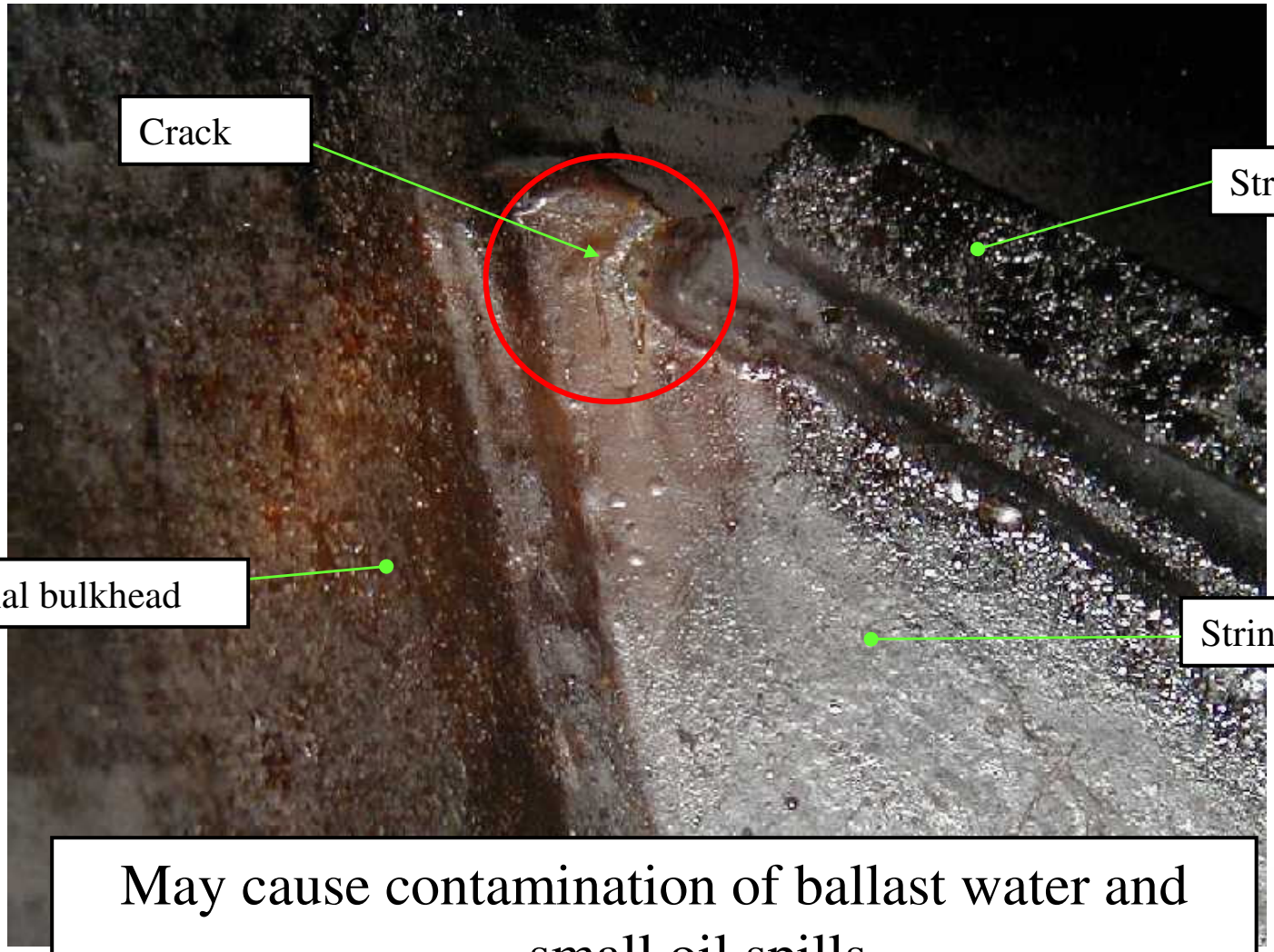
Cracks in stringer

4. Transverse bulkhead

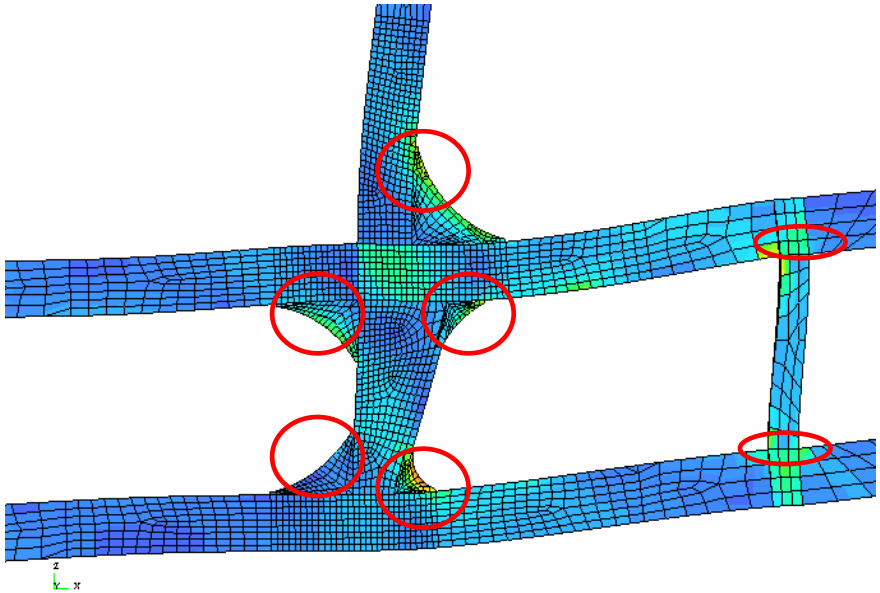


May cause contamination of ballast water and small oil spills

DNV

Double btm at transverse bulkhead

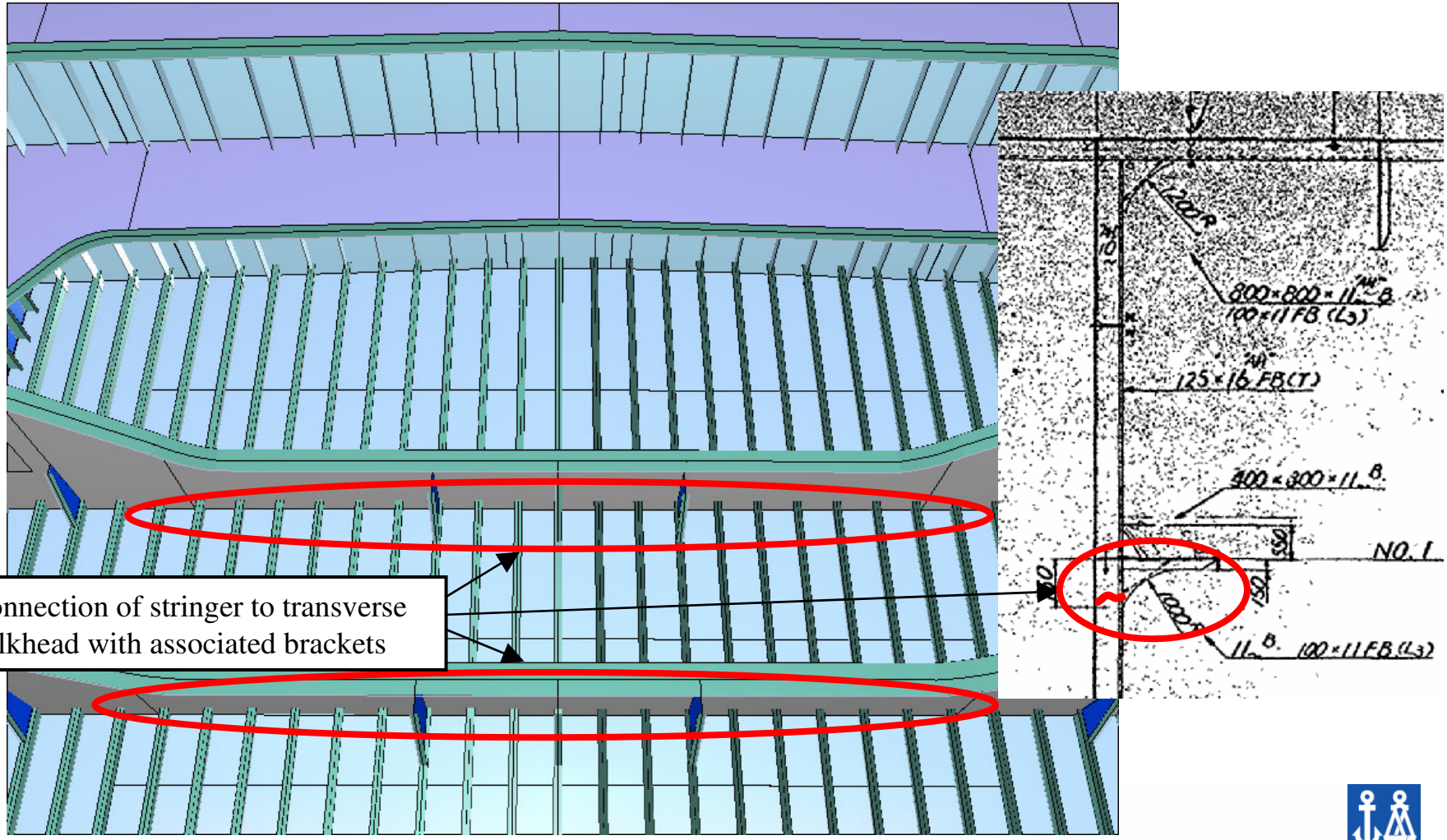
Similarily, one sided alternate loading at the transverse bulkhead also induces high stresses for a double bottom structure



Critical areas

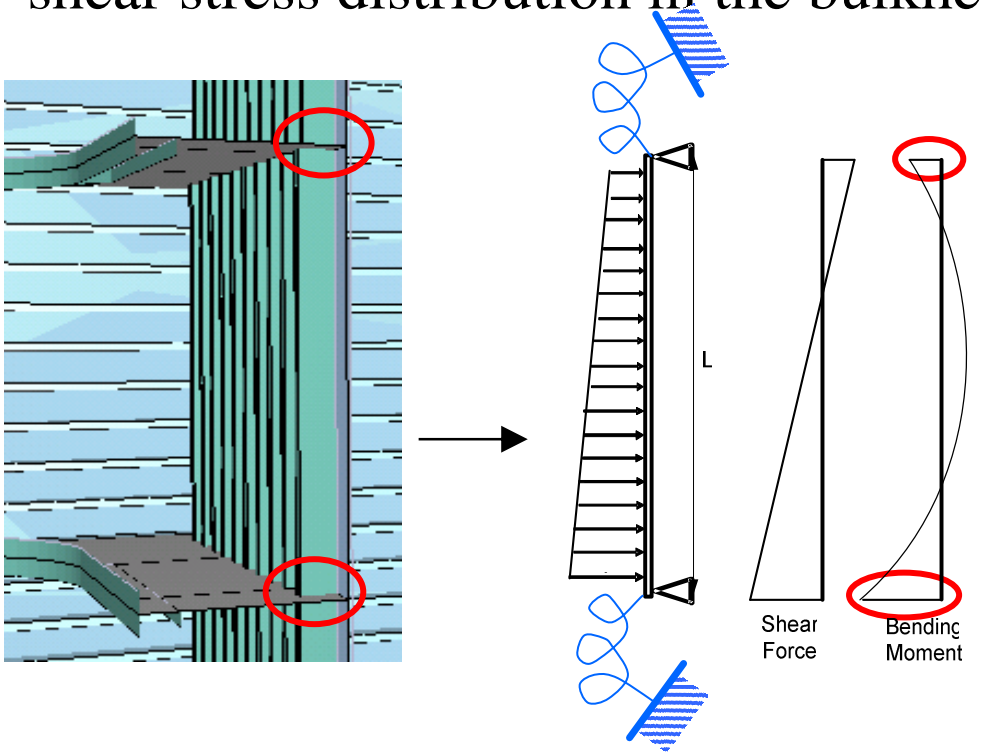
Modern designs have no longitudinal girders in double bottom giving large relative deflection

Crack in transverse bulkhead stiffeners connection to stringers



Cause for cracking in transverse bulkhead stiffeners

One sided internal loading from cargo and ballast sets up a shear stress distribution in the bulkhead stiffener



Highly stressed areas are created around geometric 'hard points' at stiffener end connections to the stringer

-may cause ballast water contamination and possible oil spills