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1. SCOPE

The purpose of the present operative procedure is to define the Responsibilities, the Operational Criteria, the equipment, and the operative steps to be followed for the execution of the load-out onto the barge the TOP SIDE which is reported in the *Table 1*.

	JACKET MARK / ID	WEIGHT (contingency included or not)
Item #1	TOP SIDE BLPH	1802 t

Table 1: TOP SIDE detail

The load-out operations will be carried out at the Rosetti Yard (Ravenna – Italy)

The present procedure covers the following operations:

- Heavy transport of the TOP SIDE by Self Propeller Modular Trailer (SPMT) from storage area to the berth.
- Loading TOP SIDE on the barge.

This procedure is a general guideline for the preparation and execution of the load out operations. Other operational details shall be also taken from the specific drawings attached to the present document.
The procedure shall be read in conjunction with the documentations provided by the HSE's departments related to the safety aspects of the preparations and the operations.

The present procedure defines the staff responsibility, the equipment to be used for the operations and the steps for the safe execution of the job. Any deviation to this procedure shall be reviewed first by the Site Manager / Load out Manager (SM) and in case of need approved by the Fagioli Engineering Department prior to making the changes.

The **load-out starting point** is when the barge is moored (as per load-out mooring arrangement), SPMT's trailers are positioned underneath the TOP SIDE, the "Ready for load-out certificate" and "Certificate of Approval" are issued, and the TOP SIDE is ready to be loaded out.
The **load-out ending point** is when the TOP SIDE is released on the grillage of the barge and the minimum required sea-fastening is installed.

2. REFERENCE DOCUMENTS

Herein the standard related standards code.

2.1 Standard and code

1. ISO 9001:2015 “Quality Management System – Requirements”.
2. UNI ISO 45001:2018 “Occupational Health & Safety Management Systems - Requirements with guidance for use”.
3. DNVGL-ST-N001:2020 “Marine operations and marine warranty”.

The reference Codes and Standards shall be used in their last edition / revision available at the date.

2.2 Client documents

Client documents:

- To see in appendix 1

The reference documents shall be used in their last revision “*issued for use*”, “*issued for execution*”.

2.3 Fagioli documents

Fagioli documents:

- To see in appendix 2

The reference documents shall be used in their last revision “*issued for use*”, “*issued for execution*”.

3. STAFF AND RESPONSIBILITY

3.1 Responsibility matrix

With regards to the reference Contracts between Fagioli, the Client and possible Other Parties (contractors, subcontractors, port authority, etc.), the company Fagioli, the Client and the Others are responsible for the design, the procurement, and the operations according to the Responsibility Matrix which is reported below.

Type of activities	Activities	Fagioli	Client (Rosetti)	Others	Note
Engineering	Provide information about JACKET (weight, CoG position, protrusion, etc.)		X		
Engineering	Provide load-out quay details drawing, capacity and section through quay wall		X		
Engineering	Investigation / check of the underwater soil in the load-out area to identify and remove rocks and debris that could damage barges		X		Subsea survey report or bathymetry shall be available
Engineering	Preparation of installation area and site path from loading up to load-out area (removal of obstructions, fences, curbs…)		X		
Engineering	Check of bridges, culverts, underground or similar in the SPMT operational area		X		
Engineering	Load-out quay structural check for the SPMT's imposed loads		X		The input for the structural checks are reported in the Transport drawings (local and global bearing pressure of the SPMT's)
Engineering	Provide tide table for the berth		X		
Engineering	Provide environmental parameters (wave, current, wind, etc.) for the berth		X		
Engineering	Provide barge's booklet complete of drawings, hydrostatic tables and curves of stability		X		
Engineering	Barge general arrangement drawing with allowable deck load		X		
Engineering	Barge stowage plan drawings		X		
Engineering	Details of ballast pumping system		X		

Type of activities	Activities	Fagioli	Client (Rosetti)	Others	Note
Engineering	Method of fendering between barge and quay		X		
Engineering	Fenders data sheet and positioning on the quay		X		
Engineering	Barge positioning during load-out		X		
Engineering	Ro-ro ramp design and check		X		
Engineering	Load-out operative procedure	X	X		
Engineering	Ballast plan during load-out and preparing the barge at required height for the load-out		X		
Engineering	Mooring drawings and mooring calculation report for load-out		X		
Engineering	Mooring drawings and mooring calculation report for stand-by condition		X		
Engineering	Transport drawings for the load-out	X			
Engineering	Grillage and sea-fastening design (drawings and calculations)		X		
Engineering	Barge local structural check and calculations		X		
Supply	Mooring equipment for the load-out		X		
Supply	Mooring equipment for the stand-by condition		X		
Supply	Ro-ro ramps		X		
Supply	Grillage and sea-fastening		X		
Supply	Barge ballast equipment and Ballast Operators		X		
Supply	SPMT's Convoy and SPMT's Operators	X			
Supply	Fire Extinguishers		X		
Supply	Tugboats for barge movement		X		
Supply	Welding equipment		X		
Supply	Site lights on the barge		X		
Supply	Site lights on quay and storage area		X		
Operational	Engage the Marine Warranty Surveyor		X		
Operational	Transport permits		X		
Operational	Berth permits		X		
Operational	Provide weather forecast		X		
Operational	Winches positioning on barge/quay		X		

Type of activities	Activities	Fagioli	Client (Rosetti)	Others	Note
Operational	All barge mooring operations / activities for load-out		X		
Operational	All barge mooring operations / activities for stand-by condition		X		
Operational	Barge mooring equipment installation / removal for load-out		X		
Operational	Barge mooring equipment installation / removal for stand-by condition		X		
Operational	Ro-ro ramps installation / removal		X		
Operational	Gas free certificate for Barge		X		
Operational	Barge ballast operations during load out		X		
Operational	Barge ballast operations during stand-by condition		X		
Operational	SPMT's convoy preparation	X			
Operational	Grillage installation before load-out operation		X		
Operational	Ready for Load-out certificate		X		
Operational	Certificate of Approval for load out		X		
Operational	Load-out operation by means of SPMT's	X			
Operational	Sea-fastening installation after the load-out operation		X		
Operational	Protection of SPMT's in case of hot works (sparks, etc.)		X		
Operational	Load-in operation of empty SPMT's trailer from the barge	X			
Operational	Survey of item in its final position		X		
Operational	RINA approval according to the MWS approved sea fastening and grillage plan		X		If any
Operational	Barge tug operations		X		
Operational	Barge preparation for sail away		X		
Operational	Any barge movements inside the quay area		X		
Operational	Pre-sail-away (PSA) inspection		X		

Table 2: Responsibility Matrix

3.2 Organization chart

The load-out activities will be executed in accordance with this procedure. As per the below "*Organization chart*", the load-out planning and preparation involves key members of Client, Fagioli and Other organizations.

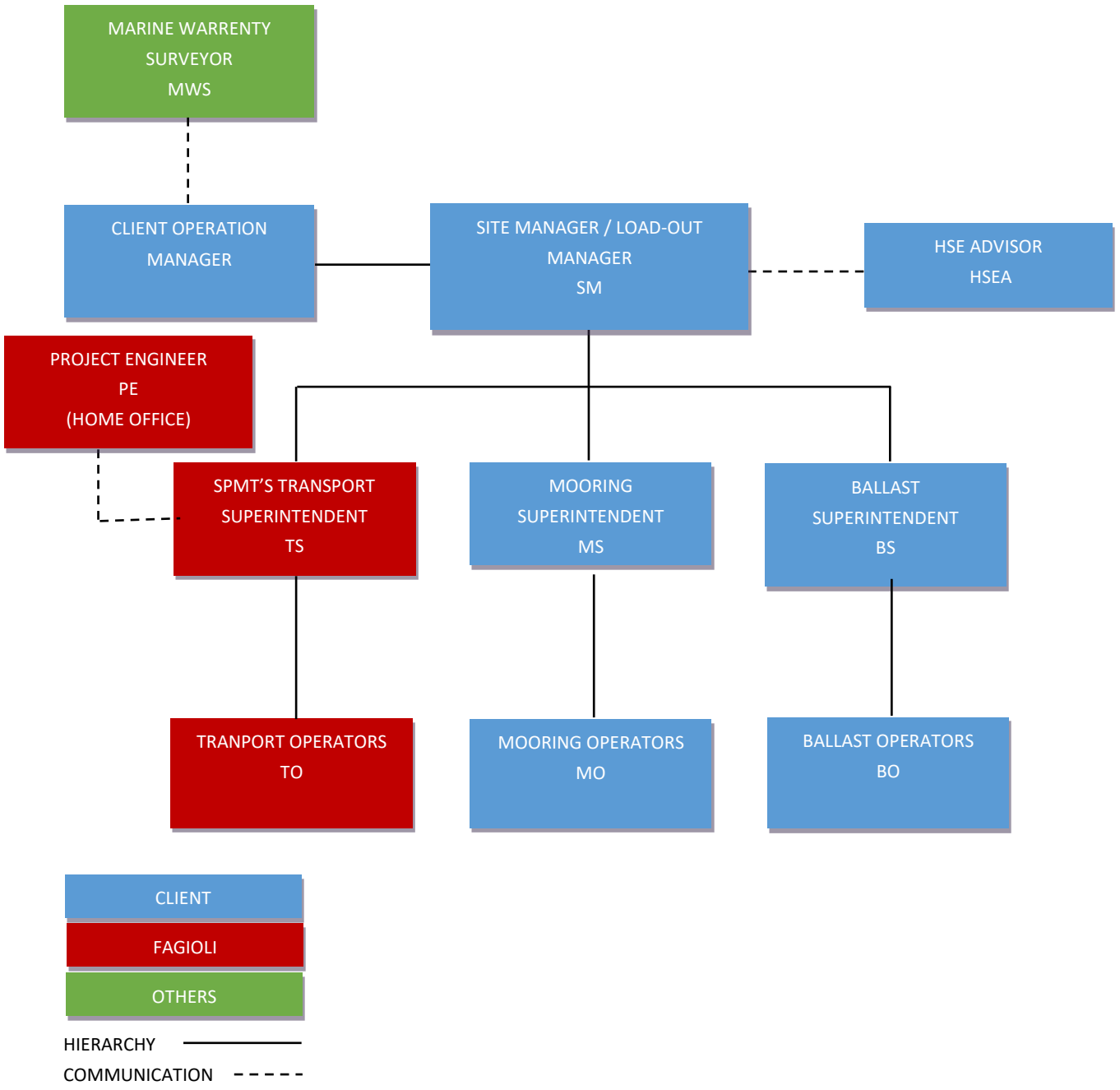


Figure 2: Organization chart

3.3 Key personnel

The key persons involved in the operations and their applicable responsibilities are as follows:

Key person	**Client Operation Manager**
Company	**Client**
Give instruction to:	Site Manager / Load-out Manager (SM)
Receive instruction from:	Client Management
Main duties	1) Acts as Client Company representative during the load-out operations. 2) Issues in agreement with MWS the "*Ready for Load-out certificate*" and coordinates all Parties with the MWS during the load-out operations. 3) Provides weather forecast from 7 days before the operations every 6 hours until load-out is completed.

Key person	Marine Warranty Surveyor (MWS)
Company	LOC
Assist:	Client Operation Manager
Receive instruction from:	Head Office
Main duties	1) Provides independent third-party technical review and approval of load-out operations on behalf of Client, from the planning stages through to the physical execution. 2) Prepares and issues the "*Certificate of Approval*" before start of load-out operations with the agreement of COM.

Key person	**Site Manager / Load-out Manager (SM)**
Company	**Client**
Give instructions to:	Ballast Superintendent (BS) Transport Superintendent (TS) Mooring Superintendent (MS)
Receive instruction from:	Client Operation Manager (COM)
Main duties	1) Be responsible for the execution of the transport and of the load out activities. 2) Explains the operations to all parties involved and establish the coordination with them, according to the Organization Chart in

	field, interfacing with the Fagioli Home Office Departments, the Client and the other Parties. 3) Conducts the *Daily Tool Box Meeting* with all parties involved about the activities that will take place in the site. 4) Plans and schedules all the site activities for the preparations and the executions of the load out. 5) Ensures that the communication between all parties is maintained in field. 6) Collects, keeps updated and distributes to all the parties involved the technical documentation. 7) Manages the deviation to the present procedure, getting approval, as required, by Home Office (PE) and by COM. 8) Collects all the certificates for the equipment and the materials used during operations. 9) Collects the *check list* duly prepared and signed by the Superintendents. 10) Be the only person who gives the conventional signals to the superintendents during job execution. 11) Be authorized to suspend the work in case of any unacceptable environmental or safety risk. 12) Ensures that the weather forecast values are within the limit of the weather criteria for the operations according to the present procedure.

Key person	**HSE Advisor (HSEA)**
Company	**Client**
Assist:	Site Manager / Load-out Manager (SM)
Receive instruction from:	HSE Manager
Main duties	1) Ensure development and timely delivery of HSE documentation. 2) Provide assistance to SM in implementing HSE requirements. 3) Liaise with internal and external stakeholders to assist/advise in HSE matters. 4) Participate in incident investigations to identify root causes and lessons learned.

Key person	**Project Engineer (PE)**
Company	**Fagioli**
Assist:	Transport superintendent
Receive instruction from:	Engineering Management
Main duties	1) Receives and collects the right and valid input engineering information from Client. 2) Prepares the operational drawings helped by drafting personnel, getting the required approval from Client, and issues the drawings / documents in revision "Issued for Use" to be followed in field. 3) Prepares the operational procedure, getting the required approval from Client, and issue the document in revision "Issued for Use" to be followed in field. 4) Develops all the engineering activities related to yard transport and to the load out according to the project design criteria established with the Client. 5) In case of need he (himself or substitute) is present during the operations and assist the operational team in case of a deviation from the present operational procedure for unexpected reasons.

Key person	**Transport Superintendent (TS)**
Company	**Fagioli**
Give instruction to:	Transport Operators (TO)
Receive instruction from:	Site Manager / Load out Manager (SM)
Main duties	1) Be responsible for the correct preparation and execution of the transport operations by SPMT's. 2) Be the only person who gives the conventional signals to the SPMT's operators during job execution. 3) Be responsible for the SPMT's hydraulic and electronic functions. 4) Superintends the SPMT's preparation, in particular the hydraulic suspension groups. 5) Be responsible for the lashing of the TOP SIDE's on the SPMT's according to the transport drawings. 6) Be responsible for the preparation of the *check lists* of the SPMT's before their use. 7) Superintends the *functional tests* of the SPMT's before their use. 8) Instructs the operators of the SPMT's about their duties for the transport operations.

	9) Superintends the periodic inspection and maintenance activities of SPMT's. 10) Be authorizes to suspend the work in case of any unacceptable environmental or safety risk. 11) Inspects the operational area and the job site before moving the SPMT's. 12) Coordinates the *contingency plan* in case of need.

Key person	**Transport Operator (TO)**
Company	**Fagioli**
Give instruction to:	-
Receive instruction from:	Transport Superintendent (TS)
Main duties	1) Prepares the convoys following the instructions of TS, in particular for the hydraulic suspension groups and lashing. 2) Performs the *functional tests* of the SPMT's before their use. 3) Be responsible for trailer hydraulic and electronic functions. 4) Performs the periodic inspection and maintenance activities of SPMT's. 5) Implements the *contingency plan* in case of need.

Key person	**Ballast Superintendent (BS)**
Company	**Client**
Give instruction to:	Ballast Operators (BO)
Receive instruction from:	Site Manager / Load out Manager (SM)
Main duties	1) Be responsible for the correct preparation and execution of the ballast operations. 2) Be the only person who gives the conventional signals to the ballast operators during job execution. 3) Be responsible for the ballast equipment functions. 4) Superintends the ballast equipment preparation. 5) Be responsible for the preparation of the *check lists* of the ballast equipment before their use. 6) Superintends the *functional tests* of the ballast equipment before their use. 7) Instructs the operators of the ballast equipment about their duties for the ballast operations.

	8) Superintends the periodic inspection and maintenance activities of the ballast equipment. 9) Be authorizes to suspend the work in case of any unacceptable environmental or safety risk. 10) Coordinates the *contingency plan* in case of need.

Key person	**Ballast Operator (BO)**
Company	**Client**
Give instruction to:	-
Receive instruction from:	Ballast Superintendent (BS)
Main duties	1) Prepares the ballast equipment following the instructions of BS. 2) Performs the *functional tests* of the ballast equipment before their use. 3) Performs the periodic inspection and maintenance activities of ballast equipment. 4) Implements the *contingency plan* in case of need.

Key person	**Mooring Superintendent (MS)**
Company	**Client**
Give instruction to:	Mooring Operators (MO)
Receive instruction from:	Site Manager / Load out Manager (SM)
Main duties	1) Be responsible for the correct preparation and execution of the mooring operations; 2) Be the only person who gives the conventional signals to the mooring operators during job execution; 3) Be responsible for the mooring equipment functions; 4) Superintends the mooring equipment preparation; 5) Be responsible for the preparation of the *check lists* of the mooring equipment before their use; 6) Superintends the *functional tests* of the mooring equipment (winches and fairleads) before their use; 7) Instructs the operators of the mooring equipment about their duties for the mooring operations; 8) Superintends the periodic inspection and maintenance activities of the mooring equipment (winches, etc…). 9) Be authorizes to suspend the work in case of any unacceptable environmental or safety risk;

	10) Coordinates the *contingency plan* in case of need.

Key person	**Mooring Operator (MO)**
Company	**Port Authority**
Give instruction to:	-
Receive instruction from:	Mooring Superintendent (MS)
Main duties	1) Prepares the mooring equipment following the instructions of MS; 2) Perform the *functional tests* of the mooring equipment (winches) before their use; 3) Performs the periodic inspection and maintenance activities of mooring equipment (winches); 4) Implements the *contingency plan* in case of need.

4. SAFETY

As far as Occupational Health, Safety & Environment aspects are concerned, all personnel involved in the operations shall refer to the documents provided by the HSE's department, such as DVRS, DUVRI and any additional applicable documentation relevant to the project.

Furthermore, the following aspects are particularly important for a safe and successful execution of the operations in subject and shall be organized/checked carefully by the Site Manager / Load out manager (SM):

1. Carry out an Operational Meeting with all involved parties, to explain the load out operations, to clarify the responsibility of everybody and to set up the communication lines.
2. Carry out a toolbox meeting before the execution of each operation, discussing the hazards associated with the task and outlining what preventive and protective measures are foreseen to mitigate such hazards.
3. Ensure that *Risk Assessment* and *Contingency Plan* are well known by all personnel involved.
4. Ensure that sightseers are kept away from the operations.
5. Ensure that personnel are at adequate distance from *tensioned mooring wires* during tensioning and during all the operations.
6. Monitor weather forecast.
7. Ensure that all personnel wear all necessary *Personal Protective Equipment*.
8. Check all equipment before use, in particular check all hydraulic hoses using the relevant check lists. operation shall not start if there is any pending points.
9. Ensure that the anticipated loads on SPMTs are known, including the safe working loads and the pressure for the equipment being used.
10. Absorber material shall be available in case of oil/fuel spillage.
11. Fagioli SM, TS, MS and BS shall always be present during the operations.
12. Fagioli SM shall ensure that the *Emergency Plan* is available, the plan shall comprise of a layout with indication of Muster Points, First Aid Kits, Fire Extinguishers, Spill Kits, Life Buoy and any additional emergency response equipment.

5. COMMUNICATIONS

The communication between all party involved will be in English language.

Before starting the operations, a meeting is held with all the parties involved, to explain the load out operation and to clarify the responsibility of everybody and set up the communication lines. Each personnel shall be aware about its task and its location on board or onshore, according to the *Safety Plan* and according to their duties during the operations.

The SM, BS, BO, TS, TO, MS and MO are provided with radio.

All parties are aware of all applicable *Emergency Procedures* according to the *Safety Plan*.

6. Operational Requirements and Criteria.

In this chapter It'll be listed the operational criteria/requirements for the main activities.

6.1 Loading Phase

The **loading operation starting point** begin after that the SPMT will be in Rosetti yard beside the TOP SIDE.
The **loading operation ending** point when the TOP SIDE will be completely positioned onto SPMT.

The final decision for starting with the operations will be agreed on site, considering the following operational guidelines:

PARAMETER	VALUE
Max operational wind for yard transport by SPMT's	10 m/s (3s gust at 10m above waterline)
Min operational temperature	-15° C
Max operational temperature	+50° C
Visibility limit	± 100 m

6.2 Heavy transport by SPMT

Heavy Transport engineering shall consist of an analysis and selection of appropriate transportation arrangement for SPMT's, defining also the operational tolerances (max. SPMT's speed, max axle load, max wind speed, max out of verticality).
The load distribution in a transport should normally be calculated as a quasi-static load case by distributing the design transport weight of the transported unit and any special load to each structural temporary member and to the SPMT's.
The Nominal Weight is supplied by Client trough a Weight Report and adequate contingency factor is already included. Envelope ± 500 mm of CoG location shall be taken into consideration to compensate any inaccuracy.
Between bottom steel frame of transported unit and top steel frame of SPMT's, plywood shall be used (friction coefficient wood/ steel = 0,21).
Additional lashing for safety reason between SPMT's bed and support beams will be carried out. The lashing system definition is showed in dedicated DWG.
SPMT's hydraulic circuits shall be arranged in such a way that a 3 points system is realized; with this system, the reactions on the trailers are practically constant and there is no overstress on the transported unit.

In the operational conditions, the pressures on the SPMT's hydraulic circuits shall never exceed the allowable values stated by the manufacturer, which depend also from the travelling speed.
For transport, the stability analysis shall be carried out, considering the maximum transverse / longitudinal wind, center of gravity location inaccuracy and the operational tolerances (max. out of verticality) and brake and inertial movement effect.
Total tractive power (number of powered axles) shall be checked to be sufficient to overcome acceleration and slope along the road path.

PARAMETER	VALUE
Max operational wind for yard transport by SPMT's	10 m/s (3s gust at 10m above waterline)
Min operational temperature	-15° C
Max operational temperature	+50° C
Visibility limit	1.5 times the length of the TOP SIDE no activities will occur in case of thunderstorm with lightning, fog, heavy rain which reduce visibility below this limit
TOP SIDE longitudinal out of verticality	± 1°
TOP SIDE transversal out of verticality	± 1°
Min. transport path capacity	11.5 t/m^2
Speed limit	0.5 Km/h

Note: Friction coefficient table

Table 2-4 Friction Coefficients

Surface 1	*Surface 2*	*Condition*	*μ*
Steel	Steel	Wet	0.0
Steel	Steel	Dry	0.1
Steel	Timber (wood)	Wet	0.2
Steel	Timber (wood)	Dry	0.3
Steel	Rubber	Wet and dry	0.3

Note: The table is based on recommendations in IMO re. A.714(17). It is assume that the friction surfaces are free from oil or other lubricating fluids

6.3 Load-out operation

The **load-out operation starting points** begin after BARGE preparation. The **load-out operation ending point** is when the TOP SIDE will be in final position before lowering phase.
The final decision for starting the operations will be agreed on site, considering the following operational guidelines:

PARAMETER	VALUE
Max operational wind for load-out by SPMT's	10 m/s (3s gust at 10m above waterline) (or to be advise by Client in case of lower value)
Min operational temperature	-15° C
Max operational temperature	+50° C
Max significant wave height	to be advise by Client
Max current velocity	to be advise by Client
Visibility limit	1.5 times the length of the BARGE no activities will occur in case of thunderstorm with lightning, fog, heavy rain which reduce visibility below this limit
Max difference in elevation between barge deck and quay	0/+100 mm during crossing the ro-ro ramps only
Max. swell effect on barge	± 100 mm (minimum period 10 sec).
Barge max trim	1.0 %
Barge max heel	0.5 %
TOP SIDE longitudinal out of verticality	± 1° Including trim effect
TOP SIDE transversal out of verticality (controlled during the operations by spirit level positioned onto SPMT load bed)	± 1° Including heel effect
Min. quay ground capacity and deck capacity	11.5 t/m^2
Tide range	As per Tide Tables attached, to be verified with tide measurements starting no later than 5 days prior the scheduled load-out

Note: SPMT load-out weather limitation shall be compared with mooring weather limitation.

6.4 TOP SIDE transfer on barge grillage structure activity

The **unloading operation** will start after the load-out convoy will be in final position in accordance with operational dwg. The **lowering operation ending point** is when the TOP SIDE will be completely seated on BARGE grillage.

PARAMETER	VALUE
Max operational wind for load-out by SPMT's	10 m/s (3s gust at 10m above waterline) (or to be advise by Client in case of lower value)
Min operational temperature	-15° C
Max operational temperature	+50° C
Max significant wave height	to be advise by Client
Max current velocity	to be advise by Client
Visibility limit	1.5 times the length of the BARGE no activities will occur in case of thunderstorm with lightning, fog, heavy rain which reduce visibility below this limit
Max. swell effect on BARGE	± 100 mm (minimum period 10 sec).
BARGE max trim	1.0 %
BARGE max heel	0.5 %
TOP SIDE longitudinal out of verticality	± 1 % Including trim effect
TOPSIDE transversal out of verticality	± 1 % Including heel effect

7. BERTH DATA

The Module will be loaded-out from Rosetti Yard (Piomboni) along the ro-ro ramps, positioned between the barge and berth, and transferred to the grillage onto the Barge.

The Berth is shown in the picture below.



Figure 2: Berth plan view

8. EQUIPMENT FOR THE OPERATION

The main equipment to be used for the yard transport and load-out operations are reported in the following chapter. As a general rule, all the equipment shall be inspected and functionally tested before their use at site with relevant *check lists*.

8.1 Equipment for RO-RO operations

The equipment to be used for the yard transport and load-out operations are as follows:

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- N. 12 x 6 axles (48t/axle capacity) + N. 4 x 4 (48t/axle capacity).
- N. 3 PPUs.

All the above equipment available at job site, is subject to periodic inspections. moreover prior to commencement of the operations the equipment will be checked according to inspection *check lists*.

Client / Others

- Grillage and sea-fastening;
- Ro-ro ramps;
- Site lights for Quay and Storage Area;
- Site lights for Barge;
- Service cranes;
- Service forklift(s) / mainlift(s);
- Equipment and tools for installing grillage and sea-fastening;
- Gangway with safety net

The details of TOP SIDEs/equipment provided by Client / Others are being worked outside of this procedure using other project processes and will be confirmed by the owner prior to commencing the load-out operation.

9. OPERATION

Herein will be listed the operative phases and related check for execution of the operation.

9.1 Trailers assembly

SPMT will be assembly at Rosetti yard by hydraulic service crane min SWL 60 t.

9.2 Preliminary check prior TOP SIDE loading operation

Preliminary check prior loading operation phases of items, the following checks shall be carried out (as applicable) under the supervision of SM with the assistance of TS.

1. Weather conditions are suitable for the execution of the operation.
2. Coordination information has been notified to the other Contractors working in the area.
3. All transportation equipment, installation aids, standard rigging hardware is available.
4. Drivers/operators have full understanding of the load-in Procedure and Safety Plan.
5. Immediately prior to the operation a 'tool box talk' will be held to explain in detail the extent of the operation and the procedures involved.
6. All required personnel (qualified drivers/operators, safety, signal persons, mechanics...) are available for the operation.
7. Before the operation, the work area will be clearly identified, and all unauthorized personnel excluded.
8. The clearance below the is suitable for SPMT insertion
9. Throughout the operation one clearly identified person (SM) will be in charge and it is only this person who is authorized to issue instructions to the equipment operators to commence. However, any person involved and conversant with the operation if they feel safety is being compromised is authorized to say STOP.
10. Organization/roles/responsibilities, communications plan have been defined and clearly understood by all the personnel involved in the operation.
11. Check that radio systems are functioning correctly.

9.3 Loading operation

The TOP SIDE is located internal of Rosetti yard. It'll be loaded directly by SPMT.
Loading operation shall not commence until MWS CoA has been issued.
The loading operation will be done after weighing activities. At this stage, the elevation of the TOP SIDE will be as follow:

The lower grillage structure elevation from ground level:

- TOP SIDE row A - A lower grillage structure height is 2400 mm;

- TOP SIDE row B - B lower grillage structure height is 2400 mm;
- TOP SIDE row C - C lower grillage structure height is 2400 mm.

The TOP SIDE will be finally loaded onto transport trailers by jacking up trailer platform, using the hydraulic stroke of same trailer.

The loading sequence will be as follow:

1. SPMT block will be transferred from the assembling nearly TOP SIDE area.
2. Loading of will start immediately after Client Superintendent (CS) authorization.
3. SPMT units will be maneuvered into position beneath the support point and will be positioned according to the transportation arrangement drawings to ensure accurate positioning. Make sure that trailers are hydraulically connected in the right way so that stability is grant and no overstress is induced in the steel structure of the TOP SIDE.
4. SPMT units will be gradually elevated to take the load by raising the SPMT's stroke till they are in contact with the bottom of the TOP SIDE upper grillage. Shim with plywood as required to have full contact between SPMT's and the contact point.
5. Take gradually: check that the pressure in the hydraulic circuits agrees with the predicted values.
6. Check that the TOP SIDE structure has no abnormal deflections
7. Another careful check will be made on the pressure of the hydraulic supporting groups and the level of the platform, before starting the lifting operation.
8. Lifting of the TOP SIDE, by hydraulic stroke of trailer, up to have 50 mm clearance between upper grillage structures and concrete block.
9. Check that the TOP SIDE/spreader beams structure has no abnormal deflections.
10. Check if the SPMT spine beam deflection is in accordance with the predicted calculation.
11. Another careful check will be made on the pressure of the hydraulic supporting groups and the level of the platform, before starting the lashing operations.
12. Lashing material will be installed as for DWG

9.4 Preliminary check prior starting inland transport

Before starting the inland transport of TOP SIDE, the following checks shall be carried out (as applicable) under the supervision of SM with the assistance of TS.

1. All lashing arrangement has been performed as for drawing.
2. Weather conditions are suitable for the execution of the operation: max operational wind speed = 10 m/s gust clear visibility (no fog, no heavy rain, and no snow).
3. Weather forecast are suitable for to carried out the operation
4. All spare contingency equipment / materials are available at the quay.
5. SPMT check list is done
6. Transport route and ro-ro jetty areas are clear from obstructions and the other working Contractors.

7. Rosetti CS together with Fagioli SM will check that at no point on the path of the SPMTs the terrain inclination will exceed the capability of the SPMTs to maintain a maximum of 1° of out of verticality.
8. Coordination information has been notified to the other Contractors working in the area by Rosetti
9. All transportation equipment, installation aids, standard rigging hardware are available.
10. Drivers/operators have full understanding of the load-in Procedure and Safety Plan.
11. Immediately prior to the operation, a 'tool box talk' will be held to explain in detail the extent of the operation and the procedures involved.
12. All required personnel (qualified drivers/operators, safety, signal persons, mechanics...) are available for the operation.
13. Before the operation, the work area will be clearly identified and all unauthorized personnel excluded.
14. Throughout the operation one clearly identified person (SM) will be in charge and it is only this person who is authorized to issue instructions to the equipment operators to commence. However, any person involved and conversant with the operation if they feel safety is being compromised is authorized to say STOP.
15. Organization/roles/responsibilities, communications plan have been defined and clearly understood by all the personnel involved in the operation.
16. Check that radio systems are functioning correctly.

9.5 Inland transport

The heavy transport operations shall be executed under the supervision of the SM, according to the transport drawings and Method Statement "issue for execution".

The SM/TS will be in contact by radio with the SPMT operators to instruct them during the operation. The TS will be constantly monitoring the operations for conformity with information elaborated during the engineering phase.

During the transportation phase, check:

1. The pressure in SPMT's hydraulic circuits remains in accordance with the anticipated values.
2. Upon arrival at the storage area, the TOP SIDE will be aligned with the barge long. axis.
3. The maximum speed doesn't exceed 0.5 Km/h
4. The pressure in SPMT's hydraulic circuits remains in accordance with the anticipated values.
5. For Yard maneuver to see DWG in appendix 2

9.6 Preliminary check prior load-out phase

Before starting the load-out convoy, the following checks shall be carried out (as applicable) under the supervision of SM with the assistance of TS.

1. Weather conditions are suitable for the execution of the loadout operation (with 24 hours forecast window): max operational wind speed = 10 m/s (3 s gust). (no fog, no heavy rain, no snow)
2. Weather forecast are suitable for carried out the operation
3. Sea conditions are within the operational limits (tides and swell)
4. Barge mooring is correctly/suitable
5. All spare contingency equipment / materials are available at the quay.
6. SPMT check list is done
7. Link span bridges are installed according to the drawing.
8. Jetties area are clear from obstructions and the other working Contractors.
9. Coordination information has been notified to the other Contractors working in the area.
10. Drivers/operators have full understanding of the load-out Procedure and Safety Plan.
11. Immediately prior to the operation, a 'tool box talk' will be held to explain in detail the extent of the operation and the procedures involved.
12. All required personnel (qualified drivers/operators, safety, signal persons, mechanics...) are available for the operation.
13. Before the operation, the work area will be clearly identified and all unauthorized personnel excluded.
14. Throughout the operation, one clearly identified person (SM-TS) will be in charge and He is only this person who is authorized to issue instructions to the equipment operators to commence. However any person involved and conversant with the operation if they feel safety is being compromised is authorized to say STOP.
15. Organization/roles/responsibilities, communications plan have been defined and clearly understood by all the personnel involved in the operation.
16. Check that radio systems are functioning correctly.

9.7 Load-out

The Load-out commence after the barge has been ballasted to the required draft. The barge will be moored with stern to quay side. When the barge mooring will be ready the barge bridge plates will be installed by Rosetti.
In charge of the load-out will be the SM who will be in constant radio contact with the barge load-out engineer (by Rosetti) and TS. SM/TS will be in constant radio contact with the experienced SPMT Operators who will steer and adjust SPMT height/elevation as the SPMT's negotiate the change in elevation of the ramps.
The barge moorings will be checked periodically by visually inspection.
The SPMT's will pause periodically in line with the flow rate of the ballast pumps to maintain the barge level with the quay during all stages of the transfer operation.

Load-out operation must take care of the following steps:

1. The SPMT's are ready;

2. When the BARGE is in level with the quay, at the suitable tide the SPMT will start moving slowly on bridge steel plates. Travelling speed will be synchronized with the BARGE ballasting.
3. Ballast Engineers shall instruct the SM to move and to stop. The BARGE ballast system shall work to keep even keel throughout the roll-on.
4. Do not overtake the maximum travelling speed (0.5 km/h); synchronize the movement with the BARGE ballasting.
5. The SM shall monitor the level of the bridge plates.
6. The BARGE mooring shall be continuously monitored by visually checking the mooring lines' catenaries and mooring lines' terminations.
7. Mooring winches are appropriately tensioned and ready for loadout.
8. Level difference between BARGE and quay shall not exceed 0mm/+100 mm
9. The Load-out will continue until Load transfer is complete i.e. last axle of SPMT's is on the BARGE.
10. The transport convoy will move forward (bow side) up to reach the TOP SIDE BARGE final location

During TOP SIDE load-out activities the SPMT height will be kept at approx. 1500 mm.

9.8 Preliminary check before TOP SIDE lowering activities on BARGE grillage

Before starting the TOP SIDE final lowering on grillage, the following checks shall be carried out (as applicable) under the supervision of SM with the assistance of TS.

1. TOP SIDE position is in accordance with stowage plan
2. Weather conditions are suitable for the execution of the lowering operation (with 24 hours forecast window): max operational wind speed = 16 m/s (3 s gust). (no fog, no heavy rain, no snow)
3. Sea conditions are within the operational limits (tides and swell)
4. BARGE mooring is correctly/suitable
5. All spare contingency equipment / materials are available at the quay.
6. Coordination information has been notified to the other Contractors working in the area.
7. Drivers/operators have full understanding of the load-out Procedure and Safety Plan.
8. Immediately prior to the operation, a 'tool box talk' will be held to explain in detail the extent of the operation and the procedures involved.
9. All required personnel (qualified drivers/operators, safety, signal persons, mechanics...) are available for the operation.
10. Before the operation, the work area will be clearly identified and all unauthorized personnel excluded.
11. Throughout the operation one clearly identified person (SM) will be in charge and He is only this person who is authorized to issue instructions to the equipment operators to commence. However, any person involved and conversant with the operation if they feel safety is being compromised is authorized to say STOP.
12. Check that radio systems are functioning correctly.

9.9 TOP SIDE lowering on BARGE grillage phase

The unloading operation for TOP SIDE will start after the convoy will be in final position in accordance with stowage plan.
The TOP SIDE will be finally seated onto lower grillage by jacking down trailer platform, using the hydraulic stroke of same trailer.

The lower grillage structure on BARGE will have the following height:

- TOP SIDE row A lower grillage structure height is 2450mm
- TOP SIDE row B lower grillage structure height is 2450mm
- TOP SIDE row C lower grillage structure height is 2450mm

Due of spreader/spacer equipment design, the trailer contact height – i.e. the height of the trailer load bed at the time of first contact with the lower grillage structure – is:

- TOP SIDE row A: height 1600 mm
- TOP SIDE row B: height 1600 mm
- TOP SIDE row C: height 1600mm

Unloading operation must take care of the following steps:

1. The SPMT's bed lowers up to get 10 mm clearance from TOP SIDE upper grillage structure to BARGE grillage
2. Another position check will be made from SM and load-out engineer
3. 50% weight download on lower grillage: by SPMT lifting system
4. Check of gap on each support point
5. TOP SIDE weight resuming on SPMT system.
6. Shimming insertion on required location between lower grillage and upper grillage, if any.
7. Complete TOP SIDE weight download on lower grillage.
8. Transport lashing material removal
9. SPMT removal

10. DECISION TO DISCONTINUE THE LOAD-OUT

This section describes the condition which would require discontinuing load-out operations.
This decision will be made as a result of a major failure of load-out system and only if it is safer to discontinue than to continue with the load-out operation.
The decision to postpone or terminate the load-out operation has to be taken after technical discussion among all Parties (Client / MWS / Fagioli / Contractor / Subcontractor).

Load-out shall stop and the TOP SIDE shall be made safe if any of following conditions occur:

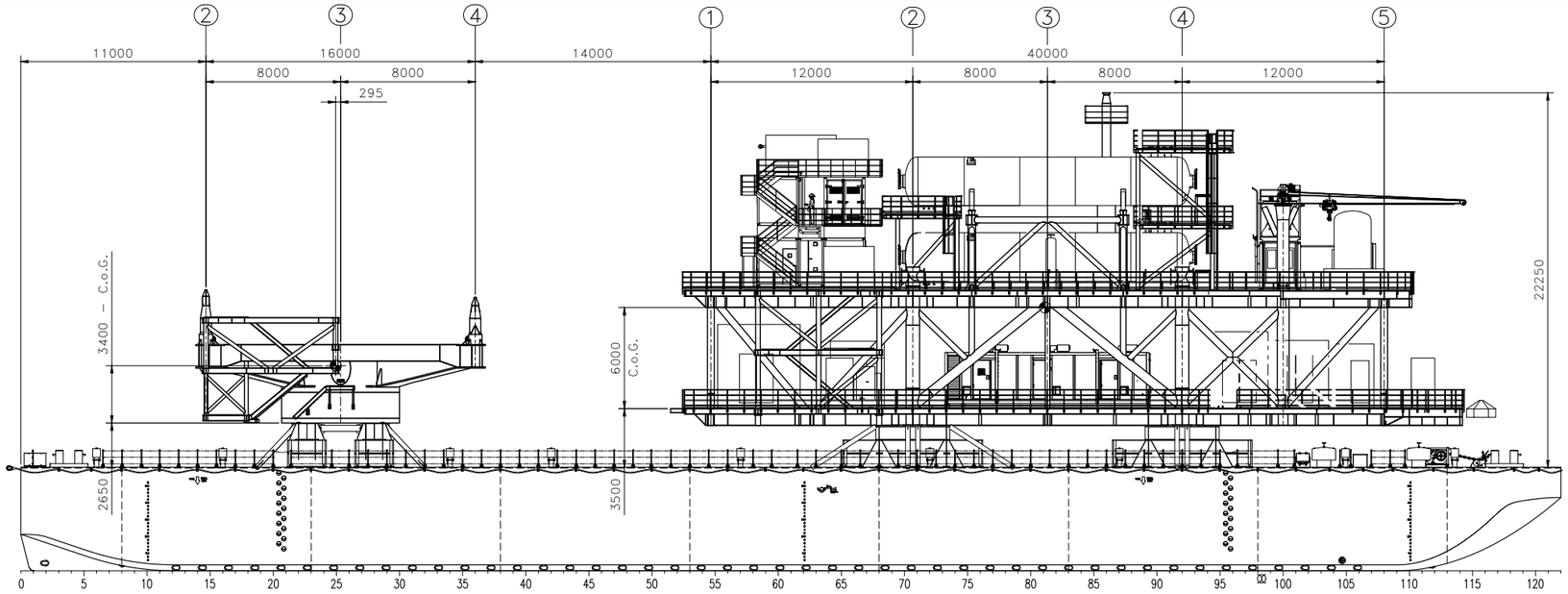
a) If a problem develops with the stability or buoyancy of the BARGE (see Client contingency plan).
b) If a problem develops with the mooring of the BARGE (temporary stop, see Client contingency plan).
c) If a problem develops with the SPMTs (see attachment – SPMT's contingency plan).
d) If a problem develops with ballasting system failure (temporary stop, see Client contingency plan).

11. ATTACHMENT

11.1 Client drawings

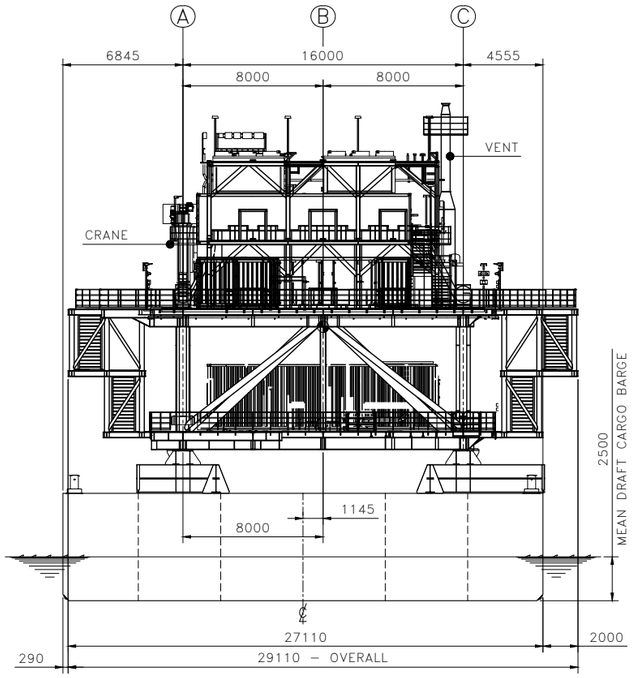
DRAWING NO. 123A90-DDL-TI-DD-99015

REV. 02



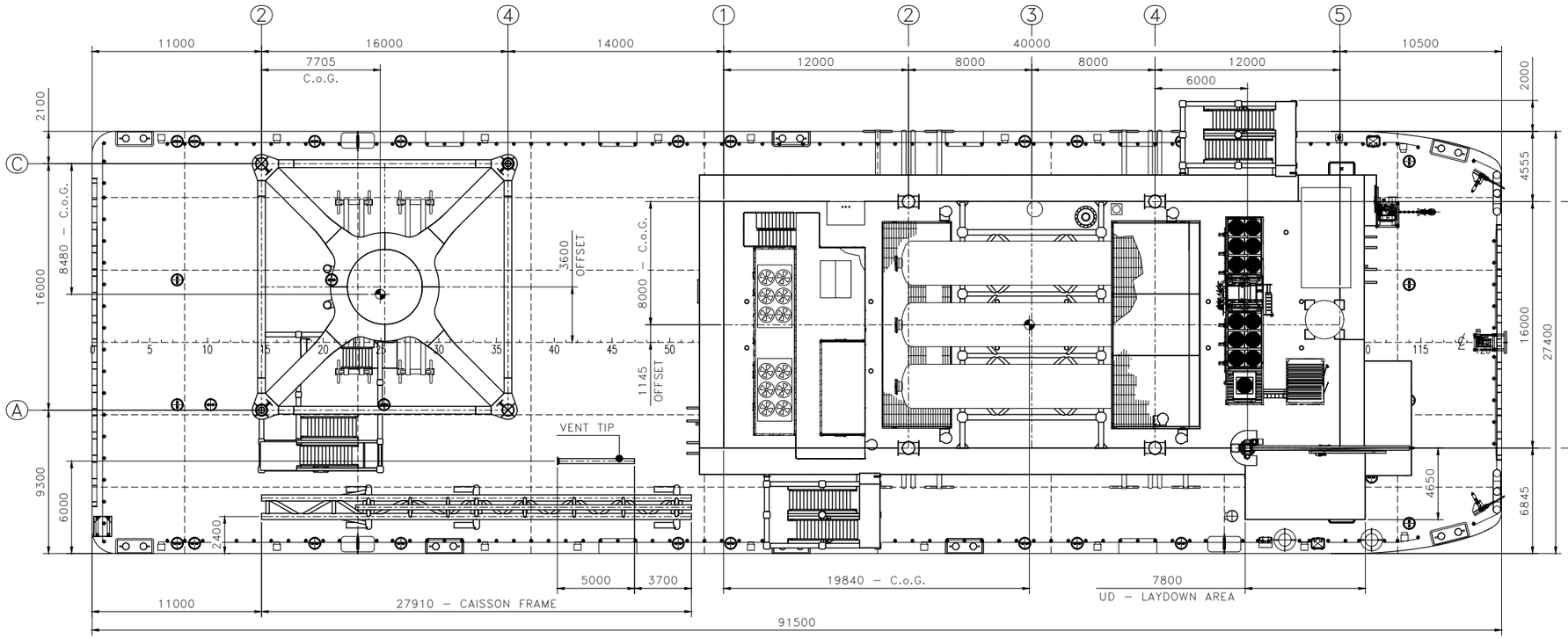
ELEVATION – LONGITUDINAL VIEW

SCALE 1:175



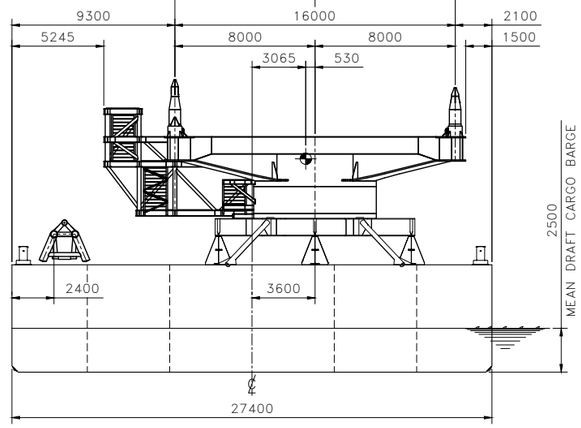
TOPSIDE – TRANSVERSAL SECTION

SCALE 1:175



BARGE LAYOUT – PLAN VIEW

SCALE 1:175



TP – TRANSVERSAL SECTION

SCALE 1:175

02

STAN PONTOON - B27		
LENGTH	= 300' 0"	91.500 m
BREADTH	= 90' 0"	27.400 m
DEPTH	= 20' 0"	6.100 m
DRAUGHT ABT	= 15' 75"	4.800 m
UNIFORM DECK LOAD	= 20 T/sqm	

WEIGHT LIST	
TOPSIDE	= 1830 t
TP	= 280 t
TOPSIDE GRILLAGE & SF	= 100 t
TP GRILLAGE & SF	= 45 t
CAISSON FRAME	= 26 t
VENT TIP	= 0.4 t

NOTES	HOLDS
1 – ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS U.N.O. 2 – ALL ELEVATIONS ARE REFERED TO C.D.	

TECON

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	11/09/24	SGR	AB	DLS	ACCEPTED FOR CONSTRUCTION (AFC)
01	05/02/24	SGR	AB	DLS	ACCEPTED FOR CONSTRUCTION (AFC)
00	12/01/24	SGR	AB	DLS	ISSUE FOR REVIEW (IFR)

CROSSWIND

ROSETTI MARINO

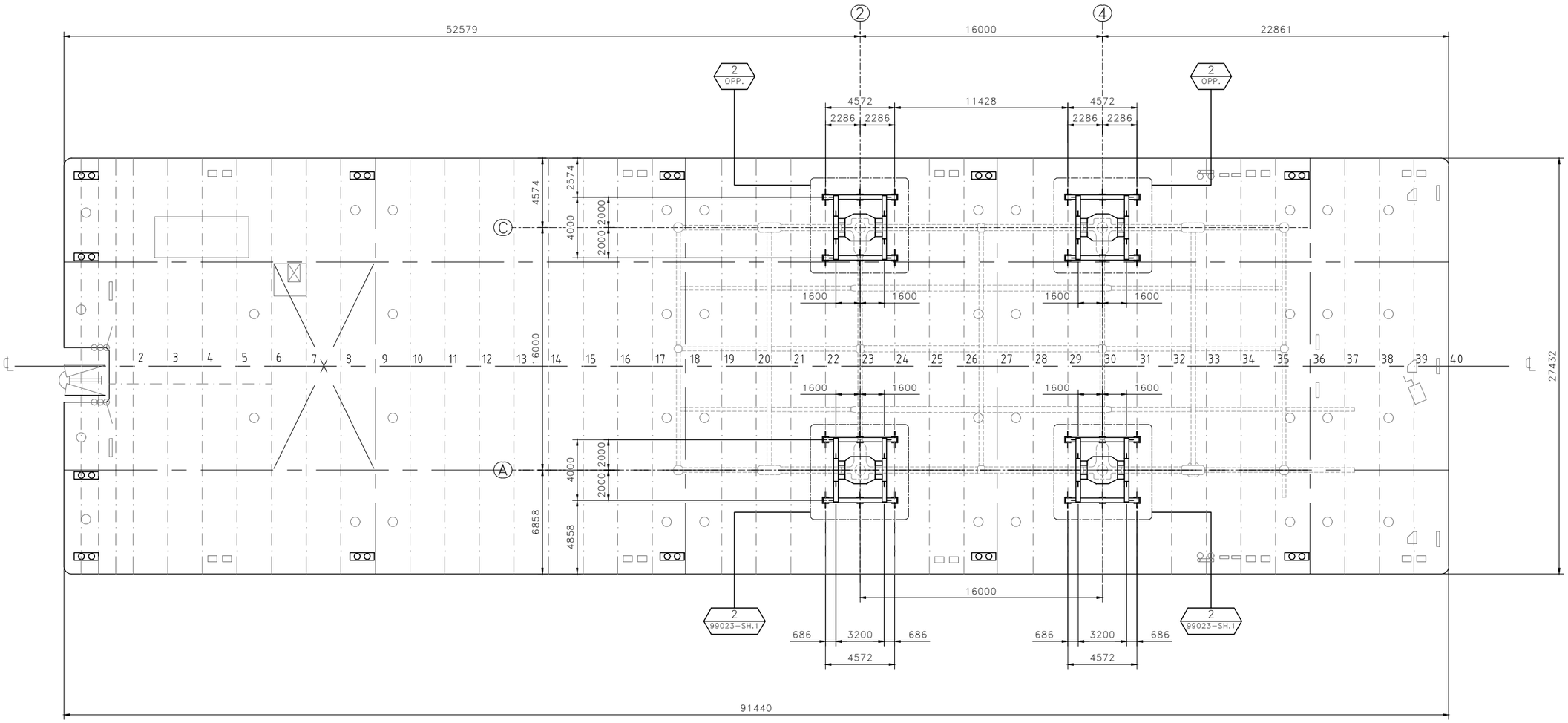
TITLE : BASE LOAD POWER HUB (BLPH)
BARGE LAYOUT

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE 1:175
DRAWN S.GRIFFINI	CHECKED A.BALZAROTTI	APPROVED D.LO STERZO	DATE 11/09/24
A1	DRAWING NO. 123A90-DDL-TI-DD-99015	SHEET 001	REV. 02

File Name : 123A90-DDL-TI-DD-99015_02.dwg

DRAWING NO. 123A90-DDL-TI-DD-99021

REV. 01



TOP SIDE – GRILLAGE – ASSEMBLY

SCALE 1:150

NOTES

1 – ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS U.N.O.
2 – ALL ELEVATIONS ARE REFERED TO C.D.

HOLDS

REFERENCE DRAWINGS

DWG No.	DESCRIPTION
123A90-DDL-ST-DD-90025	DRAWING LIST
123A90-DDL-ST-DD-90026	GENERAL NOTES
123A90-DDL-TI-DD-99022	TOP SIDE – GRILLAGE ROW C – PLAN AND SECTION
123A90-DDL-TI-DD-99023	TOP SIDE – GRILLAGE ROW A – PLAN AND SECTION

TECON

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
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00	20/01/25	SGR	AB	DLS	ISSUE FOR REVIEW (IFR)

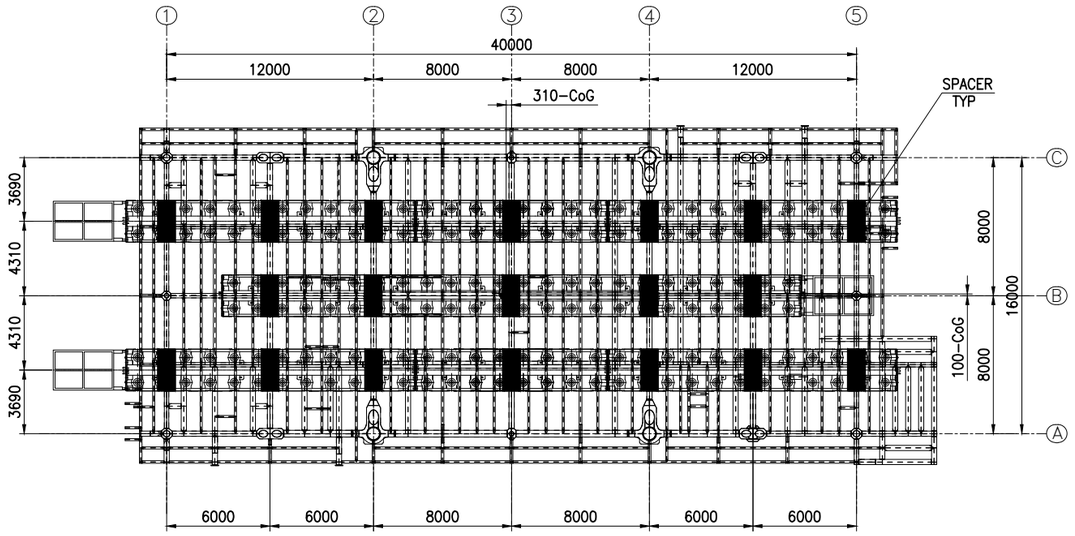
CROSSWIND

ROSETTI MARINO

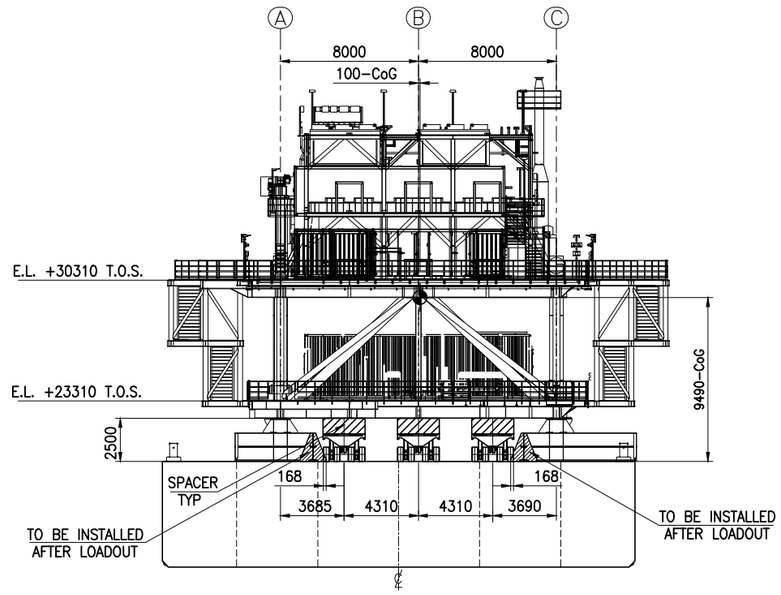
TITLE : BASE LOAD POWER HUB (BLPH)
TOP SIDE – GRILLAGE
ASSEMBLY

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE 1:150
DRAWN S.GRIFFINI	CHECKED A.BALZAROTTI	APPROVED D.LO STERZO	DATE 14/02/25
A1	DRAWING NO. 123A90-DDL-TI-DD-99021	SHEET 001	REV. 01

File Name : 123A90-DDL-TI-DD-99021_01.dwg



TOPSIDE – PLAN VIEW
ITEM WEIGHT=1802 T



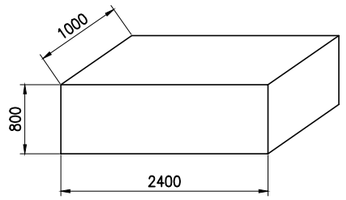
BARGE – TRANSVERSAL SECTION

NOTES

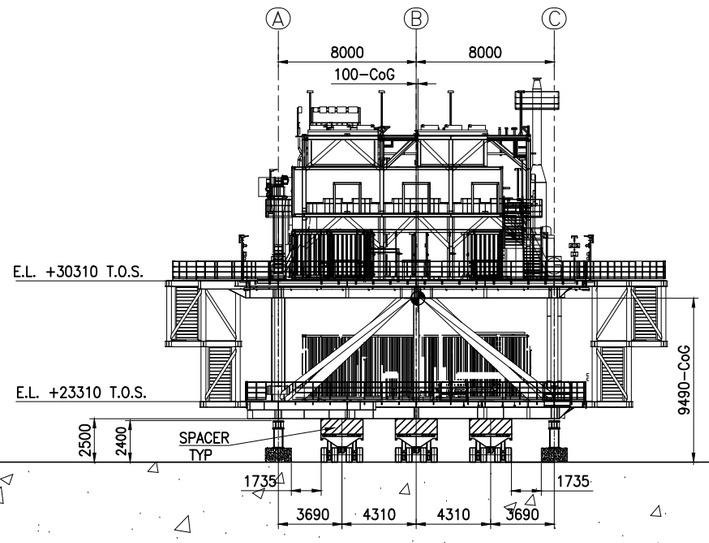
1 – ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS U.N.O.
2 – ALL ELEVATIONS ARE REFERED TO C.D.
3 – LOADOUT DESIGN GROSS WEIGHT AND CoG AS PER WCR REV.03

TYP SPACER DETAIL

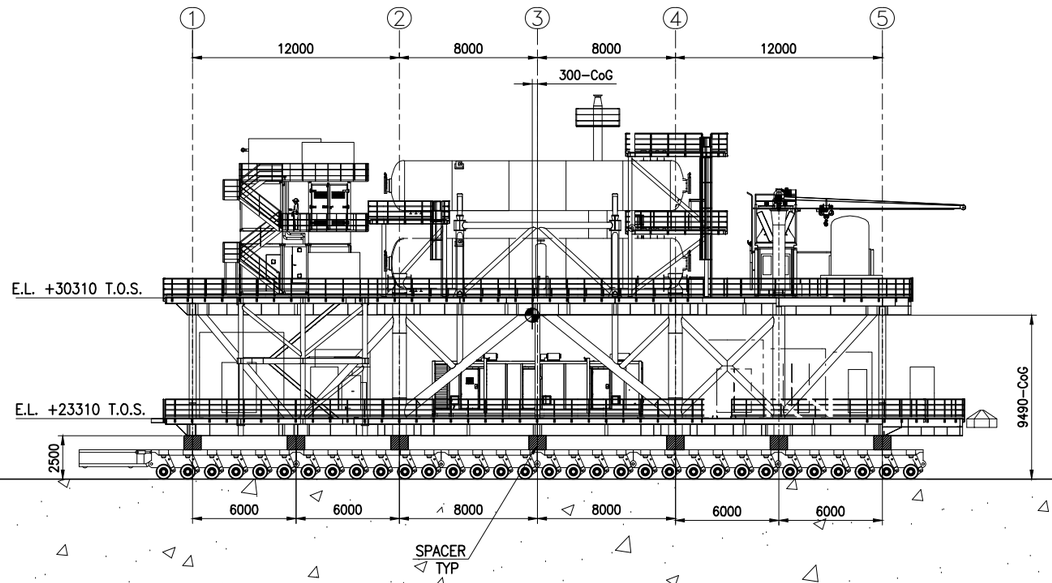
SUPPORT POINT SPMT – STRUCTURE



No. 19 PCS REQD



YARD – TRANSVERSAL SECTION



TOPSIDE – LONGITUDINAL VIEW

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

TECON

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	02/10/24	AG	FC	CA	

CROSSWIND

ROSETTI MARINO

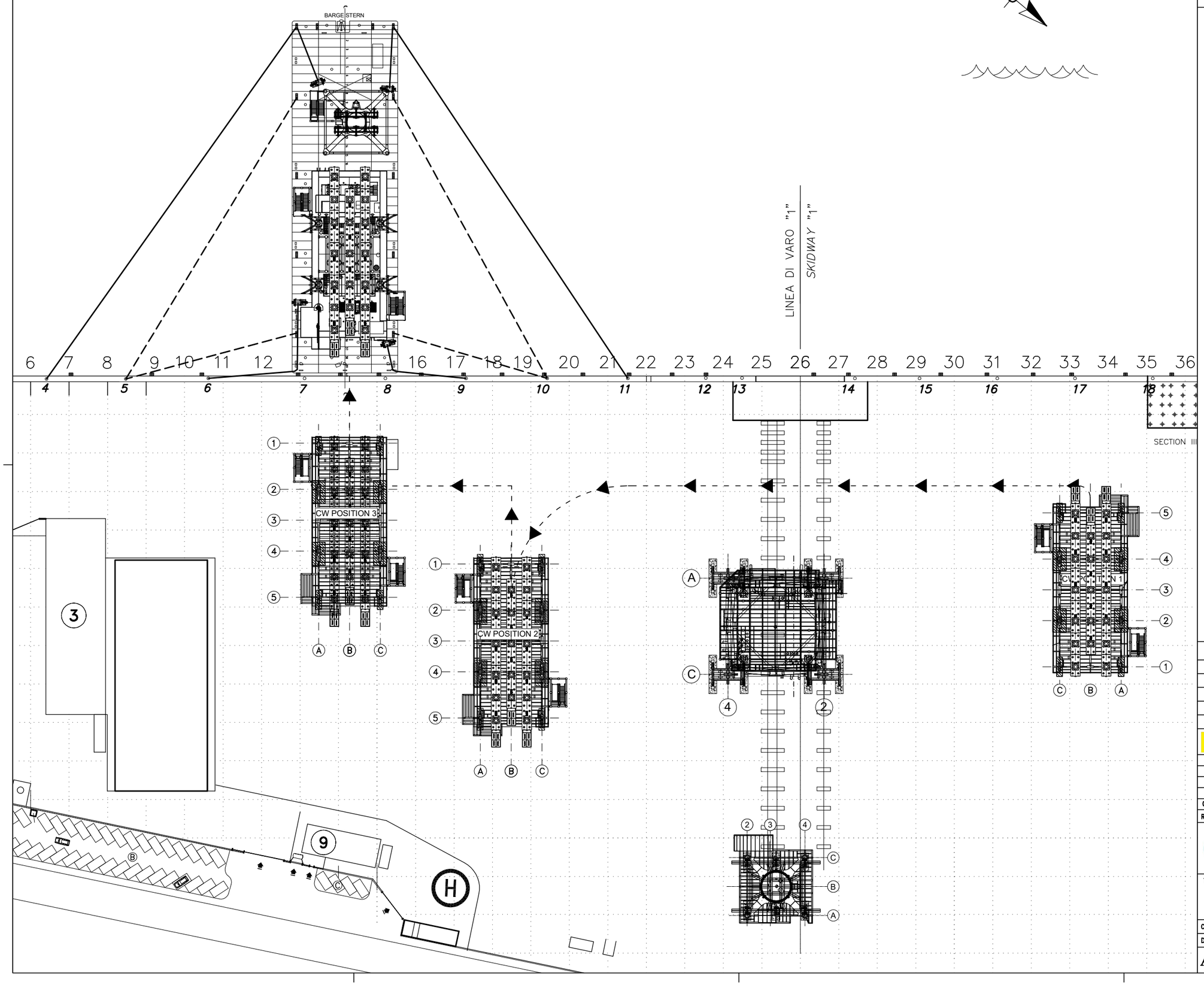
TITLE :

TOPSIDE LOADOUT – SPMT CONFIGURATION

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK .			SCALE
DRAWN A.GASPERONI	CHECKED F.CERONI	APPROVED C.ANTONELLINI	DATE 02/10/24

A1	DRAWING NO. 123A90-FDL-MT-DD-00401	SHEET 001	REV. 00

STEP 2



NOTES

1 – ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS U.N.O.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

TECON

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	27/05/25	GS	FC	CA	ISSUED FOR CONSTRUCTION

CROSSWIND

ROSETTI MARINO

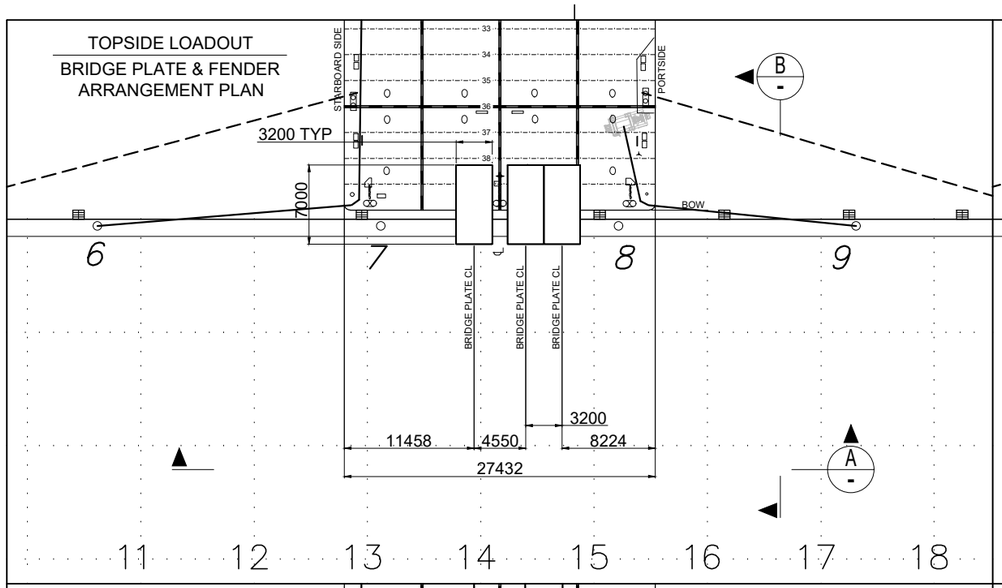
TITLE :

BASE LOAD POWER HUB (BLPH)
CROSSWIND LOADOUT
YARD LAYOUT – STEP 2

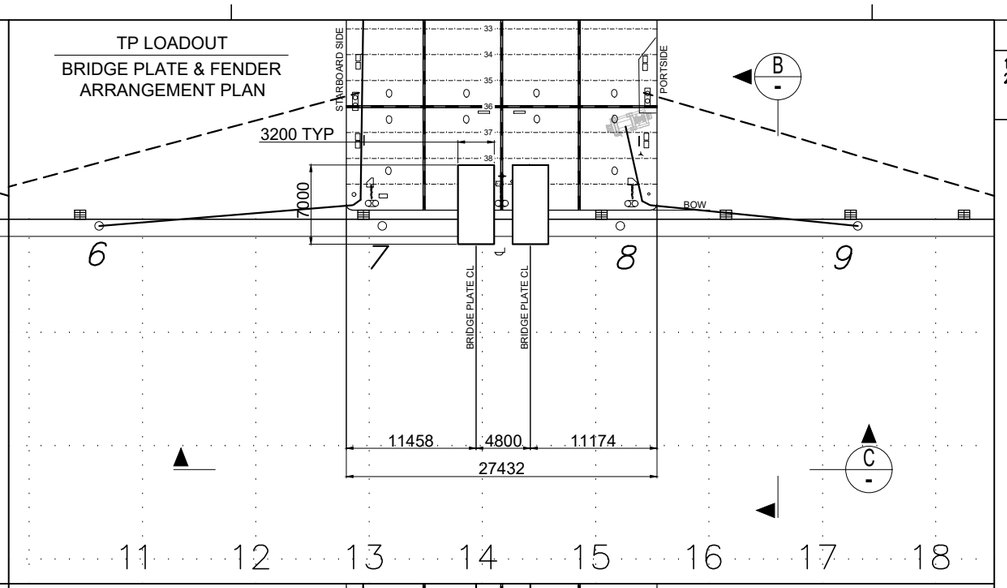
CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE
DRAWN G.SEGURINI	CHECKED F.CERONI	APPROVED C.ANTONELLINI	DATE 27/05/25

A1	DRAWING NO. 123A90-FDL-MT-DD-00403-00	SHEET 001	REV. 00

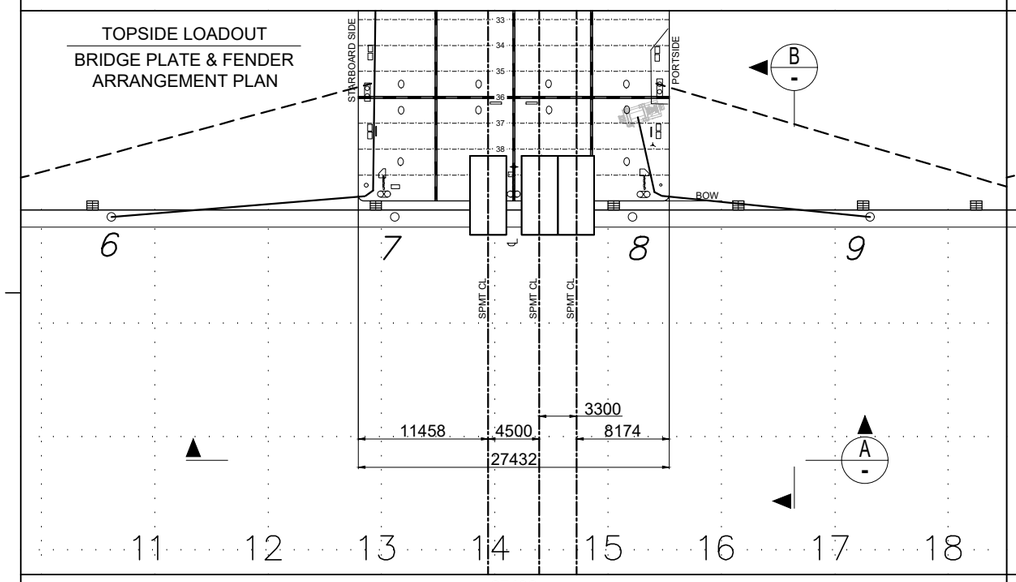
TOPSIDE LOADOUT
BRIDGE PLATE & FENDER
ARRANGEMENT PLAN



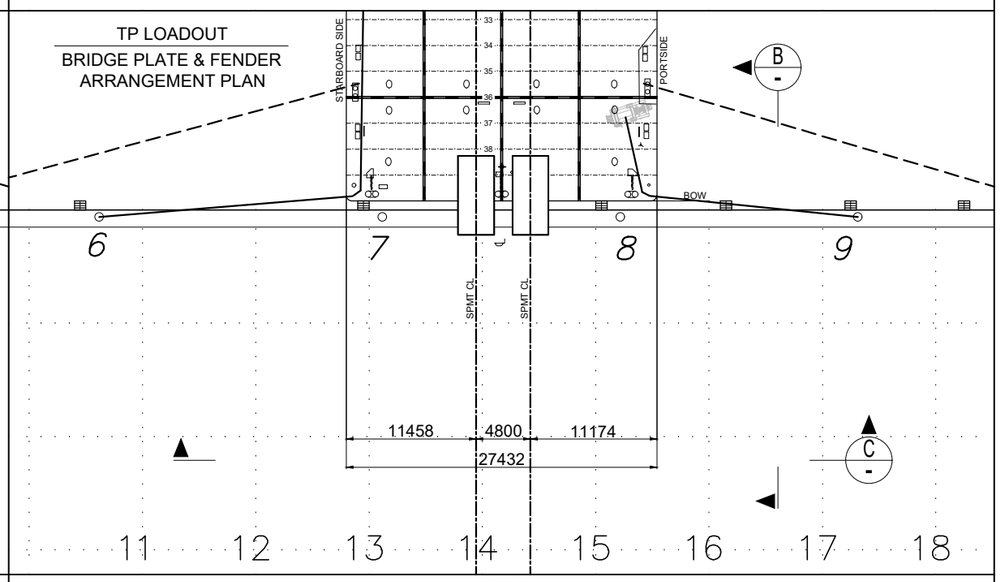
TP LOADOUT
BRIDGE PLATE & FENDER
ARRANGEMENT PLAN



TOPSIDE LOADOUT
BRIDGE PLATE & FENDER
ARRANGEMENT PLAN

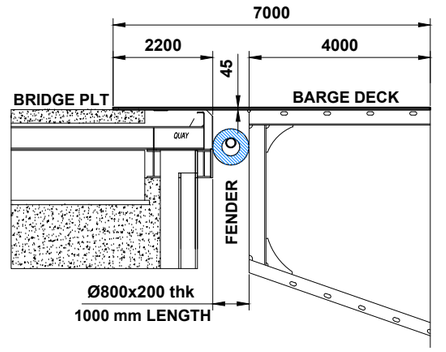


TP LOADOUT
BRIDGE PLATE & FENDER
ARRANGEMENT PLAN



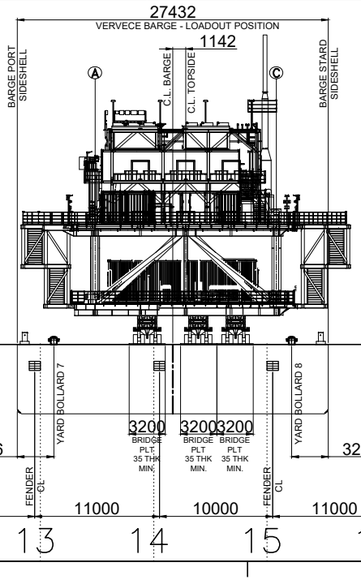
NOTES

1 – ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS U.N.O.
2 – PLATES FOR LOADOUT ARE 7000x3200x35 min

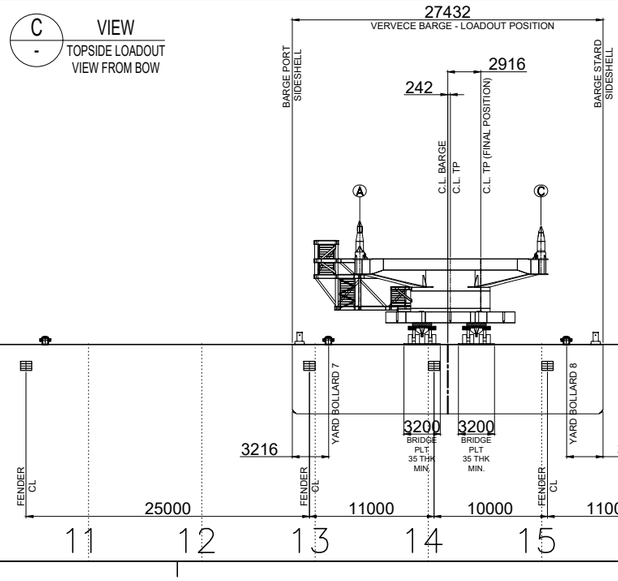


B / - VIEW
TYP SECTION

A / - VIEW
TOPSIDE LOADOUT
VIEW FROM BOW



C / - VIEW
TOPSIDE LOADOUT
VIEW FROM BOW



REFERENCE DRAWINGS

DWG No.	DESCRIPTION

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
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00	03/03/25	CB	FC	CA	

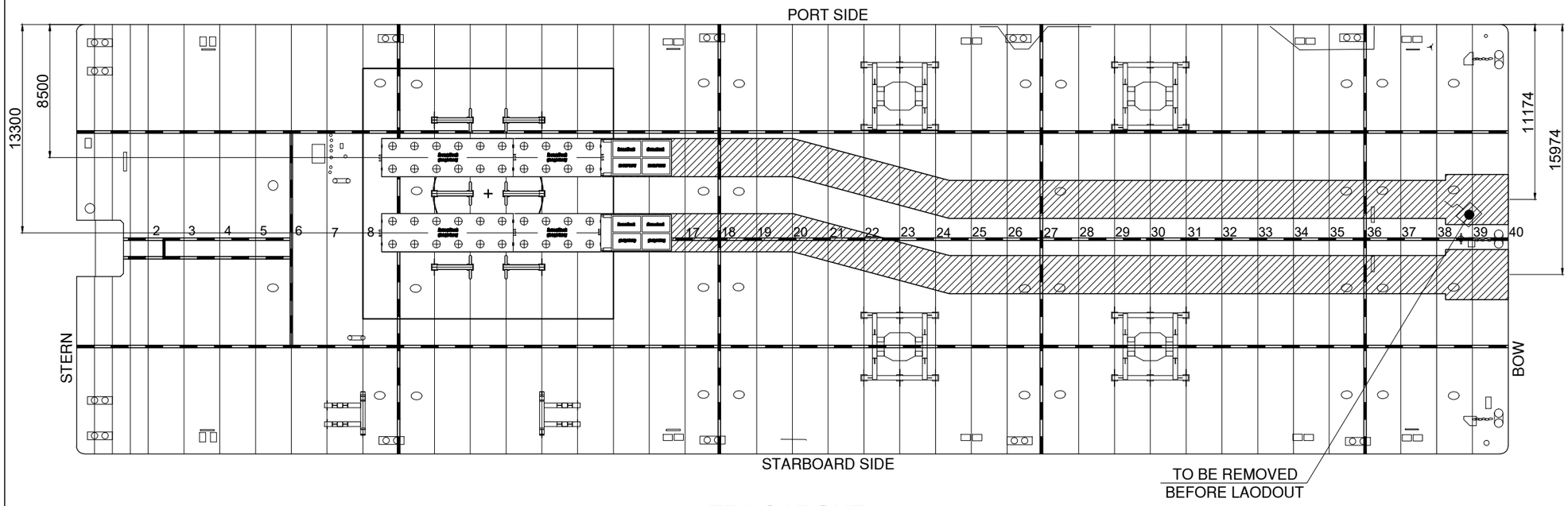
CROSSWIND

ROSETTI MARINO

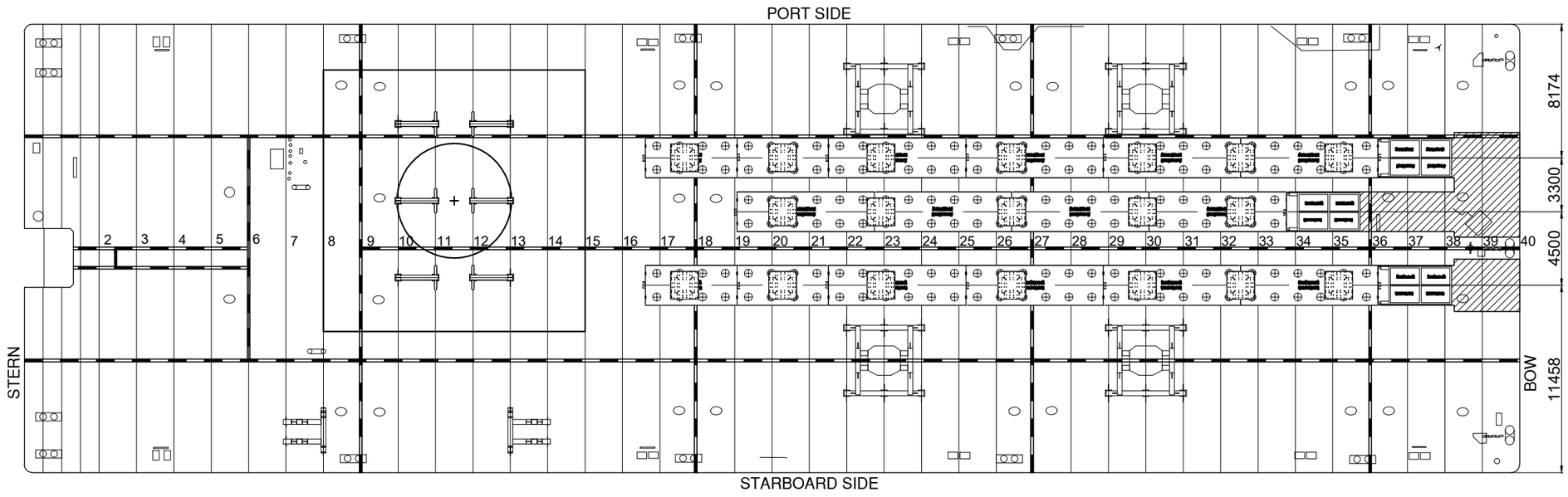
TITLE :
BASE LOAD POWER HUB (BLPH)
BRIDGE PLT & FENDERS
GENERAL ARRANGEMENT

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE
DRAWN C.BENZONI	CHECKED F.CERONI	APPROVED C.ANTONELLINI	DATE 12/06/25

A1	DRAWING NO. 123A90-FDL-MT-DD-00407-01	SHEET 001	REV. 01



TP LOADOUT



TOPSIDE LOADOUT

NOTES

1 – ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETERS U.N.O.

REFERENCE DRAWINGS

DWG No.	DESCRIPTION

TECON

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
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00	30/05/25	GS	FC	CA	ISSUED FOR CONSTRUCTION

CROSSWIND

ROSETTI MARINO

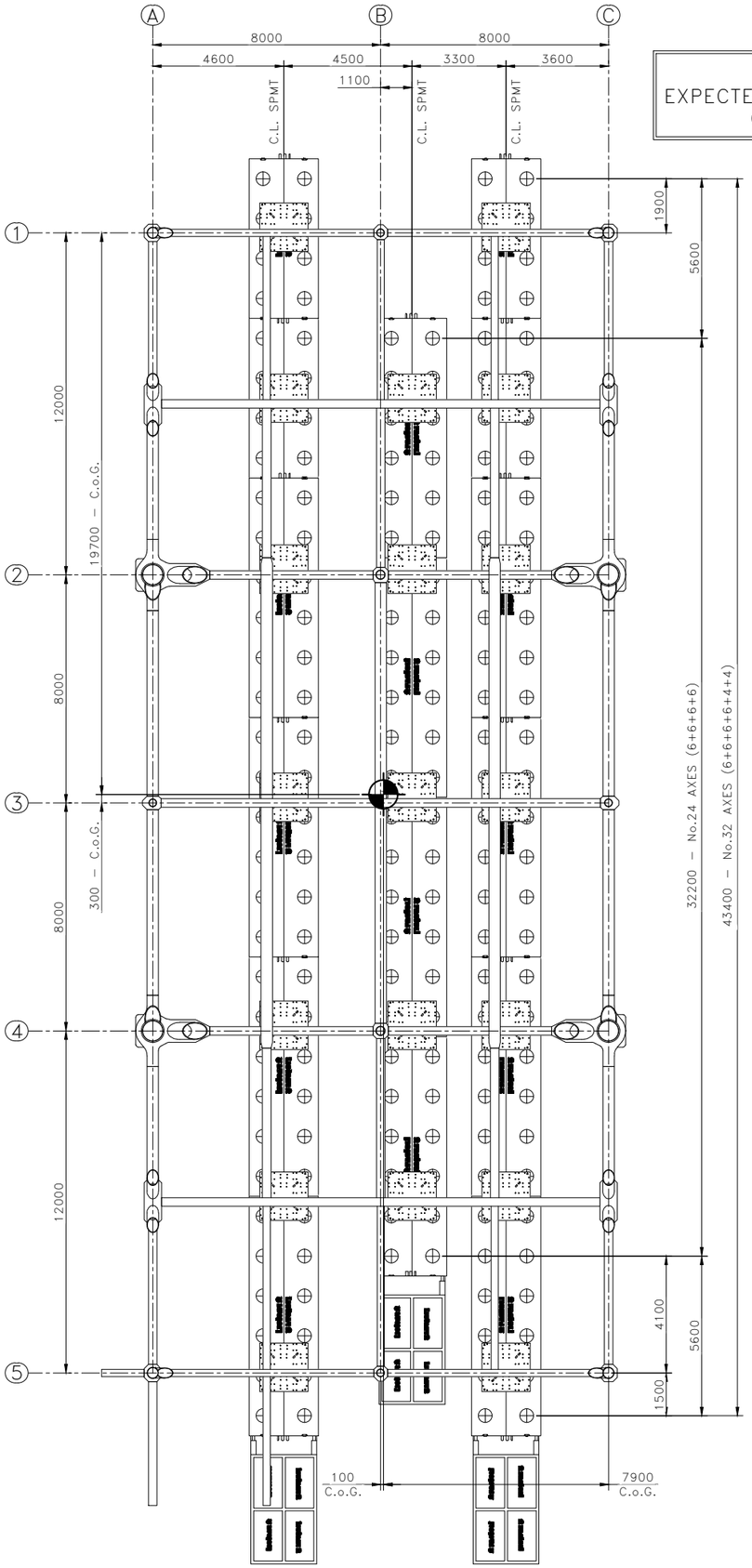
TITLE :
BASE LOAD POWER HUB (BLPH)
LOADOUT TOPSIDE & TP
SPMT PATH ON BARGE

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK . | SCALE

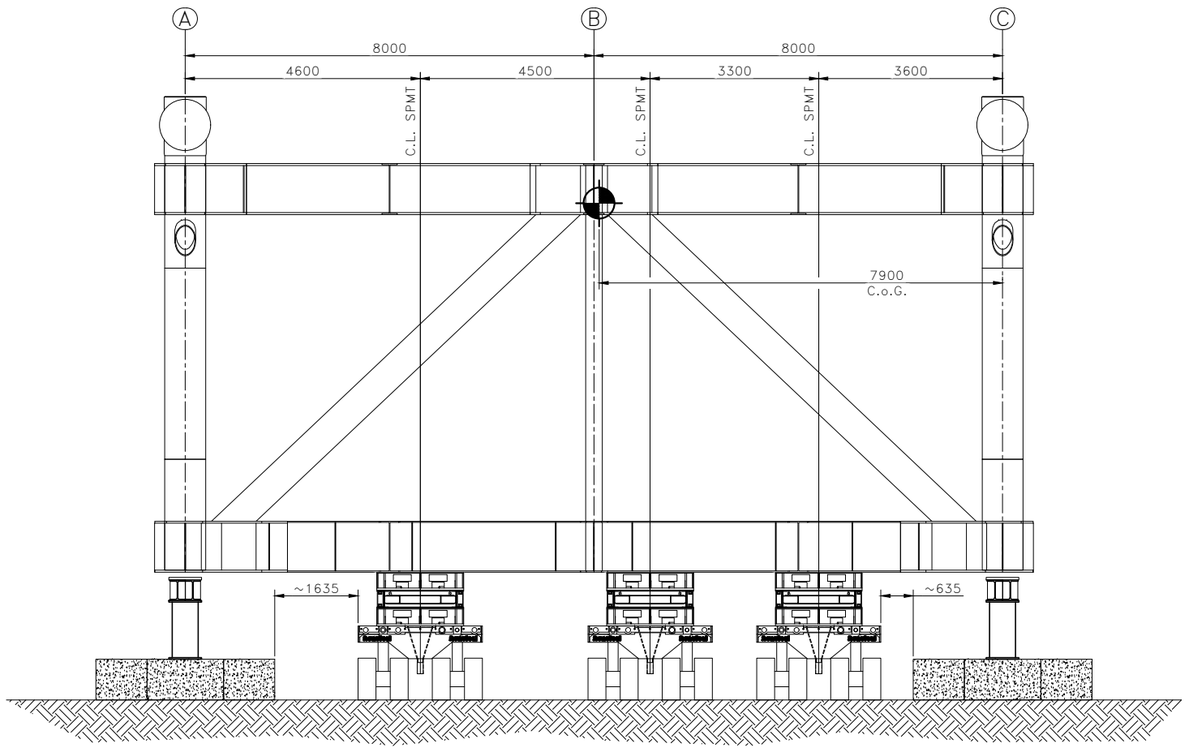
DRAWN G.SEGURINI | CHECKED F.CERONI | APPROVED C.ANTONELLINI | DATE 12/06/25

A1 | DRAWING NO. 123A90-FDL-MT-DD-00409-00 | SHEET 001 | REV. 01

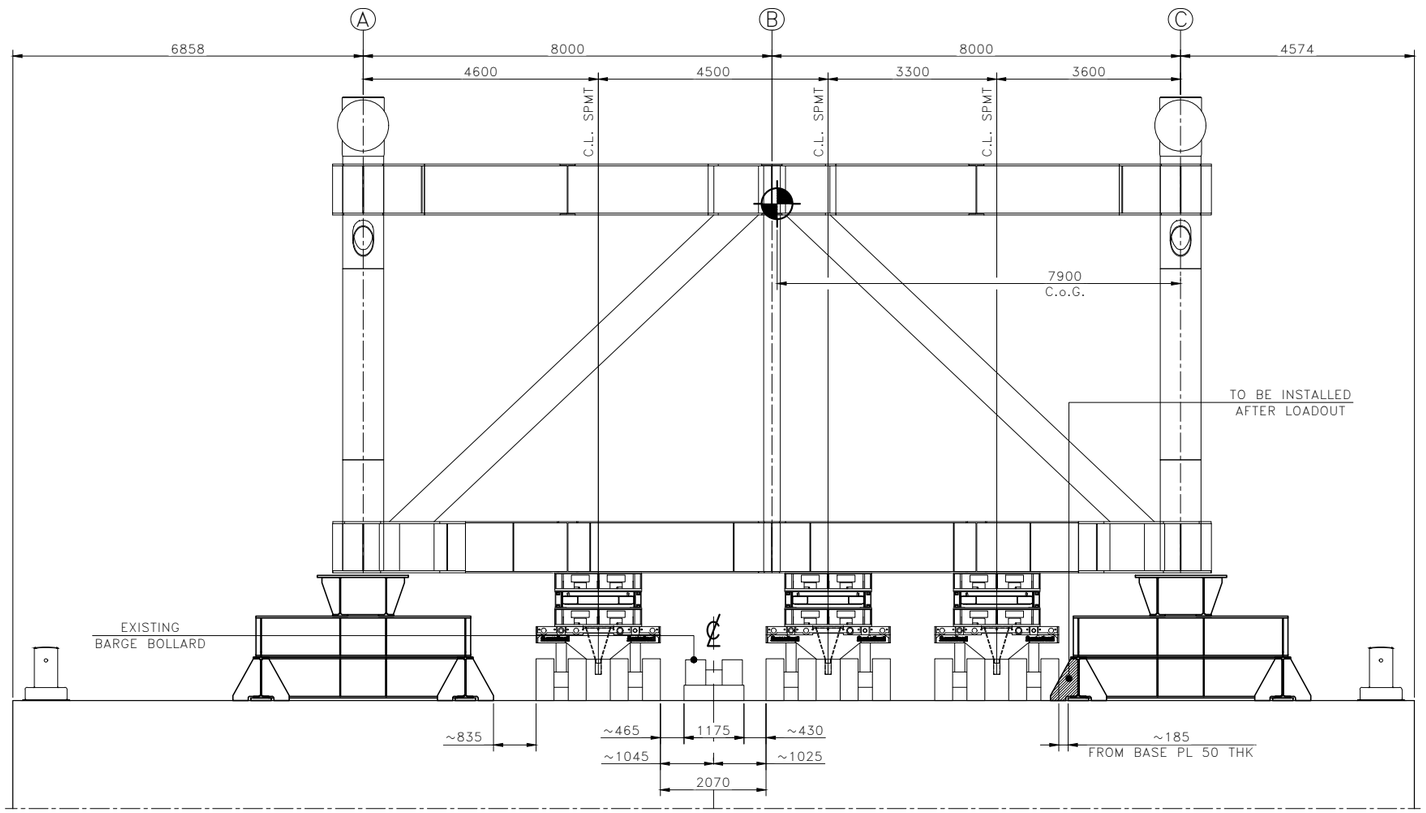
LOADOUT
EXPECTED WEIGHT = 1802 ton
(CONTINGENCY INCLUDED)



TOPSIDE – LOWER DECK – PRIMARY STEEL
SCALE 1:100



TOPSIDE – TRANSVERSAL VIEW AT YARD
SCALE 1:60



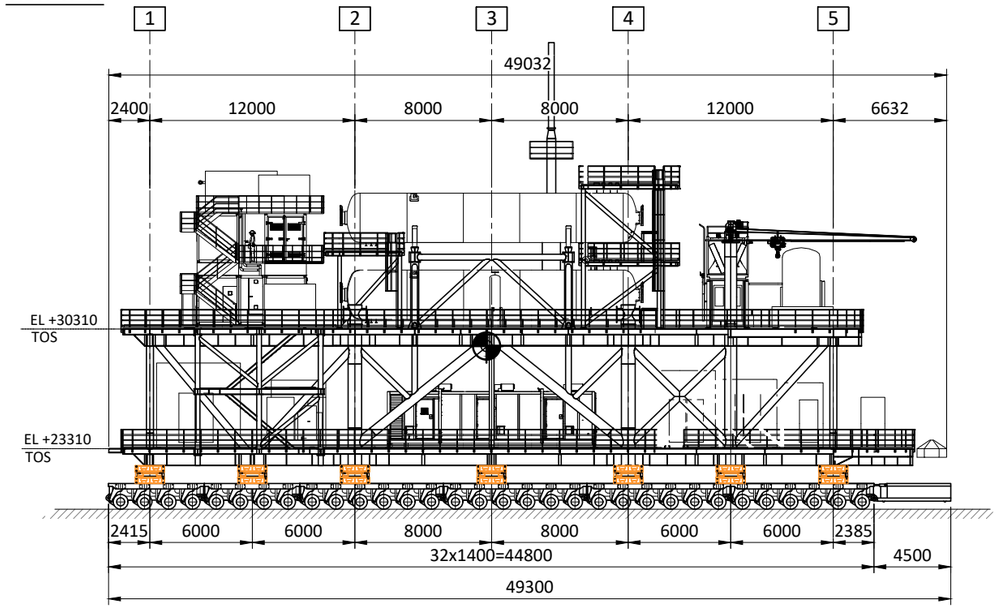
TOPSIDE – TRANSVERSAL VIEW AT BARGE
SCALE 1:60

TKtecon
ROS1783 – SK-011_02 10.06.2025

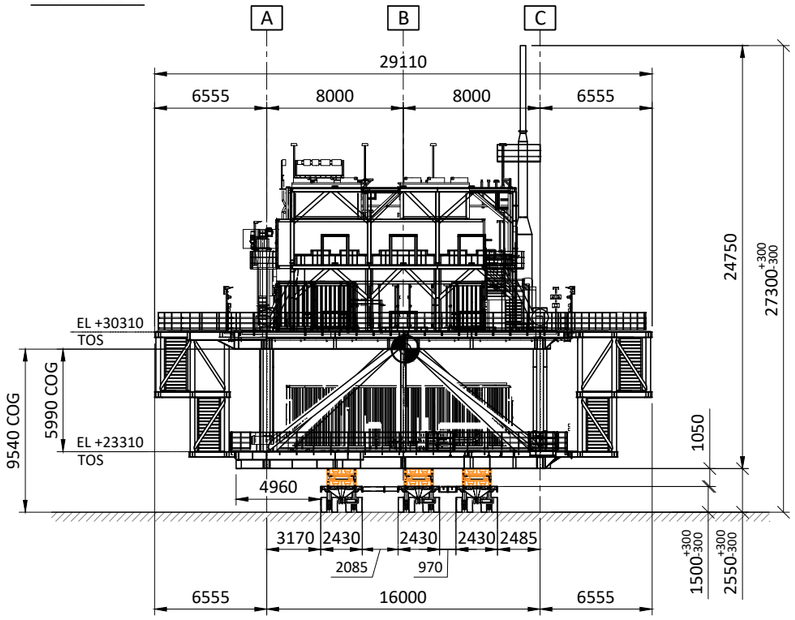
11.2 Fagioli drawings

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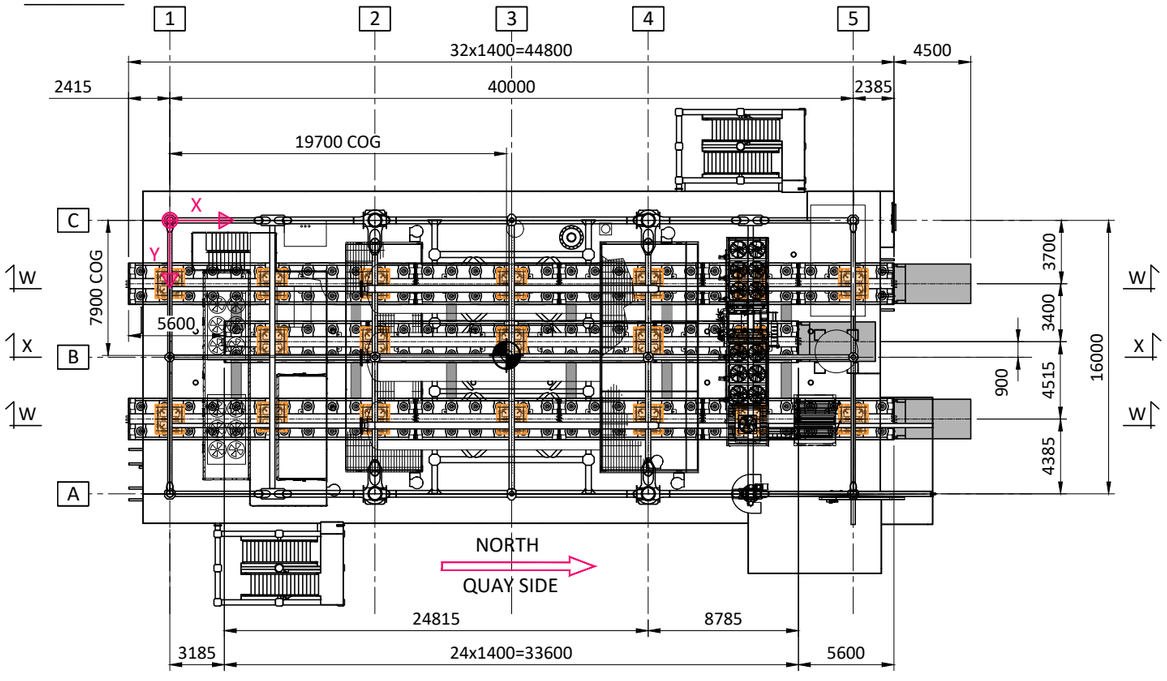
VIEW W-W



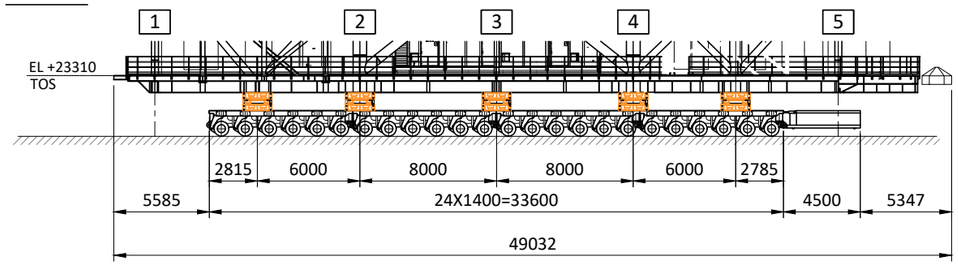
FRONT VIEW



PLAN VIEW

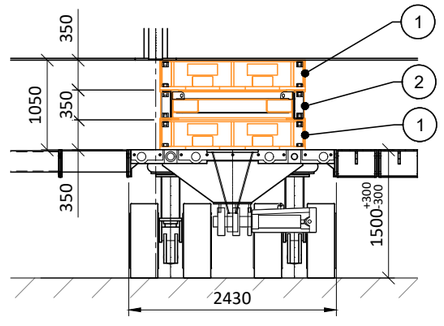


VIEW X-X



EQUIPMENT DETAIL

scale x5



MATERIAL LIST

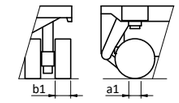
#	DESCRIPTION	WEIGHT cad. (Kg)	Q.TY TOT
1	TWR 17.00 1700x1700x350 mm	2050.0	38
2	TWR 17.01 1700x1700x350 mm	525.0	19
TOTAL WEIGHT (Kg)			87875.0

TRANSPORT CONFIGURATION: 88 AXLES

ITEM weight (contingency included)			**1802 t**
SPMT dead weight			392,1 t
EQUIPMENT weight			87,875 t
TOTAL weight			2282 t
		BASE VALUES	**MAX VALUES**
Group A 22 AXLES	Weight per axles	28,6 t	36,2 t
	Capacity per axles	48,0 t	48,0 t
	Cylinder pressure	171 bar	219 bar
	Contact pressure under the wheel	8,5 kg/cm²	9,4 kg/cm²
	Average Ground pressure	8,4 t/m²	10,6 t/m²
Group B 22 AXLES	Weight per axles	28,6 t	36,2 t
	Capacity per axles	48,0 t	48,0 t
	Cylinder pressure	171 bar	219 bar
	Contact pressure under the wheel	8,5 kg/cm²	9,4 kg/cm²
	Average Ground pressure	8,4 t/m²	10,6 t/m²
Group C-D 44 AXLES	Weight per axles	23,3 t	28,6 t
	Capacity per axles	48,0 t	48,0 t
	Cylinder pressure	139 bar	171 bar
	Contact pressure under the wheel	7,8 kg/cm²	8,5 kg/cm²
	Average Ground pressure	6,9 t/m²	8,4 t/m²

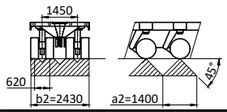
LOCAL WHEEL BEARING AREA [a1xb1] = $[\frac{P}{(n*p)}]$

where P = weight per axle (kg)
n = number of wheels for axle (4)
p = contact pressure under the wheel (kg/cm²)



GLOBAL LOADED AREA BELOW CONVOY [a2xb2] = $[\frac{P}{p2}]$

where P = weight per axle (kg)
p2 = average ground pressure (kg/cm²)



OPERATIONAL PARAMETERS:
- MAX TRAVELING SPEED: 0.5 km/h
- MAX OPERATIONAL WIND SPEED : 16.0 m/s
- MINIMUM REQUIRED GROUND BEARING CAPACITY: 10.8 t/m²
- THE GROUND SHALL BE COMPACTED AND LEVELED. MAX SLOPE:1%
- ALLOWABLE TRANSVERSE INCLINATION OF CONVOY(OUT OF VERTICALITY): 1°
- ALLOWABLE LONGITUDINAL INCLINATION OF CONVOY (OUT OF VERTICALITY):1°
- AXLES PRESSURE SHALL BE CONTINUOUSLY CHECKED, ACTING ON THE HYDRAULIC SYSTEM TO COMPENSATE ANY DEVIATION RESPECT TO THE EXPECTED VALUES. USE WATER LEVEL TO CHECK SPMT OUT OF VERTICALITY .

NOTE:
1. MODULE WEIGHT: 1802 t (NET WEIGHT +0.00% CONT. INCLUDED).
2. MODULE WEIGHT AND COG AS PER CLIENT DOCUMENT: 123A90-FDL-MT-DD-00401 (Last Rev) 123A90-DDL-TI-DD-99015 (Last Rev)
3. MAX VALUES INCLUDE ALL THE EFFECTS SUCH AS WIND, OUT OF VERTICALITY, COG ENVELOPE.
4. TIPPING ANGLE: 16.2°
5. OVERLOAD ANGLE: 9.6°
6. PLYWOOD OR RUBBER SHEETS SHALL BE POSITIONED BETWEEN ANY STEEL SURFACE IN CONTACT (U.O.N.).
7. LOCAL AND GLOBAL ITEM STRENGHT CHECK BY CLIENT;
8. THE BOTTOM PART OF THE MODULE SHALL BE CLEAR OF OBSTRUCTIONS (PIPES, SECONDARY STRUCTURE).
9. BEFORE MOVING THE TRAILER, CHECK THE HYDRAULIC PRESSURE / AXLE LOAD AND BE SURE THAT THE VALUES ARE EQUAL TO THE THEORETICAL VALUES IN THE TABLE (BASIC VALUES).
10. ITEM TO BE LASHED TO THE TRAILER FRAME AS PER DRAWING. IF NOT SHOWN, LASHING SHALL BE DEFINED BY TRANSPORT SUPERINTENDENT.

Rev.	Descrizione revisione / Description of revision	Data / Date	Disegnato / Drawn by	Controllato / Checked by	Approvato / Approved by
A	FOR COMMENT	08/07/25	SMG	GG	LG

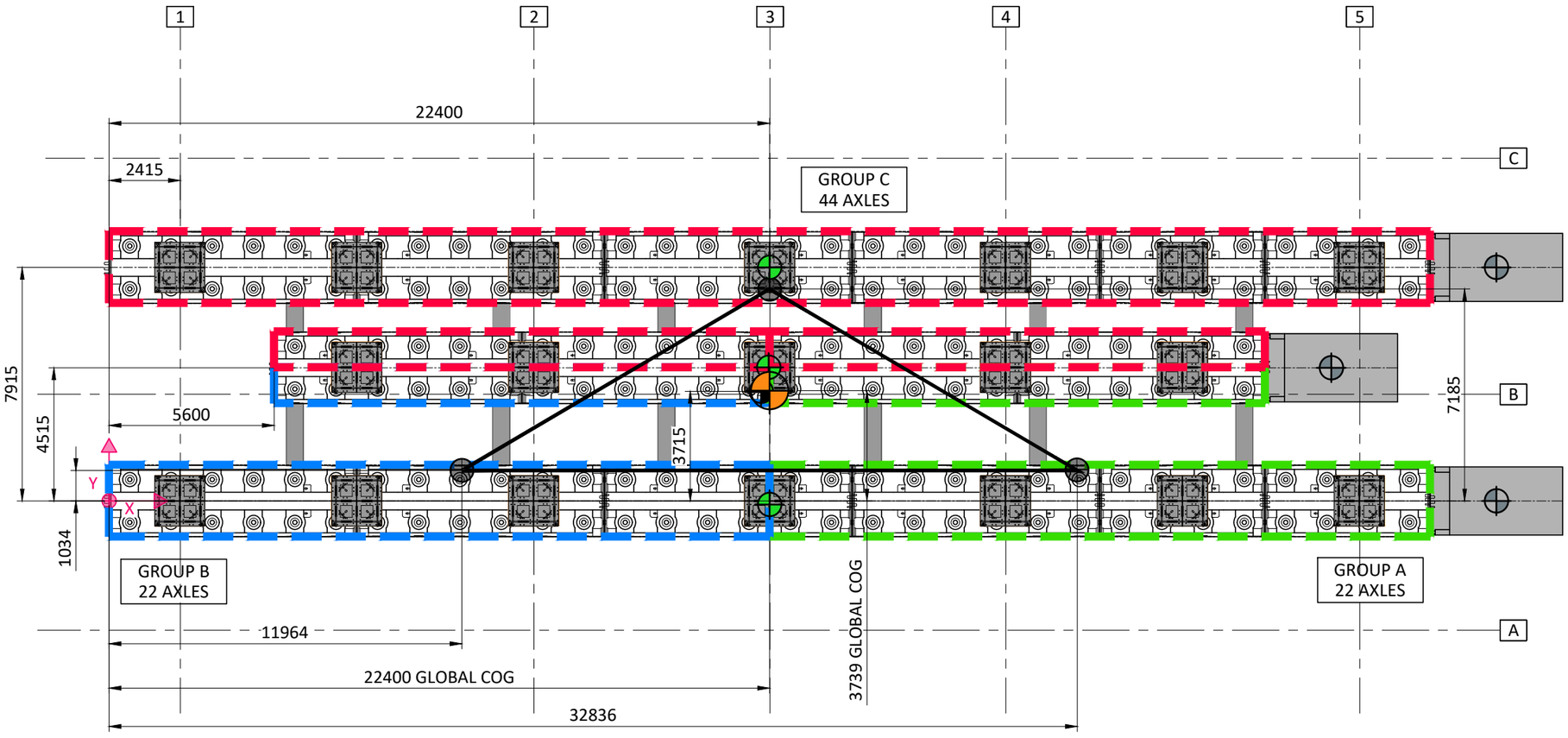
FAGIOLI

CLIENTE/CUSTOMER: ROSETTI
FAGIOLI AREA: EMEA
DESCRIZIONE COMMESSA/JOB DESCRIPTION: CROSSWIND PROJECT -LOADOUT & WEIGHING TOPSIDE & TP
DESCRIZIONE DISEGNO/DRAWING DESCRIPTION: TOPSIDE - TRANSPORT DRAWING - SHEET 1/2

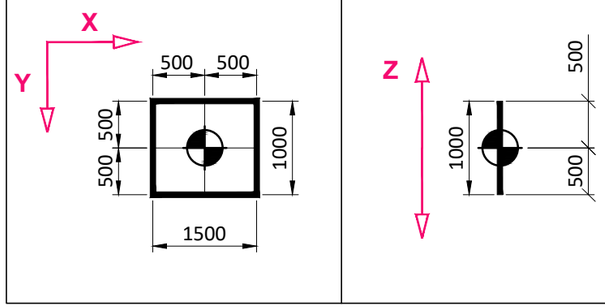
NUM. DISEGNO/DRAWING NUMBER	SCALA/SCALE	FORMATO/SIZE	COMMESSA/JOB
030-CRO-DP-01-001	1:350	A3	

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HYDRAULIC CIRCUIT ARRANGEMENT



C.O.G. ENVELOPE



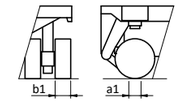
LEGEND

- TOPSIDE COG
- PPU SPMT COG
- EQUIPMENT COG
- GLOBAL COG= TOPSIDE COG +PPU SPMT COG + EQUIPMENT COG

TRANSPORT CONFIGURATION: 88 AXLES			
ITEM weight (contingency included)			**1802 t**
SPMT dead weight			392,1 t
EQUIPMENT weight			87,875 t
TOTAL weight			2282 t
		BASE VALUES	**MAX VALUES**
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	Capacity per axles	48,0 t	48,0 t
	Cylinder pressure	171 bar	219 bar
	Contact pressure under the wheel	8,5 kg/cm^2	9,4 kg/cm^2
	Average Ground pressure	8,4 t/m^2	10,6 t/m^2
Group C-D 44 AXLES	Weight per axles	23,3 t	28,6 t
	Capacity per axles	48,0 t	48,0 t
	Cylinder pressure	139 bar	171 bar
	Contact pressure under the wheel	7,8 kg/cm^2	8,5 kg/cm^2
	Average Ground pressure	6,9 t/m^2	8,4 t/m^2

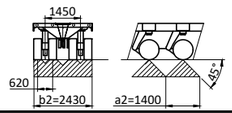
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where P = weight per axle (kg)
n = number of wheels for axle (4)
p = contact pressure under the wheel (kg/cm²)



GLOBAL LOADED AREA BELOW CONVOY [a2xb2] = $[\frac{P}{p2}]$

where P = weight per axle (kg)
p2 = average ground pressure (kg/cm²)



OPERATIONAL PARAMETERS:
- MAX TRAVELING SPEED: 0.5 km/h
- MAX OPERATIONAL WIND SPEED : 16.0 m/s
- MINIMUM REQUIRED GROUND BEARING CAPACITY: 10.7 t/m²
- THE GROUND SHALL BE COMPACTED AND LEVELED. MAX SLOPE:1%
- ALLOWABLE TRANSVERSE INCLINATION OF CONVOY(OUT OF VERTICALITY): 1°
- ALLOWABLE LONGITUDINAL INCLINATION OF CONVOY (OUT OF VERTICALITY):1°
- AXLES PRESSURE SHALL BE CONTINUOUSLY CHECKED, ACTING ON THE HYDRAULIC SYSTEM TO COMPENSATE ANY DEVIATION RESPECT TO THE EXPECTED VALUES. USE WATER LEVEL TO CHECK SPMT OUT OF VERTICALITY .

NOTE:
1. MODULE WEIGHT: 1802 t (NET WEIGHT +0.00% CONT. INCLUDED).
2. MODULE WEIGHT AND COG AS PER CLIENT DOCUMENT: 123A90-FDL-MT-DD-00401 (Last Rev) 123A90-DDL-TI-DD-99015 (Last Rev)
3. MAX VALUES INCLUDE ALL THE EFFECTS SUCH AS WIND, OUT OF VERTICALITY, COG ENVELOPE.
4. TIPPING ANGLE: 16.2°
5. OVERLOAD ANGLE: 9.6°
6. PLYWOOD OR RUBBER SHEETS SHALL BE POSITIONED BETWEEN ANY STEEL SURFACE IN CONTACT (U.O.N.).
7. LOCAL AND GLOBAL ITEM STRENGHT CHECK BY CLIENT;
8. THE BOTTOM PART OF THE MODULE SHALL BE CLEAR OF OBSTRUCTIONS (PIPES, SECONDARY STRUCTURE).
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Rev.	Descrizione revisione / Description of revision	Data / Date	Disegnato / Drawn by	Controllato / Checked by	Approvato / Approved by
A	FOR COMMENT	08/07/25	SMG	GG	LG

FAGIOLI

CLIENTE/CUSTOMER	FAGIOLI AREA
ROSETTI	EMEA

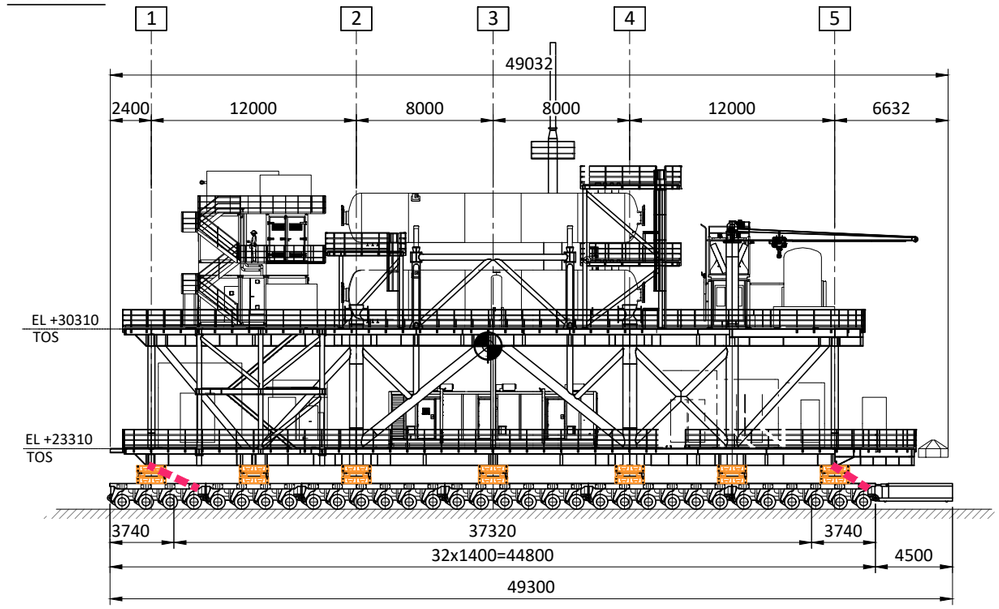
DESCRIZIONE COMMESSA/JOB DESCRIPTION
CROSSWIND PROJECT -LOADOUT & WEIGHING TOPSIDE & TP

DESCRIZIONE DISEGNO/DRAWING DESCRIPTION
TOPSIDE - TRANSPORT DRAWING - SHEET 2/2

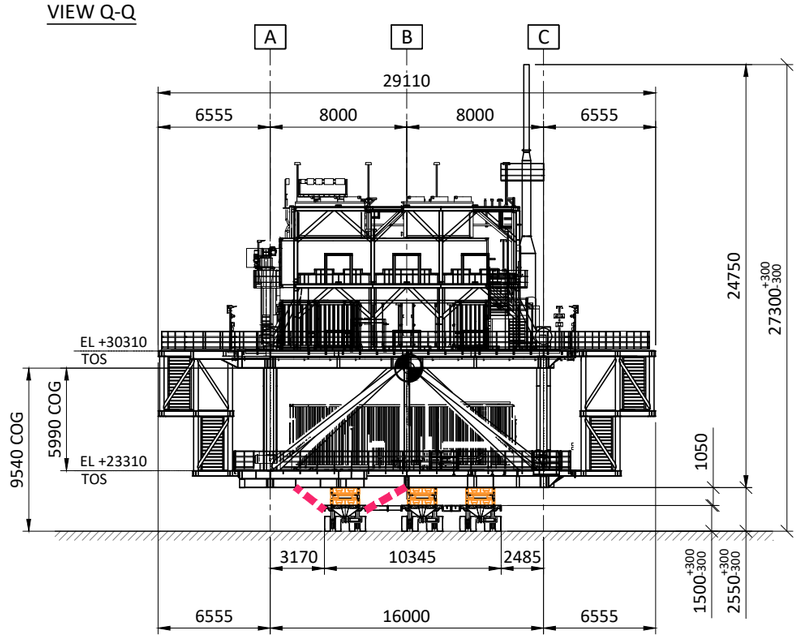
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030-CRO-DP-01-002	1:175	A3	

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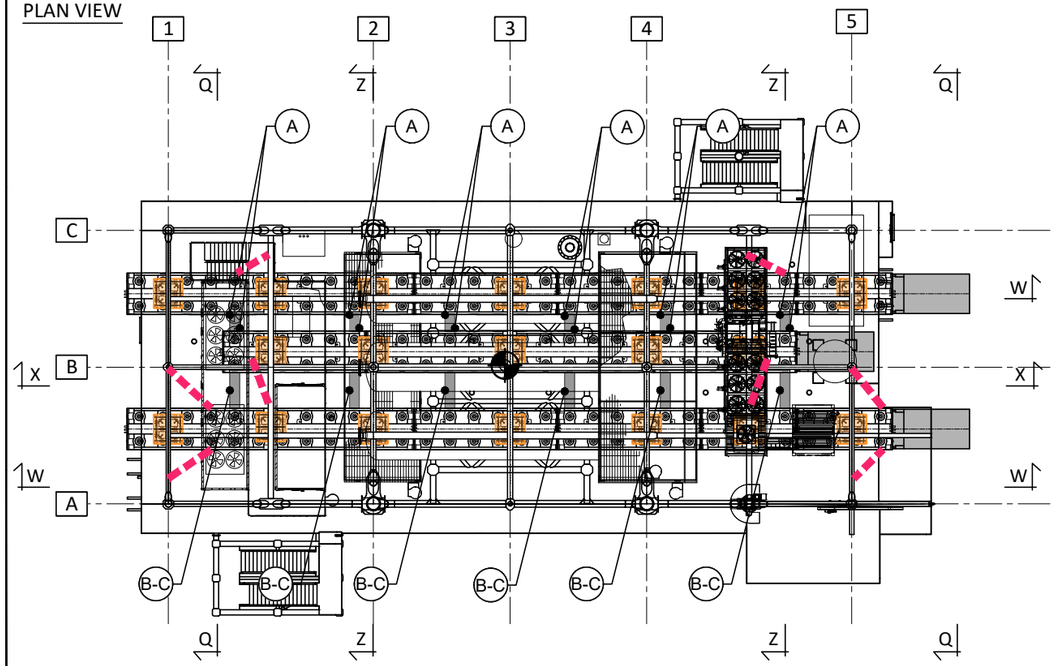
VIEW W-W



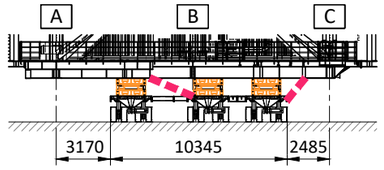
VIEW Q-Q



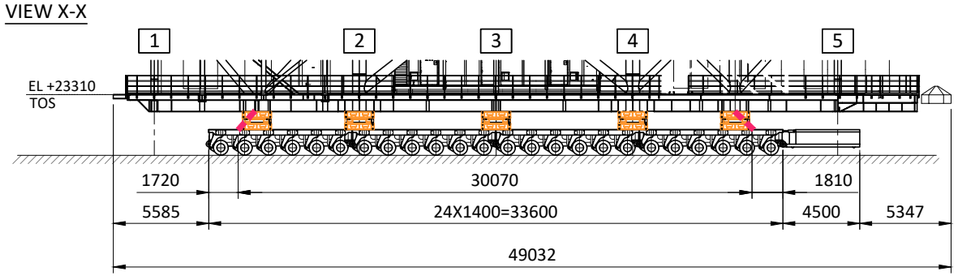
PLAN VIEW



VIEW Z-Z

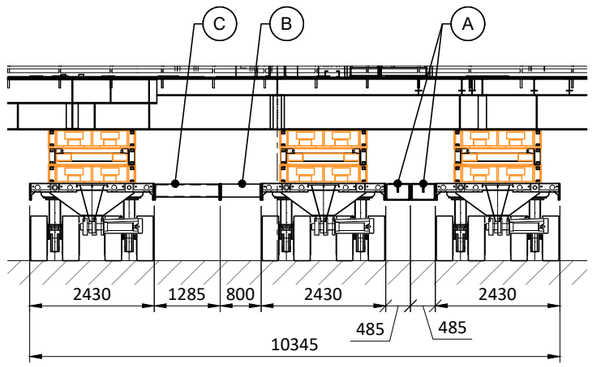


VIEW X-X



SPMT SPACERS

scale x3



MATERIAL LIST

#	DESCRIPTION	WEIGHT cad. (Kg)	Q.TY TOT
A	SPACER L=470 mm 580x485x320 mm	147.5	12
B	SPACER L=800 mm 800x580x320 mm	222.0	12
C	SPACER L=1285 mm 1285x580x320 mm	208.0	12
TOTAL WEIGHT (Kg)			6930.0

LASHING LINE DETAILS - SWL 14 t - TYPICAL

POS D: HOOK
Lifting: SWL=8t S.F=6
Lashing: SWL=16t S.F=3

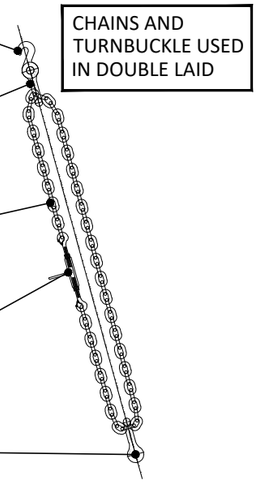
POS A: SHACKLE
Lifting: SWL=9.5t S.F=6
Lashing: SWL=19t S.F=3

POS C: CHAIN Ø13mm
Lifting: SWL=5.3t S.F=4
Lashing: SWL=7t S.F=3

POS B: TURNBUCKLE
Lifting: SWL=5.4t S.F=4
Lashing: SWL=7t S.F=3

POS A: SHACKLE
Lifting: SWL=9.5t S.F=6
Lashing: SWL=19t S.F=3

CHAINS AND TURNBUCKLE USED IN DOUBLE LAID



	LASHING LINE EQUIPMENTS	Q.TY
A	SHACKLE SWL 9.5 t (SF.6 per Lifting) → SWL 19 t (SF.3 per Lashing)	16
B	Turnbuckle for chain Ø13 mm	8
C	CHAIN Ø13 mm SWL 5.3t (SF.4 per Lifting) → SWL 7t (SF.3 per Lashing) USED IN DOUBLE LAID Real lashing line SWL 14.0t-MBL 42.0 t	8
D	HOOK SWL 8t (S.F 6 per Lifting) → SWL 16 t (SF.3 per Lashing)	8

NB:
LASHING LINE CONNECTION TO ITEM CAN BE DONE BY WITH OR WITHOUT HOOK

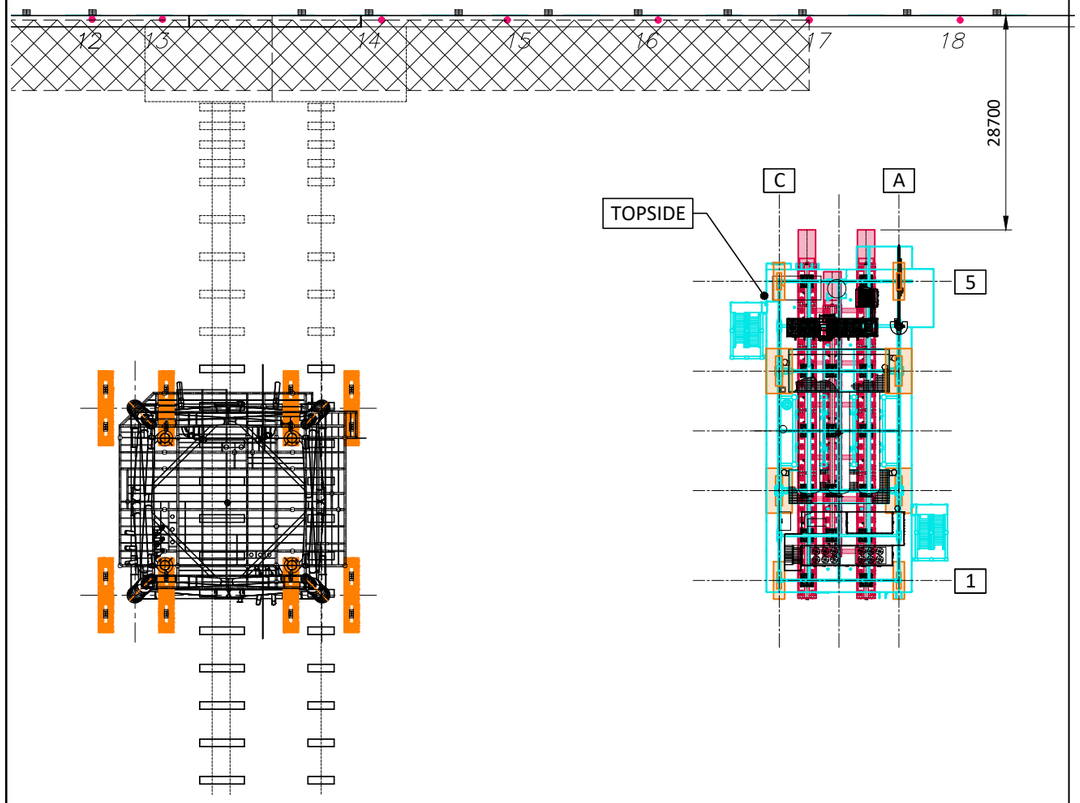
Rev.	Descrizione revisione Description of revision	Data Date	Disegnato Drawn by	Controllato Checked by	Approvato Approved by
A	FOR COMMENTS	08/07/25	SMG	LG	GG

FAGIOLI

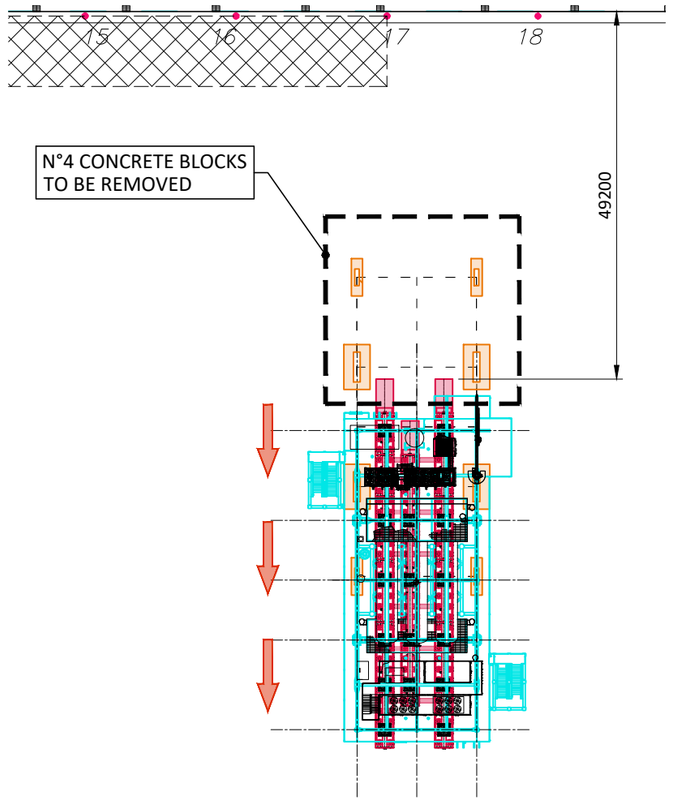
CLIENTE/CUSTOMER: ROSETTI
FAGIOLI AREA: EMEA
DESCRIZIONE COMMESSA/JOB DESCRIPTION: CROSSWIND PROJECT
DESCRIZIONE DISEGNO/DRAWING DESCRIPTION: TOPSIDE - TRANSPORT DRAWING ON ROSETTI YARD - LASHING SYSTEM

NUM. DISEGNO/DRAWING NUMBER	SCALA/SCALE	FORMATO/SIZE	COMMESSA/JOB
030-CRO-DP-01-005	1:350	A3	

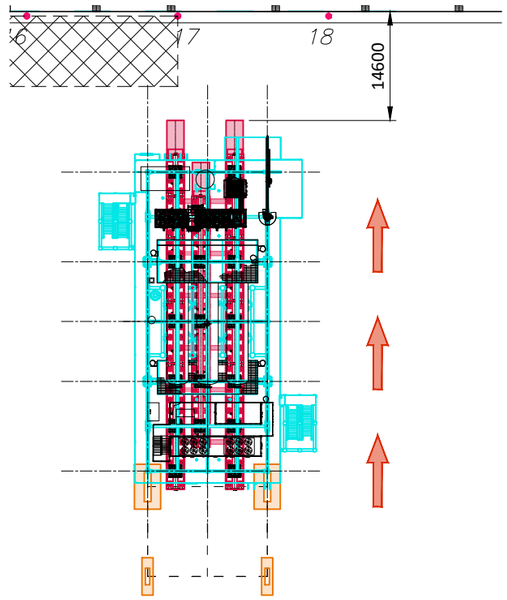
PHASE 1



PHASE 2



PHASE 3



Rev.	Descrizione revisione Description of revision	Data Date	Disegnato Drawn by	Controllato Checked by	Approvato Approved by
A	FOR COMMENT	08/07/25	SMG	GG	LG

FAGIOLI

CLIENTE/CUSTOMER: ROSETTI

FAGIOLI AREA: EMEA

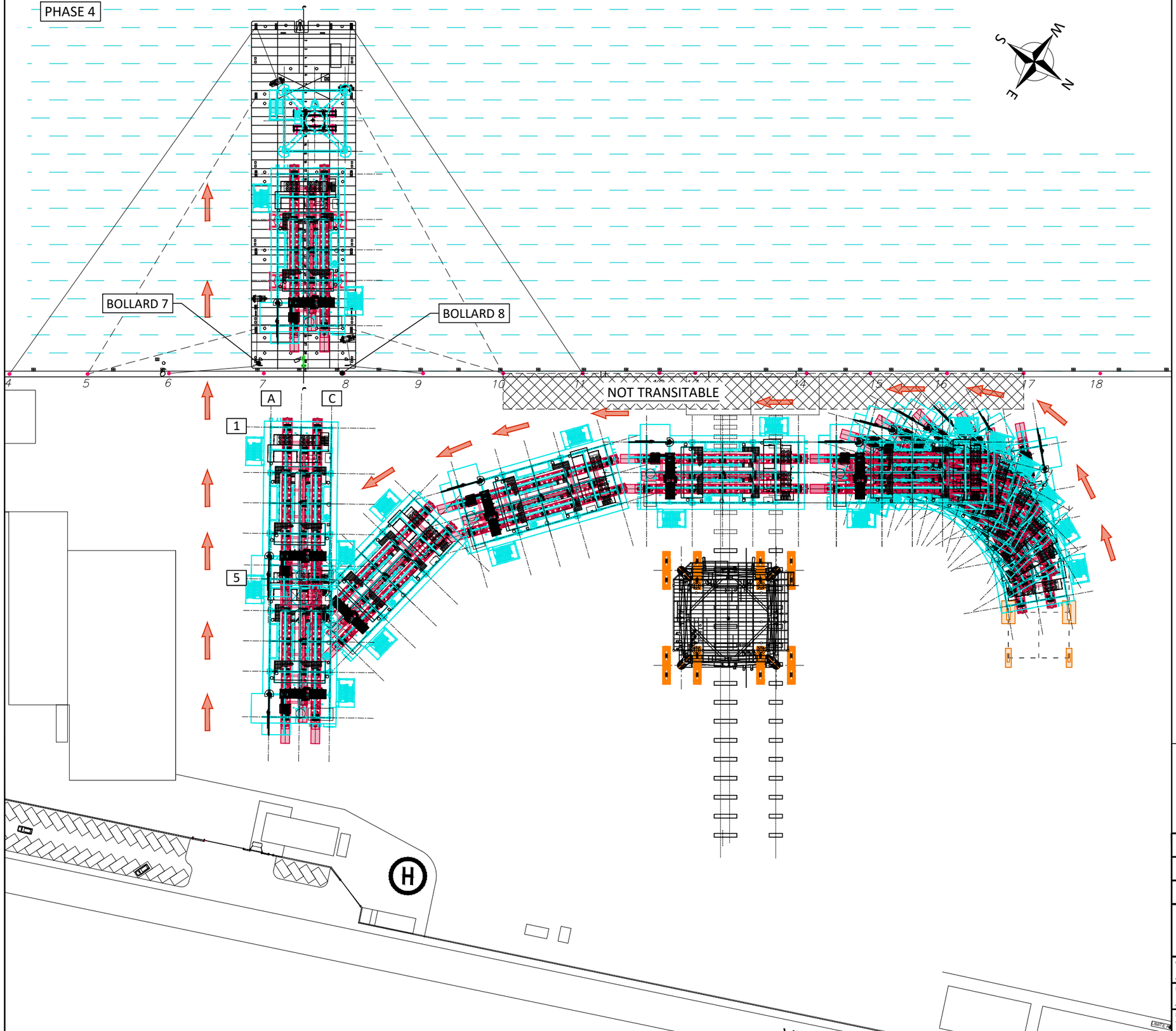
DESCRIZIONE COMMESSA/JOB DESCRIPTION: CROSSWIND PROJECT - LOADOUT & WEIGHING TOPSIDE & TP

DESCRIZIONE DISEGNO/DRAWING DESCRIPTION: TOPSIDE - LOAD OUT TRANSIT CHECK - PHASES 1-2-3

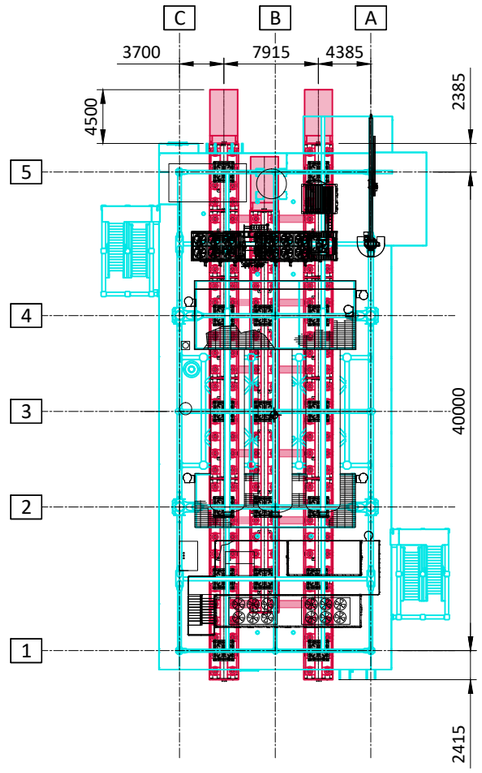
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NUM. DISEGNO/DRAWING NUMBER	SCALA/SCALE	FORMATO/SIZE	COMMESSA/JOB
030-CRO-DP-01-101	1:1000	A3	

PHASE 4



TOPSIDE
scale x2



NOTE:

1. FOR TRANSPORT DRAWING SEE DWG:
   030-CRO-DP-01-001-002 (LAST.REV.)

Rev.	Descrizione revisione Description of revision	Data Date	Disegnato Drawn by	Controllato Checked by	Approvato Approved by
A	FOR COMMENT	08/07/25	SMG	GG	LG

FAGIOLI

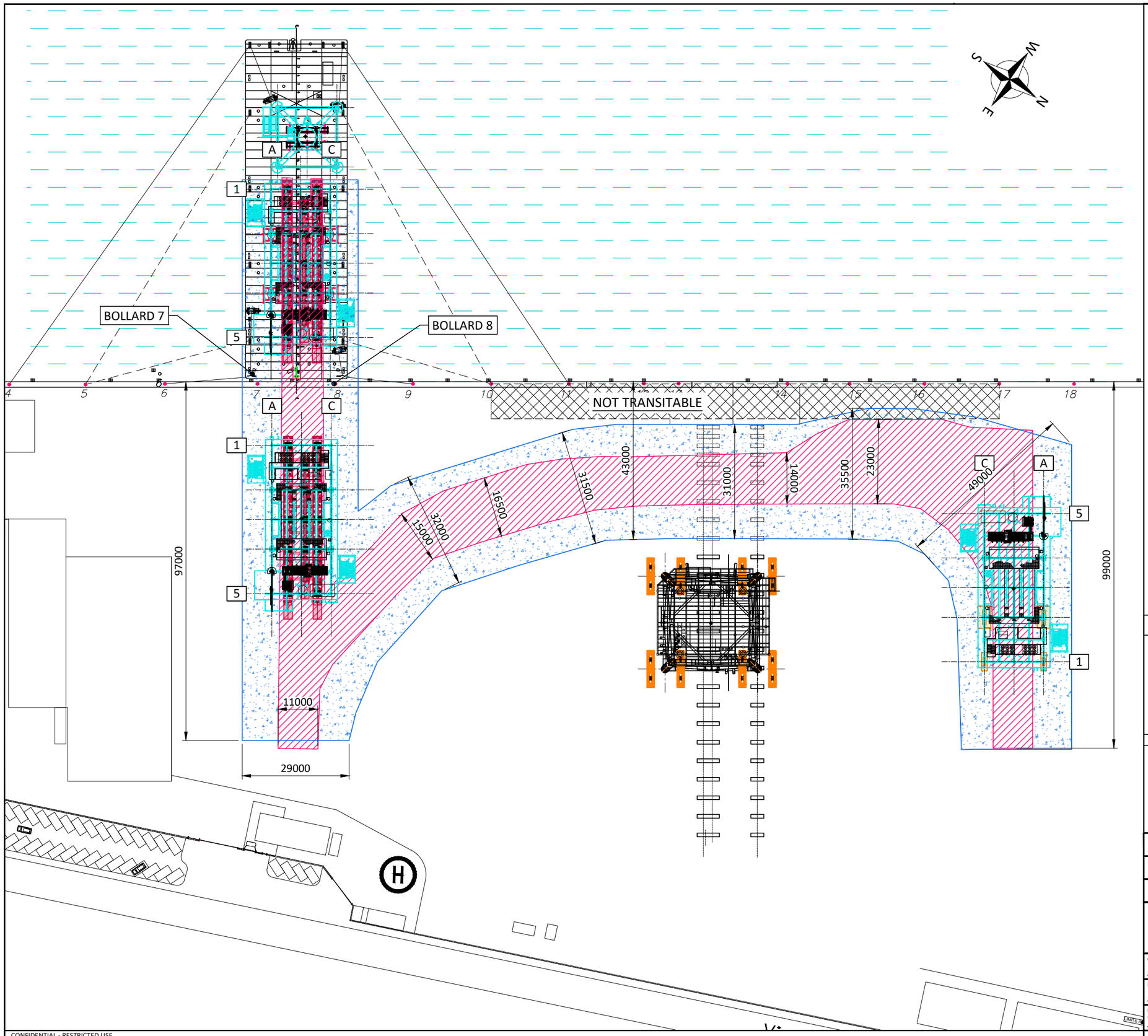
CLIENTE/CUSTOMER	FAGIOLI AREA
ROSETTI	EMEA

DESCRIZIONE COMMESSA/JOB DESCRIPTION
CROSSWIND PROJECT - LOADOUT & WEIGHING TOPSIDE & TP

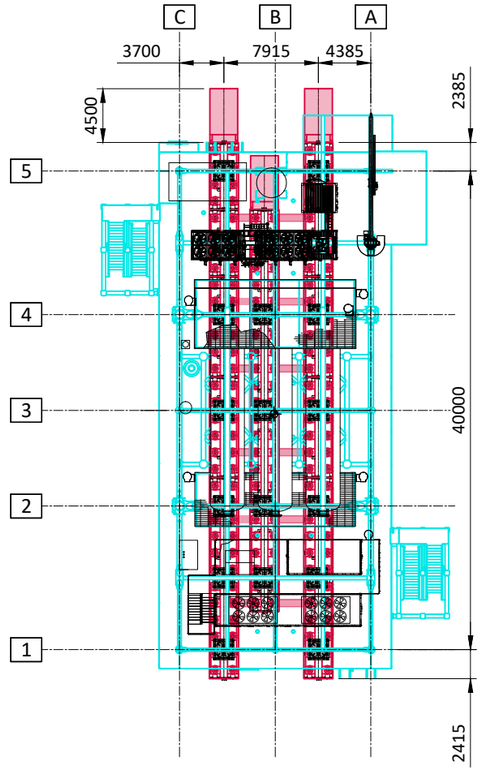
DESCRIZIONE DISEGNO/DRAWING DESCRIPTION
TOPSIDE - LOAD OUT TRANSIT CHECK - PLAN VIEW - PHASE 4

NUM. DISEGNO/DRAWING NUMBER	SCALA/SCALE	FORMATO/SIZE	COMMESSA/JOB
030-CRO-DP-01-102	1:1000	A3	

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TOPSIDE
scale x2



LEGEND

TRAILER AREA

ITEM AREA

NOTE:

1. FOR TRANSPORT DRAWING SEE DWG:
   030-CRO-DP-01-001-002 (LAST.REV.)

Rev.	Descrizione revisione Description of revision	Data Date	Disegnato Drawn by	Controllato Checked by	Approvato Approved by
A	FOR COMMENT	08/07/25	SMG	GG	LG

FAGIOLI

CLIENTE/CUSTOMER: ROSETTI

FAGIOLI AREA: EMEA

DESCRIZIONE COMMESSA/JOB DESCRIPTION: CROSSWIND PROJECT - LOADOUT & WEIGHING TOPSIDE & TP

DESCRIZIONE DISEGNO/DRAWING DESCRIPTION: TOPSIDE - LOAD OUT TRANSIT CHECK - AREAS TO BE PREPARED

NUM. DISEGNO/DRAWING NUMBER	SCALA/SCALE	FORMATO/SIZE	COMMESSA/JOB
030-CRO-DP-01-103	1:1000	A3	

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11.3 SPMT stability check

SPREADSHEET NR.	SSH-SPMT-001		
REV.	7	DATE	24/07/2024
PREP.	ACL	APPR.	LG

SELF PROPELLED MODULAR TRAILER
AXLE LOADS AND STABILITY CALCULATION

FAGIOLI

PROJECT	CROSSWIND	ITEM	TOPSIDE	DATE	10/07/2025
CLIENT	ROSETTI			PREP.	SMG
DOC. N.	030-CRO-SSH-01-001	REV.	A	APPR.	GG

DATA SUMMARY

Item weight	1912,4 t
Convoy weight	369,6 t
Equipment weight	0,0 t
Total weight	2282,0 t
Max convoy speed	0,5 km/h
Axles	88
Open axles	88
Hidden axles	0
Wind speed	16,0 m/s
Wind action height	9,5 m
Shape factor	1,5
Transversal area	1000,0 m²
Longitudinal area	600,0 m²

TRAILER DATA

	Group A	Group B	Group C/D
Type	MSPE 48 t	MSPE 48 t	MSPE 48 t
Axle weight	4,2 t	4,2 t	4,2 t
Open axles	22,0	22,0	44,0
Hidden axles	0,0	0,0	0,0
x	32836 mm	11964 mm	22400 mm
y	1034 mm	1034 mm	7185 mm

Global CoG

Weight	X	Y	Z
1912,4 t	22400 mm	3738 mm	9327 mm

STABILITY CHECK

Allowable stability angle	7,0 °
Tipping angle	16,2 °
Safety factor	2,3
Check	OK

Overload angle

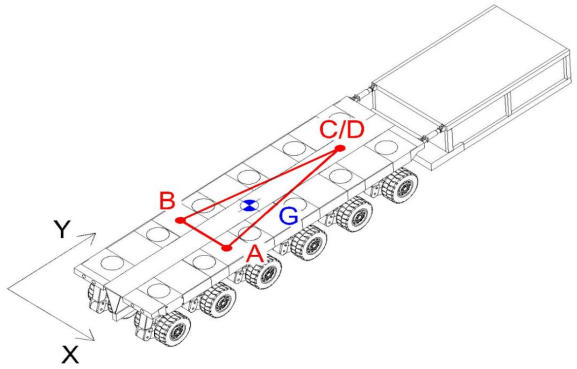
9,6 °

STRENGTH CHECK - BASE CASE (NO WIND, NO COG ENVELOPE, NO OUT OF VERTICALITY)

Group	Axle load	Capacity	Check	Cylinder pressure	Average Ground pressure	Tyres Ground pressure
Group A	28,6 t	48,0 t	OK	171 bar	8,4 t/m²	8,5 kg/cm²
Group B	28,6 t	48,0 t	OK	171 bar	8,4 t/m²	8,5 kg/cm²
Group C/D	23,3 t	48,0 t	OK	139 bar	6,9 t/m²	7,8 kg/cm²

STRENGTH CHECK - MAX CASE (WIND, COG ENVELOPE, OUT OF VERTICALITY)

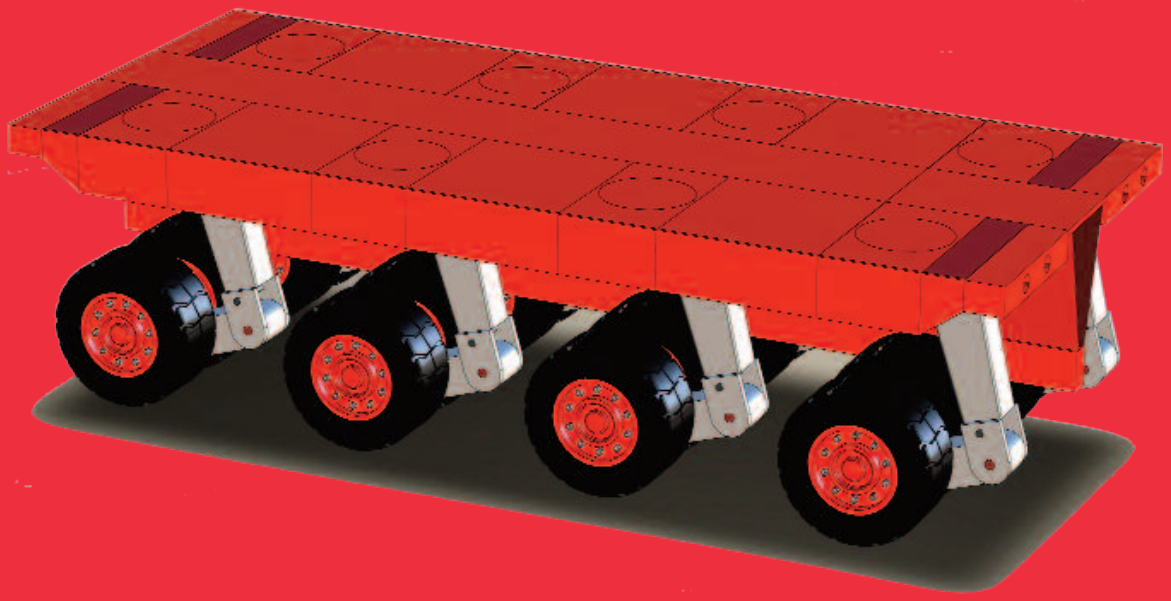
Group	Axle load	Capacity	Check	Cylinder pressure	Average Ground pressure	Tyres Ground pressure
Group A	36,2 t	48,0 t	OK	219 bar	10,6 t/m²	9,4 kg/cm²
Group B	36,2 t	48,0 t	OK	219 bar	10,6 t/m²	9,4 kg/cm²
Group C/D	28,6 t	48,0 t	OK	171 bar	8,4 t/m²	8,5 kg/cm²



11.4 SPMTs data sheet

FAGIOLI

SPMTs (36 - 40 - 50 - 60 TON)





TECHNICAL BROCHURE

SPMTs - OVERVIEW

Self-propelled modular transporters (SPMT's) are multi-axle trailers designed for the transportation of large and heavy cargoes. The SPMT's are designed in **modular construction** and can be coupled side to side and end to end.

The SPMT's consist of a very strong and rigid chassis, which also acts as a load-carrying platform to which wheel bogies are attached in pairs to form the required length of transporter.

Each wheel bogie consists of two rubber tyres wheels and is rigidly fixed to the chassis by a hinged elbow joint, which is supported on hydraulic rams. This hydraulic ram acts as the suspension for the SPMT and also provides the lifting capability. Attached to the end of the SPMT is a Diesel driven power pack, which provides hydraulic power to the various functions of the SPMT.

The SPMT is propelled by **hydraulic drive motors**, which are mounted on the axles of the SPMT. Hydraulic power is supplied from a pump on the power pack to each of the drive motors and speed is controlled via a remote hand operated portable console. Forward and reverse travel is achieved by reversing the flow of hydraulic oil to the drive motors.

Speed of the driven axle is controlled by flow regulators, which prevent over-speed of the wheels occurring. Normal operating speed of the SPMT's is 5 km/hr, but may vary depending on the load and configuration.

The **steering** of the SPMT's offers major advantages over other forms of conventional hydraulic trailers. The steering is controlled by electro-hydraulic motors rather than by a series of mechanical steering rods.

Each of the axles of the transporter moves independently and are monitored and controlled by the computerised control system of the transporter. This offers total flexibility of steering options with each wheel bogie able to swing through 260o (+130°). The position of each wheel is controlled electronically through the remote operations console and nine steering programs are available. The electronic steering control can be utilised for a group of two or more SPMT's to ensure that all wheel bogies of all the transporters act together and turn about a single point.

A hydraulic cylinder supports each of the wheel bogies. The cylinders on each bogie can be linked hydraulically to the other wheel bogie cylinders to form groups, this allows free flow of hydraulic fluid between each hydraulic ram allowing the SPMT to negotiate uneven ground, cambers and gradients whilst maintaining equal loading in each hydraulic ram within that group.

To link all hydraulic rams on a single trailer would result in an unstable transporter bed with no control. The SPMT is normally split hydraulically into three separate hydraulic groups (A three-point suspension) that can be controlled individually from the main power unit.

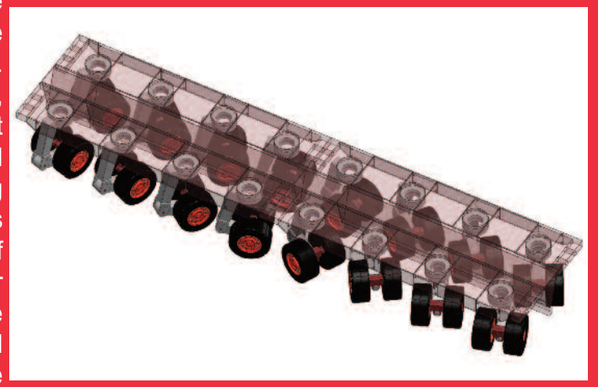


SPMTs - TECHNICAL DATA

As the SPMT negotiates uneven ground, or gradients the hydraulic fluid will free flow within each suspension to maintain equal loading within each suspension group. Addition hydraulic fluid can be can be pumped from the Power Unit (PPU) into or out of each cylinder group to adjust the level of the SPMT.
Systematic and controlled pumping of hydraulic fluid into or out of each suspension can raise or lower the transporter bed +300mm from the normal running height of 1500mm.
Control of the elevation of the transporter is through the hand operated remote console. Safety valves protect the hydraulic circuit so that the transporter platform does not collapse in the unlikely event of hydraulic failure. The SPMT's are equipped with an electro-hydraulic braking system with hydraulically activated spring loaded brake cylinders installed in the wheel hubs. The brakes are controlled through the hand operated remote console. Hydraulic pressure supplied to the brake cylinders pre-loads the brakes and any reduction in this hydraulic pressure will activate the brakes via a mechanical spring; the braking force that results is in proportion to the reduction in hydraulic pressure. In the event of failure of the diesel power pack, hydraulic pump, electronic control system, or other controlling equipment causing a loss in hydraulic pressure, the brakes will be applied automatically through the spring mechanism. The load carrying capacity of a transporter platform (or group of platforms) is directly proportional to the number of axle line. The capacity of each axle line varies from 36 up to 60 ton gross. A transporter convoy, composed of transporter units and power packs can be controlled by a single operator by means of the hand operated remote console. All units are both CE and TUV certified and are provided with identification plates that allow them to be driven on public roads.



COMPENSATION BY HYDRAULIC SYSTEM IN CASE OF UNEVEN GROUND



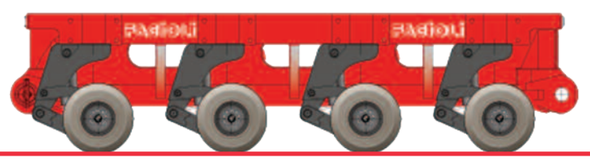
STEERING CAPABILITY

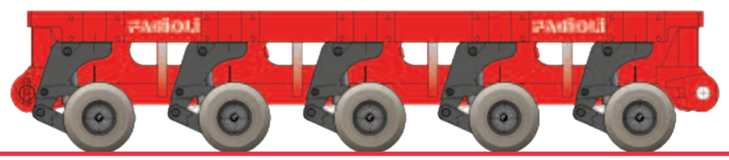


SPMTs					
		36	36	40	40
DETAILS	AXLE LINES	4	6	4	6
	SUSPENSIONS	8 (4 of which driven)	12 (4 or 6 of which driven)	8 (4 of which driven)	12 (4 or 6 of which driven)
	TYRES TYPE	215/75 R 17.5" (4 per suspension) 355/65-15 PR 24 IC 40	215/75 R 17.5" (4 per suspension) 355/65-15 PR 24 IC 40	355/65 Pr24 IC40 (2 per suspension) 355/65-15 24 Pr	355/65 Pr24 IC40 (2 per suspension) 355/65-15 24 Pr
	LOAD PER AXLE LINES	36 ton	36 ton	40 ton	40 ton
	GROSS WEIGHT	up to 146.4 ton	up to 219.6 ton	160 ton	240 ton
	DEAD WEIGHT	up to 18 ton approx.	up to 24 ton approx.	up to 18 ton approx.	up to 24 ton approx.
	PAYLOAD CAPACITY	up to 130 ton approx.	up to 195.6 ton approx.	up to 143.5 ton approx.	up to 216 ton approx.
	PLATFORM HEIGHT	1350 + 380 - 220 mm 1500 +/- 350 mm	1350 + 380 - 220 mm 1500 +/- 350 mm	1500 +/- 350 mm	1500 +/- 350 mm
	PLATFORM DIMENSIONS	5920 x 2430 mm	8720 x 2430 mm	5600 x 2430 mm	8400 x 2430 mm
	INTER-AXLE	1400 mm			

SPMTs - TECHNICAL DATA

SPMTs					
		50	50	60	60
DETAILS	AXLE LINES	4	6	4	5
	SUSPENSIONS	8 (4 of which driven)	12 (4 or 6 of which driven)	8 (4 of which driven)	10 (5 of which driven)
	TYRES TYPE	H37x14-15 24Pr TUBELESS	H37x14-15 24Pr TUBELESS	33,5x11,25-15 26Pr TUBELESS	33,5x11,25-15 26Pr TUBELESS
	LOAD PER AXLE LINES	50 ton	50 ton	60 ton	60 ton
	GROSS WEIGHT	200 ton	300 ton	240 ton	300 ton
	DEAD WEIGHT	17,5 ton	25,5 ton	19,1 ton	23,5 ton
	PAYLOAD CAPACITY	182,5 ton	274,5 ton	220,9 ton	276,5 ton
	PLATFORM HEIGHT	1540 +/- 350 mm	1540 +/- 350 mm	1460 +/- 300 mm	1460 +/- 300 mm
	PLATFORM DIMENSIONS	5600 x 2430 mm	8400 x 2430 mm	5600 x 2430 mm	7000 x 2430 mm
	INTER-AXLE	1400 mm			



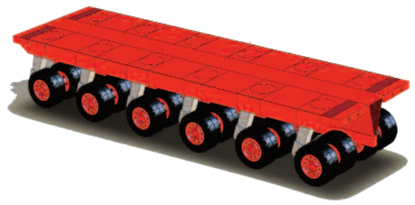




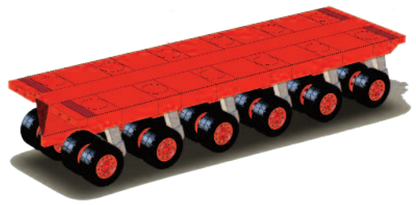
SPMTs - TECHNICAL DATA



STEERING

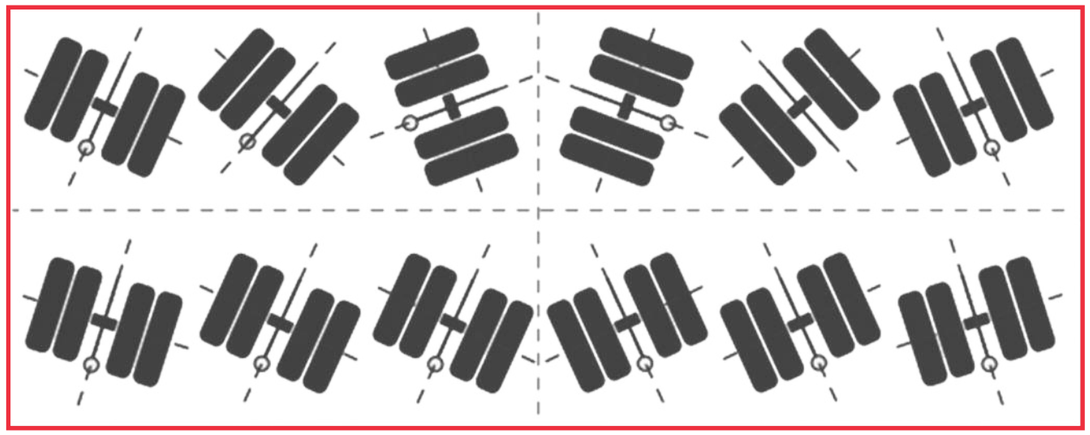


CAPABILITY

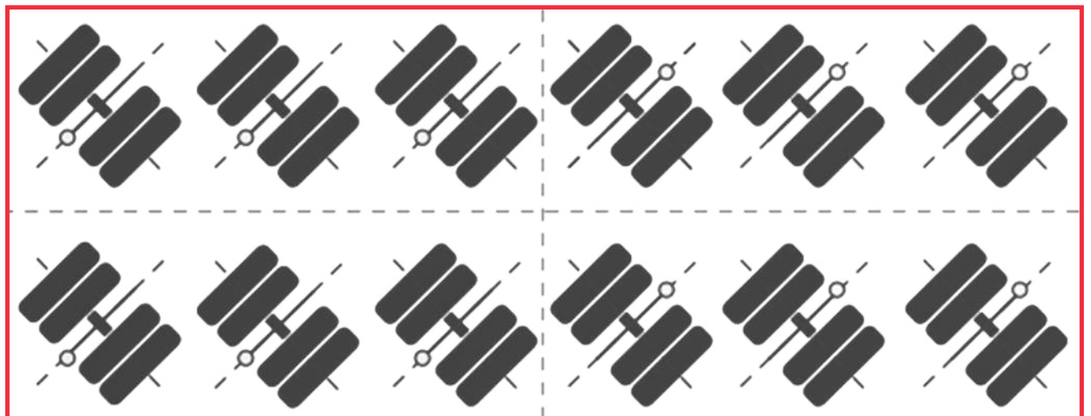




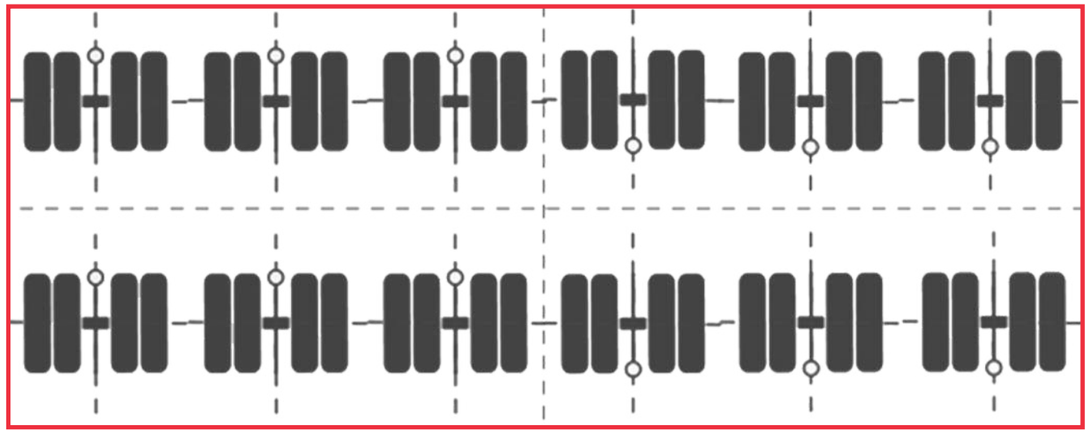
NORMAL DRIVE



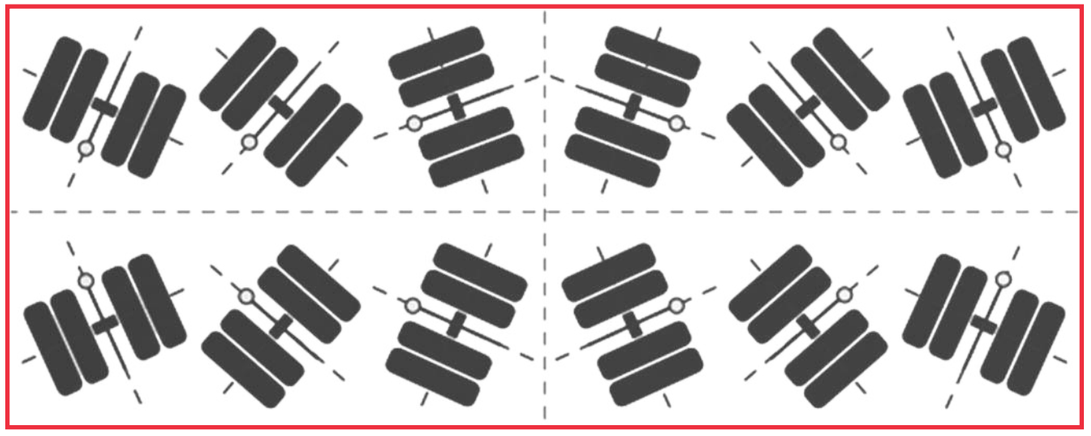
DIAGONAL DRIVE



LATERAL DRIVE



CIRCULAR DRIVE



SPMTs - TECHNICAL DATA

POWER PACK UNITS (PPU's)	SMALL	BIG
Length	2,420 mm	4,450 mm
Width	2,330 mm	2,330 mm
Height	1,100 mm	1,600 mm
Weight	3.8 ton	6.9 ton
Engine Capacity	100 HP	320 HP

•Power pack units (PPU's) can be attached to either (or both) universal and bolt end couplings to supply power for hydrostatic self-propulsion, hydraulic axle support lift and lower system, VD-steering, hydraulic brake system and for supply of the electric/electronic systems.

•Distribution gear and hydraulic axial piston pump with variable displacement for the various working systems. Hydrostatic propulsion, lift/lower system, steering and brake system and distribution gear flanged directly to the diesel engine with hydraulic axial piston pump.

•Hydraulic oil tank (approx. 7001 tr) designed for the operation with extended combinations. Tank designed in stainless steel.

•Diesel fuel tank with a volume of approximately 4001.

•PPU's hydraulically adjustable on the coupling side, which is advantageous for barge operations.

•Four adjustable landing gear, lifting eyelets for crane loading as well as lashes for forklift operation.

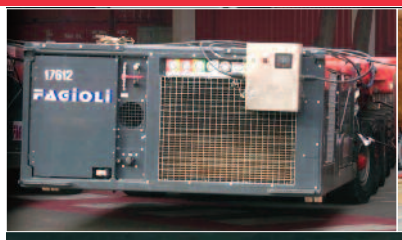
•PPU's completely covered. System connection lines for direct longitudinal coupling as well as side connection for the PPU's in a compound operation.

•Operating and control instruments arranged and protected in the terminal box.

•PPU's completely equipped and ex-works tested.

•Electronic throttle control of the single PPU as well as control of the PPU's in a compound. In addition, manually actuated accelerator for emergency operation.

•Engine Power up to 355 kW









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11.5 Fagioli SPMT's check list

FAGIOLI	**SPMT SITE CHECKLIST** *CHECK LIST DI CANTIERE PER SPMT*	STCH-SPMT-01	Revision / *Revisione*:	0
			Date / *Data*:	01.06.18

Project: *Progetto:*		**Serial No. / Plate:** *N° Seriale / Targa:*		**Location:** *Luogo:*	
Client: *Cliente:*		**Date:** *Data:*		**Time:** *Ora:*	

Check: *Controlli:*	**Ok** *Ok*	**No** *No*	**N/A** *N/A*	**Remarks:** *Osservazioni:*
PPU – Power Pack Unit				
1. Confirm check workshop maintenance completed *Conferma check list manutenzione d'officina completata*				Ask for a copy at the workshop maintenance *Chiedere copia ad officina*
2. Check integrity of lifting points *Controllare integrità punti di sollevamento*				
3. Check control and signalling elements working properly *Verificare il corretto funzionamento degli elementi di controllo e segnalazione*				
4. Check buzzer working properly *Verificare il corretto funzionamento del segnalatore acustico*				
5. Check emergency stop switches working properly *Verificare il corretto funzionamento degli interruttori di arresto di emergenza*				
6. Check display working properly *Verificare il corretto funzionamento del Display*				
7. Check engine oil level *Verificare il livello di riempimento dell'olio motore*				Topping up engine oil, if necessary *Eventualmente rabboccare*
8. Check cooling system for damage or leaks *Verificare che il sistema di raffreddamento non presenti danni o perdite*				
9. Check that front of radiator panels is not obstructed and is not dirty *Verificare che il fronte dei pannelli radiatori non sia ostruito e non sia sporco*				
10. Check cooling filling level *Controllare il livello di riempimento del fluido refrigerante*				Check only when the engine is cold and if necessary, always top up with cold engine *Controllo solo a motore freddo ed eventualmente rabboccare sempre a motore freddo*
11. Check integrity and correct connection of the engine air manifolds *Controllare integrità e corretta connessione collettori aria motore*				
12. Check that hydraulic connections, rigid and flexible hydraulic pipes are not damaged or leaking *Verificare che i collegamenti idraulici, i tubi idraulici rigidi e flessibili non presentino danneggiamenti o perdite*				
13. Check that pumps and valves are not damaged or leaking *Verificare che pompe e valvole non presentino danneggiamenti o perdite*				
14. Check that hydraulic tank is not damaged or leaking *Verificare che il serbatoio idraulico non presenti danneggiamenti o perdite*				
15. Check oil level in the hydraulic tank *Verificare il livello dell'olio nel serbatoio idraulico*				Oil level in the hydraulic tank must be at "Max" indication with SPMT floor completely lowered, topping up if necessary *A pianale completamente abbassato il livello di riempimento del serbatoio idraulico deve essere in corrispondenza dell'indicazione "Max", eventualmente rabboccare*
16. Check that diesel engine belts are taut and not worn or damaged *Verificare che le cinghie del motore diesel siano tese e non usurate o danneggiate*				Check, tighten or replace the belts with the engine switched off and reassemble any disassembled protections *Controllare, tendere o sostituire le cinghie a motore spento e rimontare le protezioni eventualmente smontate*
17. Check that fuel tank is not damaged or leaking. *Verificare che il serbatoio del carburante non presenti danneggiamenti o perdite*				
18. Check fuel level in the fuel tank *Verificare il livello di carburante nel serbatoio carburante*				Topping up, if necessary *Eventualmente rabboccare*
19. Check tightness of all fuel pipes *Controllo della tenuta di tutti i tubi carburante*				
20. Check for any damage or leaks to hydraulic filter *Verificare l'eventuale presenza di danni o perdite al filtro idraulico*				
21. Check compressed air tank *Controllare il serbatoio dell'aria compressa*				If necessary, drain air tanks *Eventualmente drenare i serbatoi aria*
22. Check functioning of the PPU lighting *Verificare funzionamento illuminazione PPU*				If necessary, replace the faulty bulbs *Eventualmente sostituire le lampadine difettose*
23. Check that power lines and fittings are not damaged or incorrectly connected *Controllare che le linee elettriche ed i raccordi non presentino danneggiamenti o errate connessioni*				

Check: *Controlli:*	**Ok** *Ok*	**No** *No*	**N/A** *N/A*	**Remarks:** *Osservazioni:*
24. Verify that Use and Maintenance Manual is available at site *Verificare che il Manuale d'uso e manutenzione sia disponibile in cantiere*				
25. Check for any damage, cracks and deformations on the steel structures (frame, fasteners, etc…) *Verificare eventuale presenza di danneggiamenti, cricche e deformazioni sulle strutture in acciaio (telaio, elementi di fissaggio, ecc…)*				
26. Check connections of the control panel cables (clean and dry) *Verificare i collegamenti dei cavi della pulsantiera (pulita ed asciutta)*				
27. Connect control panel to PPU and run the diagnostic programs *Connettere la pulsantiera alla PPU ed eseguire i programmi di diagnostica*				
28. Check that "brake reserve" pressure gauge is at 200 BAR *Verificare che il manometro "riserva freno" sia a 200 BAR*				
29. Check, after releasing the brakes, that "Brake" pressure gauge has risen to 200 BAR *Verificare, dopo aver sbloccato i freni, che il manometro "Freno" sia salito a 200 BAR*				
30. Complete any project specific check lists *Completare eventuali check list specifiche di progetto*				See Project operating procedure *Vedere Procedura operativa di progetto*
Moduli				
31. Confirm check workshop maintenance completed *Conferma check list manutenzione d'officina completata*				Ask for a copy at the workshop maintenance *Chiedere copia ad officina*
32. Check integrity of lifting points *Controllare integrità punti di sollevamento*				
33. Check emergency stop switches working properly *Verificare il corretto funzionamento degli interruttori di arresto di emergenza*				
34. Check for any damage or leakage to hydraulic cylinders *Verificare l'eventuale presenza di danni o perdite ai cilindri idraulici*				
35. Check for any damage or leakage to hydraulic hoses, rigid pipes and screw connections *Verificare l'eventuale presenza di danni o perdite ai tubi idraulici flessibili, nelle tubazioni rigide e nei raccordi a vite*				
36. Check that connections of flexible hydraulic pipes are correct *Verificare che le connessioni dei tubi idraulici flessibili siano corrette*				
37. Check that connection valves of hydraulic hoses are correctly tightened *Verificare che le valvole di connessione dei tubi idraulici flessibili siano correttamente serrate*				
38. Check that all hoses are well grouped and do not interfere the steering *Verificare che tutti i tubi flessibili siano ben raggruppati e non siano d'intralcio alla sterzatura*				
39. Check the correct mechanical connection between modules and between modules and PPU (lower pin and upper tie rods) *Verificare la corretta connessione meccanica tra moduli e tra moduli e PPU (perno inferiore e tiranti superiori)*				
40. Check convoy lighting working properly *Verificare funzionamento corretto dell'illuminazione*				If necessary, replace the faulty bulbs *Eventualmente sostituire le lampadine difettose*
41. Check that the power lines and fittings are not damaged or incorrectly connected *Controllare che le linee elettriche ed i raccordi non presentino danneggiamenti o errate connessioni*				
42. Check that control rods of the hydraulic cylinders are clean and grease-lubricated *Controllare che le aste di controllo dei cilindri idraulici siano pulite e lubrificate con grasso*				

Check: *Controlli:*	**Ok** *Ok*	**No** *No*	**N/A** *N/A*	**Remarks:** *Osservazioni:*
43. Check tire tread wear *Verificare l'usura del battistrada dei pneumatici*				If necessary, replace *Eventualmente sostituire*
44. Check for any damage to tires *Verificare l'eventuale presenza di danneggiamenti nei pneumatici*				If necessary, replace *Eventualmente sostituire*
45. Check for any foreign bodies in the tires *Verificare l'eventuale presenza di corpi estranei nei pneumatici*				If necessary, replace. *Eventualmente sostituire.*
46. Check correct tire pressure *Verificare la corretta pressione dei pneumatici*				10 BAR for all standard SPMT tires (up to 40t/axle capacity). EVO type carriages (up to 50t/axle) and EVO II (up to 60t/axle) tire pressure is function of axle load: refer to the Use and Maintenance Manual *10 BAR per tutti i pneumatici SPMT standard (fino a 40t/asse di capacità). Carrelli tipo EVO (fino a 50t/asse) ed EVO II (fino a 60t/asse) la pressione del pneumatico è funzione del carico assiale: consultare Manuale di uso e manutenzione*
47. Check for any damage, cracks and deformations on the steel structures (frame, fasteners, etc…) *Verificare eventuale presenza di danneggiamenti, cricche e deformazioni sulle strutture in acciaio (telaio, elementi di fissaggio, ecc…)*				
48. Check that all pantograph locking pins have been removed *Verificare che tutti i perni di blocco dei pantografi siano stati rimossi*				
49. Check that cutting valves are correctly positioned (open / closed) according to the project diagram *Controllare che le valvole di sezionatura siano correttamente posizionate (aperte/chiuse) in accordo allo schema di progetto*				
50. Check that all traction and cylinder shut-off valves are open *Controllare che le valvole di intercettazione trazione e cilindro siano tutte aperte*				
51. Complete any project specific check lists *Completare eventuali check list specifiche di progetto*				See Project operating procedure *Vedere Procedura operativa di progetto*

Note:
Note:

This Check List refers to the checks to be carried out on site before the SPMTs are put into operation and before the operations are carried out.
Questa Check List è relativa ai controlli da effettuarsi in cantiere prima della messa in funzione dei carrelli e prima dell'esecuzione delle operazioni.

1. Check list to be completed by qualified SPMT Supervisor and Operator trained to use the machine, according to Use and Maintenance Manual, Operative Designs and Operating Procedure related to the specific Project
   Check list da compilarsi da parte di SPMT Supervisor ed Operatore qualificati ed addestrati per l'utilizzo della macchina, seguendo il Manuale di Uso e Manutenzione, i Disegni Operativi e la Procedura Operativa relativi al Progetto specifico
2. Any repairs and oil topping up must be carried out by trained and authorized personnel
   Eventuali riparazioni e rabbocchi olio devono essere eseguiti da personale addestrato e autorizzato
3. Maintenance checks are to be performed by maintenance personnel according to the maintenance plan according to Use and Maintenance Manual
   I controlli di manutenzione si intendono eseguiti da personale di manutenzione secondo il piano di manutenzione previsto nel Manuale Uso e Manutenzione del mezzo.
4. For any doubt / clarification contact the engineering department of the Fagioli head office
   Per qualsiasi dubbio/chiarimento contattare il dipartimento di ingegneria della sede Fagioli

Operator *Operatore*	**Supervisor** *Preposto*
Name and surname: *Nome e cognome:*	**Name and surname:** *Nome e cognome:*
Signature: *Firma:*	**Signature:** *Firma:*

11.6 SPMT spine beam check

FAGIOLI EMEA

Department ENGINEERING

Client	**ROSETTI MARINO S.P.A.**
Project	**CROSSWIND**
Document type	**CALCULATION REPORT**
Content	**SPINE BEAM CHECK – TOP SIDE**
Doc. nr.	**030-CRO-TR-01-001**
Client doc. nr.	**n.a.**

A	10/07/2025	For comments	MM		
Rev.	**Date**	**Document status**	**prep.**	**check.**	**appr.**

Revision history:

Rev.	Date	Description of revision
A	10/07/2025	For comments

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1. SCOPE

Scope of the present document is the structural check of the SPMT's spine beam used for the land transport and load-out of the Top Side of the Crosswind project.

This document shows the loads applied to the Module as well, in order to permit adequate structural checks of the Module's structures and upper grillage (if any) during SPMT transport phase.

Below the geometrical characteristic of the Module are reported:

	ITEM MARK / ID	WEIGHT (contingency included)	MAIN DIMENSIONS (L x B x H)
Item #1	Top Side	1802 t	49032 x 29110 x 24750 mm

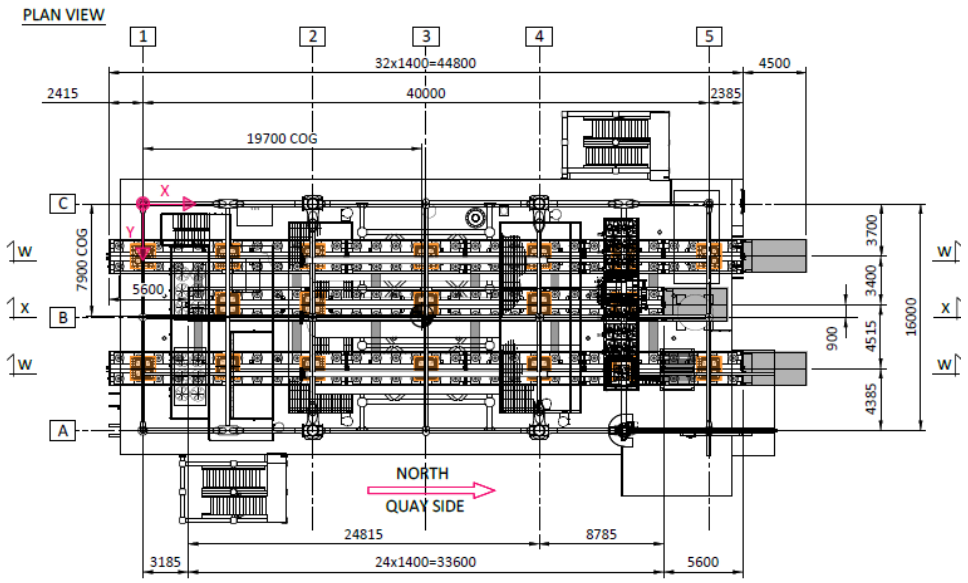


Figure 1. Item transport arrangement (plan view).

2. REFERENCE DOCUMENTS

2.1 STANDARD AND CODES

- The structural checks are carried out using the Allowable Stress Method (ASM);

2.1 CLIENT DOCUMENTS

- n.a.

2.2 FAGIOLI DOCUMENTS

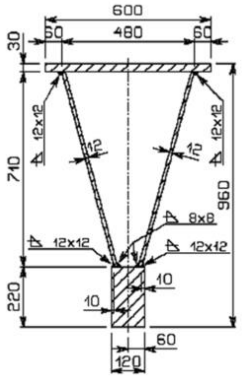
- 030-CRO-DP-01-001
- 030-CRO-DP-01-002

3. MATERIALS AND STRUCTURES

3.1 SPMTs SPINE BEAM

SPMTs spine beam is made by ***S690QL*** steel and its main static parameters are:

- σ_{yield} 6900 kg/cm^2
- A: 620 cm^2
- A_s: 228 cm^2
- J_{xx}: 826634 cm^4
- W_{xx}: 17570 cm^3
- $M_{all-SPMT}$: +670 tm/-500 tm
- $V_{all-SPMT}$: 350 t



4. TRAILER STRUCTURAL CHECKS

4.1 LOADS AND EFFECTS

The following calculations will be referred to the maximum load values. In particular, the maximum axle load include:

- CoG envelope window effect
- Out of Verticality effect
- Slope effect
- Wind effect
- Acc/Deceleration effect

CoG envelope window effect:

Tolerance box in all directions considered:

	CoG envelope
Transversal x direction [mm] +/-	500
Longitudinal y direction [mm]+/-	500
Vertical z direction [mm]+/-	500

Out of Verticality effect:

Max Out of verticality considered in any direction is 1.75% (1°).

Slope effect:

Max slope considered in any direction is 1% (0.57°).

Wind effect:

Wind load on the modules and on the trailers has been calculated as follows:

$$0{,}5 * C_s * C_h * \rho * V^2 * A$$

where:

- ρ is the density of the reference air, conventionally assumed constant at 1.25 kg/m^3;
- V is the wind reference speed (in m/s), 3 sec gust;
- C_s is the shape coefficient, depending on the shape of the conveyed accessory exposed to wind;
- C_h is the height coefficient, depending on the height on the ground of the area exposed to wind;
- A is the area exposed to the wind on the module, including any secondary structures present.

The wind reference design speed is chosen at V = 16 m/s (10 m above the ground, 3 second gusts).

The shape coefficient of the transported object, including any secondary structures, has been taken equal to C_s = 1.5.

The areas exposed to the wind on the module, including any secondary structures present, are conventionally taken as per *Figure 2* here below:

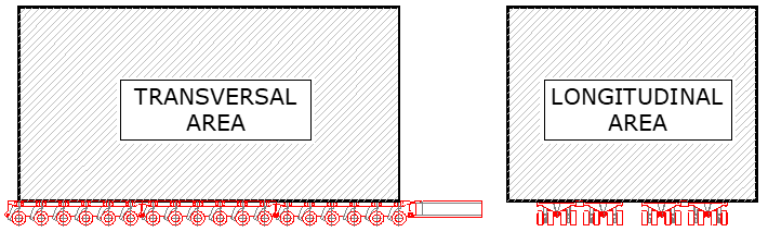


Figure 2: *Area exposed to the wind.*

Acc/Deceleration effect

The force of inertia in the longitudinal and transverse direction due to the acc/deceleration of the carriages, as their travel speed varies, will be assumed to be equal to:

a) for speed < 1,0 km/h $\Rightarrow$ $a_{1/2}$ = 0,00 – acc/deceleration 0,00g $\Rightarrow$ negligible effect;

b) for speed < 5,0 km/h $\Rightarrow$ $a_{1/2}$= 0,05 – acc/deceleration a = 0,05g $\Rightarrow$ effect comparable to 2.8 ° of inclination of the walkway;

c) for speed > 5,0 km/h $\Rightarrow$ $a_{1/2}$ = to be evaluated case by case, according to the real speed of the vehicle and the type of road surface.

The force of inertia in the vertical direction:

- a_v = 0.00 x g Vertical acc/deceleration negligible.

4.2 SPINE BEAM CHECK AND DISPLACEMENTS

A FEM model was created to find the correct values of the reactions and so of the bending moment. The SPMT's spine beam has been modelled using beam elements with equivalent inertia. A concentrated force is applied to the beam where the axles transfer the hydraulic pressure of the circuit. The vertical restraints (DY) are applied in correspondence of the module structure/grillage beams. The first one has both DX and DY fixed.

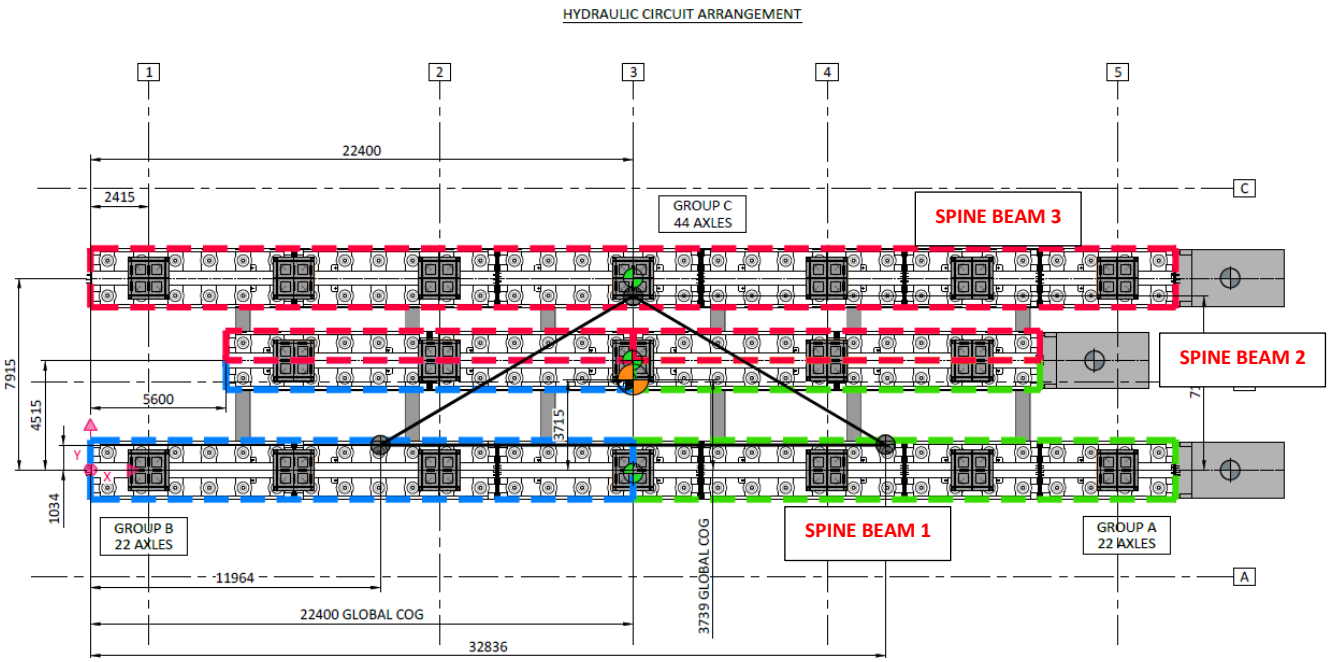


Figure 3: SPMTs line arrangement.

Considering what is expressed below, each axle is subjected to the following load:

$$F = SP - DL$$

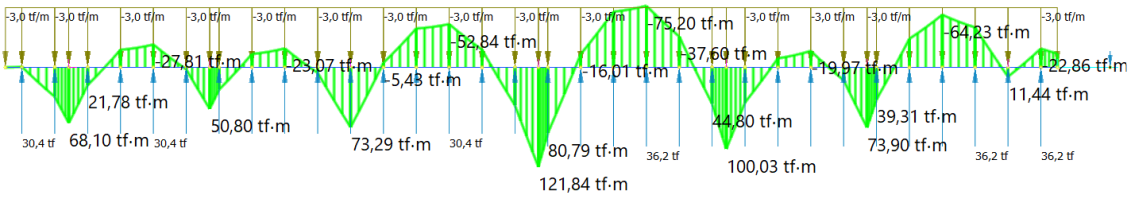
where:

- DL = 4,2 t is the axle self weight;
- SP = 36,2 t is the hydraulic group A maximum reaction for axle;
- SP = 36,2 t is the hydraulic group B maximum reaction for axle;
- SP = 28,6 t is the hydraulic group C maximum reaction for axle.

4.2.1 SPINE BEAM 1 – Group B/A

In the following figures, the bending moment (*Figure 4*) and shear force (*Figure 5*) diagrams are presented, obtained by applying the loads that maximise the reactions per axis for Group A (36,2 t) and Group B (36,2 t) respectively, along with the self weight of the spine beam.

	MIN	MAX
BM2 (tf·m)	-75,20	121,84
	[Bm:16]	[Bm:33]



	MIN	MAX
BM2 (tf·m)	-75,39	121,72
	[Bm:12]	[Bm:32]

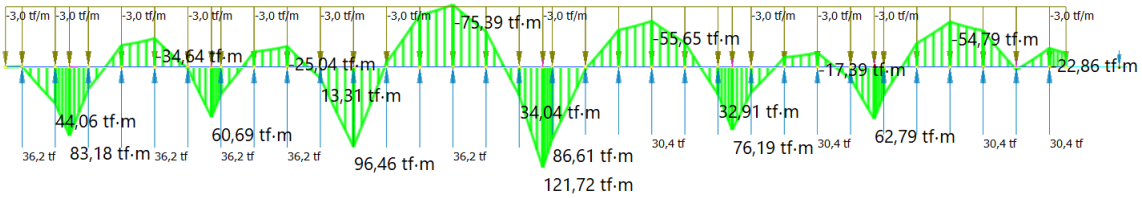
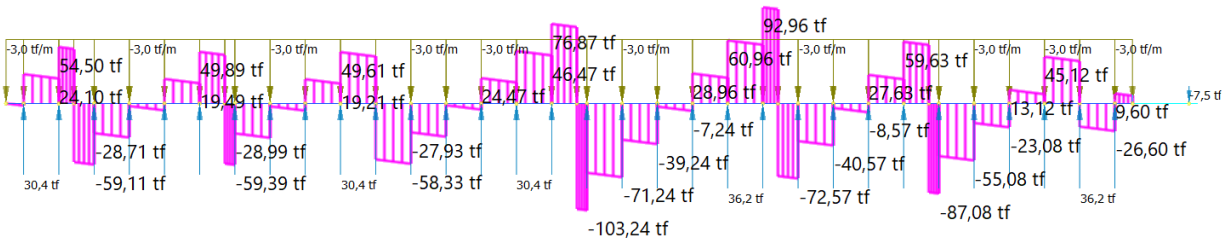


Figure 4: Bending moment diagram of the spine beam, for maximising axle loads on Group A (top) and Group B (low), respectively.

	MIN	MAX
SF2 (tf)	-103,24	92,96
	[Bm:33]	[Bm:34]



	MIN	MAX
SF2 (tf)	-88,37	89,18
	[Bm:33]	[Bm:32]

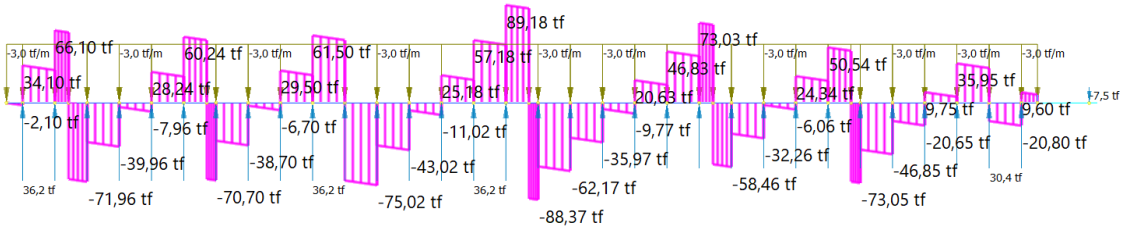


Figure 5: Shear force diagram of the spine beam, for maximising axle loads on Group A (top) and Group B (low), respectively.

Here below are the graphics of spine beam deflection.

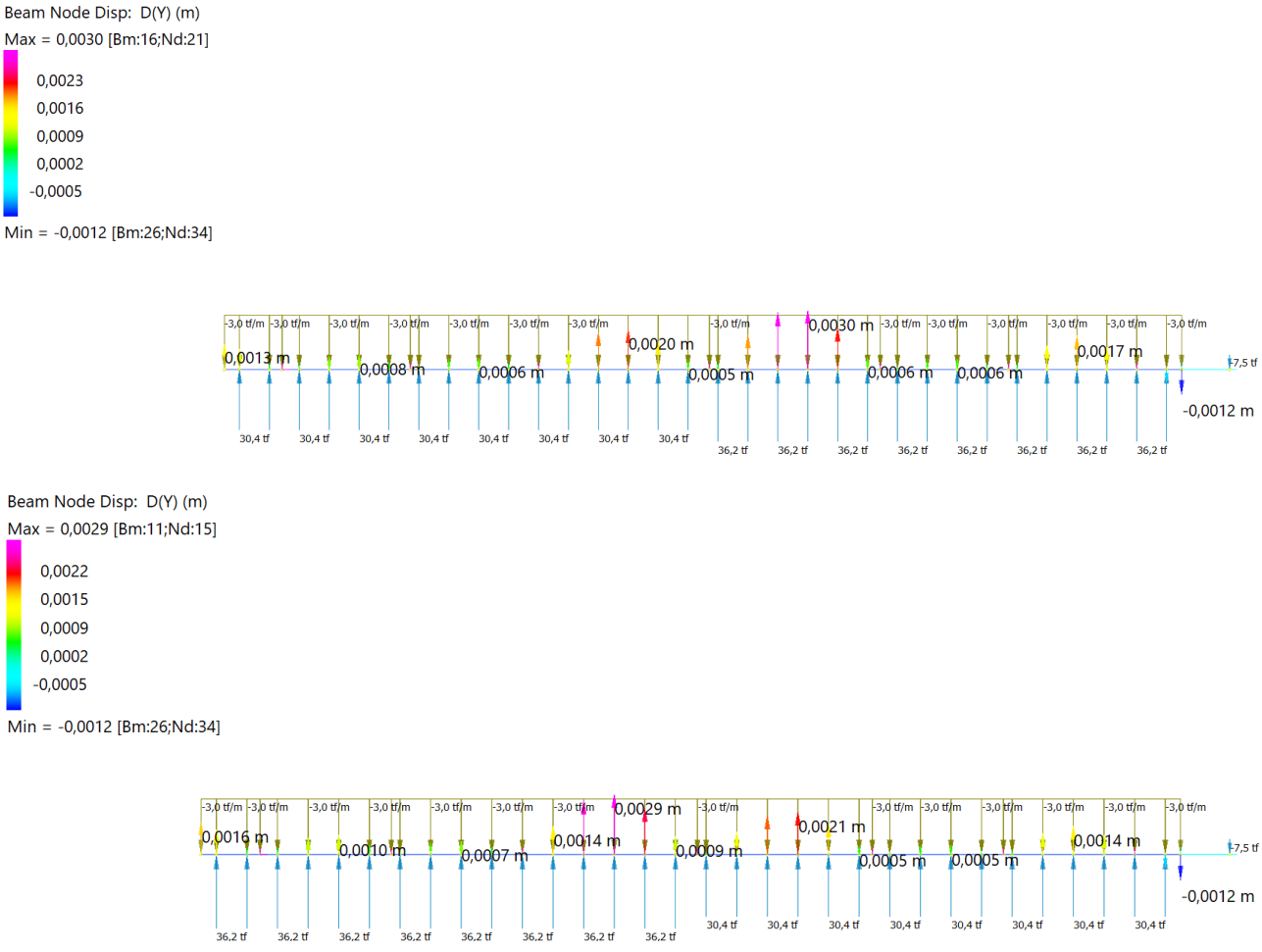


Figure 6: Spine beam deflection for maximising axle loads on Group A (top) and Group B (low), respectively.

Note: Unless the max bending moment and shear value are within the max allowable, no recommendation from SPMT vendor regarding max deflection.

4.2.2 SPINE BEAM 2 – Group A/B/C

In the following figures, the bending moment (*Figure 7*) and shear force (*Figure 8*) diagrams are presented, obtained by applying the loads that maximise the reactions per axis for Group A (36,2 t), Group B (36,2 t), and Group C (28,6 t), respectively, along with the self weight of the spine beam. In particular, the average between Group B and Group C maximum reactions is applied on the left hand side of the spine beam while the average between Group A and Group C maximum reactions is applied on the right hand side of the spine beam.

	MIN	MAX
BM2 (tf·m)	-65,47	118,09
	[Bm:11]	[Bm:15]

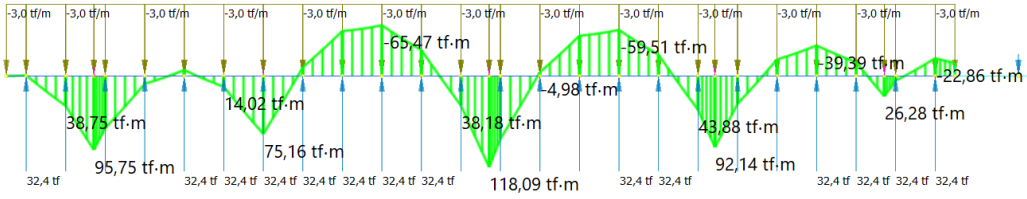


Figure 7: Bending moment diagram of the spine beam.

	MIN	MAX
SF2 (tf)	-92,07	81,42
	[Bm:15]	[Bm:14]

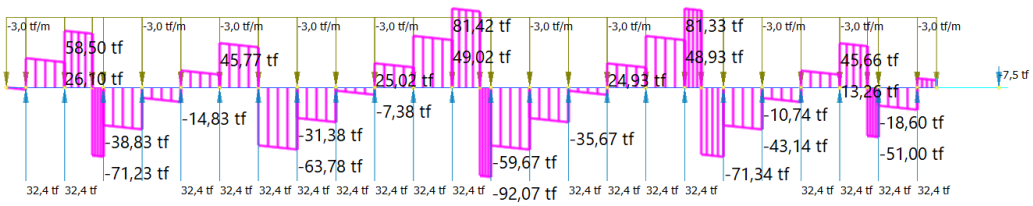


Figure 8: Shear force diagram of the spine beam.

Here below is the graphic of spine beam deflection.

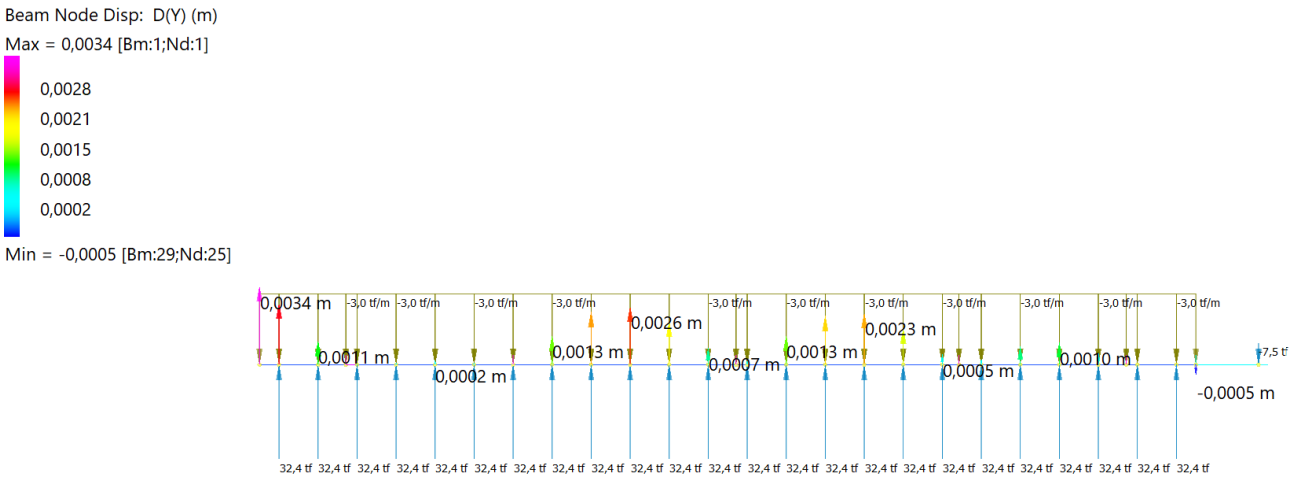


Figure 9: Spine beam deflection.

Note: Unless the max bending moment and shear value are within the max allowable, no recommendation from SPMT vendor regarding max deflection.

4.2.3 SPINE BEAM 3 – GROUP C

In the following figures, the bending moment (*Figure 10*) and shear force (*Figure 11*) diagrams are presented, obtained by applying the loads that maximise the reactions per axis for Group C (28,6 t) along with the self weight of the spine beam.

	MIN	MAX
BM2 (tf·m)	-55,03	102,17
	[Bm:17]	[Bm:32]

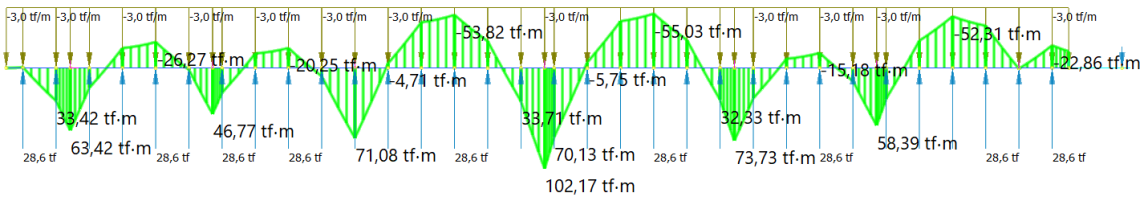


Figure 10: Bending moment diagram of the spine beam.

	MIN	MAX
SF2 (tf)	-80,70	69,96
	[Bm:33]	[Bm:32]

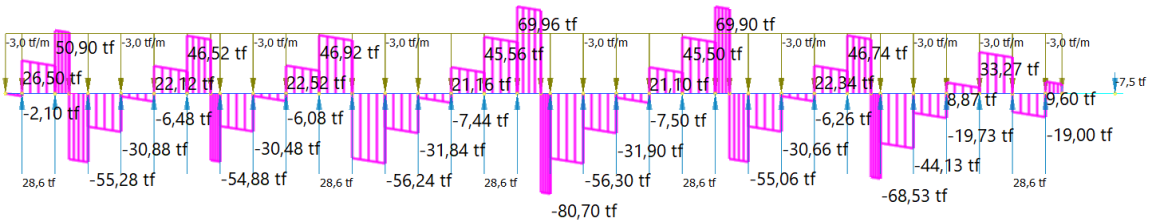


Figure 11: Shear force diagram of the spine beam.

Here below is the graphic of spine beam deflection.

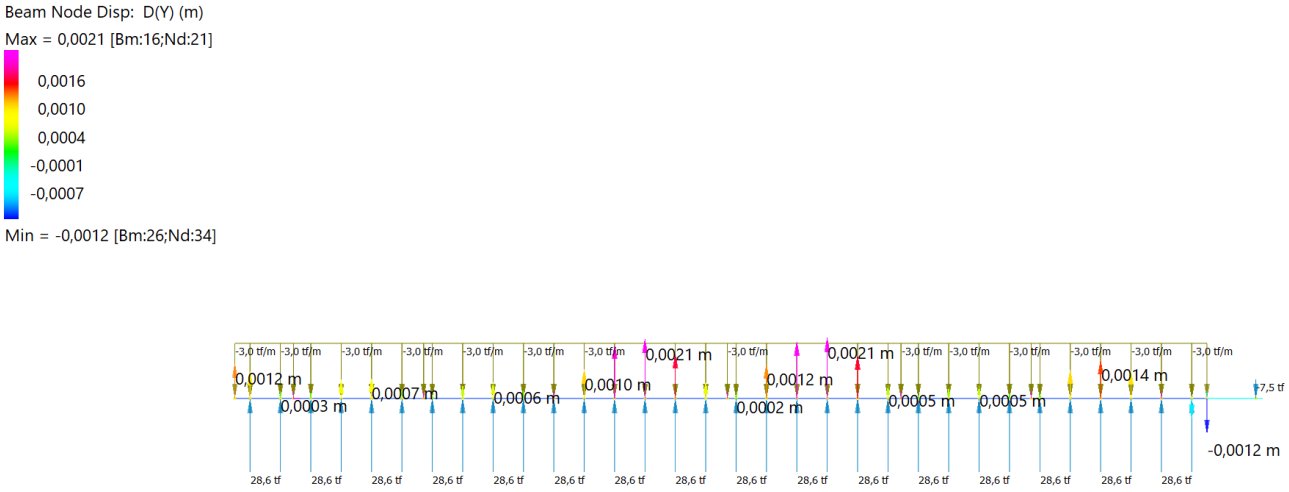


Figure 12: Spine beam deflection.

Note: Unless the max bending moment and shear value are within the max allowable, no recommendation from SPMT vendor regarding max deflection.

4.2.4 SPINE BEAMS STRUCTURAL CHECK

Table 1 presents an overview of the structural check carried out on the 3 spine beams.

	M_{sd} (tm)	$M_{all\text{-}SPMT}$ (tm)	$M_{sd}/M_{all\text{-}SPMT}$	V_{sd} (tm)	$V_{all\text{-}SPMT}$ (tm)	$V_{sd}/V_{all\text{-}SPMT}$
Spine beam 1	121,84	670	0,18	103,24	350	0,29
Spine beam 2	118,09	670	0,18	92,07	350	0,26
Spine beam 3	102,17	670	0,15	80,7	350	0,23

Table 1: Structural check of the spine beams.

CHECK OK!

11.7 Lashing calculation

OBJECTS:	**LASHING VERIFICATION FOR TOP SIDE TRANSPORTATION**
PROJECT:	**CROSSWIND**
CLIENT:	**ROSETTI MARINO S.P.A.**
REFERENCE FAGIOLI DOCUMENTS:	**030-CRO-DP-01-005**
	030-CRO-DP-01-001
REFERENCE CLIENT DOCUMENT:	**n.a.**

1. SCOPE

The scope of this technical note is to shown the lashing verification for the transportation of the item TP for the Crosswind Project. The verification is carried out in accordance with the standard "IMO – Cargo stowage and securing, 2003", following the alternative method described in the paragraph 7.3.

The lashing system is represented in the reference drawing 030-CRO-DP-01-005 (a snapshot of the drawing is reported in *Figure 1*).

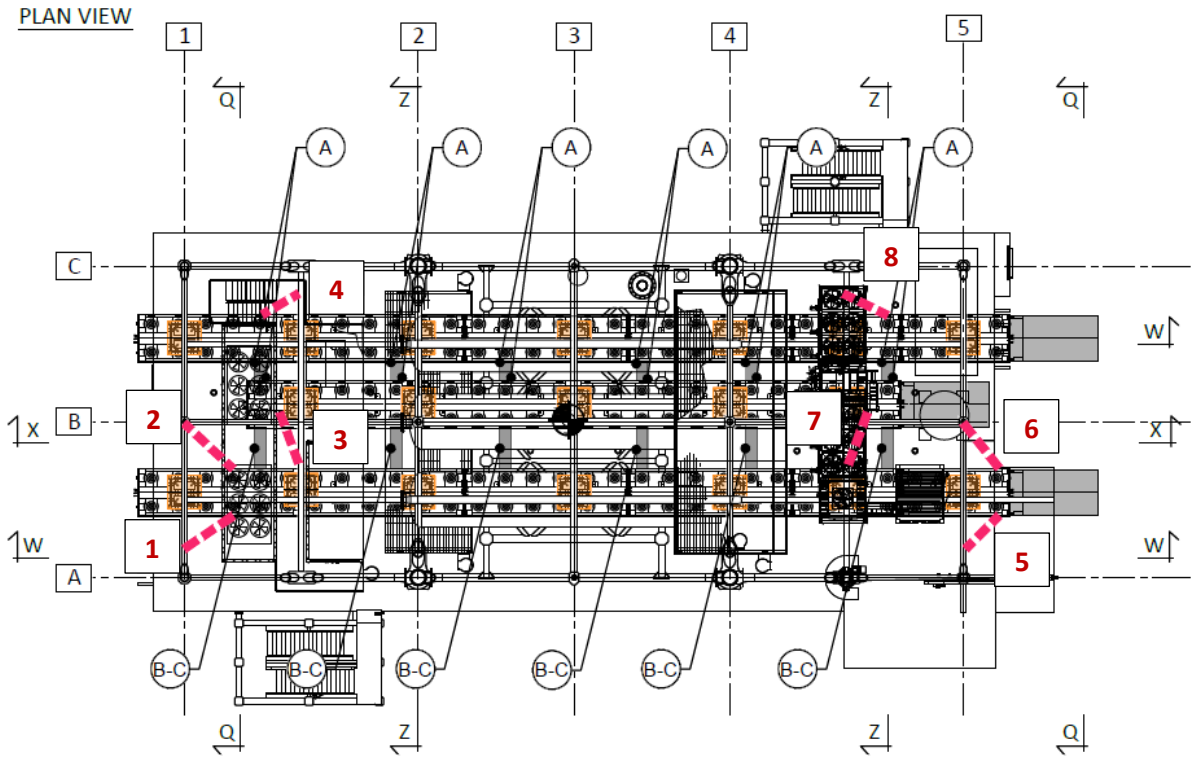


Figure 1 – Plan view of the lashing system.

2. CALCULATION OF HORIZONTAL FORCES

WIND LOAD

For the wind load calculation, NTC 2018 has been employed.

- Reference wind speed $v_r = 25\ m/s$
- Transversal area exposed to wind $A_x = 1000\ m^2$
- Longitudinal area exposed to wind $A_y = 600\ m^2$
- Height of barycenter from ground $z_w = 9{,}5\ m$
- Exposition coefficient $c_e = 2{,}02$
- Air density $\rho = 1{,}25\ kg/m^3$

The longitudinal and transversal horizontal forces due to wind are calculated as follows

$$F_{w,x} = \frac{1}{2} \cdot \rho \cdot v_r^2 \cdot c_e \cdot A_x = 80{,}31\ tf$$

$$F_{w,y} = \frac{1}{2} \cdot \rho \cdot v_r^2 \cdot c_e \cdot A_y = 48{,}19\ tf$$

FORCE DUE TO OUT OF VERTICALITY

The maximum out of verticality (OoV) considered for the transport phase is 3° in both longitudinal and transversal direction. This value is the sum of the allowable inclination of convoy (1°), and the 2° of out of verticality required by the DNV-GL. From this, the horizontal forces due to OoV (equal in the two directions) are:

$$F_{OoV} = W \cdot \sin \alpha_{OoV} = 94{,}31\ tf$$

Where W is the transported item weight equal to 1802 ton.

DIFFERENTIAL TRACTION FORCE BETWEEN SEPARETED VEHICLES

Since the vehicles are rigidly connected to each other, during starting, braking, and movement, no differential traction forces may arise.

DYNAMIC HORIZONTAL FORCE

Since the transport is carried out at a maximum speed of 0.5 km/h, it is not necessary to consider dynamic forces due to eventual accelerations.

3. CALCULATION OF RESISTANCE FORCES

The external horizontal forces must be smaller than the resistance forces, i.e. the friction force between the item and the trailer and the force of the lashing system that connect the item to the SPMTs.

FRICTION FORCE

As specified in the 030-CRO-DP-01-001, plywood or rubber sheets shall be positioned between any steel surface in contact. Therefore, it is possible to consider a friction coefficient $\mu = 0{,}3$. The friction force is calculated as:

$$F_f = m \cdot \mu = 540{,}6\ tf$$

LASHING FORCES

The item is connected to the convoy by 8 lashing lines formed by chains and turnbuckle used in double laid. The resistance of the lashing system is calculated in accordance with the standard "IMO – Cargo stowage and securing, 2003". Every lashing line has vertical and horizontal securing angles, α e β, that develop securing effects both in longitudinal and transverse direction.

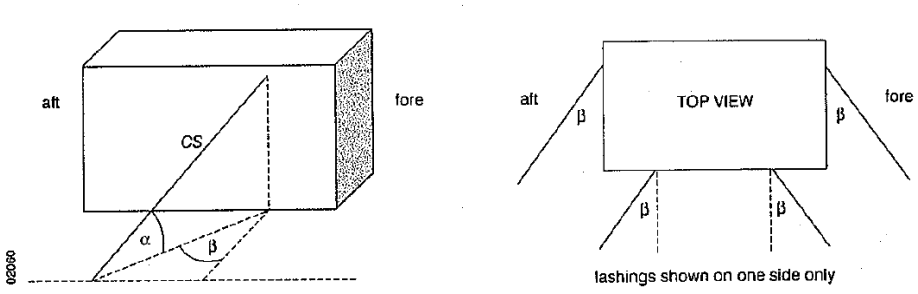


Figure 2 – Definition of the securing angles.

The properties of the lashing system are:

- Breaking load BL = 21,2

- Maximum securing load SWL = BL/2 = 10,6
- Calculated strength CS = 2·SWL / 1,5 = 14 tf

4. SLIDING AND TIPPING VERIFICATION

The lashing system must be verified in the following case:

- Transverse sliding
- Longitudinal sliding
- Transverse tipping

TRANSVERSE SLIDING

For the transverse sliding (along +y direction), the following formulae must be verified:

$$F_{y,sd} = F_{w,y} + F_{OoV} \leq F_{y,rd} = \mu \cdot m + \sum_{i=1}^{n} CS_{i,y}$$

The results are presented in the figure below:

$F_{w,y}$ (tf)	48,19						
F_{OoV} (tf)	94,31						
F_t (tf)	0						
$F_{y,sd}$ (tf)	**142,50**						
TRANSVERSE SLIDING							
Lashing line ID	CS (tf)	L tot. (m)	H tot. (m)	L projected (m)	α (°)	β (°)	$CS_{i,y}$ (tf)
1	14	3,00	1,35	2,49	24,25	56,01	7,14
2	14	3,40	1,35	2,49	21,64	47,03	8,87
3	14	2,76	1,35	0,95	26,06	20,02	11,82
4	14	2,13	1,35	1,84	32,42	59,94	5,92
5	14	2,38	1,35	1,69	29,59	45,14	8,59
6	14	2,90	1,35	1,81	24,94	38,57	9,92
7	14	2,79	1,35	0,97	25,81	20,34	11,82
8	14	2,49	1,35	2,24	28,47	63,84	5,43
						$0,5*\Sigma Cs_{i,y}$ (tf)	34,75
						$F_{y,friction}$ (tf)	540,6
						$F_{y,rd}$ (tf)	**575,35**
$F_{y,sd}/F_{y,rd}$	0,25		CHECK OK!				

Figure 3 – Transverse sliding verification.

All lashing lines are shown in the figure above. It is reasonably assumed that half of the lines will be in tension.

LONGITUDINAL SLIDING

For the longitudinal sliding, the following formulae must be verified:

$$F_{x,sd} = F_{w,x} + F_{OoV} \leq F_{x,rd} = \mu \cdot m + \sum_{i=1}^{n} CS_{i,x}$$

The results are presented in the figure below:

$F_{w,x}$ (tf)	80,31						
F_{OoV} (tf)	94,31						
F_t (tf)	0						
$F_{x,sd}$ (tf)	**174,62**						
LONGITUDINAL SLIDING							
Lashing line ID	CS (tf)	L tot. (m)	H tot. (m)	L projected (m)	α (°)	β (°)	$CS_{i,x}$ (tf)
1	14	3,00	1,35	2,49	24,25	56,01	10,58
2	14	3,40	1,35	2,49	21,64	47,03	9,52
3	14	2,76	1,35	0,95	26,06	20,02	4,31
4	14	2,13	1,35	1,84	32,42	59,94	10,23
5	14	2,38	1,35	1,69	29,59	45,14	8,63
6	14	2,90	1,35	1,81	24,94	38,57	7,91
7	14	2,79	1,35	0,97	25,81	20,34	4,38
8	14	2,49	1,35	2,24	28,47	63,84	11,05
						$0,5*\Sigma Cs_{i,x}$ (tf)	33,31
						$F_{x,friction}$ (tf)	540,6
						$F_{x,rd}$ (tf)	**573,91**
$F_{x,sd}/F_{x,rd}$	0,30		CHECK OK!				

Figure 4 – Longitudinal sliding verification.

All lashing lines are shown in the figure above. It is reasonably assumed that half of the lines will be in tension.

TRANSVERSE TIPPING

For the transverse tipping, the following formulae must be verified:

$$M_{UNSTAB} \leq M_{STAB}$$

For simplicity and safety purposes, the contribution of the lashing system has been neglected in the calculation of stabilizing moment. The previous formula then becomes:

$$1{,}5 \cdot (F_{x,sd} \cdot z_{CoG}) \leq 0{,}9 \cdot (W \cdot a_x)$$

$$1{,}5 \cdot (F_{y,sd} \cdot z_{CoG}) \leq 0{,}9 \cdot (W \cdot a_y)$$

Where a_x, a_y are the stabilizing arm, equal to the minimum distances between the CoG of the item and the support of the item on the convoy, the longitudinal and transversal direction, respectively. Therefore:

$$1{,}5 \cdot (174{,}62 \cdot 9{,}50) \leq 0{,}9 \cdot (1802 \cdot 19{,}83)$$
$$2488{,}34\ tm \leq 32160{,}29\ tm$$

CHECK OK!

$$1{,}5 \cdot (142{,}50 \cdot 9{,}50) \leq 0{,}9 \cdot (1802 \cdot 5{,}07)$$
$$2030{,}63\ tm \leq 8222{,}53\ tm$$

CHECK OK!

11.8 SPMT traction check

FAGIOLI	DRIVIN FORCE CHECK	rev. 00 date 19-11-2011 by U.S.

PROJECT: 123A90 (CROSSWIND) PROJECT **ITEM :** TOP SIDE **DATE :** 01/07/25

DWG FAGIOLI: 030-CRO-LO-01-002-0

DATE

Item Weight				P	=	1.802,00	t
Equipment weight				Pe	=	87,88	t
Trailer dead weigth				Pp	=	392,10	t
Total weight				Wl	=	2.281,98	t
Axles number				N	=	88	
Drive axles number				Nt	=	36	
Weight load for axles				Wl	=	25,93	t
Rolling Friction f_R				f_R	=	0,025	
Modular type (SPMT;MSPE;MSPE Evo;MSPM)						MSPE	
Inclination (%)						5	%
Inclination (radiant)						0,050	rad
Inclination (degree)						2,9	deg
Soil friction coefficient	Rubber- Off road compacted			Φ	=	0,4	
Max axle driving force (No 2 suspension)		F_{Z1}	=	12,23	t	120	KN

TRACTION CHECK

Total driving force	(F_{Z1}*Nt)	F	=	440,37	t	4320	KN
Max theoric slope	((F-Wl*g*f_R)/(Wl*g))*100			α	=	16,80	%
Max real slope (-15%)				**α***	=	**14,28**	**%**
Max angle				φ	=	8,13	deg

SLIPPING CHECK

Total weight on drive axles	(Nt*Wl)	W_{Nt}	=	934	t	9158	KN
Traction force	(W_{Nt}*Φ)	F_1	=	373,41	t	3663	KN
				α**	=	**13,86**	**%**

MAX ALLOWABLE SLOPE **13,86364 %**

THE CONVOY CAN TRANSIT AT MAX SLOPE **5 %**

11.9 Risk assessment

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1. Definitions

A 'Risk' is defined as the combination of the Damage of the consequences and the likelihood that harm or damage will actually occur.
A 'Hazard' is defined as anything that has the potential to cause harm or damage.

1.1. Risk Assessment (Hazard Identification and Risk Analysis)

This Risk Assessment has been based on many similar projects and carried out as follows:

- All activities and actions have been identified;
- All hazards associated with these activities and actions have been identified;
- The Hazard Effect of any hazards have been identified;
- The Damage of consequences and probability of each hazard have been identified;
- A Risk Assessment for each hazard has been produced;
- Risk mitigating preventative and protective measures have been developed as required;
- Residual risks remaining have been confirmed as acceptable.

In the event of this Risk Assessment not reducing all risk to an acceptable level the following actions are required:

- Further risk mitigating preventative and protective measures are to be developed as required;
- An action plan is to be completed for those hazards where adequate control measures still need to be confirmed and the risks reduced to an acceptable level.

A flow diagram showing this process is included in the following pages of this document.

The Risk Assessment for each activity has been documented on Risk Assessment Record Sheets and these forms are attached to this document.

A combination of FAGIOLI equipment will be used in the execution of this project.

This Risk Assessment Document identifies all hazards that may expose personnel, property or the environment to danger, assess the risk involved and ensure that preventative and protective measures are implemented to reduce these risks to an acceptable level.

1.2. Criteria (Project Risk Matrix)

R = P x D

P				
4	4	8	12	16
3	3	6	9	12
2	2	4	6	8
1	1	2	3	4
	1	**2**	**3**	**4**

D

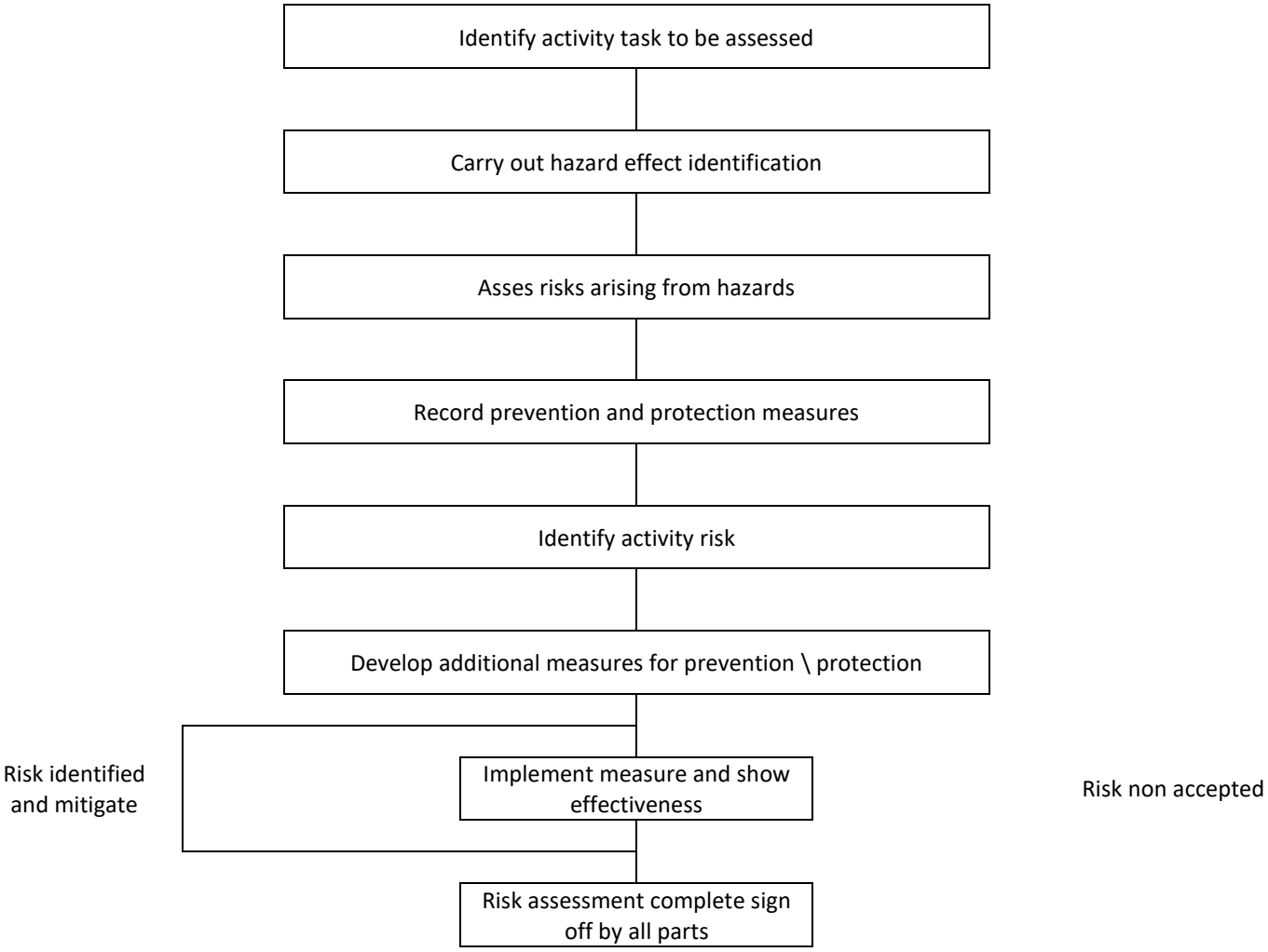
Probability Definitions (P)

Category	Definitions	Working Definition
4	Very Likely	Almost inevitable the same event will routinely occur during the course of similar work
3	Likely	It is considered likely the same event could still occur during the course of similar work
2	Unlikely	A rare combination of factors required for the same event to occur during course of similar work
1	Very Unlikely	It is considered a freak combination of factors would be required for the same event to occur in the future

Damage Definitions (D)

Damage Category		Damages Considerations		
		Harm to people	**Environmental damage**	**Damage to properties**
4	Catastrophic	Fatalities / Multiple serious injuries	Massive and uncontrolled release of a substance or damage with significant environmental impact extending well beyond site boundary. Chronic pollution resulting in damage lasting more than 12 months.	Over 500.000 €. Extensive damage (multiple fire / explosion) or loss of installation / facilities.
3	Significant	LTI / Temporary or permanent partial disability	Outside boundaries. Localized pollution given rise to significant environmental impact but unlikely to last beyond 1 month. Repeated exceeding of legal conditions. Recovery/rehabilitation may require external assistance	More than 100.000 € and less than 500.000 €. Significant damage to local area or essential plant and equipment.
2	Moderate	Medical treatment / Restricted work case	Within site boundaries. Short term environmental impact. Single legal exceeding recoverable by worksite	More than 50.000 € and less than 100.000 €. Limited damage to plant and equipment.
1	Negligible	First Aid injury	Within site boundaries. No significant environmental impact or exceeding of legal conditions. Easily controlled, recovered by worksite	Less than 50.000 €. Insignificant damage to plant and equipment.

2. Risk Assessment Plan



All risks will be assessed in conjunction with the Risk Management System.

The scope of risk assessment is to identify the hazards, evaluate mitigation measures already in place and then to identify any further mitigation measures required.

All planned activities will be assessed as early as possible to ensure that mitigation measures can be implemented in a timely fashion.

SHSE&QAO (Safety Health Security Environmental & Quality Assurance Officer), PSM (Project Site Manager), Superintendent will meet weekly to ensure that upcoming activities are identified and assessed.

In case of changing to schedule, PSM (Project Site Manager) will immediately inform the SHSE&QAO (Safety Health Security Environmental & Quality Assurance Officer).

3. Risk Assessment Record Sheets

Risk Assessment Record Sheets identified the hazard, hazard effect, preventative & protective measures and the risk calculation.

Each hazard is identified against an individual risk, however, hazard effect and preventative & protective measures are considered as factors of combined consequences and mitigation.

Activity – *Manual Lifting & Handling of Loads*

Risk Assessment Record Sheet No: 1 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
01	Fall of object from height	(4) 3	(2) 1	(8) 3	Back strain	Use of mechanical aids
	Fatigue	(3) 2	(1) 1	(3) 2	Muscle / Ligament injury	Manual handling training
	Heavy loads	(3) 2	(1) 1	(3) 2	Crushing	Split loads
	Unstable loads	(3) 2	(2) 1	(6) 2	Cuts & abrasions	Team lifting
	Sharp edges	(3) 2	(2) 1	(6) 2	Slips. Trips & falls	Good housekeeping
	Poor lifting technique	(3) 2	(1) 1	(3) 2	Hernias	Good lifting technique (refer to MGSSL-PR07-REV.02-MOVIMENTAZIONE MANUALE DI CARICHI)
	Poor housekeeping	(2) 2	(3) 1	(6) 2	Damage to plant & equipment	Good stacking methods
	Uneven surfaces	(3) 2	(1) 1	(3) 2		Good communications
						Toolbox talks
						Knowledge of load
						Job rotation
						Rest periods (do not work more than 12 hours in a day)
						PPE
						Do not lift loads heavier than 25kg

This Risk Assessment has been reviewed and accepted			
Action plan applicable		YES	NO
HSEM	General Manager	Date	
L. Fantini	M. Massetti	01.08.12	

Damage:	
4	Catastrophic
3	Significant
2	Moderate
1	Negligible

Probability:	
4	Very likely
3	Likely
2	Unlikely
1	Very unlikely

Criteria:	
R = 1	Low
2 ≤ R ≤ 3	Medium
4 ≤ R ≤ 8	High
9 ≤ R ≤ 16	Elevated

Activity – *Use Of Hand Tools*

Risk Assessment Record Sheet No: 2 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
02	Trapping / Jamming	(4) 3	(2) 1	(8) 3	Injury to personnel	Maintained equipment
	Fall of object from height	(4) 3	(2) 1	(8) 3	Damage to plant & equipment	Damaged / worn tools exchanged
	Flying particles	(3) 2	(2) 1	(6) 2		Regular tool inspections
	Damaged/worn tools	(3) 2	(2) 1	(6) 2		Good housekeeping
	Noise	(3) 2	(2) 1	(6) 2		Toolbox meeting
						Competent personnel
						PPE

This Risk Assessment has been reviewed and accepted			
Action plan applicable		YES	NO
HSEM	General Manager	Date	
L. Fantini	M. Massetti	01.08.12	

Damage:	
4	Catastrophic
3	Significant
2	Moderate
1	Negligible

Probability:	
4	Very likely
3	Likely
2	Unlikely
1	Very unlikely

Criteria:	
R = 1	Low
2 ≤ R ≤ 3	Medium
4 ≤ R ≤ 8	High
9 ≤ R ≤ 16	Elevated

Activity – *Fire Safety*

Risk Assessment Record Sheet No: 3 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
09	Overload of electrical circuits	(3) 2	(2) 1	(6) 2	Injury to personnel	Trained/Competent personnel
	Faulty electrical equipment	(3) 2	(2) 1	(6) 2	Damage to plant & equipment	Maintained equipment
	Diesel power pack	(3) 2	(2) 1	(6) 2		Good housekeeping
	Welding equipment & operations	(3) 2	(2) 1	(6) 2		Good communications (radios)
						Life saving apparatus
	Sparks from metal grinding	(3) 2	(2) 1	(6) 2		Safety Barriers
						Extinguishers fitted to Diesel Power Packs
						High visibility clothing
						Toolbox meeting
						Supervision where necessary
						Hot Woks Permit to be coordinated with Rosetti
						PPE
						AED available in the yard (short travel distance from the quay)
						Emergency response based on Yard Emergency Response Plan

This Risk Assessment has been reviewed and accepted				Damage:	Probability:	Criteria:	
Action plan applicable		YES	NO	4 Catastrophic	4 Very likely	R = 1	Low
HSEM	General Manager	Date		3 Significant	3 Likely	2 ≤ R ≤ 3	Medium
L. Fantini	M. Massetti	01.08.12		2 Moderate	2 Unlikely	4 ≤ R ≤ 8	High
				1 Negligible	1 Very unlikely	9 ≤ R ≤ 16	Elevated

Activity - *Electrical Safety*

Risk Assessment Record Sheet No: 4 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
04	Electric shock	(3) 2	(2) 1	(6) 2	Injury to personnel	Trained / Competent personnel
	Faulty electrical equipment	(3) 2	(1) 1	(3) 2	Damage to plant & equipment	Maintained equipment
	Overload of electrical circuits	(3) 2	(1) 1	(3) 2		Good housekeeping
	Thermal effects	(3) 2	(1) 1	(3) 2		Safe systems of work
						Life saving apparatus
						Toolbox meeting
						Supervision where necessary
						PPE

This Risk Assessment has been reviewed and accepted			
Action plan applicable		YES	NO
HSEM	General Manager	Date	
L. Fantini	M. Massetti	01.08.12	

Damage:	
4	Catastrophic
3	Significant
2	Moderate
1	Negligible

Probability:	
4	Very likely
3	Likely
2	Unlikely
1	Very unlikely

Criteria:	
R = 1	Low
$2 \leq R \leq 3$	Medium
$4 \leq R \leq 8$	High
$9 \leq R \leq 16$	Elevated

Activity –*Assembly / Maintenance / Demobilizing SPMT Transporters*

Risk Assessment Record Sheet No: 05 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
05	Trapping / Jamming	(4) 3	(2) 1	(8) 3	Injury to persons working in close proximity	Trained / Competent personnel
	Moving vehicles	(4) 3	(2) 1	(8) 3		Banksman
	Fall of person from height	(4) 3	(2) 1	(8) 3	Injury to operator	Maintained equipment
	Fall of object from height	(4) 3	(2) 1	(8) 3	Damage to plant & equipment	Worn damaged tool exchange
	Damaged / worn tools	(3) 2	(2) 1	(6) 2	Damage to environment	Good housekeeping
	Poor housekeeping	(3) 2	(2) 1	(6) 2		Assistance when maneuvering trailers
	Hydraulic pressure release	(3) 2	(2) 1	(6) 2		
	Adverse weather conditions	(3) 2	(2) 1	(6) 2		Good communications
						2 way radios
						Isolation of power packs
						Restricted access / Taped area
						Operations / Maintenance manuals
						High visibility clothing
						Toolbox meeting
						Supervision when necessary
						Use of safety harness
						Use the Proper Fall-Arrest Equipment
						Tools and materials must be kept in containers that are secure
						Weather forecast

This Risk Assessment has been reviewed and accepted			
Action plan applicable		YES	NO
HSEM	General Manager	Date	
L. Fantini	M. Massetti	01.08.12	

Damage:	
4	Catastrophic
3	Significant
2	Moderate
1	Negligible

Probability:	
4	Very likely
3	Likely
2	Unlikely
1	Very unlikely

Criteria:	
R = 1	Low
2 ≤ R ≤ 3	Medium
4 ≤ R ≤ 8	High
9 ≤ R ≤ 16	Elevated

Activity – *Hydraulic System Connection & Testing (SPMT's and Cranes)*

Risk Assessment Record Sheet No: 06 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
06	Hydraulic pressure release	(4) 3	(2) 1	(8) 3	Injury to personnel	Pressure testing of hydraulic system prior to dispatch (Cert. Package)
	Fall of person from height	(4) 3	(2) 1	(8) 3	Injury to persons working in close proximity	
	Fall of object from height	(4) 3	(2) 1	(8) 3		
	Poor mechanical connections	(4) 2	(1) 1	(4) 2	Damage to plant & equipment	Use of biodegradable oils
	Adverse weather conditions	(3) 2	(1) 1	(3) 2	Damage to environment	Good housekeeping
	Hydraulic oil spillage	(2) 1	(2) 1	(4) 1		Maintained equipment
						Provide power units with drip trays
						Inspected / Certified access equipment
						Erection Statement
						Certification Package
						All connections to be checked
						Spillage Kits to be provided
						Toolbox meeting
						PPE
						Use of safety harness
						Use the Proper Fall-Arrest Equipment
						Tools and materials must be kept in containers that are secure.
						Eye cleaning safety kit

This Risk Assessment has been reviewed and accepted			
Action plan applicable		YES	NO
HSEM	General Manager	Date	
L. Fantini	M. Massetti	01.08.12	

Damage:	
4	Catastrophic
3	Significant
2	Moderate
1	Negligible

Probability:	
4	Very likely
3	Likely
2	Unlikely
1	Very unlikely

Criteria:	
R = 1	Low
$2 \leq R \leq 3$	Medium
$4 \leq R \leq 8$	High
$9 \leq R \leq 16$	Elevated

Activity – *Transportation of Abnormal Loads*

Risk Assessment Record Sheet No: 07 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
7	Loss of load	(4) 3	(2) 1	(8) 3	Injury to operator	Trained/Competent operators
	Collision	(4) 3	(2) 1	(8) 3	Damage to equipment/cargo	Supervision
	Fall of object /material from height	(4) 3	(2) 1	(8) 3	Damage to ground	Maintained equipment
					Damage to underground / overhead services	High visible/Audible warning of moving vehicle
	Overturning	(4) 3	(2) 1	(8) 3		
	Trapping	(4) 3	(2) 1	(8) 3	Disruption to local traffic	High visible warning of wide/long load
	Moving vehicles	(4) 3	(2) 1	(8) 3		
	Poor securing	(4) 3	(2) 1	(8) 3		Advance notification of proposed movement to relative bodies
	Collapse/Subsidence of ground	(4) 2	(1) 1	(4) 2		
	Striking overhead obstructions	(4) 2	(1) 1	(4) 2		Engineering studies/survey of: Ground limitations/loadings; Width restrictions/clearances; Stability of load(COG)
	Inadequate access	(3) 2	(1) 1	(3) 2		
	Adverse weather conditions	(3) 2	(1) 1	(3) 2		
						Toolbox meeting
						Good communications
						Safety barriers
						Good housekeeping
						Restrict maximum speed of vehicles to 0,5 Km/hour
						Factor 1 to 2 seconds bring vehicles to a stop.
						Continuous monitoring level indicators.
						Provide watcher along the transportation road and at narrow gaps like reduced clearance to the concrete construction support

This Risk Assessment has been reviewed and accepted			
Action plan applicable		YES	NO
HSEM	General Manager	Date	
L. Fantini	M. Massetti	01.08.12	

Damage:	
4	Catastrophic
3	Significant
2	Moderate
1	Negligible

Probability:	
4	Very likely
3	Likely
2	Unlikely
1	Very unlikely

Criteria:	
R = 1	Low
2 ≤ R ≤ 3	Medium
4 ≤ R ≤ 8	High
9 ≤ R ≤ 16	Elevated

Activity – *Working Over / Near Water*

Risk Assessment Record Sheet No: 08 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
8	Falling from height / into water	(4) 3	(2) 1	(8) 3	Injury to operator/drowning	Trained/Competent operators
	Damage to quay edge	(3) 2	(1) 1	(3) 2	Damage to equipment/cargo	Supervision
					Damage to plant/equipment	Maintained equipment
					Collapse of quayside	Life saving apparatus
						High visibility clothing
						Engineering checks for imposed loads to quay
						Supervision where necessary
						Good communications
						Safety barriers
						Good housekeeping
						Toolbox meeting
						Life vests
						PPE
						Use of safety harness

This Risk Assessment has been reviewed and accepted			
Action plan applicable		YES	NO
HSEM	General Manager	Date	
L. Fantini	M. Massetti	01.08.12	

Damage:	
4	Catastrophic
3	Significant
2	Moderate
1	Negligible

Probability:	
4	Very likely
3	Likely
2	Unlikely
1	Very unlikely

Criteria:	
R = 1	Low
2 ≤ R ≤ 3	Medium
4 ≤ R ≤ 8	High
9 ≤ R ≤ 16	Elevated

Activity – *Spillage of Hazardous Materials*

Risk Assessment Record Sheet No: 09 of 9

Item	Hazard	Damage x Probability = Risk ( ) Without Controls			Hazard effect	Preventative & Protective Measures
		Damage	Probability	Risk		
9	Loss of hydraulic oil	(3) 2	(2) 1	(6) 2	Contamination of local environment	Trained/Competent operators
	Loss of diesel	(3) 2	(2) 1	(6) 2		Supervision
	Loss of engine oil	(3) 2	(2) 1	(6) 2	Slipping of pedestrians	Maintained equipment
					Skidding of vehicles	Good communications
					Fire/explosion	Safety barriers
					Contamination of skin	Good housekeeping
						Toolbox meeting
						High visibility clothing
						Life vests
						PPE
						Each convoy to carry adequate absorbent materials
						Each convoy to carry suitable fire extinguishers
						Spare liquids to be in correct containers and adequately stowed
						Spill kit

This Risk Assessment has been reviewed and accepted				Damage:	Probability:	Criteria:	
Action plan applicable		YES	NO	4 Catastrophic	4 Very likely	R = 1	Low
HSEM	General Manager	Date		3 Significant	3 Likely	2 ≤ R ≤ 3	Medium
L. Fantini	M. Massetti	01.08.12		2 Moderate	2 Unlikely	4 ≤ R ≤ 8	High
				1 Negligible	1 Very unlikely	9 ≤ R ≤ 16	Elevated

11.10 Contingency plan

Equipment/ Environment	RISK	CONTINGENCY
SPMT	Tyre failure	Isolate the axle of affected tyre by closing suspension valve. Complete the site transportation. Spare wheels complete with tyres are available at job site. The convoy system can accept max 10 isolate suspension for each hydraulic group
SPMT	Axle failure	Isolate the affected axle hydraulically, raise the axle into the elevated position and lock off. Complete the site transportation with one less axle, using the spare SPMT's capacity. The convoy system can accept max 10 isolate suspension for each hydraulic group
SPMT	Power pack failure	Disconnect the power pack not working. Make a hose by-pass from the running power pack. One power pack can move up to 40 axles
SPMT	Electronics controls failure	The digital system is a twin system. Activate the back-up. Or change the electronic box with spare components.
SPMT	SPMT spine beam overstress	Moment distribution calculations are carried out before any transportation, to ensure that moment capacity of SPMT is not exceeded. If deflection in the spine beam is greater than predicted, set down and investigate prior to moving.
SPMT	Ground failure on route	For any local failure, stop movement immediately. Lock off the affected axles and stabilize SPMT using the remaining axles. Fill the ground hole with hard wood and proceed slowly. The convoy system can accept max 10 isolate suspension for each hydraulic group
SPMT	Fuel, Oil spillage	Clean up any spillage using clean up kits (absorbent materials).
SPMT	Weight/CoG incorrectly described by Client	Carefully monitor suspension pressures / loads when initial jacking up takes place. If pressures are not acceptable, lower the unit onto temporary supports. Ask clarification; relocate the SPMT to fit with the actual location of CoG. If doubt continues, then carry out independent weighing. Max percentage overpressure lifting system is 20%; it means the max pressure circuit is 312 Bar.

11.11 Toolbox meeting

FAGIOLI	SITE TOOL BOX MEETING	STCH-TBMT-01	Revision:	0
			Date:	01.10.18

Project:				Location:	
Client:		Date:		Time:	

Attendees	Signature	Position

Activity 1				
Supervisor:				
Operators:				
Riggers:				

Activity 2				
Supervisor:				
Operators:				
Riggers:				

Activity 3				
Supervisor:				
Operators:				
Riggers:				

Activity 4				
Supervisor:				
Operators:				
Riggers:				

Activity 5				
Supervisor:				
Operators:				
Riggers:				

Activity 6				
Supervisor:				
Operators:				
Riggers:				

Notes:

HSE:	Site Manager:
Signature:	**Signature:**