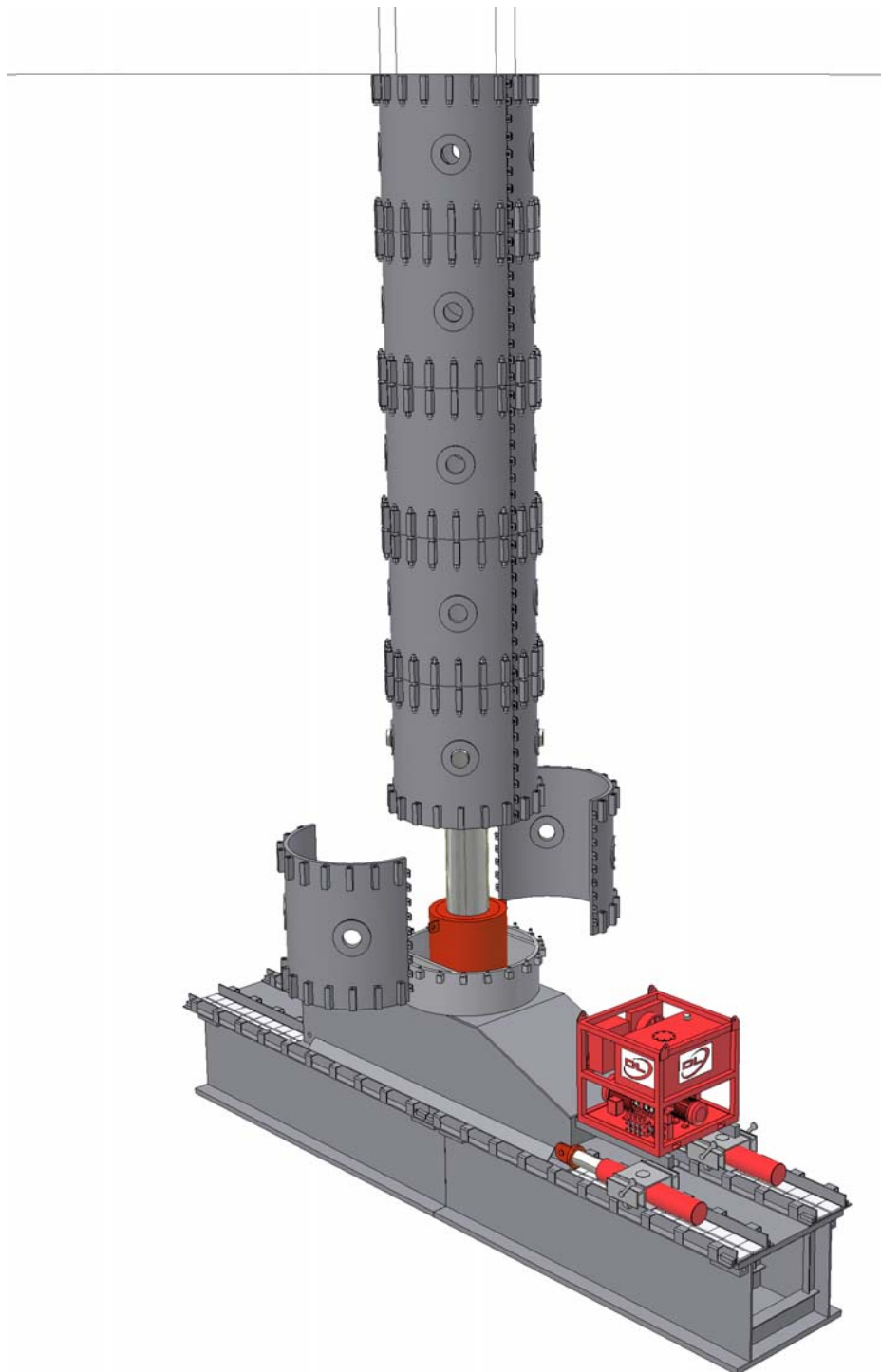




## DL-SU2000

High capacity modular movement and lifting system for load out, dry mating and wet mating operations in offshore construction





## Introduction

The DL-SU2000 modular skid and lift system has been specifically designed for the high demands of the offshore construction industry, where the movement and lifting of heavy modules is a common occurrence. The system has a safe lifting capacity of 2000 tonnes per skid unit and a jacking stroke of 2.1m, both significantly higher than any other system currently on the market and all components of the system are designed for transport between sites in standard 20ft open top shipping containers. These innovations simplify the layout and operation of the DL-SU2000, compared to other systems on the market and provide improved economy and safety, particularly for wet mating 'float over' operations.

The main features of the DL-SU2000 system are as follows :

- 2000 tonnes safe lifting capacity per unit, reducing the number of units required for each operation.
- 2.1 m stroke vertical ram, increasing safety for wet mating operations and reducing the number of jack and pack operations when carrying out lifting operations. Lifting of loads is carried out in 2m increments, much greater than existing systems and improving lifting speed and efficiency.
- All components designed to be transported in standard 20 ft open top shipping containers, for economic transport between job sites
- Fully centralised computer control system with automatic jack synchronisation and safety features, for improved safety and performance.
- Automatic computer balancing of unit loads during movement and load out operations, eliminating the need for live hydraulic hoses linking the units into hydraulic pools and thereby increasing the safety of the operation.
- Diesel powered hydraulic power packs, making the SU2000 units self contained for ease of use on site.
- 1.2m stroke launch rams, for a movement speed of 15 metres per hour and complete freedom of SU2000 unit centres along the skid track to suit the support points of the module above.
- Safe lifting at each support point with unbraced cans of up to 2000 tonnes to 20m, 1000 tonnes to 28m and 500 tonnes to 44m, with unlimited lift heights possible when stability bracing is added.

## Movement and load-out operations

The DL-SU2000 system can be used in the basic configuration shown below, with any number of skid track lines and any number of 2000 tonne capacity units.

Skid track in 5.8m long sections with PTFE faced elastomeric pads for a compressible skidding surface. Can be used with skidding beam shown or on concrete ground beams

2000 tonne capacity 2.1 m stroke main ram, with spherical bearing cap plate. The ram is removed from the body unit for transport.

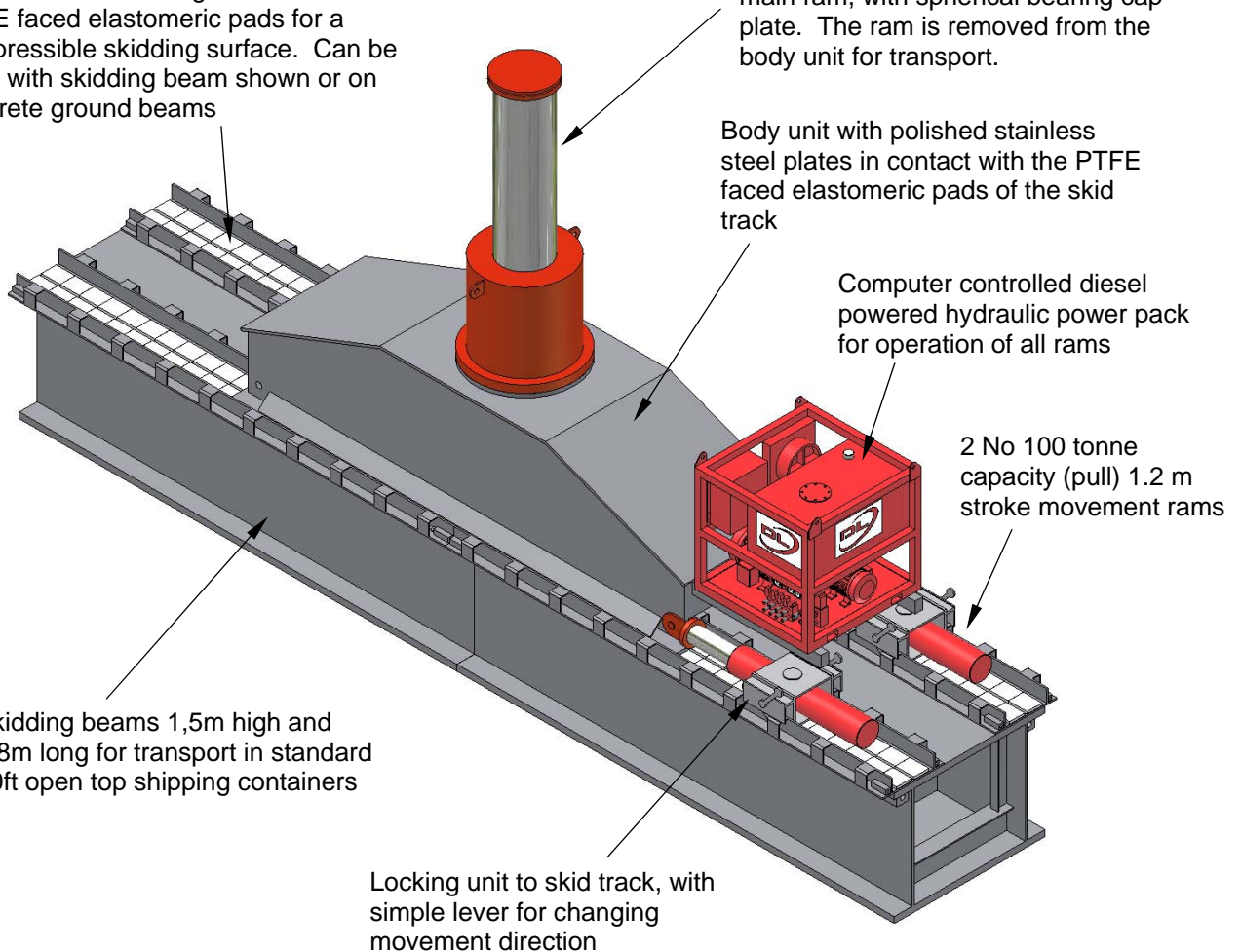
Body unit with polished stainless steel plates in contact with the PTFE faced elastomeric pads of the skid track

Computer controlled diesel powered hydraulic power pack for operation of all rams

2 No 100 tonne capacity (pull) 1.2 m stroke movement rams

Skidding beams 1.5m high and 5.8m long for transport in standard 20ft open top shipping containers

Locking unit to skid track, with simple lever for changing movement direction

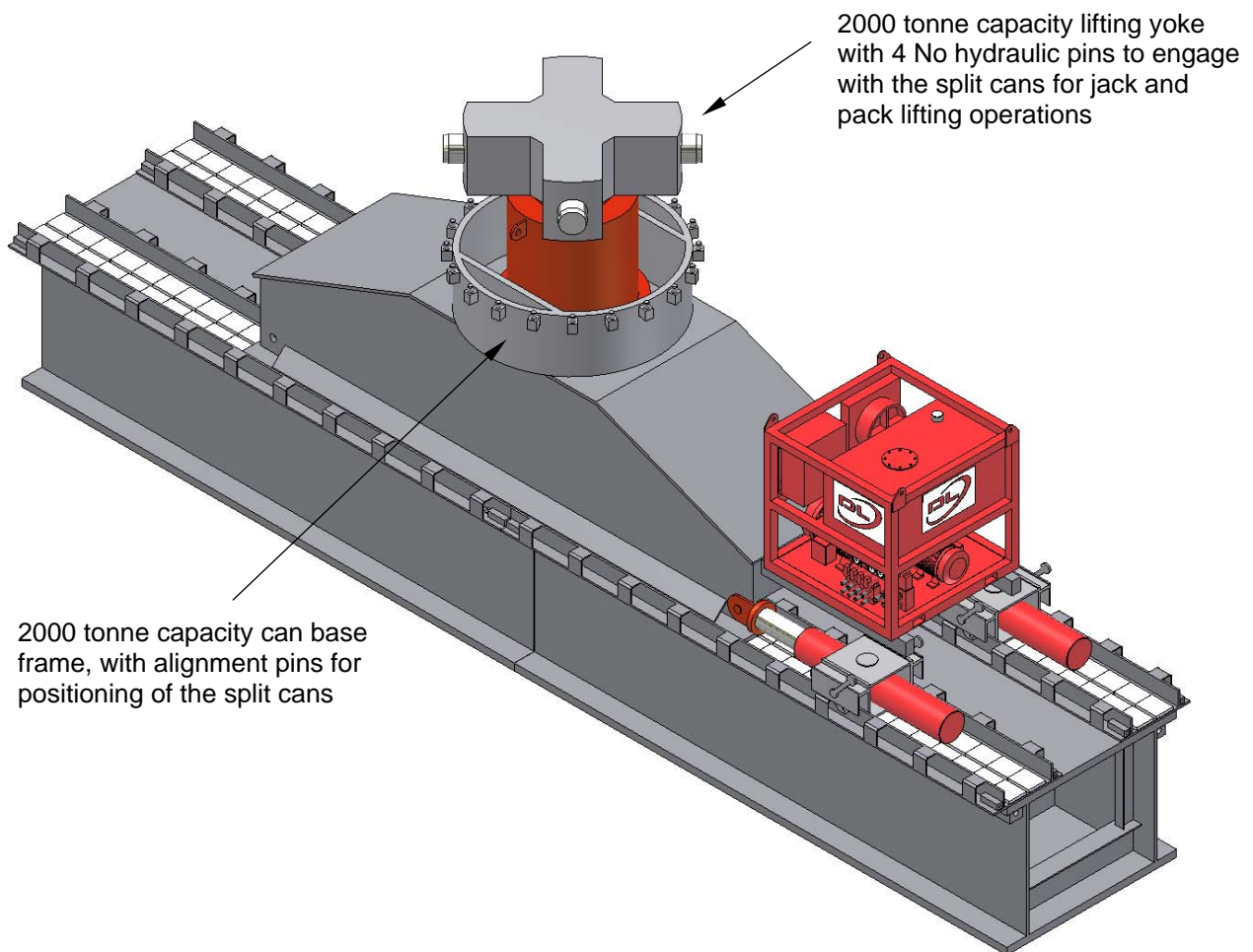


The skid tracks and DL-SU2000 units can be set out at any longitudinal and transverse centres to suit the module being moved. Each unit should be placed under strong points of the module. Once supported on the units, the module can be lifted up to 2.1m and skidded any distance at a speed of approximately 15 metres per hour. The 5.8m long skid beams can be supported on compacted ground, concrete pads or on the load out barge. The overall height of the unit plus skidding beam is 4.35m with the main ram fully retracted. If less clearance is available under the module, then the skidding beams may be left out and replaced with concrete ground beams or alternative steel beams to suit the site.

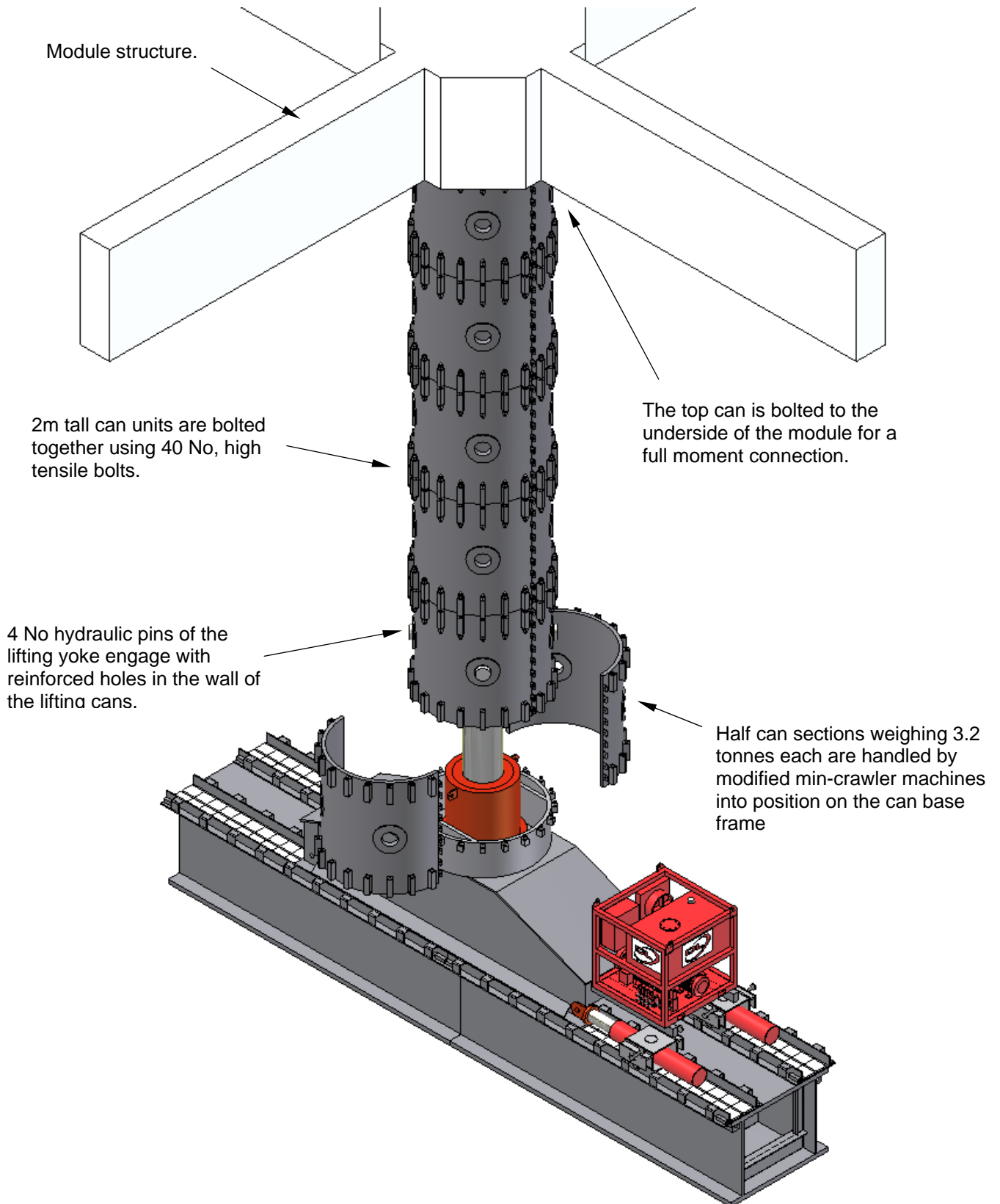
All DL-SU2000 units are centrally monitored and controlled by a single operation using our proven in house computer control system with CANbus technology for maximum reliability and safety. The operator has full information on the loads and extension of all rams and is able to set maximum allowable loads and differential strokes for safe automation of the lifting and movement operations. During skidding the computer control system will automatically adjust the main ram extensions to correct for settlement under of the track and maintain the desired load distribution. There is no need to hydraulically link the main rams, which removes the safety risk of snagging and puncturing of long hydraulic hoses running across the site.

## Lifting operations

The standard DL-SU2000 unit has a lifting range of 2.1 m. Where greater jacking heights are required, then the main ram can be fitted with a 2000 tonne capacity lifting yoke and can base frame as shown below. These work in combination with 2m tall split can units to provide a simple and efficient jack and pack lifting system that is capable of lifting 2000 tonnes to a height of 20m from ground level, 1000 tonnes to a height of 28m from ground level without bracing and to any height required with the addition of stability bracing. The maximum unbraced height varies with the vertical load, for details see drawing 04 of the general arrangement drawings later in this document. The tower of cans is bolted to the underside of the module for a full axial and moment connection and is treated for design purposes as a rigid top and pin base column with up to 5% side load co-incident with the vertical forces.

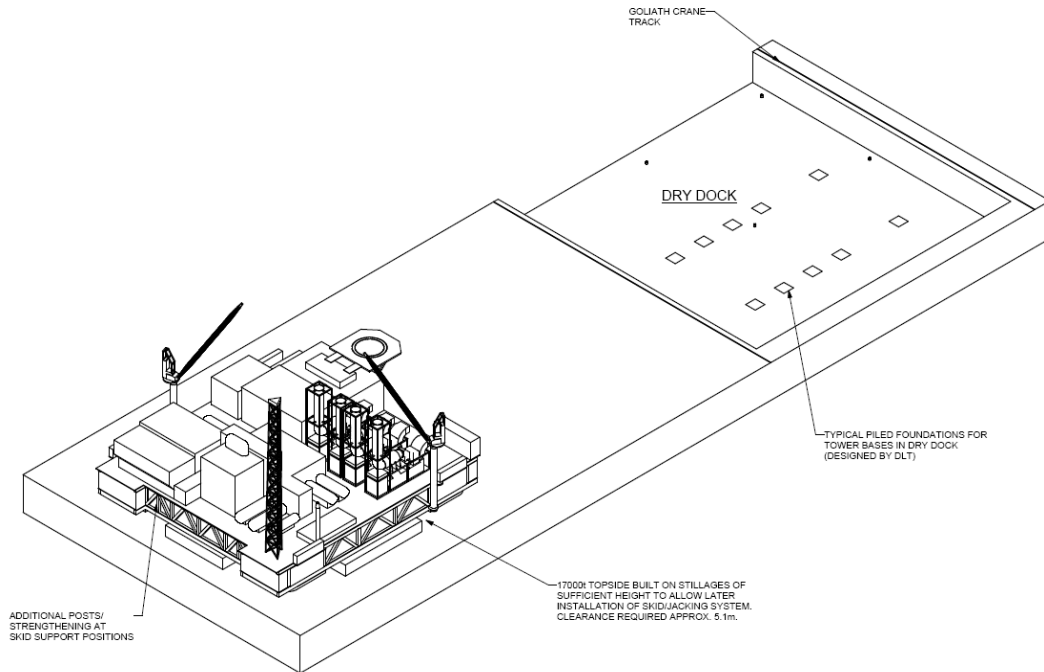


2 m tall half cans are assembled onto the top of the can base frame and bolted together. The half sections of the cans are handled on site by standard mini-crawler machines, such as an excavator, fitted with a purpose designed hydraulically powered attachment. Once bolted together the 4 No. hydraulic pins of the lifting yoke engage with the 4 No. reinforced holes in the can wall and the can is then lifted using the main ram to leave a 2.1m gap beneath for fitting of the next pair of half cans. Cans are bolted together using a ring of 40 No high tensile bars. As with all jack and pack operations the lifting speed is governed by the time taken to bolt the packs together, which is in turn dependant on the total number of bolts to fit and tighten per metre of lifting and the available labour on site. The use of 2m tall cans greatly reduces the number of bolts to fit compared with other systems with much shorter packs.

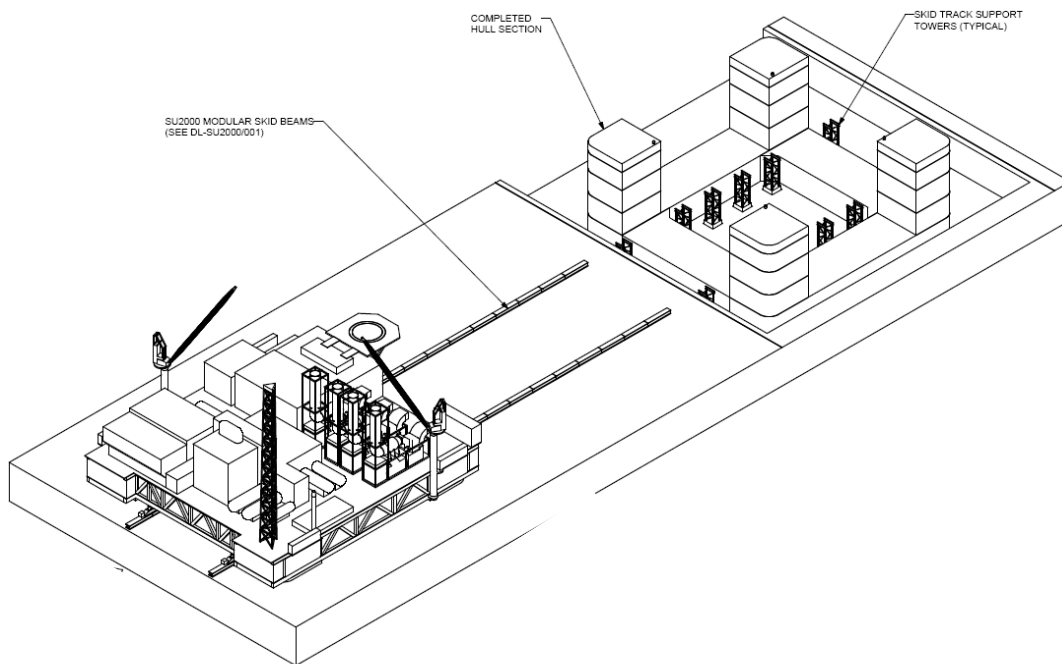


## Combined lifting and movement operations – dry mating

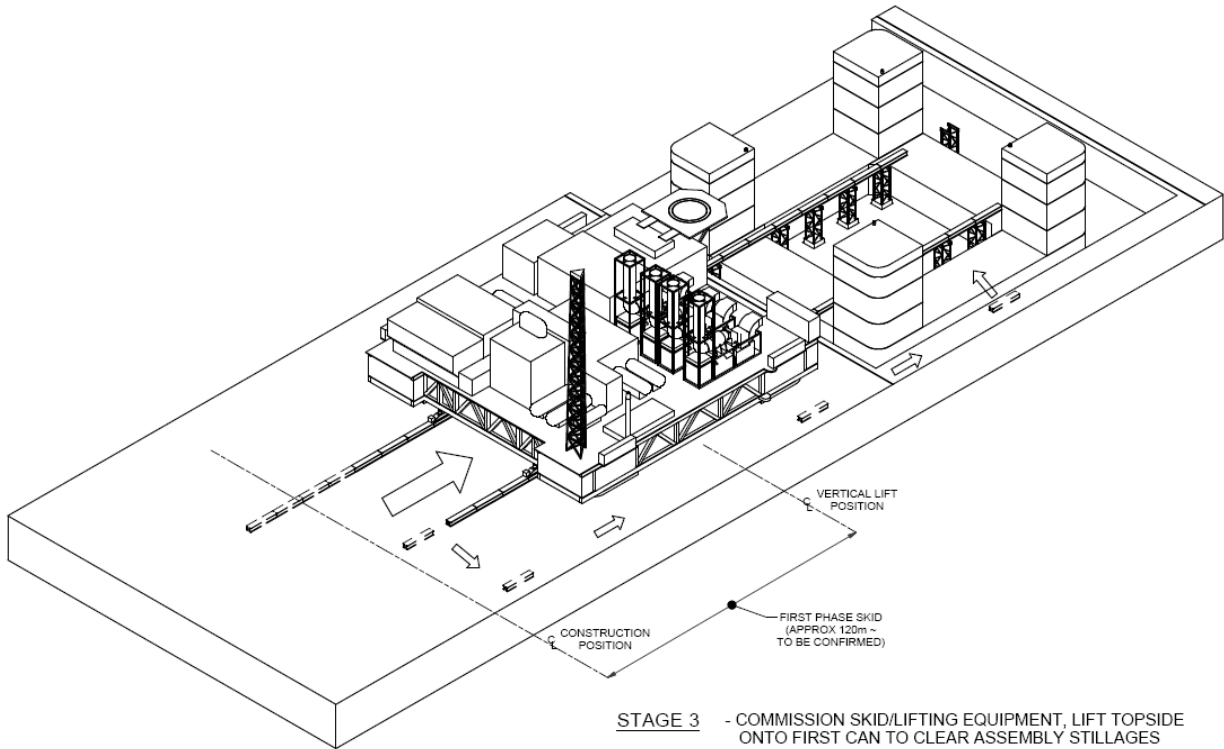
The DL-SU2000 system can be used for combined lifting and movement operations, such as required for dry mating operations as shown in the example below :



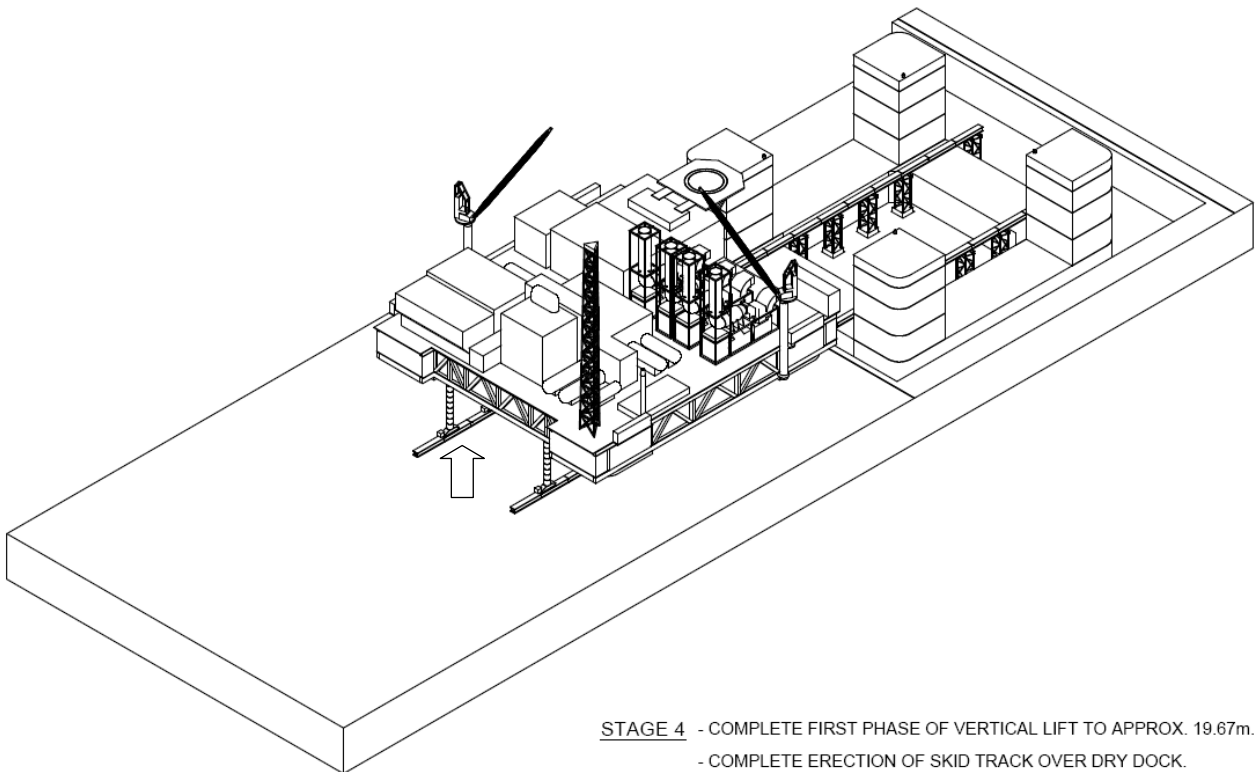
- STAGE 1 - CONSTRUCT TOP SIDE
- PREPARE FOUNDATIONS FOR SKIDDING OPERATION
  - STRENGTHEN TOP SIDE FRAMING FOR SKIDDING



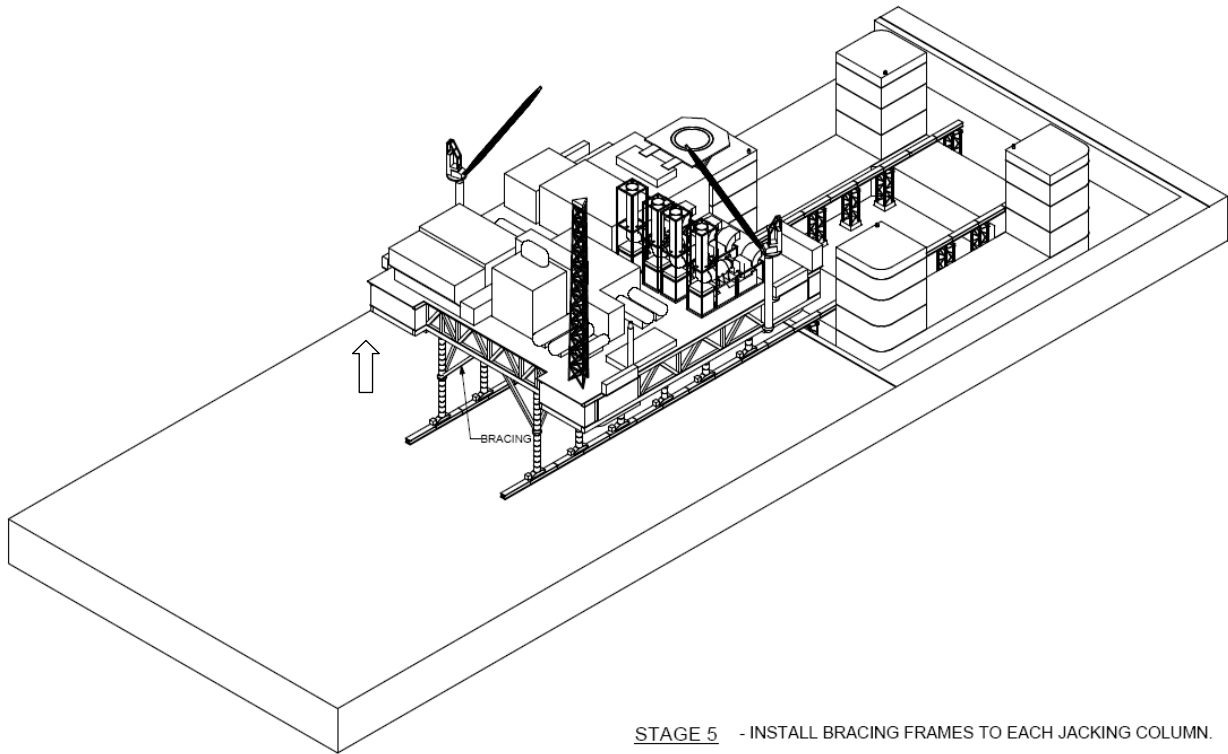
- STAGE 2 - HULL BERTHED IN DRY DOCK READY FOR MATING
- ERECT SKID TRACK TOWERS IN DOCK
  - ASSEMBLE DOUBLE SKID TRACK AND EQUIPMENT BENEATH TOPSIDE (12 No. DL-SU2000 ON 2 TRACKS)



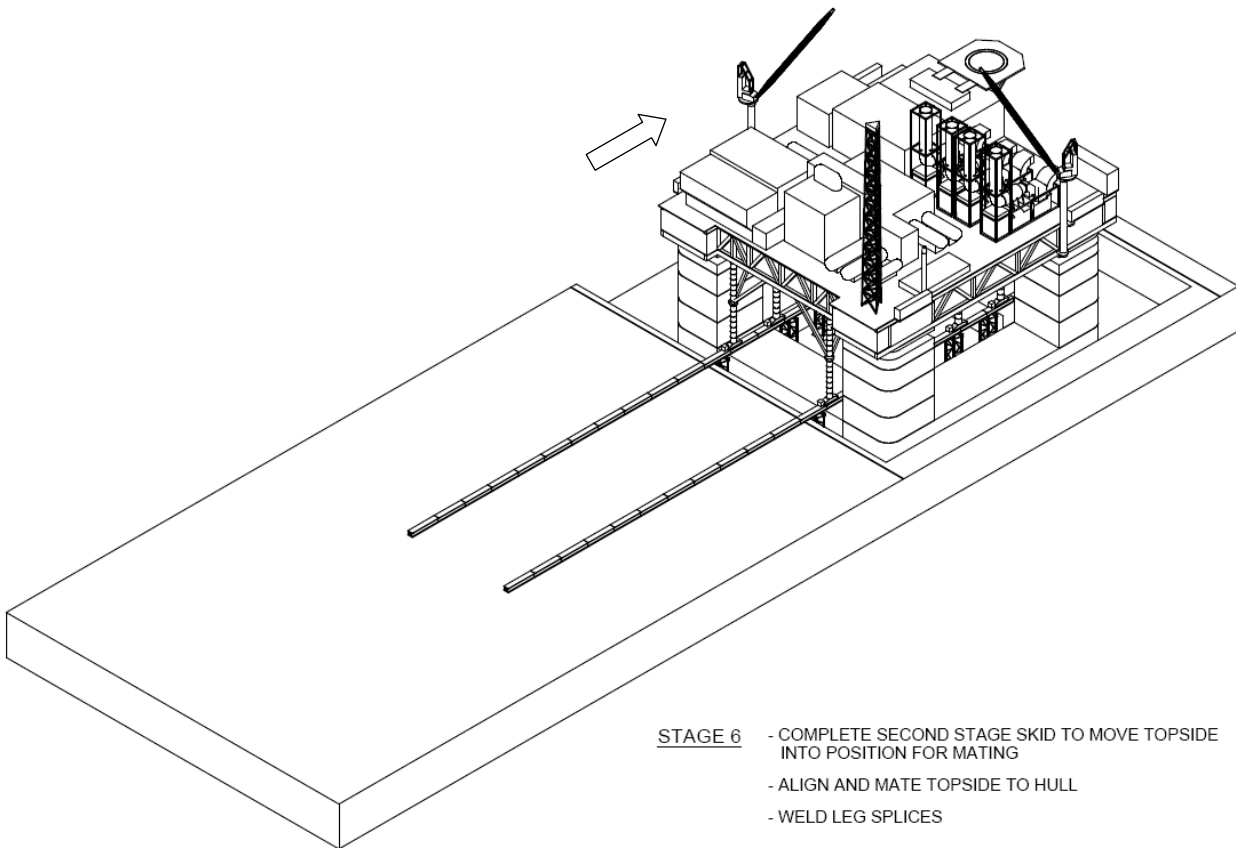
- STAGE 3** - COMMISSION SKID/LIFTING EQUIPMENT, LIFT TOPSIDE ONTO FIRST CAN TO CLEAR ASSEMBLY STILLAGES
- SKID TO VERTICAL LIFT POSITION ADJACENT TO DOCK
  - REMOVE TRACK FROM BEHIND TOPSIDE AND ERECT ON SUPPORT TOWERS IN DOCK



- STAGE 4** - COMPLETE FIRST PHASE OF VERTICAL LIFT TO APPROX. 19.67m.
- COMPLETE ERECTION OF SKID TRACK OVER DRY DOCK.



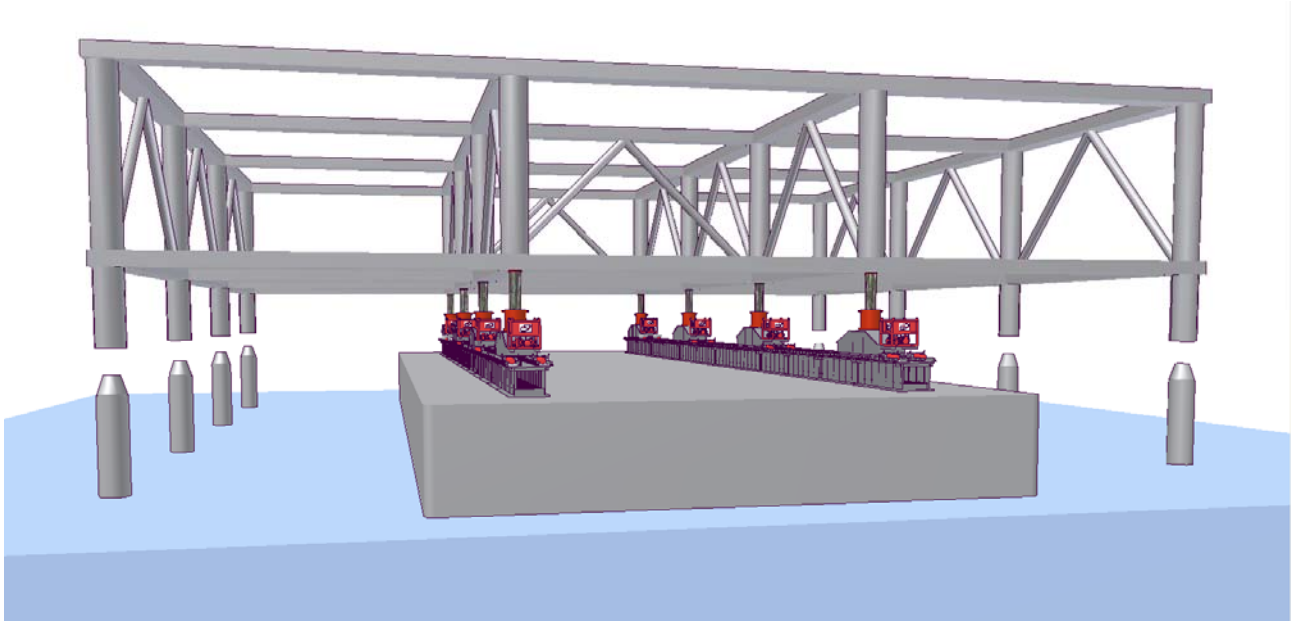
- STAGE 5** - INSTALL BRACING FRAMES TO EACH JACKING COLUMN.  
- CONTINUE SECOND PHASE OF VERTICAL LIFT TO FULL HEIGHT FOR FINAL SKID CLEARANCE.



- STAGE 6** - COMPLETE SECOND STAGE SKID TO MOVE TOPSIDE INTO POSITION FOR MATING  
- ALIGN AND MATE TOPSIDE TO HULL  
- WELD LEG SPLICES

## Wet mating operations

The 2.1m stroke of the main rams greatly increases the safety of wet mating operations by reducing the number of cycles required for lowering the modules down onto the prepared jacket and thereby significantly reducing the at-risk period when the module legs are partially engaged with the stabbing guides of the jacket. In most instances full mating can be achieved in a single uninterrupted lowering stroke. Following load out onto the delivery barge the DL-SU2000 system will travel with the barge to the installation site. The complete system is powered by integral diesel engines so has no requirement for power from the barge, apart from 240v AC supply to the control cabin.

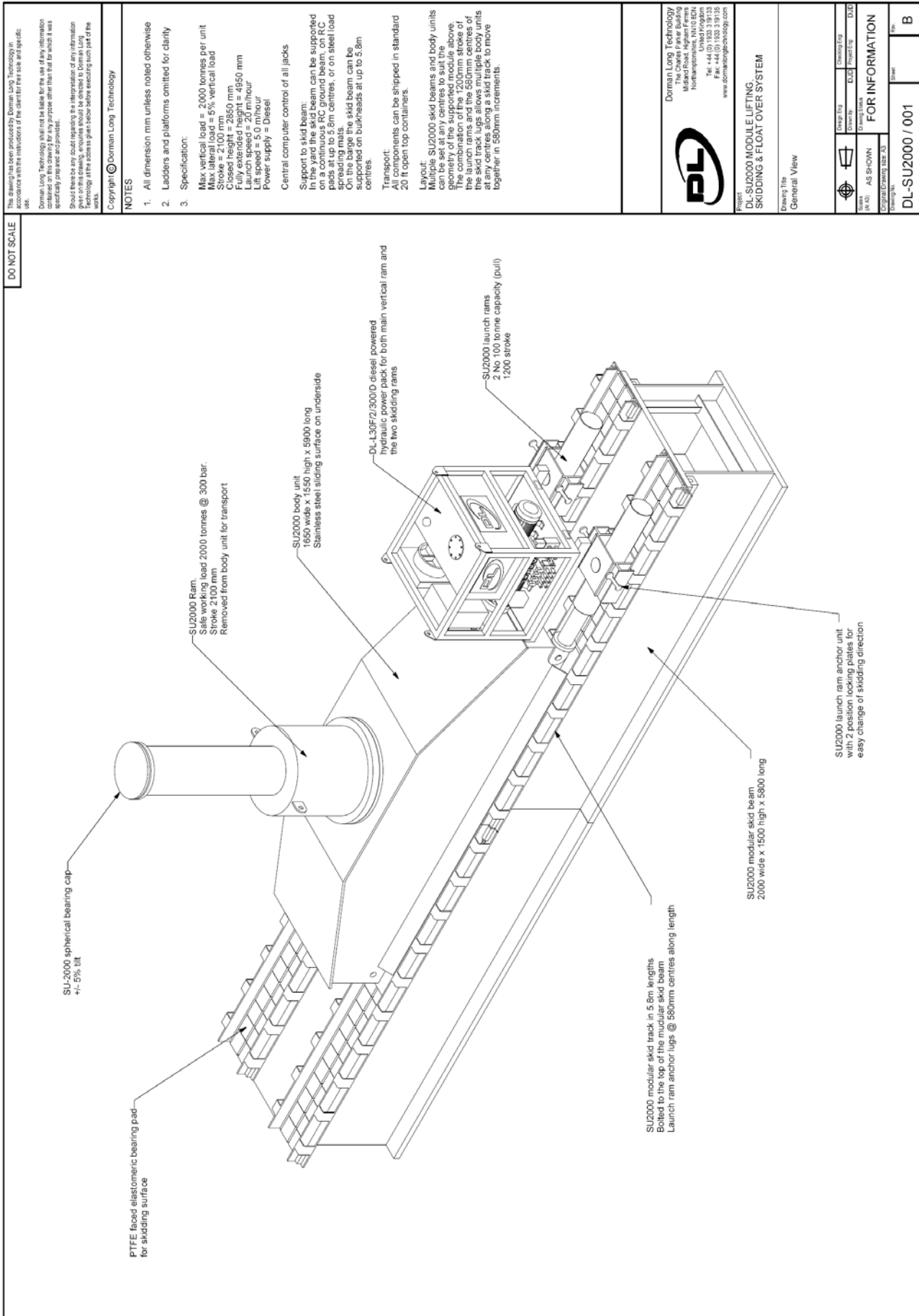


Wet mating can be carried out with or without the lifting cans, as required to suit the on-site geometry of each project. The above example is without lifting cans.



DL-SU2000

General arrangement drawings



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**NOTES**

1. All dimension mm unless noted otherwise
2. Ladders and platforms omitted for clarity
3. Specification:

Max vertical load = 2000 tonnes per unit  
 Max lateral load = 5% vertical load  
 Stroke = 2100 mm  
 Fully extended height = 4950 mm  
 Launch speed = 20 m/minute  
 Lift speed = 5.0 m/minute  
 Power supply = Diesel

Central computer control of all jacks

Support to skid beam:  
 In the event the skid beam can be supported on a continuous RC ground beam, on RC pads at up to 5.8m centres, or on steel load spreading mats.

On the barge the skid beam can be supported on bulkheads at up to 5.8m centres.

**Transport:**  
 All components can be shipped in standard 20 ft open top containers.

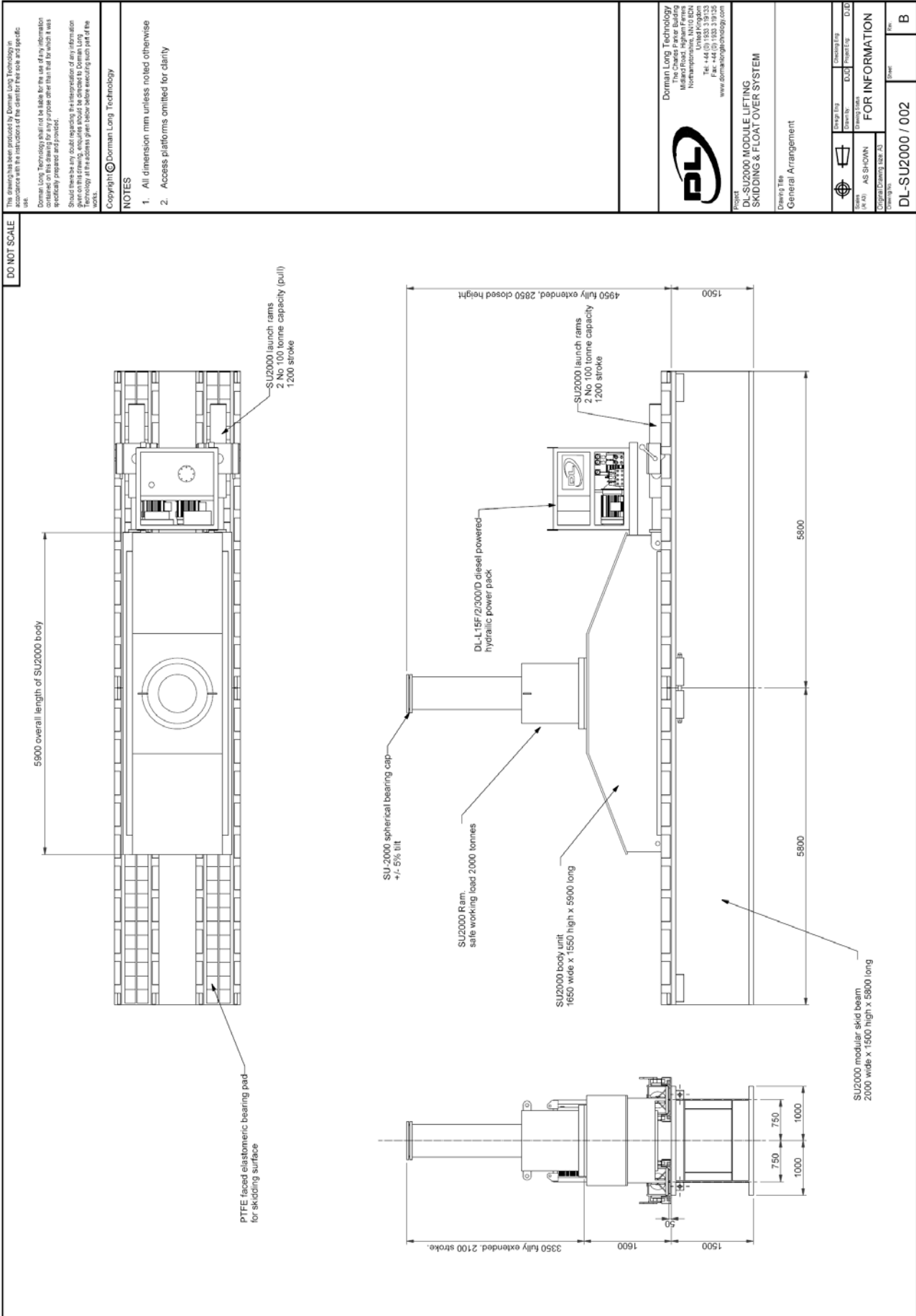
**Layout:**  
 Multiple SU2000 skid beams and body units can be set at any centres to suit the application above.  
 The combination of the 1200mm stroke of the launch rams and the 590mm centres of the skid track allows multiple body units at any centres along a skid track to move together in 500mm increments.

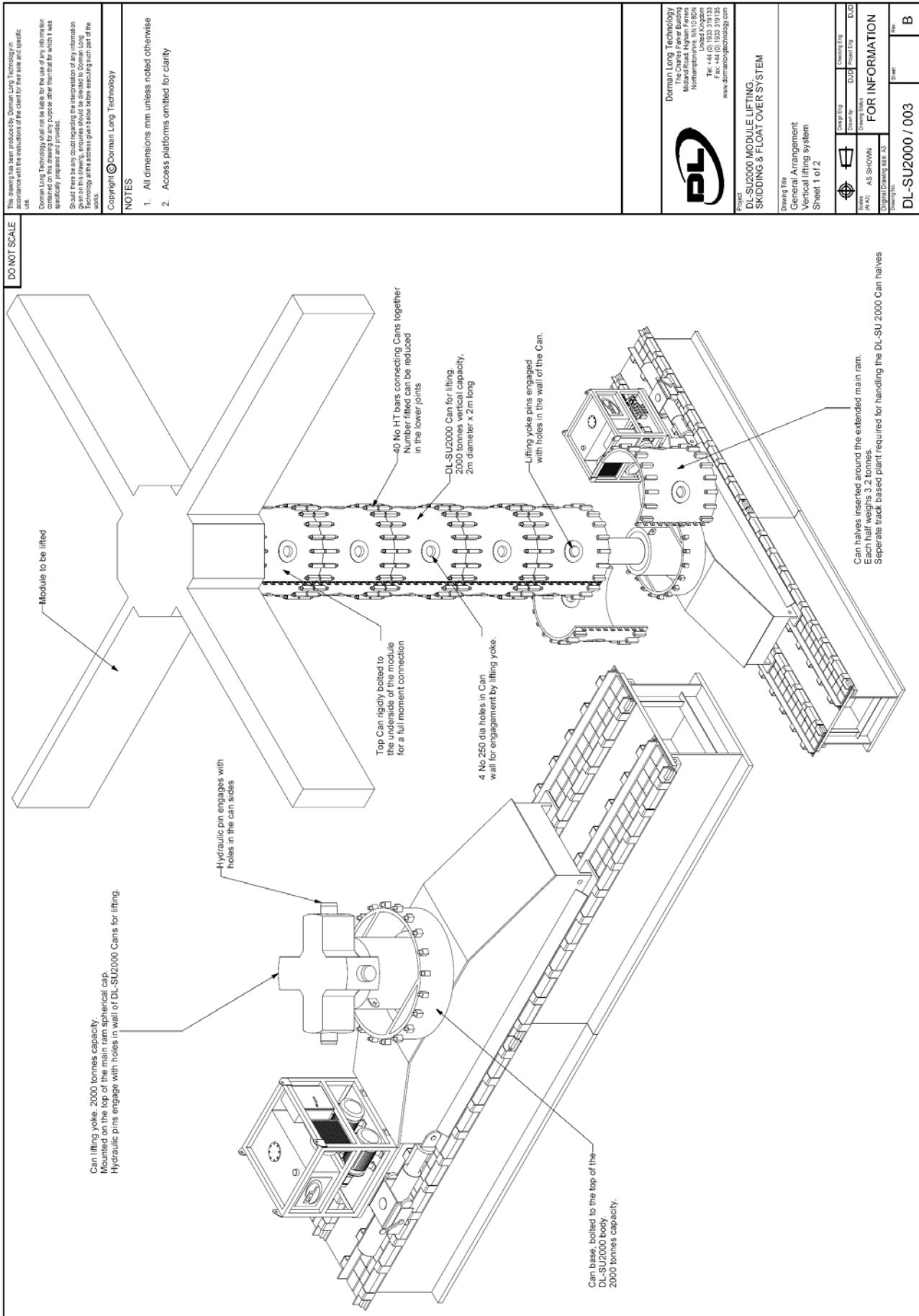
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Project: DL-SU2000 MODULAR LIFTING SKIDDING & FLOOR OVER SYSTEM

Drawing Title: General View

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Revision	AS SHOWN
Checked By	
Drawn By	
Project No.	DL-SU2000 / 001
Sheet No.	B





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- NOTES**
1. All dimensions mm unless noted otherwise
  2. Access platforms omitted for clarity

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Project  
**DL-SU2000 MODULE LIFTING  
 SKIDDING & FLOAT OVER SYSTEM**

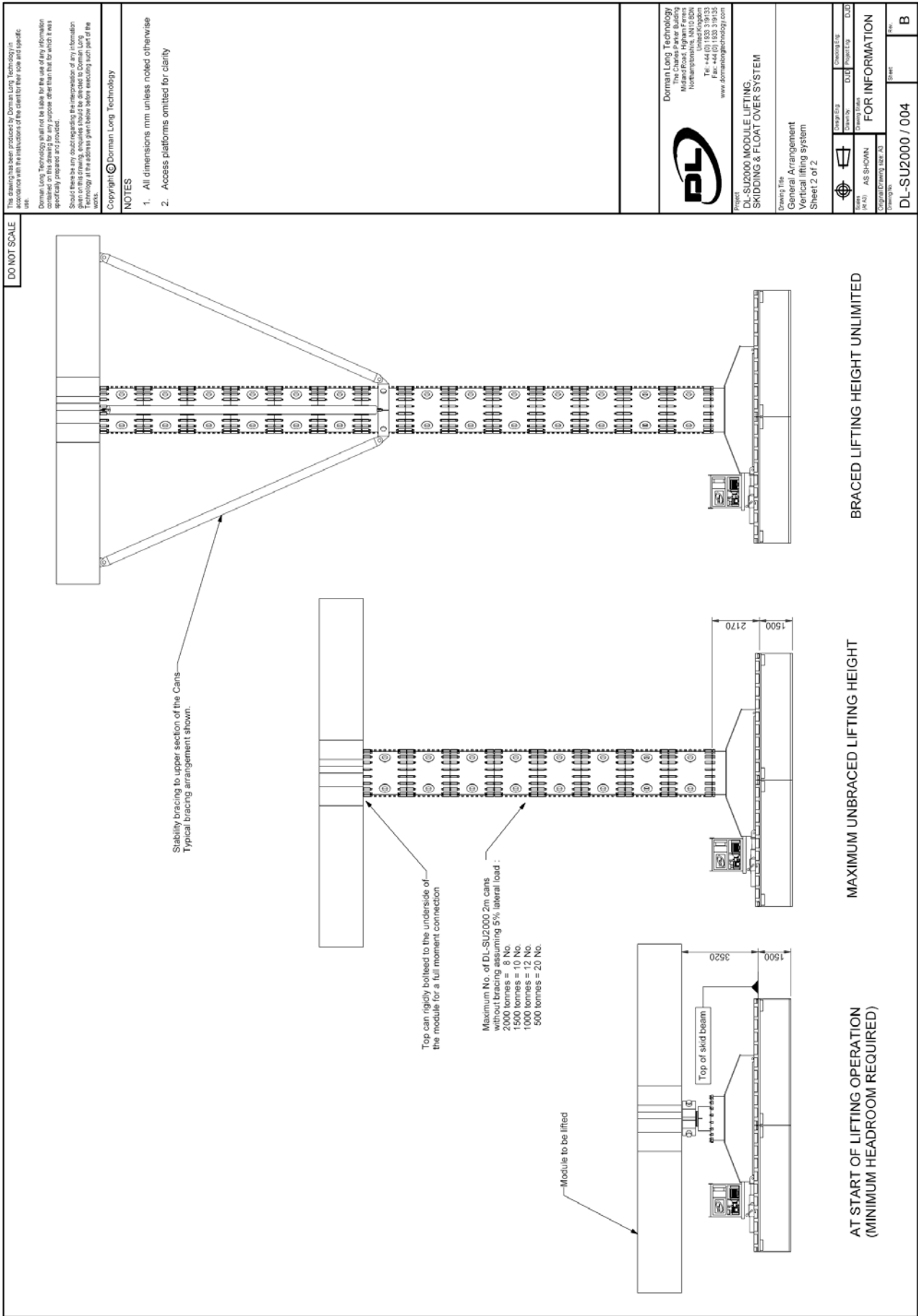
Drawing Title  
 General Arrangement  
 Vertical lifting system  
 Sheet 1 of 2

Scale	AS SHOWN	Drawn By	DL
Checked By		Project Eng	DL
Author		Project Eng	DL
Original Drawing Size A3		Project Eng	DL
Revised Size		Project Eng	DL

**FOR INFORMATION**

DL-SU2000 / 003

Sheet **B**



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Project  
**DL-SU2000 MODULE LIFTING SKIDDING & FLOAT OVER SYSTEM**

Drawing Title  
**General Arrangement Vertical lifting system**  
Sheet 2 of 2

Scale	AS SHOWN	Checked By	DJG	Checked By	DJG
Drawn By	AS SHOWN	Drawn By	DJG	Drawn By	DJG
Original Drawing Date	AS	<b>FOR INFORMATION</b>			
Drawing No.	DL-SU2000 / 004				
Sheet	B				



## Company profile

Dorman Long Technology Ltd (DLT) has been involved for many years in the design, manufacture and operation of heavy lifting systems for offshore and onshore construction of oil & gas structures, major bridges, buildings, refineries, furnaces, sports stadiums and airports. We operate as a heavy lift contractor, a manufacturer and as a consultant depending on the needs of each project.

We operate a quality management system which is accredited to ISO 9001:2000 and a company health and safety management system which is accredited to OHSAS 18001:1999. Both systems have been written in-house by our own staff to ensure total relevance to our business.

DLT was formed in 2000 from the merger of a heavy lifting contractor with two construction consultants specialising in heavy lifting and complex construction projects. The list of high profile projects we have undertaken in the oil and gas industry include numerous load outs up to 14,500 tonnes, erection of petrochemical vessel weighing up to 1,450 tonnes and the novel stage by stage jack up of the MAARI wellhead platform jacket constructed in Malaysia in 2007.



All DLT jacking equipment is fully designed and drawn in-house to UK and international standards and is then manufactured by ISO 9001 accredited component suppliers under our close supervision. The components are then fully assembled in our own workshops and tested and certified by DLT in conjunction with Lloyds Register before being delivered to our clients. DLT established a wholly owned subsidiary company in Shanghai in 2005 for the manufacture of our jacking systems in China and since then have successfully made many systems for both Chinese and overseas clients, as well as for our own use. Our China company employs highly experienced production and quality managers to ensure full compliance with our specifications. Manufacture of jacking systems in the UK and China since 2000 currently stands at 225 units with a combined lifting capacity of over 56,000 tonnes.

We also develop our own computer control systems in-house, with qualified DLT staff in China able to design hardware and software for use on all of our systems. Our computer systems use state of the art CANbus networks for maximum reliability and performance.

For further details of our services and the many projects we have worked on, please visit our website at [www.dormanlongtechnology.com](http://www.dormanlongtechnology.com)



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