



aqua engineering

System engineering and design



STRUCTURAL AND MECHANICAL DESIGN

Information Technology

Technical software - structural

- Femap/nastran: multipurpose structural modeller and solver: structural modelling, linear and not linear structural analyses
- GT Strudl: multipurpose structural solver: structural analyses and code checks; foundation analyses; environmental loads computation on lattice structures (Morison equation)
- Sesam (Genie basic package): multipurpose structural solver: structural analyses and code checks; foundation and fatigue analyses; environmental loads computation on lattice structures
- Ansys: FEM modeller and structural analyses
- Sant'Ambrogio: design and code checks of pressure vessels and flanges

Information Technology

Technical software - drafting

- Autocad LT 2D general drawings
- Solid Edge 3D and 2D drawings of structures and piping
- Creo Parametric (ex Pro-E) 3D drawings of structures and mechanical components

Information Technology

Technical software – other packages (knowledge)

Company People and consultants are familiar with the following software packages:

- Adina not linear structural analyses
- Patran pre-post processing for Finite Element analyses
- Mentat/MARC linear and not linear structural analyses

- Strauss linear structural analyses
- Sacs structural analyses

- Inventor 3D and 2D drawings
- Think 3D 3D and 2D drawings
- Tekla 3D modelling of structures and piping

Structural Engineering and special analyses

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- Preliminary configuration analyses and basic design
- Detailed design of structures and components
- Global and local structural analyses with FEM software (linear and non linear analyses)
- Design and check of structural components
- Development of structural particulars

- Foundation analyses
- Linear and non-linear static analyses on duty, transport, lifting, installation
- Special analyses (dynamic, seismic, fatigue analyses)

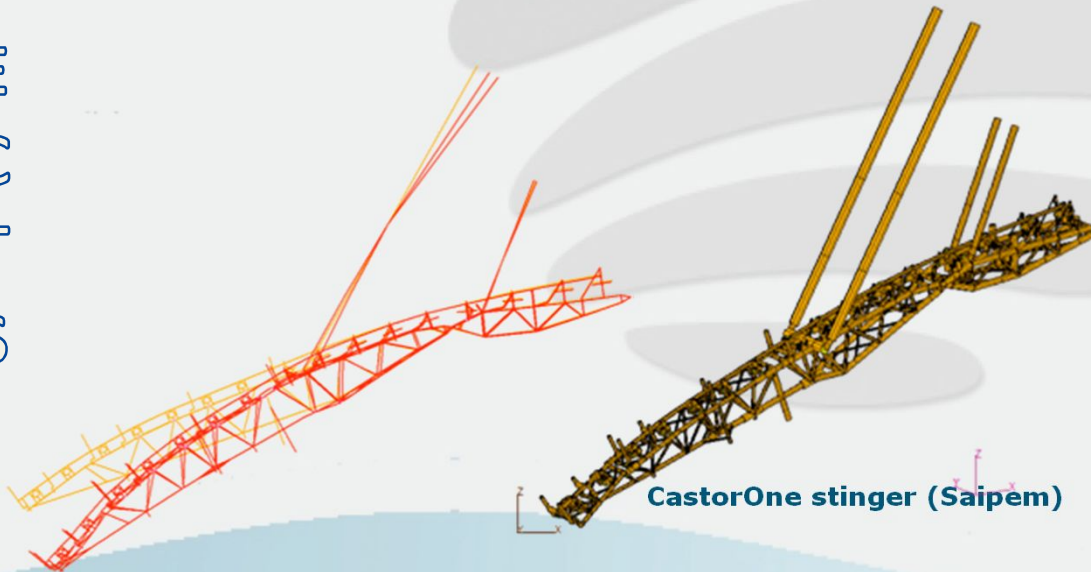
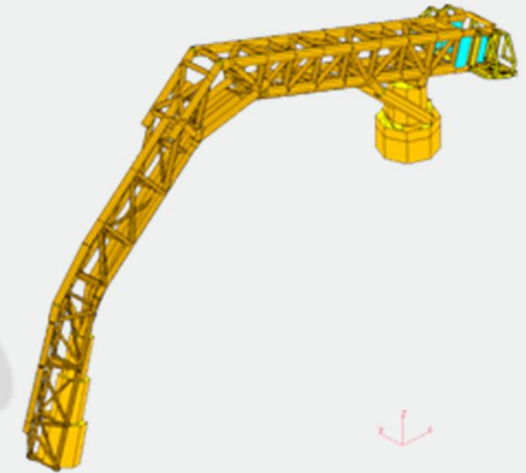
Special Structural Analyses

- Linear and non-linear static analyses on duty, transport, lifting, installation
- Dynamic analyses
- Seismic analyses
- Fatigue analyses (deterministic and stochastic)
- Analyses in elastic-plastic region
- Foundation analyses (gravity and pile foundations)

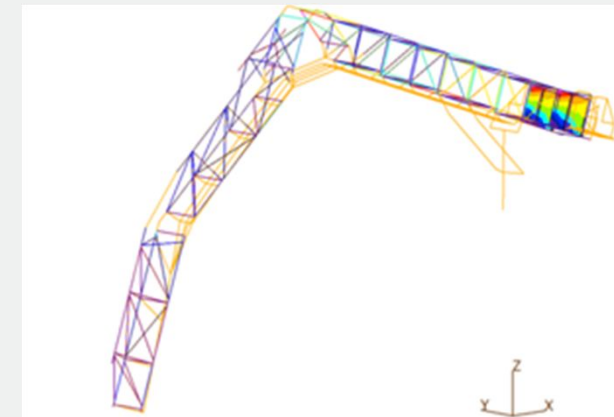
Design of fixed/mobile structures

- ❑ Hydrodynamic model of the elements/appendices in order to determine interaction between structure and wave kinematics and to compute hydrodynamic loads
- ❑ Global 3D FEM models of the system, to size/check the main elements
- ❑ Detail FEM models of main joints or critical items
- ❑ Assessment of operating procedure and limitations

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CastorOne stinger (Saipem)

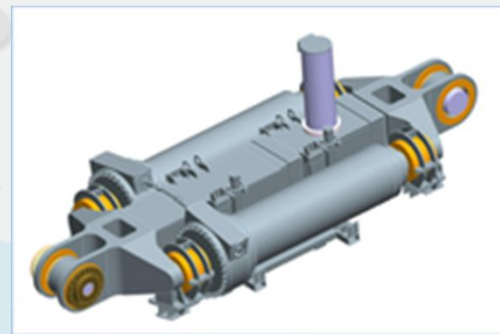
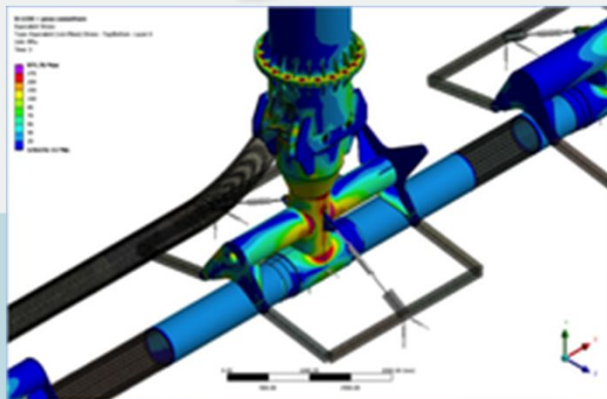
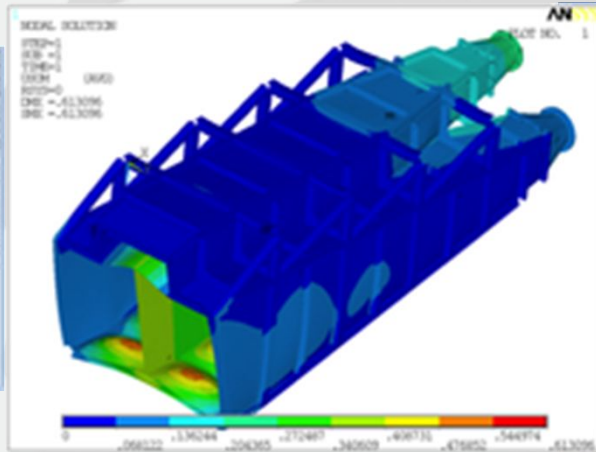
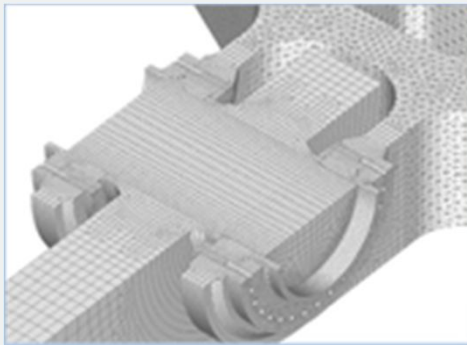


Articulated arm (Saipem)

Design of mechanical equipment and tool

- ❑ Design of structures (stingers) and equipment for pipe-laying
- ❑ Design of pipeline components (In Line TEE)
- ❑ Design of special parts

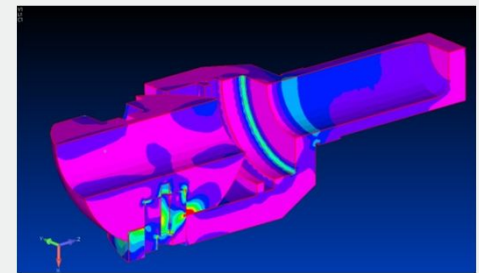
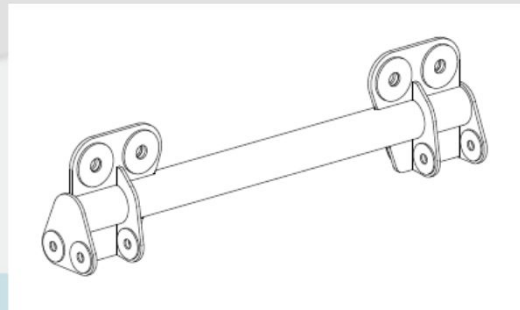
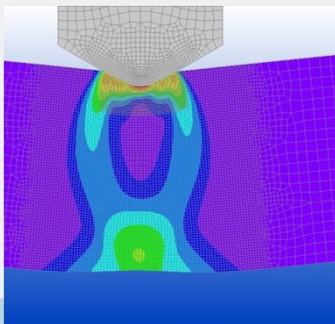
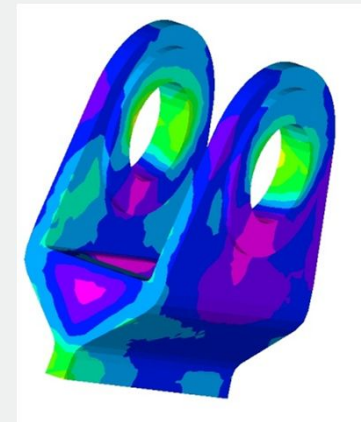
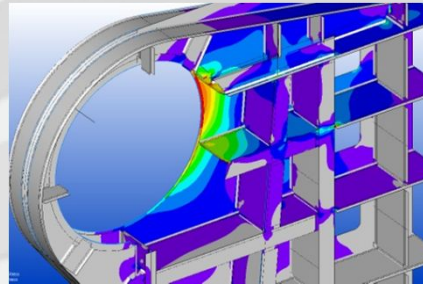
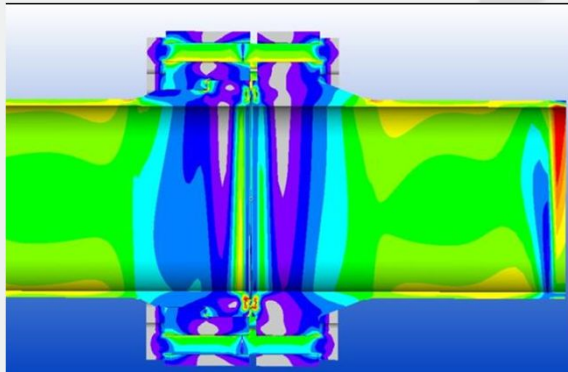
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Design of mechanical components

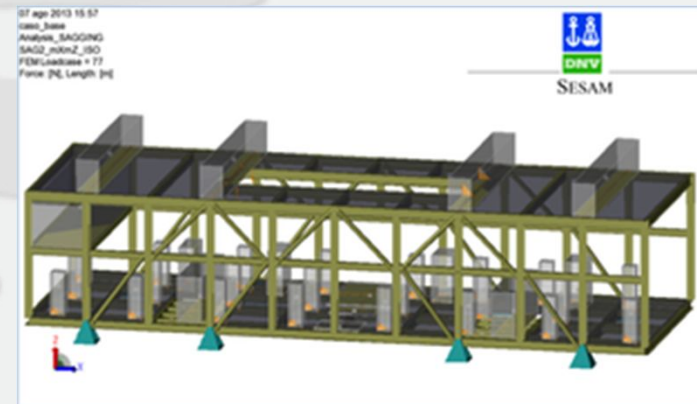
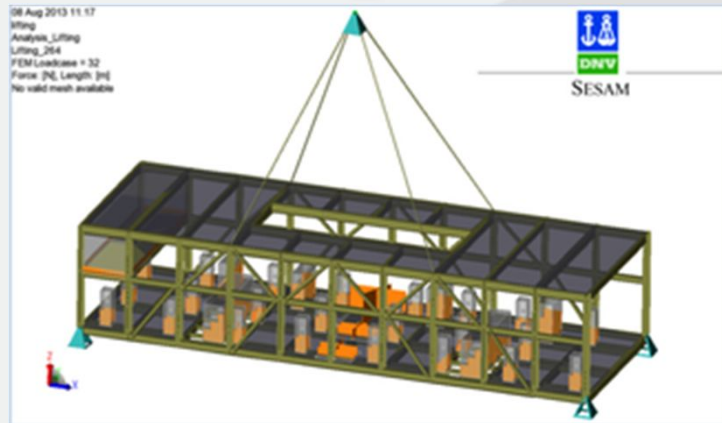
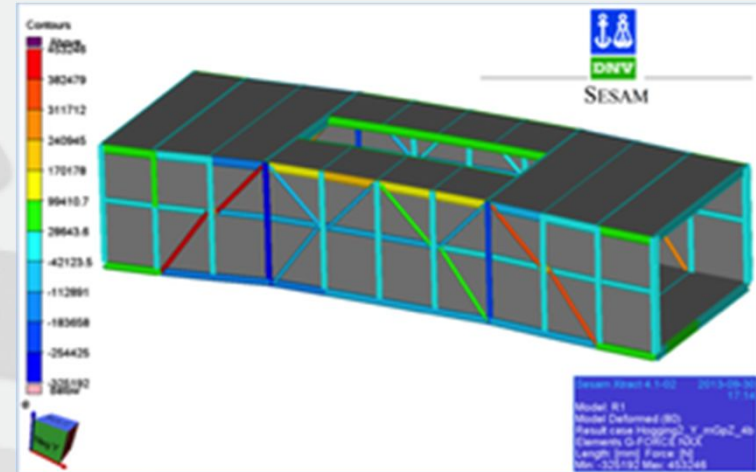
- ❑ Special joining elements (flanges, hinges, padeyes)
- ❑ Spreader bars
- ❑ Special analyses (plastic deformation, swaging)

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Modules design

- detailed design of firing line modules
 - ❑ 3D FEM modelling of the structures
 - ❑ Sizing/Checks of main and secondary elements
 - ❑ Transportation and installation dynamic analyses



Basic and detailed design of fixed and mobile platforms

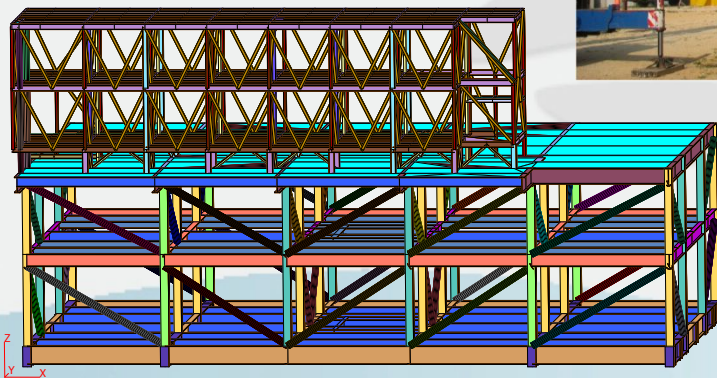
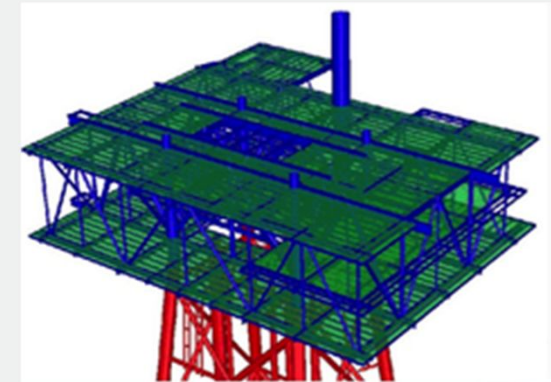
- Development of subsea templates and manifolds

Structural analyses and checks of structures, and piping

Marine operation analyses

MTO and construction drawings

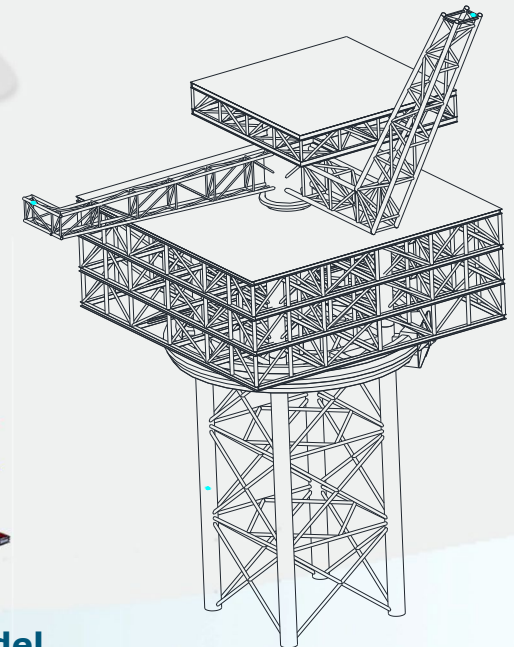
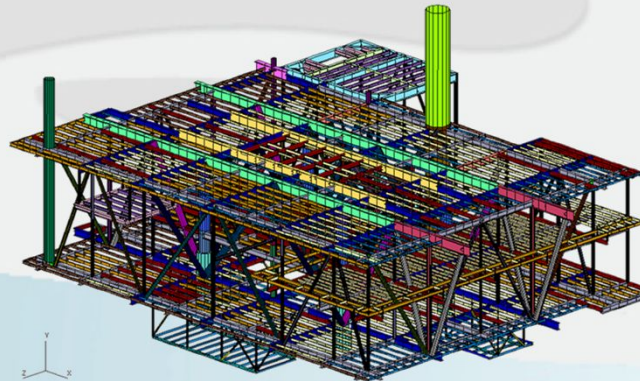
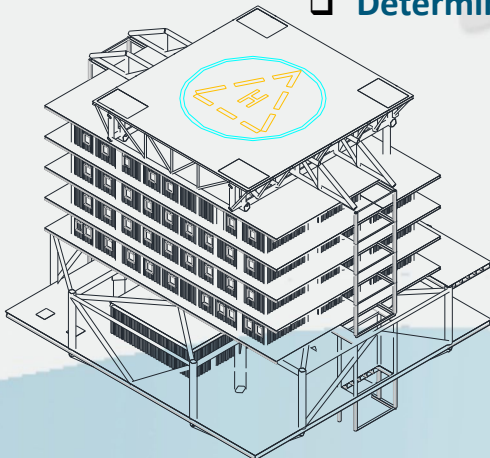
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Platforms Design and Analyses

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- **Modelling**
 - ❑ 3D model of the whole structure
 - ❑ FEM model of special elements
- **Analyses**
 - ❑ Structural analysis and code checks in operating and survival conditions
 - ❑ Collapse analysis
 - ❑ Seismic and impacts analyses
 - ❑ Deterministic or stochastic fatigue analyses

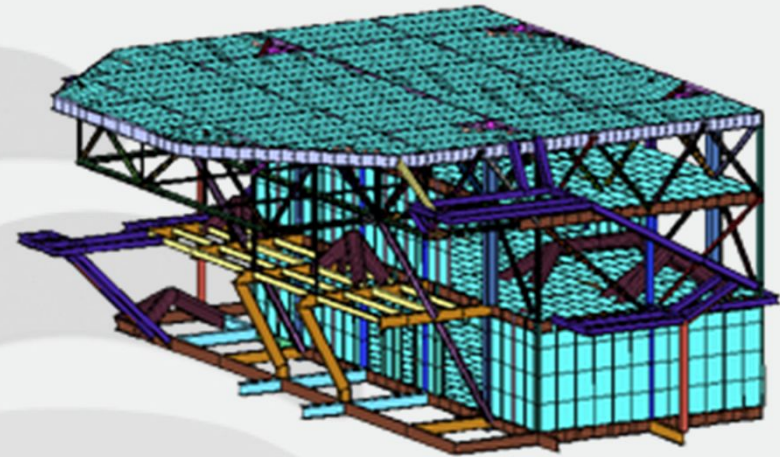
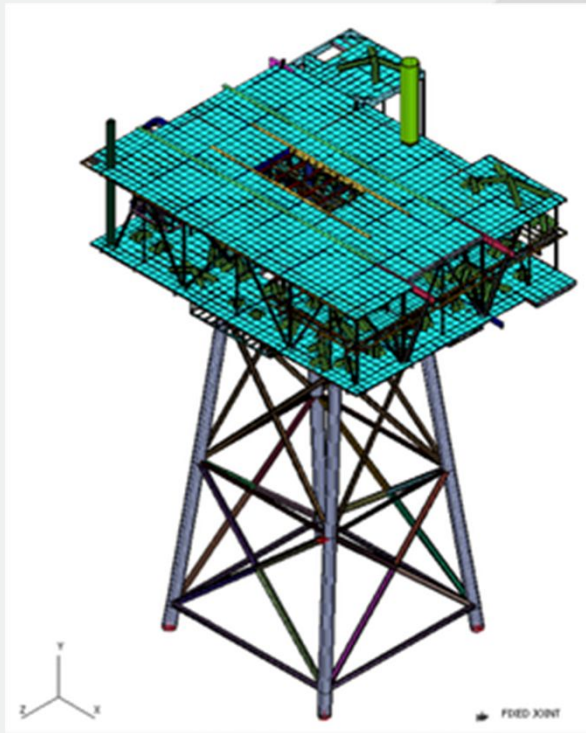


Deck Model

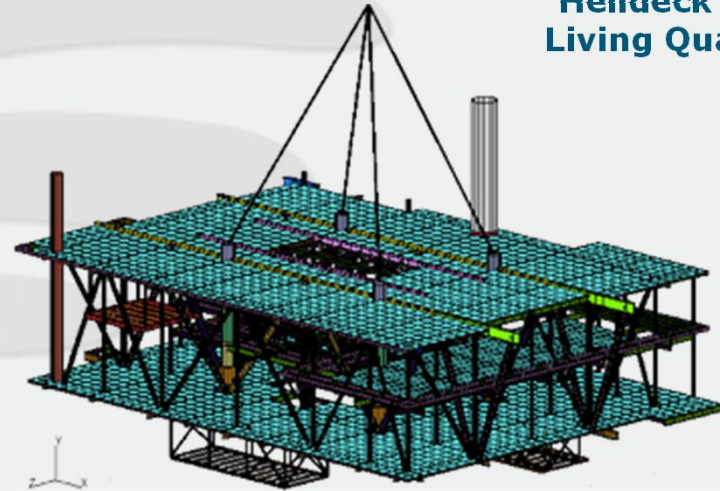
Platforms Design and Analyses

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Platform Model



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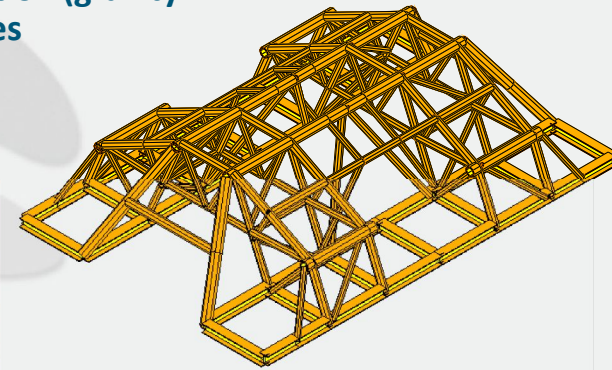


Deck Lifting Condition

Subsea templates

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- Detailed design of subsea templates (PLEM's, SSIV)
 - ❑ 3D modelling of the structures
 - ❑ Sizing of main and secondary elements and of the foundation (gravity base), accounting for permanent and temporary life phases
 - ❑ Piping stress analyses and piping interfaces development
 - ❑ Transportation and installation dynamic analyses



Typical technical design process

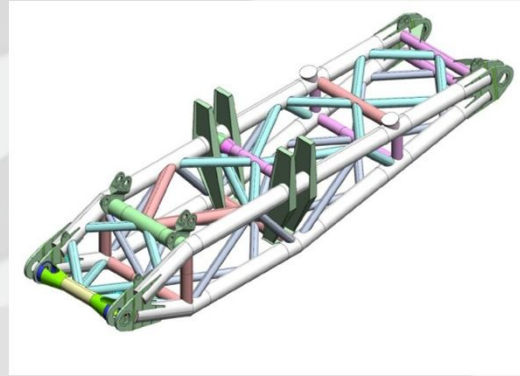
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- Kick-off meeting with client
- Internal kick off meeting
- Design premises and design brief
- Analyses and calculations, drafting
- Internal review (models, criteria, loads, constraints, computation methods, ecc)
- Reporting
- Document checks
- Review meeting with Client
- Document review after Client comment
- Final issue

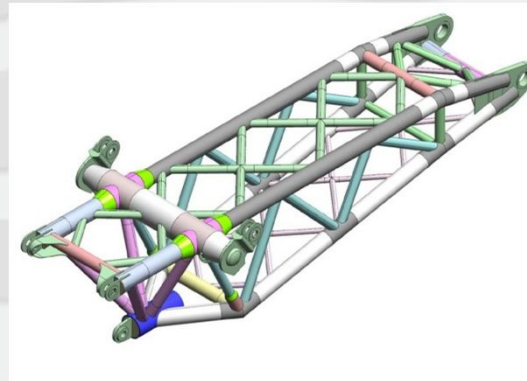
Typical structural design process

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- 3D geometric model



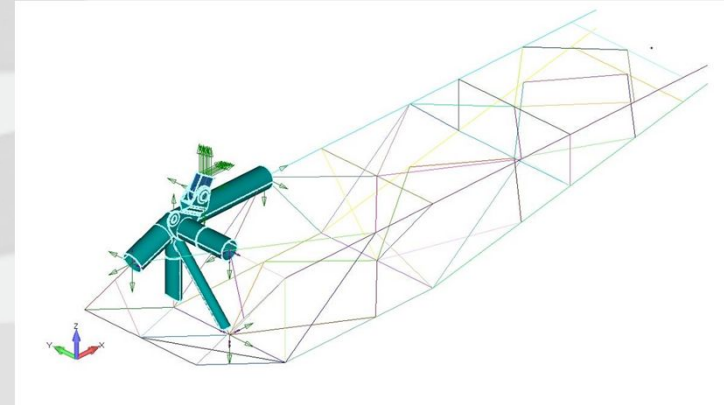
- 3D global structural model



Typical structural design process

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- Global analyses and checks
Forces and stress determination
- 3D modelling of special parts
(geometry loads, constraints)



Typical structural design process

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- Local analyses and checks
- Local stress evaluation

