

**WHITE PAPER**

All Eyes on Offshore

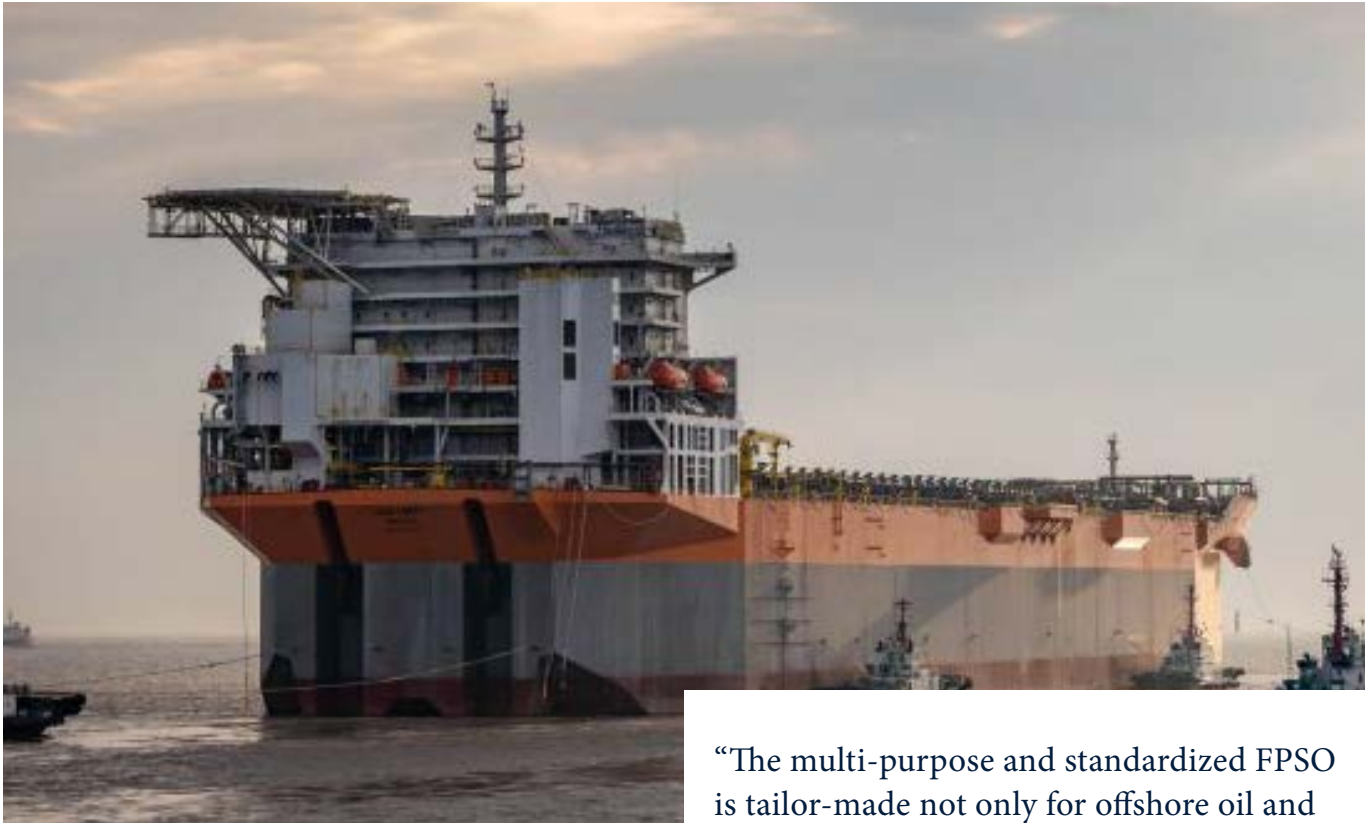
Foreword

The oil and gas sector is in an upcycle as global energy demand rebounds strongly from the COVID-19 pandemic. The roll-out of a low-carbon energy system is going to take time. Oil will continue to drive the global economy and define energy security for many years to come, meaning investment is pouring into the offshore sector from both oil and gas. Upstream projects are being awarded all around the world, including in the Middle East, South America, Africa and Europe.

This renewed engagement extends to offshore oil and gas, where years of market turmoil and the pandemic have now ebbed to allow industry growth to pick up pace. The offshore sector is now predicted to grow the most in a decade over the next two years, with \$214 billion of new project investments lined up in 2023-2024 .

These new investments will be a boon for the offshore services market, with offshore rigs, vessels, subsea and floating production storage and offloading (FPSO) activity are all set to flourish. Contracts for FPSO vessels in particular are being awarded in West Africa and South America. Amid this spending windfall, the spotlight will be on world-class operators in the market – the renowned players that can call upon years of experience to deliver outstanding outcomes.

SWS: Advancing as a FPSO Topside Module Specialist



The FPSO market is dynamic and challenging across all applications. FPSOs are site-specific systems that require a fit-for-purpose design for each project, observing reservoir characteristics, infrastructures and environment. Selecting the right engineering, procurement and construction (EPC) vendor for such a major project is mission-critical to mitigate delay risk and cost overruns, and ensure overall success.

Shanghai Waigaoqiao Shipbuilding Co. Ltd. (SWS) is ready to build on its successful track record of delivering hulls for FPSO projects to step up to providing EPC solutions for topside modules. We have the expertise, the capabilities and the determination to enable transformational outcomes for our clients. Founded in 1999, SWS is a leader in offshore EPC services with a proven track record in the design, construction and delivery of critical, complex engineering projects. Our primary mission is to provide a holistic one-stop solution for FPSOs that elevates construction efficiency

“The multi-purpose and standardized FPSO is tailor-made not only for offshore oil and gas hotspots such as the Gulf of Mexico, West Africa and Brazil, but also development operations spanning a wide variety of maritime conditions around the world. Leveraging our previous successful FPSO projects, SWS is ready and committed to providing a one-stop solution for FPSO hull and module integrated development that prioritizes HSSE, high quality and on-time delivery”

Mr Qipeng ZHANG, SWS Vice President

to unprecedented levels, most notably through our ability to integrate design and construction of the vessel hull and topside modules.

Our competitive technical solutions, delivery track record, operational excellence and construction uptime is best demonstrated by our robust long-term collaboration with the world's largest FPSO operators.

SWS has completed and delivered four hulls for a leading global FPSO operator since contracts

for hull projects and EPC services were signed in July 2017: the first in 2019, second in 2020, third in 2021 and the fourth in 2023. All four hulls adopt a proprietary generic hull design – extending to the fifth hull, which started construction in April on time as per schedule.

These repeat orders underline the high reputation gained from our past performance. We will continue to build a track record of successful projects and long-term business relationships, as part of the proud heritage at SWS.

Key to this will be helping customers to improve the capability, reliability and availability of their most critical assets in the offshore oil and gas sector. Our competitive edge and execution philosophy resides in the following areas:

One-stop Shop for Hull/ Module Integration

We can deliver vessel hulls and full topside process systems with an integrated execution model, with EPC all done in-house. This not only minimizes interfaces and costs, but also enabling fast-track project delivery for a tight time schedule.

Our experts in process system design, layout, and technologies will quickly get into the details for developing an integrated hull-module concept that suits customer needs.

High-efficiency Project Management for Clients

At the core of our offshore EPC services are our two best-in-class construction yards in Shanghai, a global shipbuilding hub and the biggest port in the world by throughput. When clients come to us, we leverage our prime location in Shanghai with its superb local talent and resources to support the entire project – from preliminary design to final delivery.

Managed by SWS, our yard for hull construction is home to an experienced and committed FPSO EPC team, and a skilled and experienced workforce, which together have honed their technical expertise and proficiency in constructing hulls that meet all quality, HSSE and operability requirements. Just an 80-minute car drive away is our yard for fabricating modules, overseen by SWS Offshore (SWSO) and boasting an excellent reputation for workmanship in complex marine process systems.

High-efficiency Cooperation with Clients

We pride ourselves on an effective customer-centric strategy to ensure the FPSO projects move forward smoothly. This extends to schedule control, permitting hull and modules to be constructed in parallel and at one location – enable significant cost savings for clients.



Our Module Capabilities: Engineering



Engineering matters to us. That's why our in-house departments perform exhaustive detailed engineering and shop designs that fully incorporate vendor data and constructability, while always keeping economy and customer specifications at the top of mind. We work with urgency to acquire all necessary design input, so that we can ensure a timely design freeze that maintains tight construction schedules. This extends to phased releases of engineering deliverables to the construction team to keep fabrication on track.

Design is in our DNA. We are known in the shipbuilding industry for our prowess that draws upon our unmatched expertise gained from constructing and delivering a broad variety of offshore specialist vessels – from FPSOs and deepwater semi-submersible drilling rigs, to jack-ups and PSVs – and our fruitful collaborations with professional design institutes.

We use leading-edge technology to assist the design process, including best-in-class software packages including:

- SWS-TIME – our proprietary self-developed next-generation shipbuilding management platform, to realize the informatization and collaborative control of the entire process, from design and procurement to site management
- TRIBON M3 – a design and information system trusted in the industry to fit the specific needs of shipbuilding and offshore industries
- AVEVA E3D Design – the world's most technologically advanced 3D design solution
- Intergraph Smart Plant P&ID – a data-centric, rule-driven intelligent design system
- CAESAR II – the industry standard for pipe flexibility and stress analysis
- AFT Fathom and AFT Arrow – fluid dynamic simulation software tools for engineers
- NAPA Steel, MSC Nastran and Patran – something
- Other engineering design software including Intergraph Smart 3D, Smart Cable, AutoCAD

Our Module Capabilities: Procurement

Our expansive national network, based out of Shanghai, and close partnerships pave the way for optimal procurement solutions. We maintain an integrated and sustainable supply chain that leads the industry, ensuring high-quality materials, equipment, and services are procured at the most competitive rates, guaranteeing cost-effectiveness without compromising on quality and project timelines.

Clients can count on SWS for the following:

- Strong supply chain and resource integration capabilities to reduce project execution risks
- Zero inventory as the goal of material procurement and warehousing management
- Intelligent storage and logistics management system
- Security of LLE Delivery to meet overall schedule



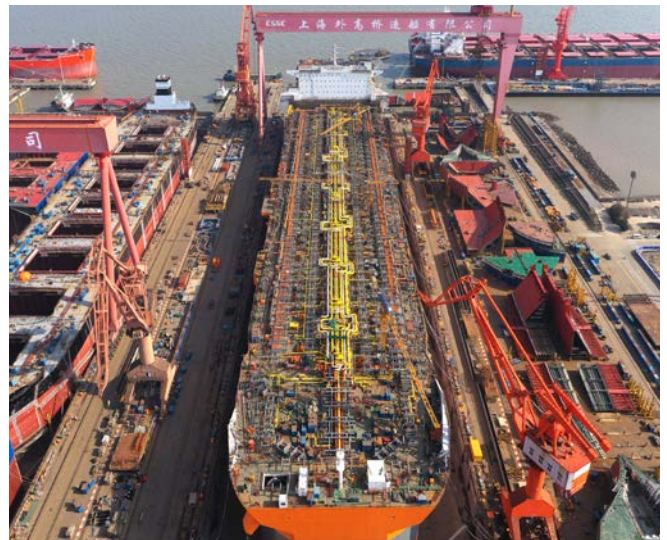
- A large number of vendor databases quickly respond to engineering work
- Advanced FAT management system
- Assignment of qualified personnel for critical or complex equipment package
- More flexible management for OFE material and equipment verification, storage and maintenance
- Timely update PSR/ESR to client to control procurement on time jointly

Our Module Capabilities: Construction

SWS has grown as one of the world's leading premier shipbuilders by providing a competitive skillset through pioneering spirit. Additionally, our broad knowledge that has built upon our experience has allowed us to lead the heavy shipbuilding market and to contribute to China's economic development.

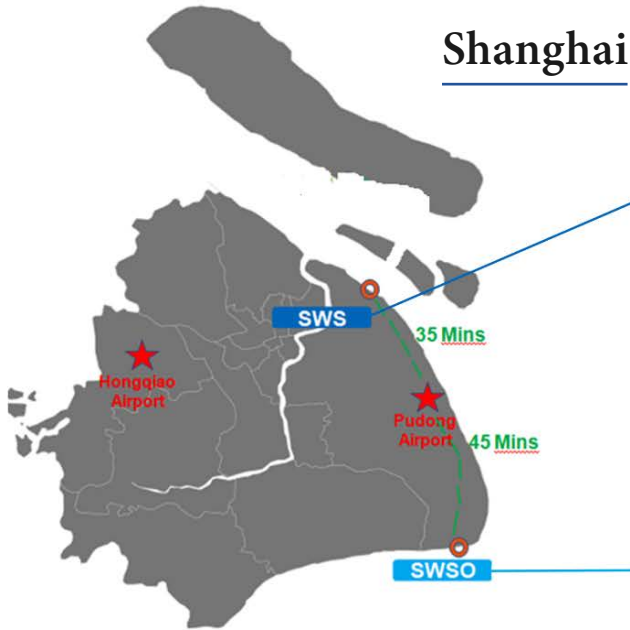
Our construction capabilities have been continuously refined since the founding in 1999 and are now placed firmly at the forefront of the global shipbuilding industry, with an indomitable record, from site and process to control and experience.

At the heart of our skilled workmanship are our two shipyards in Shanghai, each equipped with the most advanced facilities to offer a number of advantages – greater productivity gains, reduced building time, and, above all, superb ship quality. The proximity of these world-class assets and the logistical advantage of having



Shanghai as our base supports a diverse range of projects. It also enables SWS to offer integrated design and construction of both the FPSO hull and modules, with SWS responsible for hull construction and integration, and SWSO managing module fabrication.

Shanghai



The **SWS yard** spans 361 acres in the Yangtze River estuary with a quayside measuring 1.73km in length and two dry docks. No.1 Dry Dock has two 600-ton gantry cranes, and No.2 Dry Dock has two cranes that can lift a respective 800 tons and 600 tons.

The **SWSO yard** covers 255 acres on the northern coast of Hangzhou Bay south of Shanghai, and includes a 1,131-meter quayside. It features one skid way and three cranes with capacity of 1200tons, 600 tons, 300 tons and 200 tons.

Our workflow process includes:

- Assigning an offshore-standard HSSE team
- Assigning an offshore-standard QA/QC team
- Fabricating the complete hull at SWS yard
- Fabricating the topside modules and LQ at SWSO yard
- Making construction workers and facilities at the construction yard available in a timely fashion
- Mobilizing experienced construction teams for work
- Handing over each system completion through an efficient project completion management system
- Early definition of commissioning system and testing procedure
- Mobilizing skilled commissioning personnel
- Mobilizing commissioning team with FPSO project experience

- Maximum testing at each construction yard
- Documentation Control System from start to finish

Execution Model

Subassembly blast & painting

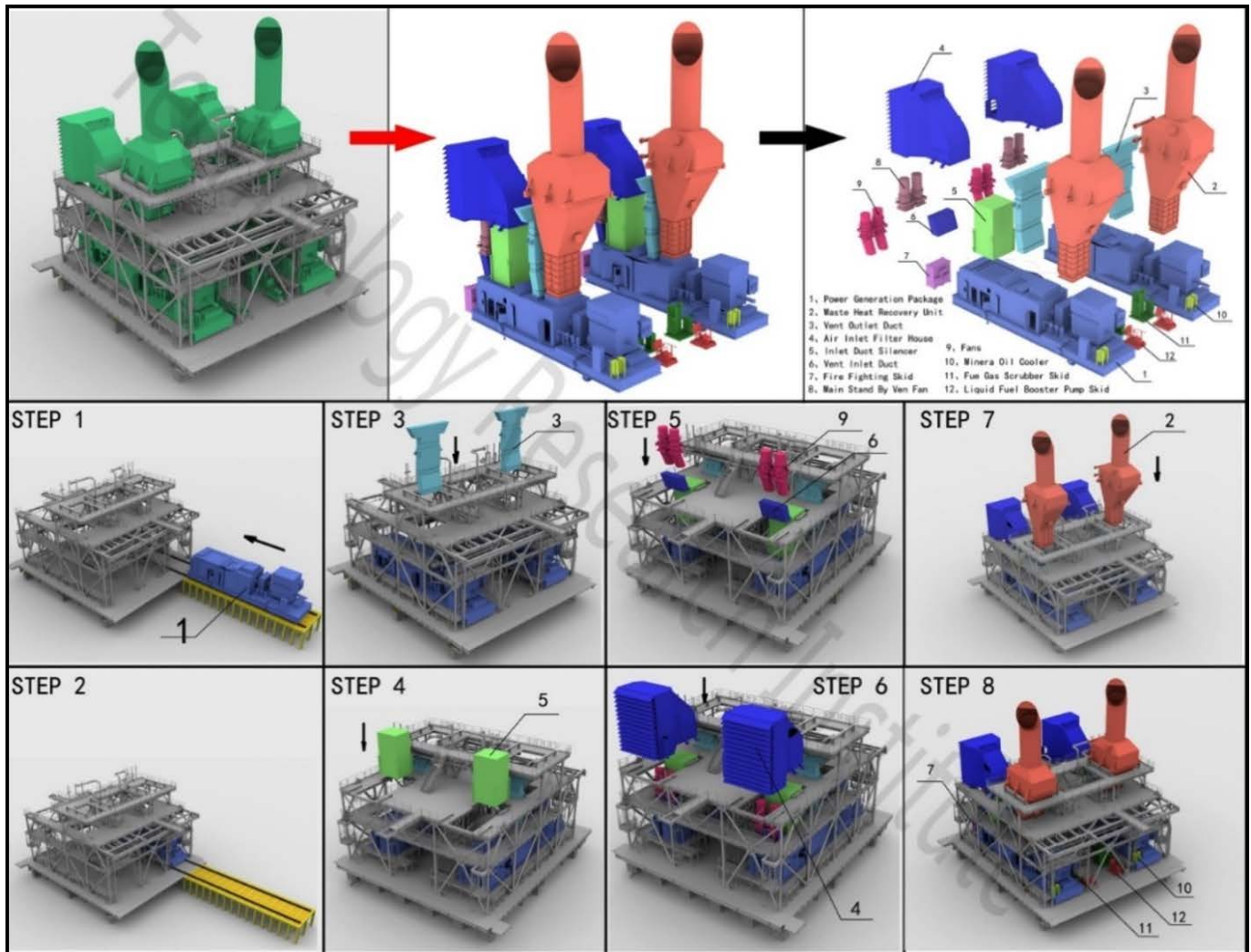
Subassemblies will be transported from prefabrication workshops to the blasting and painting shops using SPMTs and will be laid down on 1.5m-height stands directly inside the blasting and paint shops.

Considering the dimensions of the workshops and subassemblies, each shop will process one sub-assembly at the same time to avoid overloading them. The pre-outfitting including non-ferrous pipe, S.S cable tray, carbon piping after surface treatment will be rigidly protected to avoid damage during blasting. Local blasting, and painting touch-up and repair will be carried out in the erection areas for the tie-in and damaged parts to be protected.

Module Assembly on erection area

The FPSO modules will be assembled in dedicated outdoor areas following the painting process. The subassemblies with structures, piping, and cable tray will be transferred by SPMTs from the painting shop to the overturning/erection area. These lift operations will be achieved using overhead gantry cranes with capacity of 600 tons. Pancakes and other deck will be turned over by the crane.

Equipment Installation Process (TS031)



Given the critical importance of dimensional control during erection, SWS is committed to developing a robust procedure to ensure dimensional control complies with specifications and tolerances jointly agreed between the customer, SWSO and vendors. Dimensional checks will be performed during the following stages:

- Reconfirmation of raw materials. Acceptance criteria will be specified mill tolerances only
- On fabricated shapes, sub-assembled shapes and tubular members, such as plate girders and joints, the dimensions will be checked and reported after the completion of welding and NDT
- Deck rows/bridge chords, assemblies for cellar, mezzanine, top, bridges top/bottom and side framings, and miscellaneous

enclosure blocks framings will be checked for dimensional accuracy and reported

- Completed structure assemblies will be reported in the final dimensional control report in full

Module Load-out and Transportation

We offer numerous options for the safe and professional transportation of modules after their assembly on erection. All modules are transported from the SWSO quay to the SWS quay for integration with the hull. Customized SPMT combinations can be utilized for each module's loadout according to the weight. The skidway connected quayside and erection area at the SWS yard can accommodate a maximum load of 10,500 tons. The heaviest module gross weight possible is 2,402 tons while the maximum length is 120 meters.

We employ a combination of SCHEUERLE SPMTs and vessels/barges to transfer modules from the assembly and integration area to the quay, for onward transportation to the SWS yard.

Modules that weigh under 1,200 tons and in a regular shape can be transported by our 1,200-ton gantry and 1,200-ton self-propelled barge.

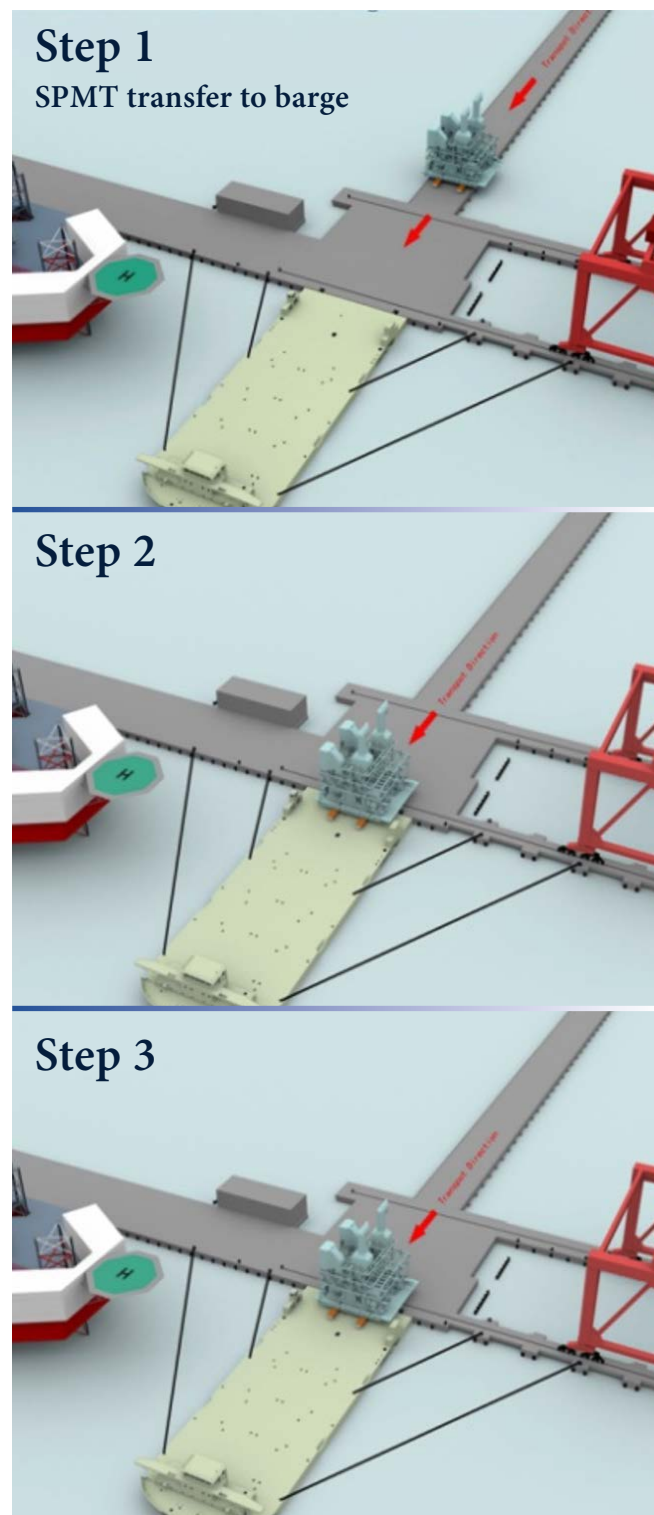


A dedicated float barge is available for modules heavier than 1,200 tons or with unique proportions. The Ro-Ro method will be adopted by SPMTs.



We have two options for transferring modules to the barge depending on the weight. Modules under 1,200 tons can be transferred by the float crane and quayside gantry to SWSO's self-propelled barge. Modules exceeding 1,200 tons can be handled with two float cranes, which will drop anchor to remain motionless as the transfer can take 10-15 days to complete.

Ro-ro is the second option – we will analyze tidal data to determine which barge to use in order to ensure the barge has sufficient freeboard height for a skidded loadout. We will also ensure that as the barge gradually absorbs the weight of the module, it discharges ballast water accordingly. And to mitigate unwanted movement caused by tidal currents and SPMTs, tugs will be employed to keep the barge in position.



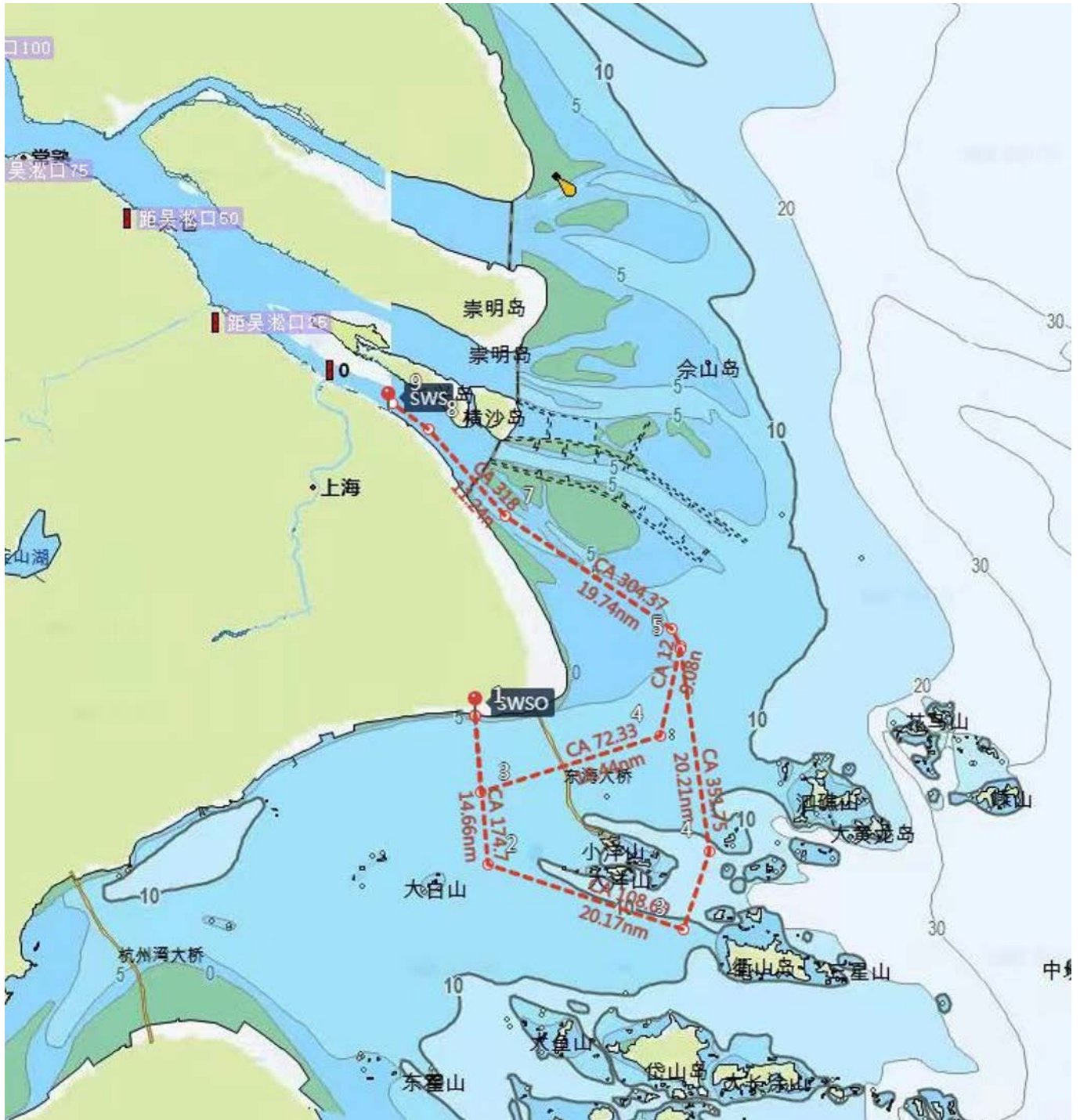
Module Transportation

There are two routes for the transporting the module by barge from SWSO to SWS for hull integration:

Route 1 is suitable for vessels with a deadweight of under 5,000 tons and a cargo height of less than 40 meters. These stipulations allow the

barge and cargo to pass safely under the Donghai Bridge, permitting a journey of 70 miles that lasts 16 hours.

Route 2 accommodates vessels too large to sail under the Donghai Bridge, sailing around Yangshan Deepwater Port for a journey of 110 miles that lasts 20 hours.



Our Unwavering Commitment to Health, Safety, Security and Environment (HSSE)



“SWS is committed to prioritizing Health, Safety, Security and Environment (HSSE) matters in all its operations. We shall continually improve our HSSE performance and strive to prevent harm to People, the Environment and Property as we firmly believe that all incidents can be prevented.”

Mr Qi WANG, SWS Chairman

Our commitment to Health, Safety, Security and Environment (HSSE) is fundamental to how we do business at SWS. It applies throughout our workflow process, from design and engineering, to construction and delivery.

We are fully aligned with our valued partners in making the safety and wellbeing of our employees, subcontractors and communities our number one goal. To this end SWS Management has implemented a robust safety policy that ensures unconditional commitment to health and safety objectives and maintain the highest achievable standard of safe working practices.

SWS's Safety Objective is to ensure the safety and health for all project-related persons and no loss of property. All levels of SWS Management lead by example and commitment to eliminating unsafe working conditions and practices to ensure accident prevention.

We employ all possible practical measures to safeguard the health and safety of persons. This extends to the provision of appropriate formal and informal education and training programs for all persons to establish accepted work procedures and adherence to a project's rules and regulations.

We maintain an effective system for accident reporting and ensure investigation and recording procedures are followed precisely.

Continuous reviewing of the health and safety performance forms a core part of our regular auditing of a project.

Our safety management prioritizes establishing procedures and systems to prevent accidents and to provide a safe and secure working environment for all SWS employees, subcontractors, clients and visitors. Our experience in shipbuilding has helped us develop and hone a comprehensive list of effective procedures that includes but is not limited to:

- Project HSSE Management
- Project Emergency Response Plan
- Environment Protection
- HSSE Communication
- HSSE Incentive and Punishment
- Subcontractor HSSE
- HSSE Training
- Job Safety Analysis
- Permit to Work
- Personnel Protective Equipment
- Confined Space
- Radiation Safety
- Scaffolding
- Fall Protection
- Electrical Safety
- Blasting and Painting
- Hot work
- Pressure Testing

Our approach starts from the ground up with the robust training of new employees, who go through an extensive series of activities, from essential tool usage to emergency incident rescue, to foster their understanding of safety rules and regulations, safety awareness, and emergency treatment ability.

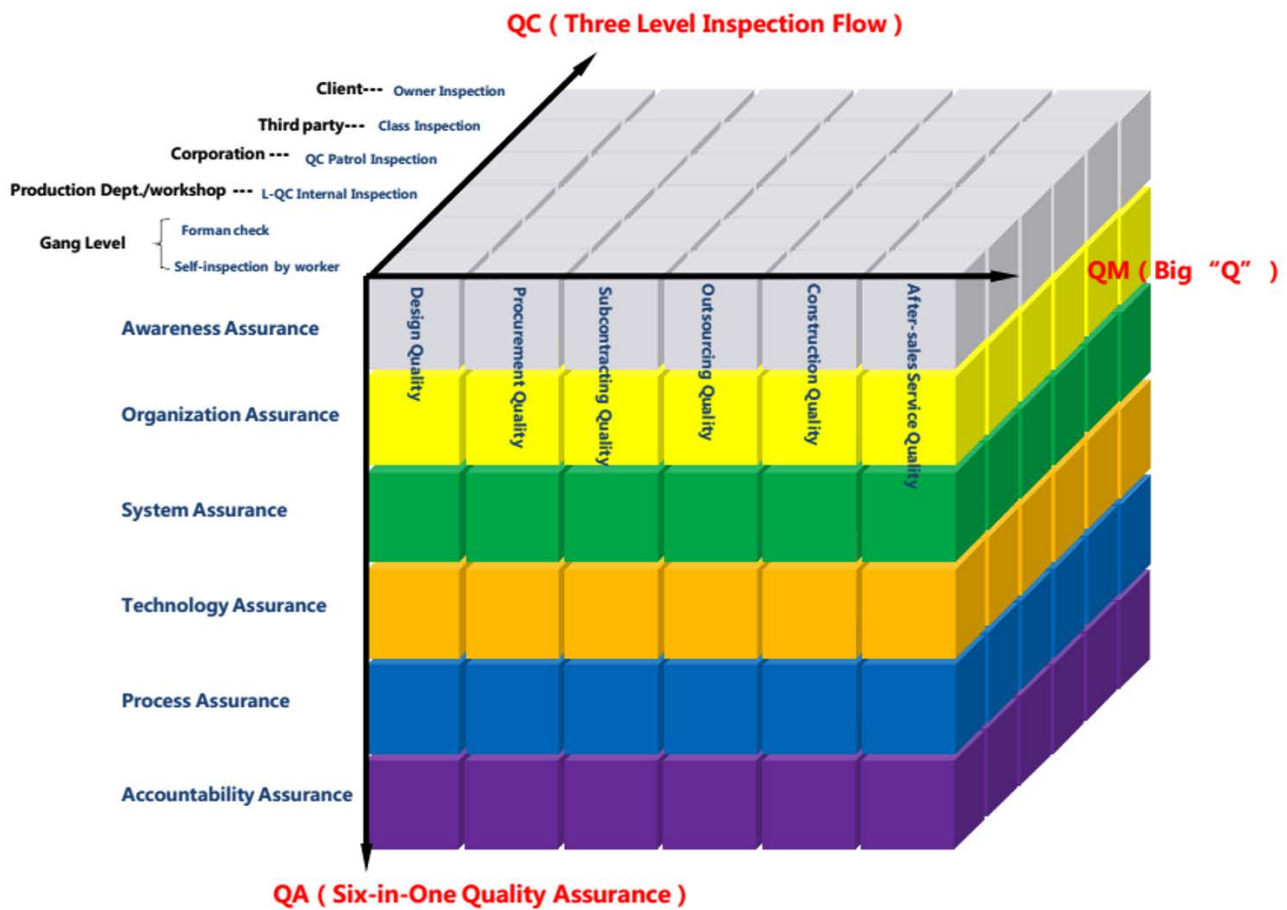
Quality Assurance & Control (QA&QC)

Quality and objectivity are at the center of everything we do at SWS. We pledge an unparalleled commitment to delivering the highest quality, from robust and meticulously crafted products to efficient and genuine quality assurance processes.

You can count on SWS to:

- Meet or exceed contract requirements for quality and performance on every project
- Avoid reworking: top-quality deliverables out of the gate each and every time
- Expediently obtain third-party certification
- Achieve effective project execution on time and budget





We innovated a unique three-dimensional quality management model that keeps us orientated on product, process and organization, under the guiding requirement of “ship fine quality management”.

On the X axis, we apply big “Q” management that covers design, procurement, subcontracting, outsourcing, construction and after-sales service.

On the Y axis is our established “Six in One” quality assurance system comprising the three components of advanced planning, intermediate monitoring and closed-loop management.

On the Z axis, we implement three-tier quality control and continuously promote digitization for quality inspection and quality management, which facilitates quality management improvements on all aspects, to realize objectives of high-quality products delivery and high-quality development.

We maintain product quality by strictly controlling the following aspects during all phases of work execution:

- Organization/planning
- Design/engineering control
- Procurement
- Special processes
- Dimensions
- Inspection /test plan
- Key activity and check list
- Type of test or observation
- Applicable inspection code or procedure
- Type of test equipment
- Test equipment calibration certificates
- Acceptance critical and results
- Inspector and review indicator (hold, witness, review, etc.)
- SUB-SWSO’s work
- Material handling, storage and preservation
- Non-conformance and corrective action
- Documentation
- Audits
- External inspection coordination
- Training