

# ROSAP - RAMBOLL OFFSHORE STRUCTURE ANALYSIS PROGRAMS

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# ROSAP - INVALUABLE DESIGN PROGRAMS FOR ALL STRUCTURAL PROJECTS

**A UNIQUELY DEVELOPED SOFTWARE THAT MEETS STRICT DEMANDS FOR DOCUMENTATION AND VERIFICATION**

The Ramboll Offshore Structural Analysis Programs - ROSAP - have been developed over the past 30+ years to meet the ever increasing demands for structural design, optimisation and lifetime extension of offshore structures.

The program development has been driven in close cooperation with Ramboll's structural experts and a team of analysts and designers. A further invaluable bond to leading oil and gas operators in the Danish offshore sector has secured a focused effort to provide high standards and offering the right analysis tools to the market. The operators have been actively involved in providing specialist knowledge supported by background studies and documentation.

The ongoing development of the programs is based on detailed insight in current market demands and client needs. This strong position makes ROSAP a unique, user-friendly and up-to-date design tool that can be tailored for any structural project.

## **Tools for design, re-assessment and lifetime extension**

ROSAP provide indispensable tools for new design, modification work and lifetime extension assessments of onshore and offshore steel structures.

The programs provide a complete package for static and dynamic analyses of spatial framed structures, covering all phases from transport and lifting to in-service. Loads, such as hydrodynamic, wind, constant force and accelerations, are intuitively defined and processed according to recognised theories and standards.

## **Tailor-made programs for structural design needs**

The primary programs in ROSAP are:

- ROSA
- RONJA
- STRECH
- TUBJOI
- RHSJOI
- JOANA
- FATIMA

ROSA is the main finite element program for linear/nonlinear elastic static and dynamic analysis.

The advanced program RONJA supplements ROSA by adding facilities for non-linear analysis of structures with large rotations and non-linear elasto-plastic material behavior. RONJA is commonly used for determination of global failure of structures taking force redistribution into account in relation to e.g. ship impact assessments or post damage analyses.

The STRECH program is an essential postprocessor developed for stress and stability check of beam members.

The program supports a number of codes such as:

- API
- AISC
- NORSOK
- ISO
- EC3
- DS449

TUBJOI, RHSJOI and JOANA are postprocessors aimed at accurate and automated verification of commonly used joint connections. TUBJOI is dedicated for tubular joint connections typically used in jacket structures. RHSJOI is tailored for typical RHS profile connections.

## **OFFICIAL VALIDATION**

The offshore industry is one of the most controlled and supervised industries in the world. All industry players must live up to the strict demands for third party verification.

The design and assessment work performed by the ROSAP packages have been successfully validated by certifying agencies such as DNV GL, Lloyds and Bureau Veritas.

JOANA is developed for stress check of typical joints applied in topside structures. The program supports, among others, verification of ring stiffeners, gusset plate connections and other standard connection details. The joint verifications made with TUBJOI, RHSJOI and JOANA follow the same codes as the STRECH program.

FATIMA is used for fatigue analysis of members and joints.

**Comprehensive application performance**

All programs have been used for analysis of the vast majority of jackets, topsides, offshore bridges and risers within the Danish sector of the North Sea. In addition, several studies have been carried out in the Middle East, UK, US and Norway.

ROSAP have also been used for design and documentation of more than 1,200 individual foundation designs for wind turbines for 21 offshore wind farms around the world.

**SELECTED REFERENCES**

**Foundations**

- Halfdan B & C (DK), Maersk Oil (now Total): A detailed design of two jackets with pile foundations.
- Al Shaheen A (Qatar), Maersk Oil (now Total): Detailed design of monotower jacket
- Nini & Cecilie (DK), DONG Energy: Detailed design of two monotower jackets
- Greater Gabbard (UK), Flour: Design of 140 monopiles (wind turbines generator foundations)

**Topside and bridges**

- Tyra West bridge module (DK), Maersk Oil (now Total): FEED and detailed design project of a 3500 mT module.
- Nini & Cecilie topsides (DK), DONG Energy: Detailed design of complete topsides for two cost-effective platforms.

**Offshore substations**

- Anholt substation (DK), Energinet.dk: Topside and jacket detailed design.
- Westermost Rough substation (UK), DONG Energy: Topside and jacket detailed design.

**FPSO topside**

- NEXUS FPSO, Samsung Heavy Industries: Complete topside design for the NEXUS FPSO. Functionality to account for FPSO movements for fatigue and extreme conditions was successfully added to the ROSAP package during the project.

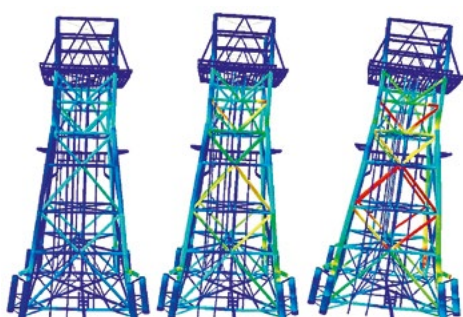
**About us**

Ramboll has more than 45 years of experience in the planning, design and implementation of energy solutions. Our 1,800 energy specialists assist our clients in the entire asset and project life cycle from early phase planning to engineering design, long-term operation & maintenance and lifetime extension. With our multidisciplinary approach across the Ramboll organisation, we provide a ‘one-stop shop’ of services based on know-how and experience unmatched by other consultancies.

**More information and contact**

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**LEFT**  
 Structural analysis of offshore platform with ROSAP.

**RIGHT**  
 Complete platform for offshore wind farm, designed with ROSAP software.

