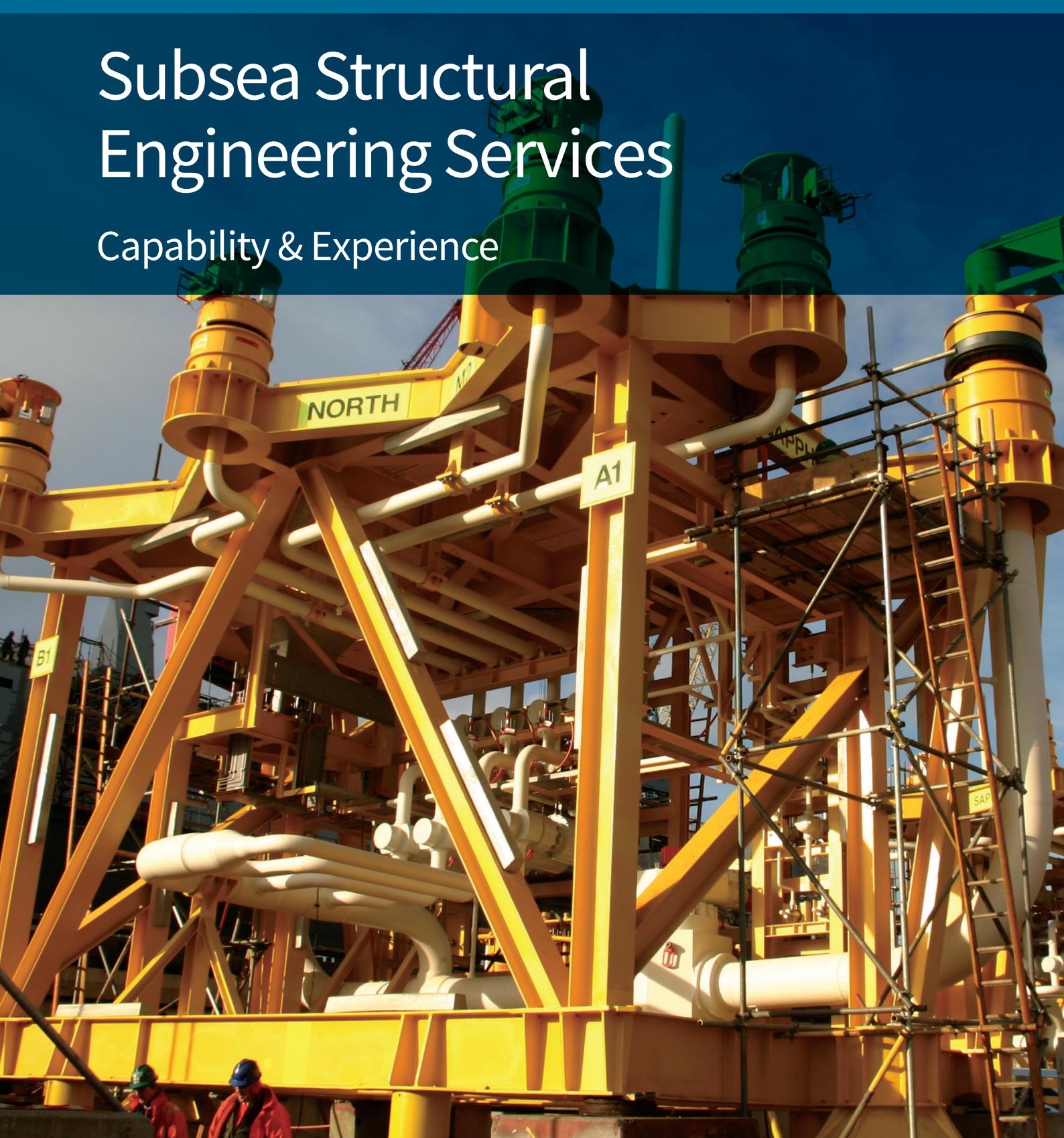


**INTECSEA**

WorleyParsons Group

# Subsea Structural Engineering Services

Capability & Experience





# Capability Overview

INTECSEA's subsea structural engineering team has a proven track record for providing solutions to problems in the implementation of frontier projects, by providing contract and execution planning, coordination, engineering, interface and offshore execution throughout the lifecycle of the project. This ensures a seamless transition from design through commissioning for the customer.

INTECSEA's subsea structural engineering personnel have experience working as and with the contractors and operators in some of the most challenging and record setting projects in the world. This experience has allowed INTECSEA's subsea structural engineering services teams to garner expert knowledge in areas such as: structural and piping detailed engineering design, advanced finite element analysis, fabricator contracting, planning and implementation, fabricator systems and capabilities, fabricators engineering and management, fabricator bidding strategies, welding and AUT systems and capabilities, and offshore construction risks.

## Project scope and type include:

- Total field developments
- Pipeline installations
- Large diameter export pipelines
- Conventional flowlines
- Pipe-in-Pipe systems
- Wet insulated pipelines
- Flexible pipe
- Offshore arctic pipelines
- Subsea structures
- Umbilicals
- Flying leads



INTECSEA supports from concept to execution phases of the project

INTECSEA provides structural design services for manifold, pipeline end terminations, tie-ins and auxiliary structural support equipment.



# Engineering Services

## Detailed Design and Design Support

During concept selection and detail design, INTECSEA's subsea structural engineering teams work with the customer engineering team(s) to ensure a design that is construction friendly and construction competitive. INTECSEA's subsea structural engineering personnel also facilitate procurement; fabrication and delivery of materials and equipment are planned and implemented in order to meet the project construction schedules.

## Construction (Installation) Execution

During construction execution, INTECSEA's Subsea Structural Engineering Team works with the owner and contractor to ensure construction plans and the intent of the design is maintained during execution. These services include: material and equipment delivery and tracking, on-site contractor interface, customer representation during execution, project status and progress tracking and reporting, management of change implementation and tracking, and lessons learned documentation.

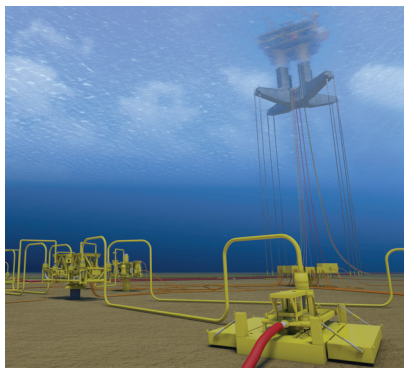
## Fabrication Planning

During fabrication planning, INTECSEA's subsea structural engineering team works with the owner in developing project contracting strategies and assist in fabricator selection. In addition, the subsea structural engineering team works with the owner and contractor in developing construction execution plans that meet the project goals and ensures the intent of the design is maintained. These services include: prepare fabrication strategy, shipyard and fabrication yard prequalification, ITB package development, bid evaluation (commercial and technical), contracting support (negotiation support), contract administration, welding procedure review and approval, AUT procedure review and approval, develop and maintain integrated project schedule, load out and transportation execution plan, and commissioning and planning.

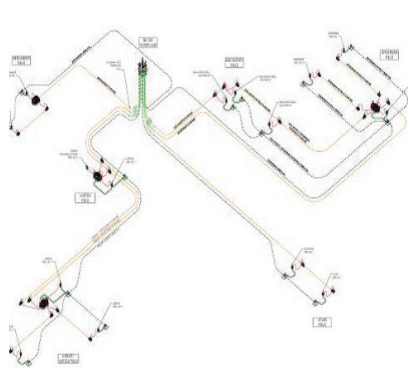




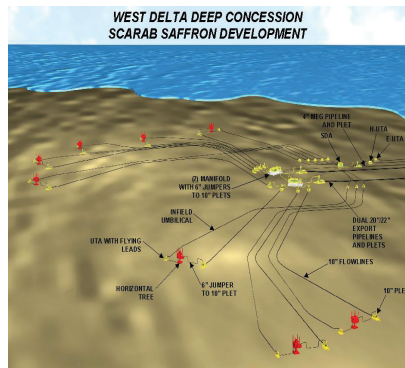
# Project Experience



**Shenzi Field Development**  
CUSTOMER BHP Billiton  
LOCATION Gulf of Mexico



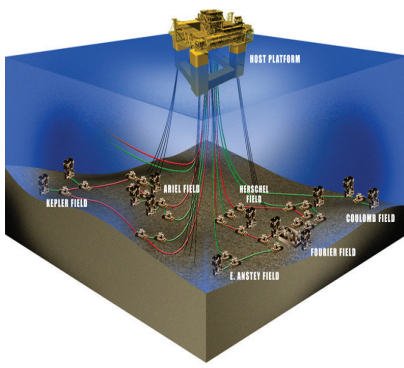
**Independence HUB (MC920) Subsea Field Development**  
CUSTOMER Anadarko, BHP Billiton, Dominion E&P, Kerr McGee  
LOCATION Gulf of Mexico



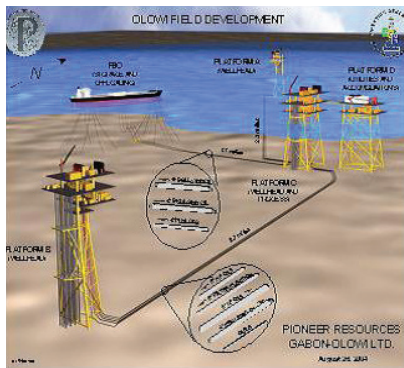
**Blind Faith**  
CUSTOMER Chevron  
LOCATION Gulf of Mexico



**Shell Malampaya Subsea Project**  
CUSTOMER Cooper Cameron (Singapore) PTE. Ltd.  
LOCATION Philippines



**NaKika Electrical Flowline Heating Project**  
CUSTOMER Shell International E&P  
LOCATION Houston, Texas



**Olowi Project – Flow Assurance FEED**  
CUSTOMER Pioneer Resources  
LOCATION Olowi Field, Gabon

IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

INTECSEA assisted BHPB in evaluating field development options and supported their steps through the concept selection process and the execution phase.

BHP Billiton (BHPB) Shenzi field is located in Green Mississippi Canyon Blocks at a water depth of approximately 4,000 ft. Shenzi is an oil system with delivery capacity of 100M BOPD and 50 MMCFPD of associated gas production. The overall development consists of three remote drill centers flowing back to a Tension Leg Platform (TLP) where the production steam will be processed to sales quality product.

IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

Anadarko Petroleum Corporation, BHP Billiton Petroleum, Dominion E&P, and Kerr-McGee Oil and Gas Corporation are developing a number of deepwater gas discoveries in the Gulf of Mexico, approximately 120 nautical miles southeast of Venice, LA.

The fields comprise up to 15 subsea wells producing dry gas situated in water depths between 7,900 ft and 9,200 ft. Production from all fields will be routed back to a centrally located floating host facility via a subsea production, flowline, and riser system. The facility will process the production and provide compression as required for export.

IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

Chevron's Blind Faith field is located in Mississippi Canyon Block 696 at a water depth of approximately 7,000 ft. Blind Faith is an oil system with a high pressure reservoir (approximately 12,500 psi WHSITP) and the potential of high temperatures at the wellhead in excess of 250° F. The high pressure and high temperature production in 7,000 ft water depth make Blind Faith a technically challenging project. In fact, these parameters put design requirements at the leading edge of industry supplier capability.

IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

The Malampaya field is located offshore NW Palawan, Philippines in 750 to 1,150 m of water. The field was developed using a manifolded cluster of subsea wells tied back to a production platform located 30 km away in shallow water.

The manifold consists of a three-pile foundation installed with the aid of a spacer template, a manifold support structure to support the manifold, and tie-in porches. The retrievable manifold contains three header ball valves and 10 gate valves. The work included the detailed design of a subsea production manifold for gas production in a water depth of 854 m, offshore Palawan, Philippines.

IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

The Electrical Heating Ready Intervention System, (EHR-IS) is a project specific modular package required for possible hydrate remediation on the Northern Flowline Loop of the NaKika Development Project, located in the Gulf of Mexico. Heating is achieved by mobilization of a portable electrical power and control system, which is loaded onto a vessel of opportunity and taken to site. The flowlines are equipped with midline electrical assemblies, as part of the flowline design, and these accept the power system through ROV operated connections, subsea transformer, and umbilical from the topside spread.

IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

Pioneer is developing the Olowi Field, offshore Gabon, with four fixed platforms. The oil has a high pour point and this poses many flow assurance challenges. The produced oil and gas from wellhead platforms A and B are sent via flowlines to platform C and commingled with production at C and processed. The gas is pressurized and transported back by flowlines and re-injected into the reservoir. Water injection flowlines run from platform C to A and B. Processed oil is exported via two insulated pipelines and flexible risers to an FSO.

# Success Through Insight