TECHNICAL DESCRIPTION JN 98/2024

Note: By signing this document, the tenderer must declare that he has carefully studied this attachment Nr. 3 »Technical description JN 98/2024« and that he is informed with all technical requirements and descriptions and that we fully agree with them. In case of possible deficiencies in the technical requirements and description of the order, the client must warn or ask a question by the public procurement portal www.enarocanje.si.

The tenderer must fill the table in this document on paragraph Nr. 22 »MAINTENANCE COSTS« with data of regular maintenance costs up to 10.000 operating hours. **If the table is empty or is not submitted the offer will be eliminated!**

TABLE OF CONTENTS

1 GENERAL 4
2 SCOPE OF WORK 4
2.1 WORK INCLUDED 5
3 SAFETY OF MACHINERY 5
3.1 STATUTORY REUIREMENTS AND MINIMUM DESIGN STANDARD 5
3.2 CONFORMITY WITH THE EU MACHINERY DIRECTIVE 6
4 STANDARD AND DESIGN PARAMETERS 6
5 STATUTORY REQUIREMENT 7
6 GENERAL DESCRIPTION 7
7 TECHINCAL DESCRIPTION 8
7.1 UNDERCARRIAGE 8
7.2 OPERATOR'S CABIN 9
7.3 SUPERSTRUCTURE 11
7.4 PROTECTIVE HOUSING 11
7.5 PROPPING SYSTEM 11
7.6 SUPPORTING PADS 12
7.7 TRAVELLING GEAR 12
7.8 STEERING 12
7.9 TRAVELLING 12
7.10 SLEW MOTION 12
7.11 LUFFING MOTION 13
7.12 BRAKES 13
7.13 AUTOMATIC CENTRAL GREASING SYSTEM 13
7.14 MAIN DRIVE 14
7.15 ANEMOMETER 14
7.16 LUBRICATION 14
8 STRUCTURAL STEEL WORK 14
9 WIRE ROPES, PULLEYS, DRUM AND HOOKS 15
9.1 HOOK ROTATOR 16
10 PAINTING 16
11 VIDEO CONTROL 16
12 TEXT DISPLAY UNIT 16
13 CRANE CONTROL SYSTEM 16
13.1 DATA TRANSFER 17
14 STAIRS, ACCESS PLATFORMS AND LADDERS 18
15 CABLES AND WIRES 18
16 TESTING 19
17 LIGHTING AND AUXILIARIES 19
18 FIRE EXTINGUISHERS 20
19 DOCUMENTATION & MANUALS 20
20 OTHER 20
20.1 PACKAGING AND SHIPPING 20
20.2 SAFETY GUARDS 21
20.3 CRANE IDENTIFICATION NUMBERS 21
20.4 EMERGENCY STOPS 21
21 WARRANTY DURING THE DEFECTS LIABILITY PERIOD 21
22 MAINTENANCE COSTS 21
23 HIGH PRIORITY SPARE PARTS 22

24 TRANSPORT OF THE CRANE AND ASSEMBLING AT SITE 22
25 TESTING AT SITE 23
26 TRAINING 23
27 PROGRESS REPORT 24

1 GENERAL

Port of Koper intends to procure one 150 Tons or above capacity (under hook) mobile harbour crane as per manufacturer's proven standard design for installation at General cargo terminal. The crane specified shall be used for loading / unloading various types of general cargo such as steel coils, rails, steel billets, steel slabs, aluminium ingots, project cargo, pipes, sawn timber in bundles and also containers. The size of the ships will generally be up to 75000 DWT. The crane shall be suitable for hook and MHC spreader operations.

This specification describes requirements of supplying, commissioning, training and warranty of one (1) unit of mobile harbour crane with minimum 150 tons capacity, two rope design, fitted with telescopic single lift spreader – 20/40 ft, min. 40MT capacity. The mobile harbour crane shall be designed and manufactured according to high grade industrial standards. Mobile harbour crane and accessories shall be brand new and of the recent or current model, incorporating all the recent improvement in design and materials and conforming to "Technical Specification" listed below in separate attached document. Mobile harbour crane must be of the latest technology and high-quality design which can operate in temperature from -15°C up to 45ºC.

Subject of procurement is also single lift telescopic spreader – 20/40ft, min. 40MT capacity, such as Bromma EH5U or equivalent. Spreader must be equipped with 4 lifting lugs (4x10 MT) in the main frame and 4 on the end beams (4x 10MT). In this regard, crane system must also include specific spreader control mode.

Warranty shall be 24 months counting from commissioning the crane into operation.

Harbour Mobile Crane shall be delivered DDP (Incoterms 2020) at Port of Koper, Slovenia.

2 SCOPE OF WORK

The scope of work covered by this specification shall include, but not be limited to the design, supply, manufacture, paint, touch-up paint, pre-assemble, test, disassemble, matchmark, delivery, site erection supervision and site commissioning and performance testing of (1) one fully operable tyre mounted mobile harbour crane, capable of meeting all requirements of this Technical Specification.

The Tenderer shall design and undertake the full scope of work to provide a crane in accordance with the highest prevailing standards as would be expected from an internationally recognised and reputed Tenderer performing equivalent scope of work. The mobile harbour crane shall be designed and equipped with all necessary accessories and auxiliaries required to meet the designed parameters for satisfactory operations.

The Tenderer shall be responsible for design, manufacture, supply, inspection and transport to site, storage at site, erection, testing, commissioning, and operation of one 150 Tons or above capacity Mobile harbour crane. The crane shall work at dry cargo berth in Port of Koper, complete with all mechanical, electrical, and hydraulic installations / components along with hook and spreader for handling variety of general cargo and containers from / to the ships. During guarantee period the tenderer covers all repairs and costs including replacement of worn out / unrepairable components by spare ones if breakdown / malfunction is not consequence of mishap or negligence.

Operators required for the operation of mobile harbour crane will be provided by the client. After commissioning the cranes, the contractor must also organize operator's and maintenance training. The

training must be carried out at Luka Koper and must last 10 working days for crane operators. For maintenance workers, a complete training must be carried out, which must be divided into electrical and mechanical part. The training must be conducted in the Slovenian language and last one week. All training costs are covered by the contractor.

Welding shall be carried out as per the latest norms and regulations and in line with requirements. Welding shall be carried out in accordance with the recommended weld procedures for each steel quality. Only certified welders (welder qualifications according to EN 287, part 1) shall be employed and permanent quality control including non-destructive testing (NDT) shall be carried out according to the Manufacturer's QA / QC manual.

Visual inspection will be in accordance with EN 25817-B. All welds will be subjected to visual inspection. Ultrasonic, radiographic, and magnetic particle inspection will be carried out by certified examiners acc. The scope of the inspection is stated in the welding and inspection plan of the corresponding steel structure.

2.1 WORK INCLUDED

The work shall include, but not be limited to the following:
- Design and supply of steel structures for the crane including machine and electrical equipment platforms, stairs, ladders, walkways, and handrails.
- Design and supply of the fixed support pedestal complete with platforms and stairways
- Slewing/swing machinery.
- Boom, boom arm, and boom luffing machinery.
- All fasteners and accessories required for field erection.
- Match marking and labelling of all components.
- Recommended spare parts list for field erection and start-up.
- Recommended spare parts list for two years of operation c/w pricing.
- Special tools required for field erection and maintenance.
- Weights of all major components for field erection purposes.
- All documentation as listed in this technical specification.
- First fill of lubricants.
- Production and commissioning schedule.
- Ocean freight, inland freight, brokerage, import duties and insurance to site.
- Site erection supervision.
- Testing and commissioning of the complete crane system which include also static and dynamic test done by weights provided by tenderer.
- Training of operators and maintenance personnel.

3 SAFETY OF MACHINERY

3.1 STATUTORY REUIREMENTS AND MINIMUM DESIGN STANDARD

The crane electrical, electronic equipment and its mechanism shall be designed and manufactured to comply in all aspects with the requirements of all latest laws, ordinances, rules, orders, or other legal or regulatory institutes applicable in the country of operation.

Where items are not covered by local statutory requirements, the crane and other goods shall be designed and manufactured to at least the standards as specified in this Specification. For items which

are not specified above, then to at least to the current applicable recommendations of the following organizations:

- AWS – American Welding Society - Bridges and dynamically loaded structures
- BSI – British Standards Institute
- EN – European Standard
- DIN – Deutsche Industrie Normen
- FEM – Federation Europeane de la Manutention
- OSHA – Occupational Safety & Health Administration
- IEC – International Electrotechnical Commission
- IEEE – Institute of Electrical and Electronic Engineers
- ISO – International Standards Organization
- UL – Underwriters Laboratory

The Contractor shall define all standards used in the design of the Crane.

3.2 CONFORMITY WITH THE EU MACHINERY DIRECTIVE

The crane shall comply with the requirements of the European machine guidelines, particularly machinery directive 2006/42/EC. The cranes shall be provided with a declaration of conformity and the CE marking and symbol according to the relevant Appendixes of the machinery directive. The Supplier/ Contractor is solely and entirely responsible for all aspects of this conformity declaration and CE marking. A single electric power malfunction shall not damage the crane or injure personnel. If possible, component failure or malfunction shall safely stop the crane operation. If this is not possible, a redundant system shall be supplied. The redundant system shall both safely stop the crane and prevent operation until maintenance personnel complete the repair. A means shall be provided so the maintenance personnel may routinely check each redundant or backup system. The check procedure shall be included in the maintenance manual. No crane component shall change state because of a power failure. Powering or repowering the crane or any system within the crane shall not result in an unanticipated or potentially unsafe motion or condition.

4 STANDARD AND DESIGN PARAMETERS

The mobile harbour crane shall be designed for continuous heavy-duty operation for 24 hours per day throughout the year and shall operate both on Diesel engine and external electrical power.

The mobile harbour crane shall be designed, built, and tested to comply with the latest requirement of FEM 1.001 (Federation Europeennee De-La-Manutantion) Section – 1, 3rd Edition - 1998.

Crane classification:

Nr.	Nature of work	Load	Classification
1.	Hook operation	150 tons	Min. A2
2.	Hook operation	75 tons	Min. A6
3.	Container operation	40 tons	Min. A8

Classification of mechanisms:

Nr.	Nature of work	Load	Classification
1.	*Hoist mechanism*		
	Hook operation	150 tons	Min. M3
	Hook operation	75 tons	Min. M7
	Container operation	40 tons	Min. M8
2.	Slew mechanism		
	Hook operation	150 tons	Min. M7
	Hook operation	75 tons	Min. M7
	Container operation	40 tons	Min. M7
3.	*Luffing mechanism*		
	Hook operation	150 tons	Min. M7
	Hook operation	75 tons	Min. M7
	Container operation	40 tons	Min. M7
4.	*Long travel mechanism*		M4

5 STATUTORY REQUIREMENT

The mobile harbour crane shall be developed, designed, manufactured, and delivered according to the international regulations for safety such as F.E.M / DIN / VDE / IEC / ISO etc.
All the materials shall be as per relevant IS standard wherever applicable OR equivalent international standard.

6 GENERAL DESCRIPTION

Special multi-axle under carriage system mobile harbour crane with crane control and crane management system (Integrated monitoring system) shall be designed and built to incorporate the latest technological features using most advanced CAD/CAE design, engineering, and calculation technology. The design shall be as per the relevant standards, to suit the local site conditions and to meet the duties likely to occur in actual operations for following:
- Container handling with spreader
- General Cargo Handling
- Handling of Heavy Items

The machinery frame with the jib system shall rotate on a slew bearing connected to the tubular or as per manufacturer's suitable design. The structure must be designed to carry/withstand the forces and moments occurring in crane and travel operation.

The crane shall be capable of picking up the cargo from the ship's hold and discharge it onto the pier and can also be used for transferring cargo from the pier to the ship.

The crane shall be capable of handling with steel coils, rails, steel billets, steel slabs, aluminium ingots, project cargo, pipes, sawn timber in bundles, containers, etc.

The crane shall be designed to permit quick changeover from hook to spreader attachment and vice versa. The crane shall be designed for the stability, as per FEM-1998 standard.

The tendered crane is a special multi-axle undercarriage system mobile harbour crane, self-propelled, provided with the following operations:
- Electronic control system.
- Load and weight indication integrated into electronic control system.
- Star / H-shaped support base for maximum stability in any situation.
- Conformance with the most stringent safety requirement of operators and users.
- Components tested and proven for extreme conditions and performance.
- Reliable also in extreme weather and climatic conditions.
- Ergonomic design of cabin
- Operator cabin should be air conditioned.
- Continuously variable speed control from zero to max. speed.
- Simultaneous operation of all three motions of the crane (hoisting, slewing, luffing).
- Automatic power regulator for hoisting.
- Extremely low vibration level.

The crane shall consist of a self-propelled crane carrier with mechanical axle suspension including extendable outriggers for propping of the crane.

The structure of crane shall consist of electrical room, machinery room, diesel-engine room, and tower with a lattice – type luffing jib, crane operator's cabin and counterweight.
The crane consists of following main constructional groups:
- Undercarriage with star/H-shaped supporting system.
- Slewing platform (machinery house) with counterweight.
- Tower structure.
- Boom.
- Basic equipment.

7 TECHINCAL DESCRIPTION

7.1 UNDERCARRIAGE

A multi axle undercarriage with wide spacing of axles for optimum stability during traveling on rubber tyres should be provided. Ensuring an equal load distribution, the individual axles shall be connected by equalizing beams. Chassis width, chassis length and outer turning radius in traveling condition of the crane measured under consideration of the pad dimension should be specified.

The pads should be connected to the propping cylinder of the outrigger in a manner that the pads can be lifted with the propping cylinder and the crane can travel in fully rigged condition. For passing narrow passages the pads should be easy dis-connectable and they should be equipped with lifting pockets for transportation with forklifts.

The pier load capacity is 7 ton / m2, however, pad shall be designed with minimum size of 6 m x 2 m keeping in view the pier design.

Crane must be equipped with a stairway and platforms mounted at the one end of the undercarriage, which enables access from pier to engine room. From engine room to the operator's cabin stairway and platforms shall be mounted inside the mast. In addition, the crane must be equipped with an emergency escape stairs or ladders on the outside of the mast, equipped with fall protection, which guarantees safe escape from operator's cabin in case of emergency.

All stairways and walkways from the ground to the superstructure must be guarded by continuous handrails and must be galvanized.

Main fuel tank must me integrated in the steel structure. Its capacity must be sufficient for intensive multi-shift crane operation. The filler neck for filling the main fuel tank must be easily accessible.

7.2 OPERATOR'S CABIN

The operator's cabin shall be mounted on the tower in elevated position to provide full visibility of all operation specified. All operation of the crane shall be controlled from the operator's cabin. Window of safety glass (tinted/glazed) shall be provided and must be arranged in such a manner to guarantee best view to the operation area. Glass shall also be provided wherever possible in the floor where it is possible to stand on these windows and these windows shall be protected by a steel grid. Accesses must be provided for easy manual cleaning of the windows for front and side windows. Windshield wipers shall be provided for front and roof windows of the operator's cabin. Wipers shall be of such a type, which shall cover maximum coverage area. Upholstered multi-adjustable chair shall be provided with comfortable access to all control devices and for best view to the working area on ship and pier. The seat is preferably adjustable air-suspension type seat. An upholstered, revolving type seat with back and hand rest shall be provided. Seat must have adjustable height and reach. A foldup type of seat shall be provided adjacent to the operator's seat to provide a seat for instructor during operator training.

An ergonomically designed operators' cabin of generous proportion shall be provided and positioned such that operator shall have the best possible view in all directions during loading /unloading operation including better view of working area in the pier.

The cabin shall be constructed from structural steel plates suitably stiffened and welded together and lined with anti-condensation and insulation materials, which will be fireproof. Steel plates and sections which shall be protected against corrosion in a salt-laden, marine environment by a tried-and-tested paint finish. A hinged door with a lock and key shall be provided. The cabin shall be built with clear headroom of not less than 2 meters. Cabin walkways shall be designed as per manufacturer's proven standard design. The near-silent ventilation system with its air outlets on the windscreen and side windows and in the footwell must ensure the windows do not mist up.

All controls shall be designed for maximum comfort of the operator. All the indicators shall be placed in a prominent position to ensure optimum visibility.

All controls, indication panels, on board computer and fault display unit shall be installed in such a position that the operator will have clear view to control and regulate the performance and shall be able to transmit data to control computer system.

Access to the cabin shall be from a fixed platform, on one side of the cabin, at level with the cabin floor.

The crane operator must control all the functions of the crane from a spacious, ergonomically designed tower cab. Large windows and the cab position high on the tower must provide an excellent view of the work area and the ship's holds.

The non-glassed surfaces in the cab must be panelled with a material which is heat and sound insulating. The dark, carefully matched colour scheme inside the cab must minimises reflections from the windscreen. Several practical and ergonomic features must make the operators cabin a pleasant place to work:

- windows of tinted safety glass
- a floor window
- sound and heat insulating interior panelling
- upholstered operator seat, which is adjustable in the vertical and horizontal directions.
- controls and indicators
- air outlets for the windscreen and side windows and the footwell
- infinitely adjustable sun blinds on the side windows, rooflight and windscreen, and on the door
- automatic heating and climate control system
- near-silent ventilation system with electric heater
- electrically operated wipers and washers to ensure the view angle required for operation
- Communication equipment – preferred Motorola DM 4600E UHF low power – outside antenna (channel spacing 12,5/25kHz, range 430/470MHz)
- speakers for Motorola radio communication
- interior lighting
- electric socket including USB socket.
- internal and external communication system
- Interactive operator's panel, for displaying crane data and for control functions
- Coat hook
- Waste bin
- Fire extinguisher
- Vacuum cleaner
- Signal horn
- Second foldable training seat
- Radio with USB player and stereo speakers

The cabin shall be fully enclosed and airtight with a ventilation system designed to maintain a positive pressure to have dust free condition in the interior. Dust tight seals shall be provided for all doors, windows, and electrical cable entry points. Cabin shall be provided with air conditioner and fan.

As a standard the noise level shall meet the requirement of regulation as per latest version.

Vibration inside the cabin shall be limited to such level as to ensure unhampered functioning and safety of all sensitive equipment and to ensure operator's comfort for continuous working.

Public Address System: Consists of goose-neck microphone and amplifier installed in the tower cabin and a marine type of loudspeaker outside of the tower cabin.

The following accessories shall be provided in the cabin.
- Fire extinguishers CO2 (Certified and approved make are acceptable from local market)
- Radio station Motorola DM 4600E UHF1 LP with outside antenna
- Handset stations for public address
- Rechargeable lithium battery operated emergency light.

The controls and indicators for all crane functions are in control panels on both sides of the operator seat and on the crane management system.
The controls comprise light switches and control levers and switches for all main and auxiliary crane functions.

7.3 SUPERSTRUCTURE

The in-house manufactured, welded, torsional rigid construction shall be made of certified high-grade steel. The design of superstructure shall be as per manufacturer's proven standard design.

The superstructure shall be a torsional stiff welded steel load-bearing structure designed to carry/withstand all the forces and moments occurring in crane operation. The superstructure must house all electrical and mechanical components like hoists, slewing gear, and the pressure oil unit, provide sufficient room for easy maintenance access and protect the environment from noise emissions. The crane control including the electrical control and monitoring systems shall be located in a separate air-conditioned room of the superstructure. At the rear side the counterweight must be installed.

There shall be provided a safe access from the chassis platform in the superstructure.

7.4 PROTECTIVE HOUSING

A protective housing of ample size to adequately accommodate all items of hydraulic / electric and mechanical equipment shall be provided.

Protective housing shall be divided into separated machinery and electric part. The structure shall be thermal-protected and easy to dismantle for changing drive units.

A totally enclosed and lockable electrics room shall be provided for accommodation of the crane control system as well as the electric control equipment. The electric room shall be completely separated from the machinery room and shall have a separate entrance door.

The electrics room shall be dust-proof. Sufficient split-type air conditioners and heating measures shall be provided.

The protective housing must protect all components from environmental influences; it also has to protect the environment from noise emissions. The rope outlet on the roof of the superstructure must be protected against ingress of rain and dust by means of rubber seals. Water ducts must be provided for rainwater removal.

The side walls can be removed easily for replacement of individual drive units.

The diesel engine must be noise-protected and preferable separated from other equipment in an individual noise protected room. The cooler shall be installed as per manufacturer's proven standards.

Further, all openings are required to provide with the protection covers (wherever possible) to avoid seepage in different weather condition and optimum life of equipment.

7.5 PROPPING SYSTEM

The four-hinged outrigger arms form the main body of the propping configuration together with hydraulically operated control cylinders and jack-up rams. The horizontal and the vertical movements shall be activated through solenoids either individually or together. Propping system as per the manufacturer's standard proven design will also be acceptable.

The position of the stabiliser beams is constantly monitored by proximity sensors. The stabilizers can be operated in automatic or manual modes. All the extension cylinders and jack cylinders are retracted or extended simultaneously.

In automatic mode, the stabiliser system should level the crane fully automatically. Manual fine adjustment should not be necessary.

In manual mode, the stabilisers shall be operated from the tower cab by means of pushbuttons from the crane operator seat, or via the radio remote control. A level is provided in the chassis cab for monitoring whether the crane is in a horizontal position. In the tower cab, the horizontal position of the crane must be indicated.

The crane shall allow movement with extended outriggers/stabilizers.

7.6 SUPPORTING PADS

Under normal conditions the mobile harbour crane must operate with single plate gimbals mounted on each of the four jack-up rams.

The supporting pads are pivotably mounted on the jack cylinders. The supporting pads can be removed easily when the crane is to travel through narrow passages.

Size of supporting pads must be 6m x 2m, to correspond with pier structure.

7.7 TRAVELLING GEAR

The travelling gear shall be as per manufacturer's standard proven design.

7.8 STEERING

The steering system shall be as per manufacturer's standard proven design.

7.9 TRAVELLING

To move from one pier section to another, all controls can be operated from either the tower cabin or remote control. Remote control must be placed in the engine room area or other adequate place. Traveling can be done in both directions with a smooth start and step-less acceleration ensured. The traveling is selected in the control pad. The climbing capacity shall be as per manufacturer's proven standard design.

This control covers driving, steering, braking, lowering of the crane from the propped position onto the wheels, and propping for crane operation. The crane can accelerate smoothly from standstill all the way up to maximum speed in both directions.

7.10 SLEW MOTION

Slewing system shall consist of an adequate slewing drive unit located in the machinery house to be protected against the influence of the environment and best accessible for ease of maintenance.

It should be powered by motor / hydraulic with their associated brakes, directly connected by flexible / fixed couplings with a completely closed gear driving by a pinion gear a heavy-duty ball bearing ring. Special locking device shall be supplied to prevent slewing of the crane superstructure under the influence of wind when crane is in parked or in traveling condition. The locking device as per manufacturer's proven standard design is also acceptable.

7.11 LUFFING MOTION

The level luffing system shall be with the latest standard design. The horizontal load path during luffing over the luffing range must be guaranteed within a suitable vertical tolerance.

The boom shall be luffed in and out by means of a hydraulic differential luffing cylinder that holds the boom in position. Brake valves control the cylinder movement. For safety reasons, pipe-break valves are fitted.

The boom head can be lowered to a convenient working height for maintenance purposes.

For maintenance work, the valve block on the luffing cylinder can be accessed easily from the chassis platform or a platform on the superstructure.

7.12 BRAKES

The Brakes shall be as per manufacturer's proven standard design.

All driven axle sets are to be equipped with a hydraulic or any other means as per manufacturing standard design multiple-disk brake used as holding brake only.

The brake circuit shall be protected by a device which switches off the hydraulic motor and brake in the event of malfunctioning.

7.13 AUTOMATIC CENTRAL GREASING SYSTEM

Where feasible all points of the crane which require regular application of grease to ensure normal operation must be connected to an automatic greasing system.

The automatic central greasing system supplies at least the following lubrication points on the crane:
- boom root bearing
- upper and lower pivot point of the luffing cylinder
- roller bearing slew ring
- rope drum bearings

The central lubrication system is installed at an easily accessible point and has an integrated lubricant reservoir. The points to be lubricated are supplied automatically and regularly with enough lubricant via a pipework and lubricant distributors.

A second automatic lubrication system supplies the internal toothing of the roller bearing slew ring with lubricant by means of a lubricating pinion.

7.14 MAIN DRIVE

The crane's drive must be diesel engine, which must be main source of power to all driving motors/hydraulic drive for hoisting, slewing, luffing, etc. The preferred producer of engine must be Caterpillar / Cummins / Volvo or any other reputed brands to the approval of the buyer. The diesel engine must be the latest generation with the latest exhaust emissions standards, which are valid in EU (stage V).

For improved crane's performance and reduced fuel consumption, reduced CO_2 emissions and noise, the crane must be equipped with "hybrid drive". The crane must feature an additional energy storage device, such as accumulators or ultracapacitors. The energy storage device is fed/charged when the load is lowering, when braking and when there is a surplus of power from the conventional unit. Energy is deployed back in the system for handling operations such as hoisting, lowering, etc., thus saving fuel.

It is important to note, that there is no existing external power supply at the moment on the pier, where crane will be used. In this regard, the crane **SHALL NOT** be equipped with system to connect and operate via external power supply – electric drive.

However, there must be possibility to install electric drive in the future. Due to this reason, tenderer must design and deliver the crane adapted in such a way, that subsequent installation of the system for connection to **middle voltage** external power supply will be possible, without major changes and modifications to the crane.

Port of Koper is working towards electrification of all its piers at the moment and electrification of mobile harbour cranes is also taken into account. After completion of the project, an order for updating crane with electric drive will be considered.

7.15 ANEMOMETER

A wind anemometer shall be provided at the top of the crane. It shall continuously monitor wind velocity and display the wind speed. In case of exceeded wind speed warning must be displayed and alarm must sound in operator's cabin.

7.16 LUBRICATION

The cranes shall be equipped with centralized grease lubrication system. The individual lubricating points should be grouped at convenient locations for ensuring positive lubrication and shall comprise of stainless-steel heavy-duty tubes and connectors, nipples, bushing, brackets, support clips etc. duly clamped by SS clamps and fittings. Gearbox shall have splash lubrication system. Open gears and wire ropes shall be coated with suitable lubricant.

8 STRUCTURAL STEEL WORK

The in-house manufactured, welded, torsional rigid construction is made of certified high-grade steel. It features the centrally arranged reinforced circular/rectangular pedestal construction with the slewing

ring flange for the bolted connection with the slewing bearing perfectly machined to meet the specified tolerance for this connection.

Tower steel construction: Sub-arc welded pipe construction / plate girder structure of torsional rigid design, ensuring that mechanical forces are transferred evenly from the boom to the tower. For safe, fast, and comfortable access, lighted stair with handrail, toe boards and landing with railing at cabin level shall be provided. The boom and cylinder fulcrum are accessible to maintenance through ascent platforms.

Boom: The design of boom shall be as per manufacturer's proven standard design. For service and maintenance purposes as well as high winds, the boom needs to be enabled to lower down on ground.

9 WIRE ROPES, PULLEYS, DRUM AND HOOKS

To ensure maximum operational life, low twisting, galvanized (other material of higher standard is acceptable) suitably anti-dripped greased lifting rope shall be made in one piece, having suitable construction F.M.C. performed with right hand/left hand ordinary lay and factor of safety, as per FEM under section 7.5.1.1.

Wire rope length shall be such that in case if the rope gets damaged from hook side about 5% of total length it shall be possible to cut and reconnect the rope in order to avoid replacement of the whole rope.

All wire ropes shall be treated with approved lubricant at the point of manufacture. The wire ropes shall also be re-lubricated in the field prior to being placed in service. The contractor shall furnish one copy of the wire test certificate for each wire rope on the crane prior to the time the crane is to be certified.

Blocks of hardwood / Teflon guide or of other suitable material as per manufacturer's standard proven design shall be mounted on the crane structure to prevent damage to wire rope, which would otherwise contact steel during operations.

Large diameter sheaves shall be fitted with anti-friction bearings. All sheaves are made from a specially selected steel / Teflon.

All steel wire ropes shall be made in one piece. Rope selection shall be based on F.E.M. 1.001 3rd Ed. All ropes shall be Warrington-Seale type or equivalent with steel core and have an ultimate tensile strength of 1960 N/mm². Manufacturer's test certificate of the quality and breaking strength of each rope shall be provided.

Main hoist wire ropes shall have a minimum safety factor of 6.0 with a concentric load and 5.0 with an eccentric load.

The ratio of the sheave pitch diameter to the wire rope diameter shall be a minimum of 30:1.

The main hoist rope sheaves shall be of cast or welded construction with machined grooves.

Sheaves are to be provided with rope guards to prevent slack rope coming off the sheave. The gap between the sheaves and guards shall be minimized to avoid ropes coming off the sheaves.

All sheaves shall be designed with easy access and with ample space for maintenance and repair. The

clamp and retainer shall be fitted opposite to the wire rope pulling force direction. Clamp and retainer bracket shall easily be removed for sheave replacement.

9.1 HOOK ROTATOR

The crane must be equipped with a hook rotator, which rotates the hook so that the load can be turned to any desired position from the operator's cabin. The hook can rotate freely or be locked in position.

The lifting gear comprises a beam from which a ramshorn hook equipped with safety catches is suspended by means of a universal joint. The hook, which is mounted in roller bearings, is remote-controlled from the operator's cabin. It is infinitely rotatable.

The electro-hydraulic hook rotator comprises an electric motor, a hydraulic pump, a hydraulic motor and a gear unit. These assemblies plus the slipring assembly are accommodated in a closed rotator beam and protected from environmental effects and jolts or impacts.

The rotator beam and the rotator must have possibility to attach spreader, grab, and other lifting gear.

10 PAINTING

All load-bearing parts must be sandblasted and painted using proven methods. The painting of crane shall be as per the standard proven design of manufacturer. Painting scheme shall be suitable for marine atmosphere and for the given site condition.

The contractor shall submit painting protocol at the time of submission of its tender.

11 VIDEO CONTROL

To assist the crane operator working in hatches or in ship cells the crane should be equipped with a HD television along with latest HD camera installed on the boom tip, frontside and backside of the crane with a monitor placed in the operator's cabin.

12 TEXT DISPLAY UNIT

Display unit must be installed on the operation desk in the cabin. The display unit shall serve to provide necessary information required to the operator in English and Slovenian language.

13 CRANE CONTROL SYSTEM

Programmable Logic Controller (PLC) shall be used to perform the logic function on the crane. Major drive controls for main hoist, slewing, luffing and gantry travel shall be full digital control and performed by PLC.

Crane Management System computer (CMS) shall be installed in electrical house on the crane working in conjunction with the PLC. This shall provide continuous monitoring, diagnostics, data collection and alarm history on the crane.

CMS computer in the E-room must have following functionalities:

- All functionalities from operators panel in the cabin
- Installed all necessary Software with the licenses for monitoring and programming all equipment installed on crane (PLC, frequency inverters,…)
- On CMS computer all alarms, events and bypasses must be recorded.
- CMS computer must have the possibility to check the history of all alarms, event and bypasses.
- CMS computer must have the reporting functionality including.
    - Energy measurement
    - Maintenance and production counters
    - All energy measurement data from RCMS shall be saved in SQL database and integrated in the energy efficiency system ENIS of Port of Koper

Display for monitoring and diagnostics shall be provided in operator's cabin.

This system must display all the crane functions in a structured, easy-to-understand form on a monitor near the crane operator seat. The individual functions are indicated by coloured pictograms and are selected with function keys on the monitor. All the data required for operating and monitoring the crane are shown on the monitor. These data include:
- check list with status indicator for crane, travel, and propping operations
- actual and limit values for load, radius, and hoisting height
- wind speed
- fuel level
- operating mode (hook, spreader, or grab operation)
- diagnostic messages
- support for fault finding and remedying
- indication of remaining operating hours until end of maintenance interval
- statistics for diagnostic messages and performance data
- etc…

All texts appearing in operator's displays should be written in local language (Slovenia) and English (operator can choose which language he will use). Modification and redesigns of the operator messages and screens will be adequate to the understandable level of operators after commissioning period.

All components are designed to work in a wide temperature range and are shock proof as well as resistant to against humidity.

All data must be displayed in **metric** units.

13.1 DATA TRANSFER

It is required to have a software package that enables the terminal / port staff direct excess to the crane data, which can be stored on a laptop. Additionally, it is also required to have a possibility, that authorized service engineer can log directly on the crane for instant support, data analysis and online troubleshooting.

The features of the controlling system shall be broadly as under:
- Data logger as per latest version and printer.
- Data recording machinery and component data.

The PLC software of the Crane shall be in English (U.K.) version and friendly user interface. OEM must acquaint staff regarding downloading of programme in crane and its fault finding & rectification. OEM must submit licensed PLC software CD along with new latest version Laptop.

14 STAIRS, ACCESS PLATFORMS AND LADDERS

All stairs, ladders, rungs and platforms have to meet EN 13586 crane access standard and F.E.M. rules.

All stairs, ladders, rungs and platforms must be hot dip galvanized.

Access to the cabin from the ground level shall be by stairs to the sill level followed by a stairway inside the mast to the platform, where operator's cabin is located. Final platform shall be at the same level as cabin. In addition, the crane must be equipped with an emergency escape stairs or ladders on the outside of the mast, equipped with back protection, which guarantees safe escape in case of emergency when main stairs cannot be used.

Walkways, stairways and platforms shall be designed to avoid tripping, skidding, ducking or crawling. Clear headroom of 2.1m shall be maintained throughout the walkways, stairways and platforms. Special non-skidding treatment shall be applied for flat structural surface if used as walkways.

Stairs shall be provided to allow ample and safe access to all sheaves, pins, wheels, carriers, ropes, machineries, switches and control equipment, etc., where preventive maintenance is necessary. At least 600mm clear passage around any machinery shall be provided.

The height of handrails shall be 1100mm and an intermediate rail height 685mm for a level walkway. The height shall be increased as necessary to ensure safety of passage. The handrail shall be constructed with pipe, all welded joints finished smooth to same diameter as the pipe, and continuous along walkways platforms and stairways. Adequate safety straps or bars shall be installed between the lowest safety hoop of a vertical ladder and handrail for landing wherever there is a wide clearance which may allow a person to fall.

15 CABLES AND WIRES

Standard copper shall be used for conductors in all wiring and cables shall be sized in accordance with the requirement of IEC. Signal transmission cables shall be individually screened. Twisted differential pair cables for transmission of signals are also acceptable. All signal cables shall have the same characteristics and impedance and separated from power cables. Single strand wire shall not be used. All layout of wiring in the control cubicles shall be designed to prevent spreading of fire.

Terminations of all cables shall be made with solder-less crimped lugs. Cables shall be connected only at terminal blocks in panels, control boxes, junction boxes or at the terminal of electrical equipment. All connector or terminal blocks shall be installed in single stack manner, such that easy access can be made to the cable's terminations.

All connections shall be made with due consideration for the safety of maintenance staff. Not more than two cables shall be terminated at any terminal point. All terminals shall be properly insulated with PVC sleeves. Use of PVC tapes on the terminals shall be not allowed.

Each cable shall be secured and supported in such a manner that the cable and its termination shall not be exposed to undue mechanical strain.

All cables shall be run in conduits, trunking, ducting and supported by clips at appropriate spacing. Cables shall be laid in orderly manner and according to the requirement of the European regulations. Space factors of not more than 40% shall be applied to cables in the conduits. All cables shall be protected from the sharp edges of the structure and junction boxes wherever ducting; trunking & conduits are not possible, hot deep galvanized cable tray of suitable size shall be provided.

All conduits (rigid or flexible) and trunking shall be watertight and continuous, providing protection to the entire length of the cables and positioned, such that they are protected from accidental damages.

Each cable shall be properly marked on both sides. Marking of cables shall be done permanently by hot stamping the identifications onto PVC sleeves. The numbering of the cables shall be properly documented and shall be consistent and easy to interpret. Numbering system of the cables shall be systematic such that maintenance staff can easily identify the location, function, or electrical system of a cable through the number.

16 TESTING

If manufacturer carries out full load test at manufacturer's site, it has to inform the Port of Koper in advance in order that the representatives from Port of Koper can be present when the test will be performed. The crane shall be dismantled after full load test. The full load test shall also be carried out at the Port of Koper site, the payment, and all needed equipment including suitable weights is up to the contractor.

17 LIGHTING AND AUXILIARIES

A wall mounting type, sheet shall be no dust type, conforming to at least IP 54 lighting distribution board (LDB) shall be provided for control of different lighting circuits.

Separate transformers shall be provided for lighting. Manufacturer shall provide normal as well as emergency lighting system in the crane.

The lighting distribution board shall consist of miniature circuit breakers (MCB) for distribution and earth leakage circuit breaker (ELCB) for detection of leakage current.

All working areas such as walkways, staircase, and platform etc., operator's cabin, electrical room, boom etc., shall be provided with suitable lights. The lamp shall be industrial LED type for indoor and outdoor. The fitting shall be indoor/outdoor type, as per the requirement.

All fittings shall be suitable for working under heavy vibratory conditions, dusty atmosphere, and marine environment.

Emergency light shall be provided at walkways, staircase, ladder, platforms, operator's cabin, electrical room etc.

Lighting luminaries shall be designed in such a way so that it requires minimum maintenance.

18 FIRE EXTINGUISHERS

CO2 type fire extinguishers of suitable capacity are to be fitted and located as follows:

- In the machinery house – 2 pcs
- In the operator's cabin – 1 pcs
- At the dock level adjacent to the access ladder – 1 pcs

19 DOCUMENTATION & MANUALS

The contractor shall submit standard drawings for employer information. Three copies in paper form and one copy in electronic form each of the following documents shall be submitted prior to the starting of manufacture of these items. The scope of these drawings, etc. shall include but not be limited to the following:

- General safety instructions and crane book
- Operating and maintenance manuals of crane (crane specifications, Safety devices & emergency exit routes, Controls & indicators, Operating instructions, Routine maintenance, inspection procedures, Structuiral inspection, Lubrication procedures with plan and drawings,)
- Drawings
- Electrical operating & maintenance instrucions (list of electrical equipment, single line diagrams, circuit diagrams, lighting calculation, PLC network layout, safety system evaluation, declaration of conformity, cable list,)
- Supliers documentations
- MV equipment (Declaration of conformity, certificates for all installed electrical equipment, »As built« documentation, Operating instructions, Maintenance instructions, Preventive maintenance program, Assembly and installation instructions, Commissioning protocols, Factory acceptance tests, Site acceptance tests, Training of employer's O&M personnel)
- Spare parts
- Fabrication documentation – MDR
- Instruction for emergency exit from cabin - with plan
- Declaration of conformity – CE
- Laptop for programming

The Contractor must supply, bound into a suitable folder or manual, three sets of operating and maintenance instructions and spare parts manuals for use by the employer. In addition to copy of such instructions shall be supplied suitable for display in a prominent position in the operator's cabin. Also three copies of spare parts catalogue containing drawings of sub-assemblies indicating name of spare parts and other details for indenting the spare parts from OEM to be supplied by the contractor.

20 OTHER

20.1 PACKAGING AND SHIPPING

It is the responsibility of the Contractor to prepare and load the equipment supplied in such a way that it is not damaged in transit. Where required, temporary bracing, supports and protective covers or enclosures shall be installed and marked as such. Small loose items shall be shipped in wooden boxes

with weather-resistant labels identifying purchase order number and their contents. Each part shall have a mark number as shown on the assembly and erection drawings. Provision of all necessary transportation documentation, including material safety data sheets, is the responsibility of the Contractor.

20.2 SAFETY GUARDS

Guards shall be provided to machinery wherever necessary for the protection of personnel. These guards shall be designed so that they can be removed to permit maintenance and overhaul of the equipment without interference with other parts of the crane.

20.3 CRANE IDENTIFICATION NUMBERS

Crane identification number with required dimensions should be installed on crane - both sides. Additional labels should be installed to be able identification from the floor level.

Customer logo must be installed. Logo size and colour as well as identification number to be provided and approved by customer.

20.4 EMERGENCY STOPS

Emergency stop buttons shall be provided where necessary to shut the crane down and set all mechanical brakes to safeguard personnel and protect the crane.

21 WARRANTY DURING THE DEFECTS LIABILITY PERIOD

Warranty period on all components shall not be as follows:
- General (Mech. and Elec.) – Min 2 years
- Steel structure – Min 5 years
- Coating System – Min 8 years

During the defect's liability period, the purchaser requires the supplier to carry out warranty repairs, free of all charges, by competent personnel.

Bidders shall detail how they plan to cover their obligations under the warranty clause. It is expected that Bidders will have experienced personnel from their own plant based at the vicinity of the site during the warranty.

22 MAINTENANCE COSTS

The tenderer must fill in the table below with data of regular maintenance costs up to 10.000 operating hours. For each maintenance interval, the tenderer must enter at how many operating hours must be carried out and also enter cost of spare parts, that must be replaced, cost of oil and other lubricants if change is needed as well as cost of manpower and duration of service.

Maintenance intervals	Costs of spare parts [€]	Oil and lubricants [€]	Manpower [€]	
			Service duration [h]	Cost of manpower [€]
Service at **500** hours of operation				
Service at **1.000** hours of operation				
Service at **1.500** hours of operation				
Service at **2.000** hours of operation				
Service at **2.500** hours of operation				
Service at **3.000** hours of operation				
Service at **3.500** hours of operation				
Service at **4.000** hours of operation				
Service at 4**.500** hours of operation				
Service at **5.000** hours of operation				
Service at **5.500** hours of operation				
Service at **6.000** hours of operation				
Service at **6.500** hours of operation				
Service at **7.000** hours of operation				
Service at **7.500** hours of operation				
Service at **8.000** hours of operation				
Service at **8.500** hours of operation				
Service at **9.500** hours of operation				
Service at **10.000** hours of operation				

23 HIGH PRIORITY SPARE PARTS

Tenderer must submit together with the offer a list of high priority spare parts with the specified prices and quantities for each spare part separately and also total cost of all high priority spare parts. The offeror must have all high priority spare parts from a list in their stock.

24 TRANSPORT OF THE CRANE AND ASSEMBLING AT SITE

Mobile Harbour Crane shall be delivered DDP (Incoterms 2020) at Port of Koper, Slovenia. On the pier, where new crane will be assembled and operate Port of Koper can provide cranes and other port machinery with operators for assistance to assembling as listed below:

- Mobile harbour crane: Fantuzzi MHC 130 (Capacity 110t)
- Mobile harbour crane: Fantuzzi MHC 115 (Capacity 63t)
- Reach stacker: Kalmar DRF420-60S5 (Capacity 40t) – with project cargo spreader
- Forklift: Any forklift with forks, capacity from 8t to 33t.

Beside port's machinery (operators included), Port of Koper can also provide limited number of manpower (max. 5 workers per shift) and electricity (220V or 380V).

For unloading of heavy parts (undercarriage) it is not possible to use only above-mentioned mobile harbour cranes. Contractor must organise transport and unloading of heavy parts with assistance by other sufficient machinery (rented mobile crane, heavy lift vessel).

All port's machinery and manpower can be only provided according to prior agreement, at least one day in advance until 10:00 AM.

25 TESTING AT SITE

Crane must be tested after completion of erection as follows:
- In all its motions with a load of 10 percent more than the specified duty. The specified speed need not be attained in the test. For this purpose, contractor must bring it own weights in order to carry out load test.
- With full working load the general control and handling of the cranes will be tested to the satisfaction of the buyer and checks made in the specified speed tests must be carried out through 360 degrees & as per FEM standard. Buyer may witness the test at the said site.
- The crane shall also be tested for stability with 10% overload with the jib in any position.
- Any other test conformed to the FEM latest standard, as required by the buyer is to be conducted at site by contractor. Port of Koper will provide the electric supply required for test free of cost for testing purpose. However, all other equipment required for testing shall be arranged by the contractor at his own cost.

The Contractor shall provide a competent site engineer to:
- Supervise the unloading, erection, installation, testing and commissioning of the crane. The Contractor shall define work, engineering, and labour support hours and equipment, etc. included in the basic proposal provisional amount included in the supply scope.
- Instruct the buyer's operating personnel in operations and maintenance procedures for starting, operating, shutting down, lubricating, maintaining and periodically inspecting the crane.
- Calibrate the crane to meet guaranteed performance and to optimize operation. Manufacturer's representatives (the Contractor's subcontractors) shall be available, as required, for trouble shooting, commissioning, and testing of sophisticated equipment such as hydraulics, etc.

26 TRAINING

The Contractor must arrange the training of operators for a minimum period of 10 working days to get acquainted with the operations in the above cranes, after successful commissioning of the crane.

The Contractor shall arrange familiarization training programme to Port of Koper maintenance Engineers / Staff for a minimum 10 numbers of persons for a period of one week after successful commissioning of the crane.

The scope of training to maintenance staff of Port od Koper shall cover periodical / scheduled preventive maintenance as per chart of OEM in respect of all mechanical, electrical / electronic, and hydraulic operational systems of the crane. Also, to acquaint Port of Koper staff regarding downloading of programme in crane and its fault finding & rectification. The bidder must provide a trainer who will train in Slovenian language or will be assisted by translator in each discipline mentioned above to the satisfaction of buyer.

27 PROGRESS REPORT

Bar chart for manufacturing & testing / commissioning shall be given and monthly progress may be communicated.

Every month, the contractor shall submit the monthly progress report to buyer with the following information along with the time bar chart:
- Name of the work
- Schedule period of completion as per the work order (in weeks)
- Period completed (in weeks)
- Cumulative delay if any
- Reason for delay
- Action taken to overcome delay and complete the work as per the schedule

Statement

By signing this document, we declare that before submitting the offer, we have studied in detail this Attachment Nr. 3 »Technical description JN 98/2024«, so that we are informed with all the technical requirements and descriptions and that we fully agree with them. In the event of potential deficiencies in the technical requirements and description of the order, we have warned the purchaser. We will not make any subsequent claims from this title.

Place: , date:

Name and Surname:

Stamp and signature: