

Web based course: preliminary training phase for crane driver

The world is changing, and so is sea transport, with an ever-increasing number of containers; faster transit times and ship stopovers, and more intensive competition between ports.

All this demands first-class performance: any port has to strive for nothing less than excellence. And excellence is determined entirely by people and tools. Indeed, clients are demanding capable people in the fastest possible turnaround time, with trustworthy professionals, obviously in a safe environment, since capacity for performance is at stake.

To do so, it is necessary to give relevant training to men, give them the skills, the precision and the knowhow to perform. The simulator is a tool which enables to develop skills in real operating conditions (every aspect of the simulation is strikingly realistic in terms of the environment, sounds and motion) and on several different engines (up to 5 different kind of cranes).

Indeed, training through simulator is the guarantee to take home a set of proven, validated skills: through exploring the various modules on the simulator, the trainees are confronted with the range of operating scenarios. Moreover, it is the guarantee to be ready for the job in one month, compared to eight months under standard apprenticeship training. One instructor takes in charge only two trainees, which makes that the trainee learns just as much from watching in the control room what his fellow trainee is doing on simulator. And it works both ways.

Training through simulator represents a progressive apprenticeship, safe and measurable.

REMINDER

Profiles & candidate selection

Before initiating the web based course, it is necessary that any partner proceeds to the trainee selection, in order to know if the latter has the profile to drive a crane. This selection is based on a list of criteria of skills, competences and abilities that has to be defined and detailed by each partner, according to its own specificities: among those, we can list the age of the trainee, then its skills in terms of study level and general culture, and then a series of tests measuring its abilities to drive a crane or gantry crane.

These different selections are the guarantee of a successful training and a competent future crane driver.

The required age for a future crane driver depends on the kind of crane he will drive and he will be trained to :

For a gantry crane, the required age is of 23 to 35 years old.

Regarding RTG, the future driver has to be 23 to 40 years old.

And if the driver is already experiences on a port engine, he has to be 35 to 45 years old.

In terms of training standards, the minimum required to be eligible to the selection is the certificate of technical education (French BEP), or the school vocational diploma (French Bac Pro), or the advance vocational diploma (French BTS)

During the selection, the future trainee is tested on its general knowledge.

And finally, he has to pass through a series of tests which will enable to evaluate:

Its cognitive abilities

Its psychomotor abilities

Its perception abilities

Its personality in terms of stress apprehension; ability to work by night, on weekends and holidays; respect of the machine; respect of general instructions; behavior

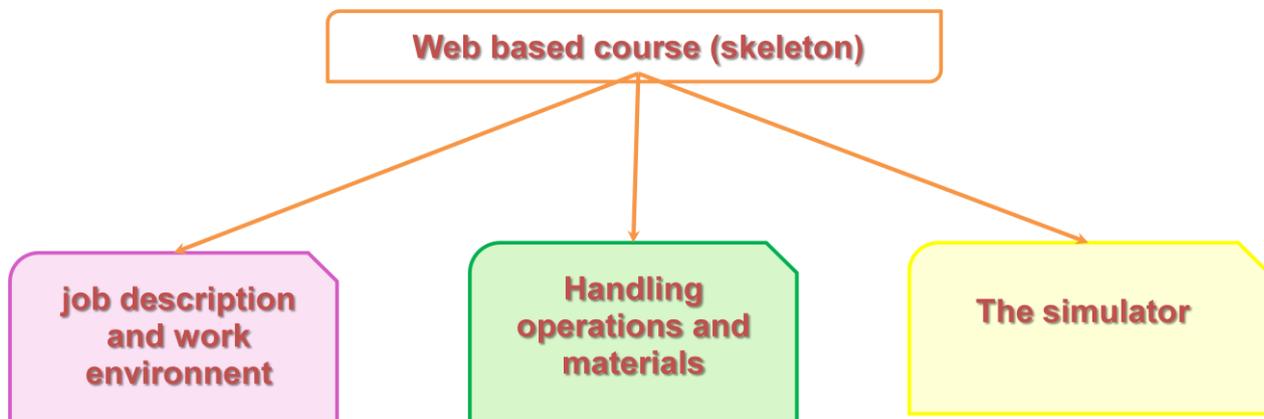
Its physical abilities, especially regarding lumbar muscles

Its motivation and knowledge on port and commercial environment

LEARNING CONTENTS - Agenda

The training is based on objective-oriented learning. This method uses three key stages to ensure a step-by-step comprehensive transfer of knowledge

The indispensable classroom training is given through the web based course (approximately 4 days of theory), and immediately followed up with full exposure to handling operations on the simulator.



It is important to notice that in the chapter related to the simulator, every partner will have to participate in the collect of information to be transferred on the web base since each partner will have to complete the information with their own equipment characteristics. At that time of the project, the GPMM has only included its own cranes and gantries technical information.

CHAPTER I. General information on job description and work environment

Module I.1 : crane driver job description

- Abilities: cognitive, psychomotor, perceptive, physical abilities; motivation and personality
- Required competencies
 - Use the relevant techniques in order to realize the horizontal and vertical driving of charging/discharging equipments
 - Driving apprehension in total safety
 - Realize any possible movements
 - Control and avoid any unintended moving of a suspended charge
 - Knowing use procedures of lifting equipments

Knowing technical characteristics of equipments to be driven

- Work process description: moving, charging, discharging goods from one point to another (ship, barge, quay, truck).

Module I.2: work environment and risks prevention

- Risks prevention linked to the circulation of equipments – quay adjustments
 - Adjustments of circulation lanes
 - Definition of circulation rules and separation of the various circulation lanes
 - Road signs and marking
- Risks prevention: fall, jamming and crushing of persons.
 - Ship access
 - Hold access and hatch protection
 - Lifting machines access
 - Work places (ship floor)
 - Doors of usual work places
- Risks prevention linked to work atmosphere
 - Lighting
 - Airing and ventilation
 - Fire and explosion
 - Room temperature
 - Noise

CHAPTER II. Handling operations and materials

Module II.1: Handling operations

- The different kinds of ships and operations
 - Polyvalent ships – general cargo
 - Container ships
 - Bulk ships for solid bulk goods
 - Handling of metallurgical products: tubes, coils...
 - Bags handling
- Manual handling
 - Principle of limitation of manual handling operations
 - Systems of assistance for manual handling
 - Risks factors
 - An adapted training

- General rules for the use of work equipment
 - Use of individual protection equipments
 - Equipments adapted and appropriated to the operation: timers and logs

Module II.2: the use of handling and lifting material

- Risks linked to charges lifting
- Risks linked to the movements of lifting material
- Lifting of persons
- The use of lifting accessories : choice, storage and maintenance
- Maintenance, conformity and check of lifting equipments

Module II.3: Professional risks prevention

- Information on risks prevention :
 - Use and maintenance of work equipments
 - Use of individual protection equipments
 - Varieties of ships, organization of terminals
- Professional training :
 - Security
 - Specific risks at work
 - Driving of lifting machines
 - Maintenance operations of lifting machines
 - Gesture and command of lifting machines
 - Measures to be respected during handling operations

CHAPTER III. The simulator

Introduction: Handouts of gantries and cranes trained through simulator

Module III.1: Bases

- Description of the different movements : orientation, direction and slack
- The driving cabin and its commands
- How to start up the machine
- How to get some points of reference
- Direction, orientation, lifting and slack

Module III.2: Acquisition of the bases

- Slack control

- Movement coordination : orientation, direction & lifting
- Distance perception
- Use of the control screen

Module III.3: Synchronization

- Adjustment and control of slack
- Coordination and synchronization of movements
- Special conditions of work : weather conditions, incidents
- Security measures and instructions

Module III.4: Qualification

- Transfer of learning
- Improvement of weak points
- Synchronization, independency, productivity

CHAPTER IV. Evaluation and tests

PEDAGOGICAL HANDOUTS

The detailed course of each lesson, once transposed on the web platform, will be composed as follows (in italic are some examples in order to illustrate the description):

TITLE: *acquisition of fundamental abilities – direction coordination/handling and slack control*

OBJECTIVES OF THE LESSON

*Take some pinpoints in order to estimate the height
Estimate the height for the final approach...*

ORGANISATION OF THE LESSON

Description minutes by minutes of the different exercise of the day

CRITERIA OF SUCCESS

*Selection of pinpoints to estimate the heights
Selection of pinpoints to estimate the approach distances*

CORRECTION

*Heighten trainee's awareness to the respect of handling heighten in order to
guarantee security*

DETAILED LEARNING CONTENTS

CHAPTER I. General information on job description and work environment

Module I.1 : crane driver job description

- Abilities (see selection of candidates).

The abilities that are to be acquired by the trainee the following ones:

Cognitive abilities such as memory and space orientation

Psychomotor abilities such as coordination and reflexes

Perceptive abilities such as eyesight, hearing and height apprehension (vertigo)

Physical abilities

Are also taken into account the motivation and knowledge of the trainee on the job and port environment, and his personality.

- Required competencies

A crane driver is able to

Use the relevant techniques in order to realize the horizontal and vertical driving of charging/discharging equipments

Drive the crane or gantry in total safety for him and its environment

Realize any possible movements

Control and avoid any unintended moving of a suspended charge

Know any use procedures of lifting equipments

Know technical characteristics of equipments to be driven

- Work process description: moving, charging, and discharging goods from one point to another (ship, barge, quay, truck).

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CHAPTER I. General information on job description and work environment

Module I.2: work environment and risks prevention

1- Work environment on quay and terminals – risks prevention linked to circulation of equipments

- *Adjustment of circulation lanes*

On the port quays, the circulation is often intense. Indeed, pedestrians, trucks, vehicles, straddle carriers are crossing each others, and in the same time cranes, gantries and other equipments are in operation. Quays are often congested with imported goods, or goods to be charged on board.

Thus marking and signalization become necessary. In order to prevent risks of collision between the equipments or between equipments and workers, the installations used by workers during their activities have to enable a safe and secure circulation of pedestrians and vehicles. These measures are to be taken in consideration on the conception and development of terminals and quay work places.

Circulation lanes must be kept free of any obstacles. Storage areas of materials, containers and goods have to be created distinctly from circulation lanes. Thus, lanes dedicated to circulation are not reduced because of storage on the lanes.

- *Definition of circulation rules and separation of the various circulation lanes*

When mobile equipments are in operation on a work area, it is necessary to establish adapted circulation rules and to make sure that

- ✓ they are correctly implemented
- ✓ the signalization is appropriated
- ✓ the characteristics of equipments circulating on the lanes and quays are taken into account, such as the size and maximum size of the equipments, brake systems...

There are no existing rules on minimal dimensions of circulation lanes; they are to be defined according to the evaluation of risks at work and to the work environment and site.

Circulation rules may include the obligation of priority circulation rules, of crossing rules and speed limits. The obligation is for the Manager of the Firm regarding the work area under his responsibility. It is not applicable for work equipment situated on areas which are already under public rules of circulation.

- *Road signs and marking*

-  Work places presenting a risk for the safety have to be surrounded or at least marked out. Regarding the circulation lanes, they have to be marked out, unless they are equipped of fences or adapted paving.

The identification of circulation lanes is generally made with colored strips, for instance white or yellow, depending on the color of the ground, since the strips have to be highly visible.

- ✚ Inside the constructed areas of the firm, obstacles which are to induce crashing or people falling, and any dangerous places have to be marked with yellow & black strips, or red & white strips.
- ✚ Notice boards have to be put up in a well-lit and easily accessible place at the beginning of an area presenting a general risk, or near a precise risk. Their dimension must enable a good visibility.
Besides notice boards imposed by local rules regarding health and security, other boards can be set up according to the specific risks of a firm. Indeed, a firm can create any necessary additional notice boards, without impeding the visibility or efficiency of any other notice boards. This induces to avoid setting up an excessive number of boards on a limited area.
- ✚ Regarding public quays, marking have to respect the specific circulation rules of the country. These markings have to be set up complementarily to the risks prevention markings, linked to the professional activity of port actors. For instance :

* * * *

Road Sign
Photo

CHAPTER I. General information on job description and work environment

Module I.2: work environment and risks prevention

2- Work environment on quay and terminals – risks prevention : fall, jamming and crushing of persons

Port handling is mainly made of ship charging and discharging operations. Thus workers realize part of these ships operations. International rules includes rules for the equipment of ships in order that workers in charge of operations can get on board and on platforms, enter the holds and handling equipments without any danger.

- *Ship access*

Ship access is one of the most important points of work security in ports.

Indeed, level variation occurs depending on

the tide effect

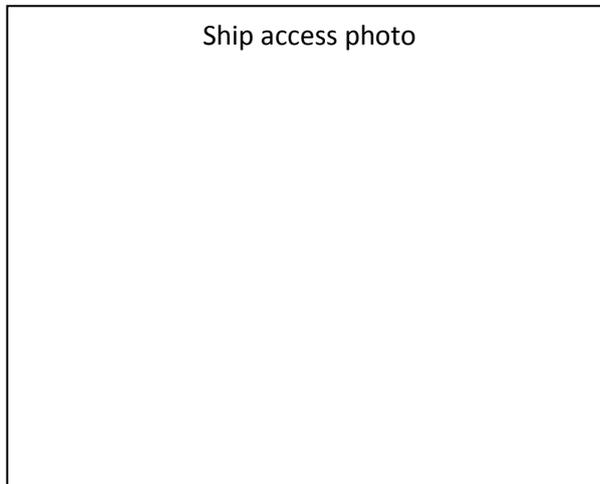
charge repartition inside the ship

wind and currents

which have an influence on the ship position.

Access means, gangway scale and footbridges have to be solid enough in order to support the weight of persons getting on and off board, and also to resist to the position variation of the ship.

Ship access photo

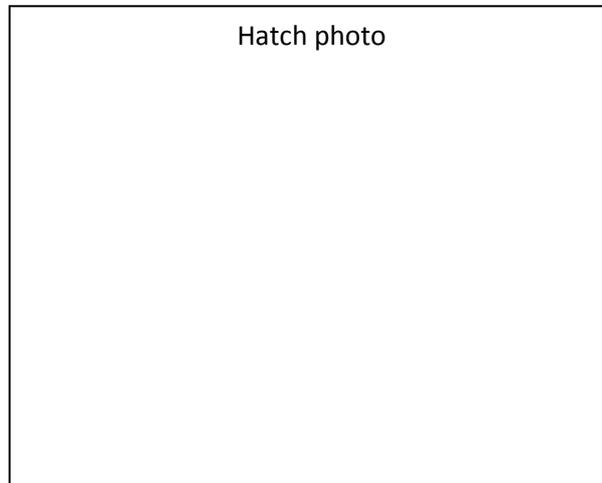


- *Hold access and hatch protection*

✚ The hatch protection is an important element of work safety on board. Hold can exceed 12 meters high. So, it is possible to fall in a hold either by toppling over through a hatch, or by going in a hold. This risk is part of the work accident causes (which can sometimes be fatal) and concerns any people on the ship, and not only the crew members.

✚ The hold access must be made in a different hatch than that used for charging/discharging operations, through a (leaning, if possible) fix scale. It is highly recommended to set up

removable handrails of a minimum of 0.90 meters high, before any handling operation. This is recommended when people walk or work near a hatch or any other opening system on decks and are exposed to risks of falling.



The stevedoring company can complete these protections with some removable systems such as cables, handrails, chains or nets.

- ✚ When handling operations are made on different levels of the ship, the opened part of the higher deck hatch has to be protected in order to avoid falling of persons.
 - *Lifting machines access*
- ✚ The access means to the cabin of lifting machine have to be safe. The scale leading to the lifting machines are to be metal and have to respect the prescription of hold scales: sufficient number of landings, handrails, a maximum 30cm separation between rungs...
- ✚ If the leaning of the scale is over 15°, the scale must have some handrails. But the scale leaning will never exceed 25°.
- ✚ Vertical scales of more than 3 meters high must be fitted with crinolines.
 - Ship floors, work places
- ✚ Ships must be equipped with nonskid floors, and if not possible due to the destination of the place, some falling protections will be set up.
- ✚ No obstacles are to be present on floors, unless they are indispensable to the ship functioning. If obstacles are present, they have to be identified with high color or appropriated marking.
- ✚ Floors must enable washing to respect appropriated hygiene conditions.
- ✚ Footbridges and decks having no sufficient resistance to workers weigh and their equipment have to be clearly marked.
 - *Doors and usual work places*

A ship security notice fixes technical door requirements regarding material, marking, opening sense or closure systems.

For instance,

- swing doors must be transparent, with a marking in the middle of the height.

- sliding doors must be equipped with security system avoiding them to get out of rails or fall.

- mechanic doors must be fitted with urgency stopping system easily accessible, and allowing doors to open automatically in case of energy failure, and to be opened manually.

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CHAPTER I. General information on job description and work environment

Module I.2: work environment and risks prevention

3- Work environment on quay and terminals – risks prevention linked to work atmosphere

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CHAPTER II. Handling operations and materials

Module II.1: Handling operations – the choice of adapted handling means and equipments

1- The different kinds of ships and operations

- ✚ The majority of ships are made with a steel hull, often full in order to maximize the quantity of goods transported.

The hull is divided in one or several holds, the latter being divided vertically by heads and sometimes horizontally by in-between decks. Over the holds is the main deck, on which are situated cranes and other lifting equipments.

In general, the engine room is situated at the back of the ship, topped by the superstructure in which lives the crew. At the top of this superstructure are situated the ship commands.

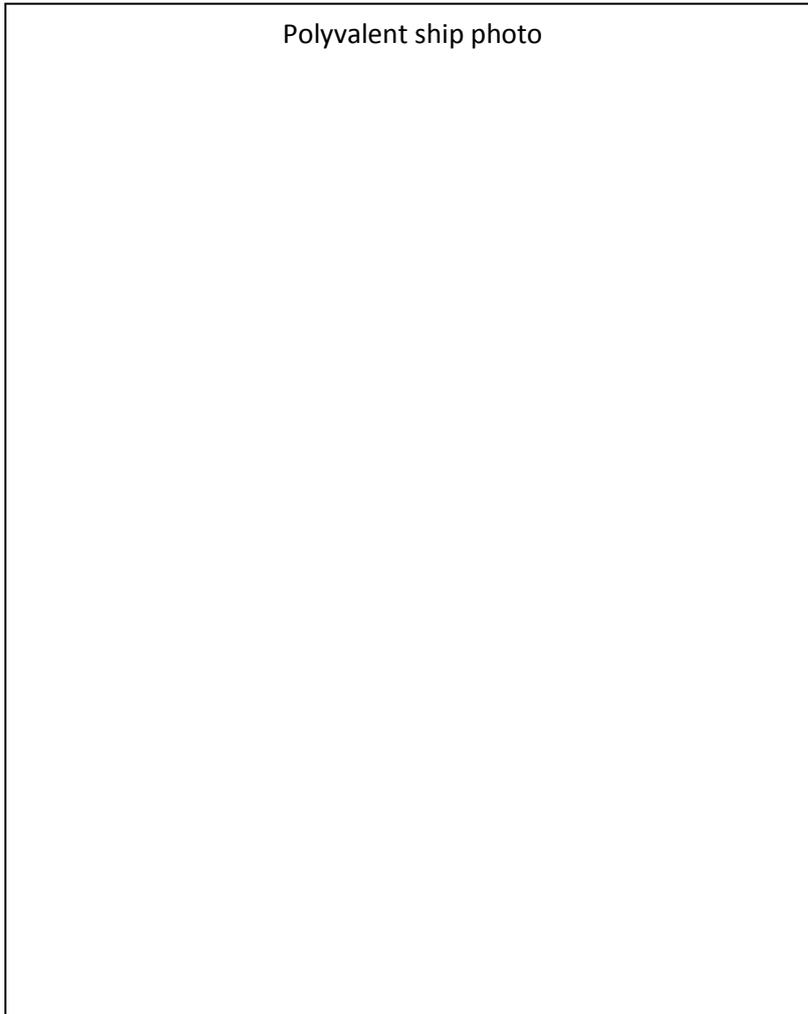
- ✚ The propulsion is generally made by one or several diesel engines. Big ships generally have a single two stroke diesel engine with a low rotation speed, driving a single propeller. Electricity production is then made by several independent four-stroke diesel generators. Smaller ships rather have four-stroke diesel engines driving one or two propellers through a reducer. In this case, propellers sometimes have some adjustable blades in order to improve maneuverability.

- ✚ There are different kinds of ships according to the kind of goods that are transported.

- *Polyvalent ships for general cargo*

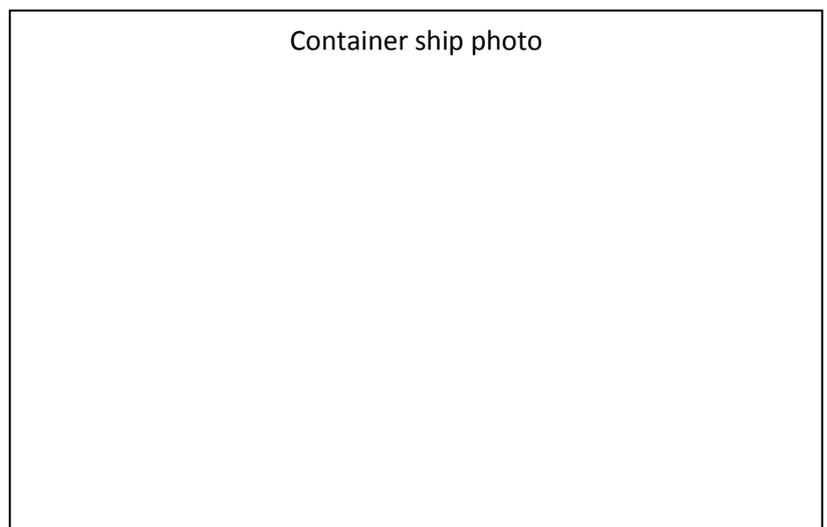
- ✚ A polyvalent ship is a ship destined to the transportation of goods.
- ✚ On the contrary to container or bulk ships, these polyvalent ships are not specialized in a kind of goods, and are rather characterized by their polyvalence: they can transport general goods, packed or not, in bags, bulk, containers, cars, manufactured goods... They can also transport oversize goods such as paper rolls, crates, and goods transported per unity such as logs.
- ✚ Depending on their size, they are classified either as polyvalent ships or bulk ships. Goods are operated by onboard cranes and put in the holds and on the deck.
- ✚ The handling of any general cargo such as tubs, coils, logs, bags, crates, cars, trains, paper rolls, pallets... is made with quay cranes.
- ✚ The handling equipment must be chosen and used according to the goods to be operated, the grasping points, the hanging and slinging system.

Polyvalent ship



- *Container ships*

- ✚ The container is much easier to charge, discharge and transport by trucks. As a consequence, it has become essential. It can be charged on the deck of general cargos, or on dedicated ships: container ships.
- ✚ The first integral container ships (i.e. transporting only containers, without any break-bulk goods – crates, rolls or bags) were built in the 70's and the cellular



containerships in the 90's. Their size/capacity is ever growing, being of 1.000 teus in the 70's and of more than 11,000 teus in 2006.

✚ For output reasons, the handling of containers is exclusively made with specialized gantry cranes.

- *Bulk ships for solid bulk goods*

✚ These ships transport solid-bulk goods like ballasts, cereals, ore... in wide holds. Some are specialized in ore transport (ore carrier), in pulverulent transport (cement carrier). There are also combined transport which combines ore and oil, or solid-bulk and oil.

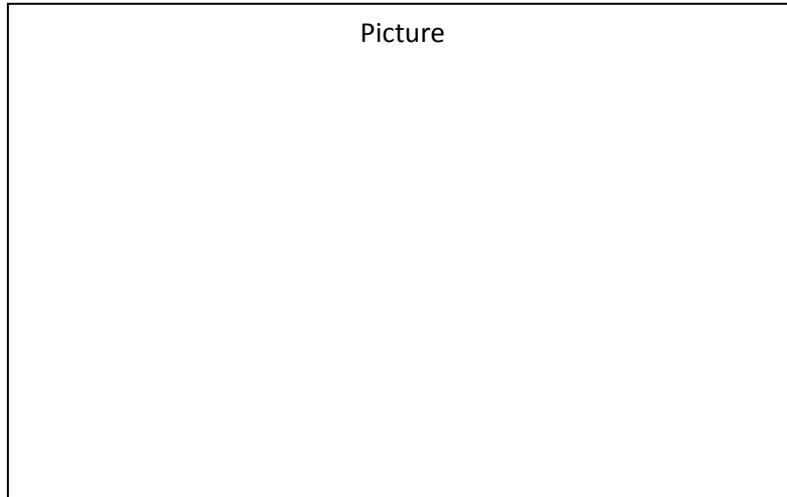
Logs handling photo

Logs handling

✚ Except for logs which are operated with cranes equipped with slings or tongs, the handling of other goods is made with a dumpster gantry (*see picture*) or, failing that, rail/electric cranes.

Picture

- ✚ The operation of solid bulk is generally made with a quay crane or a loader (*see picture*).



- *Handling of metallurgical goods: tubes, coils...*

- ✚ Tubes

Tubes are made of steel, with a wide diameter. Their length can vary from one to another. They weigh several tons. They are transported by trucks or trains, and stocked before being charged on board.

They are charged on board with quay cranes, or on board cranes equipped with slings.

In holds, they are discharged with magnetic systems or suction pads with lower accident risks.

- ✚ Metals

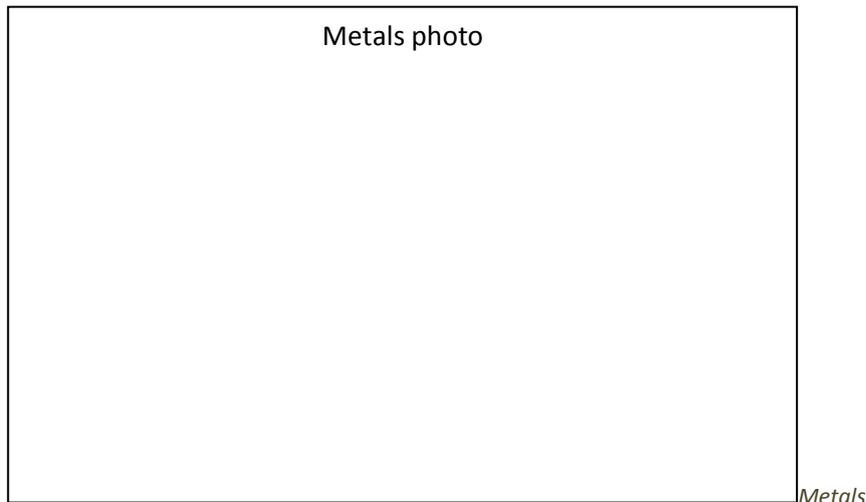
Metals are massive metallic and rectangular plates weighing several tons (*see picture*). These goods are transported by train, and stocked on quay, on wooden rafters in order to facilitate the handling with a forklift.

The handling equipment used for metals are the following ones:

- Quay crane or on-board crane

- Singletree

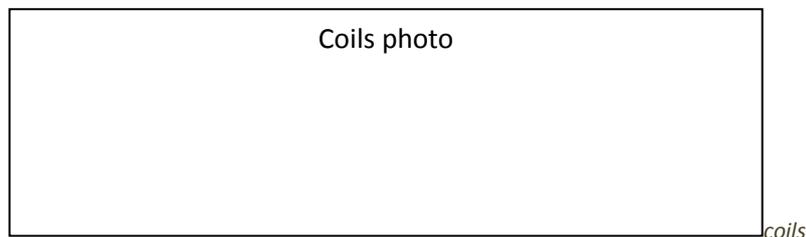
- Metallic chains with hanging rings on the singletree



Coils

Coils are fine steel sheets, rolled in reels (*see picture*). Their weight can be of several tons. They are transported on wagons equipped with cradles.

The handling is made with cranes and flat sling. Coils are discharged in holds on wooden rafters.



Metal plates

Metal plates are sheets made of iron or rolled steel. These goods are transported by train or truck, stocked on quay and handle with cranes (quay or on-board) equipped with jamming rings.

- Bags handling

Bags are used for different kinds of goods: sugar, flour...; Different kinds of handling are used for these goods.

With a special sling hanging several bags and allowing handling with a singletree, sling or hooks.

On bands which transport bags in holds on a toboggan

By dockers, who reconstitute a stack of bags, handled by a sling to the hold.

CHAPTER II. Handling operations and materials

Module II.1: Handling operations – the choice of adapted handling means and equipments

2- Manual handling

- *Principle of limitation of manual handling operations*

Manual handling is a transport operation inducing a physical effort of one or several workers. The use of manual handling must be limited and made according to the following recommendations in order to limit risks:

- Use of lifting equipment or systems of assistance for manual handling

- Settlement of a real risks evaluation when manual handling cannot be avoided. The latter must take into account the charge characteristics, the required physical effort, the work environment characteristics, the demands of the activity and the aggravating factors (unsuitability of clothes, insufficient training...).

- Information of workers on existing risks and on the weight of the charges

- Training of the workers to gestures and positions

- *Systems of assistance for manual handling*

The use of automate or mechanical handling equipments (transporters, forklifts...) is a solution to limit manual handling. This presupposes that these equipments can circulate on the quay and that any obstacles are removed from the circulation lanes.

- *Risks factors*

Risks factors are often the following ones: stress, tiredness, wrong position when lifting the charge, bad analysis of the movement, unawareness, cardiac or vascular weakness.

- *An adapted training*

- Respect of the rules related to the limitation of charges

- Work reorganization: adjustment of working hours, reduction of the number of repetitive tasks, alternating of tasks

- Modification of work methods through information and training on gestures and positions for instance

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CHAPTER II. Handling operations and materials

Module II.1: Handling operations – the choice of adapted handling means and equipments

3- General rules for the use of work equipment

During the handling operations of containers on board of ships, the employees dedicated to lock and unlock stacking are submitted to permanent danger, such as falling from the container, jamming, collision by objects or by tools used to lash or lift. In addition to rules, it is recommended to handling companies to take and apply additional prevention measures.

- *Use of individual protection equipments*

+ Dockers and crane drivers must wear:

- Dedicated clothes with luminescent marking, in order to be seen from above
- Gloves and hard hats
- Safety shoes

+ Material

To avoid any manual operations, except for specific operations, ship to shore gantry cranes are equipped with automatic spreaders and the mobile cranes with rotating spreader.

To move Dockers and equipments on top of the container, the use of a basket is highly recommended. When possible, the basket must be equipped with a wire attached to the Docker, allowing him to move on the top of the container.

The gantry crane must be equipped with a device warning the users in the basket that the basket is being moved (for example: a light)

A radio must be installed, allowing talks between the driver and the Docker

During night operations, or when visibility is low, the crane or gantry crane must be equipped with sufficient flood-lights.

+ Work organization

In order to limit exposure to risks, each operator must know clearly his role.

The access, by makeshift, on the second container, must be forbidden.

When a basket is used to move Dockers and equipments it is forbidden to throw or make fall pieces or tools (twist-locks,...)

- *Equipments adapted and appropriated to the operation: timers and logs*

+ Adjustment of the equipments

The type of equipment (crane, hook,..) must be chosen according to the sort and weight of logs.

✚ Methods of lifting

Start by the handle of one log with adapted sling. If the diameters of logs are homogeneous, they can be handled, by 2 or 3, with a self tightening sling.

In case of logs with same size (length, diameter), let proceed to handle them with 2 same slings, and respect the following procedure.

Place each sling at $\frac{1}{4}$ of the length of the logs

Use slings with a length which enables an angle of 60° at the hook

Proceed to the handle of logs

✚ Instructions for maneuvering

Never let a log hanging

The movement of the load has priority on any other operations

During the lifting, Dockers around must withdraw from the area.

Let take account of the lift of the ship

Let lay the log perpendicularly at the quay, in order to avoid the inopportune movement, and let evacuate them permanently.

Let authorize people in charge of control of the logs, only when the logs are unhooked, and slings off

When transshipment on trucks or wagon, let forbid workers (Dockers or truckers,..) around.

Let forbid the parking of vehicles in the area of the crane

✚ Measures relating to the lifting apparels and the auxiliary equipments.

It is important to use these equipments in accordance with the capacity of the crane.

When using 2 slings simultaneously, let check that each of them is able to bear the whole weight of the load.

Let use only slings in steel.

Let place at disposal, close at hand, a first aid kit, a stretcher, buoys, and a telephone which is linked to a first aid post.

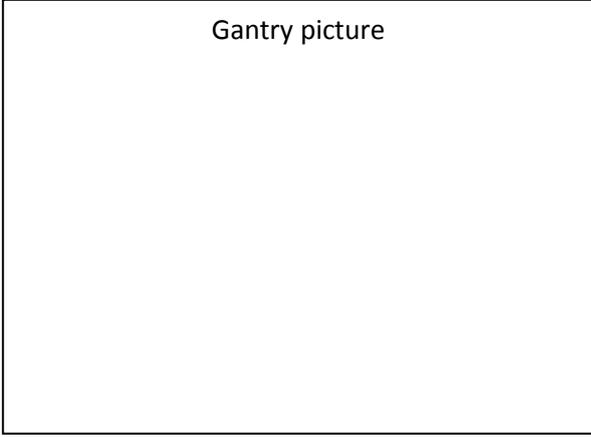
CHAPTER III. The simulator

Handouts of cranes and gantries trained through simulator

1- The Gantry Crane

- General specifications (see attached detailed presentation)

Gantry picture



Gantry crane description



- Technical specifications of the REGGIANE gantry crane in Fos

TECHNICAL SPECIFICATIONS – REGGIANE GANTRY – MARSEILLE FOS	
In operation in (year)	2000
Price	7 Billion Euros
Total weight	1109 tonnes
Energy	20 KV
wheelbase	30,48 m
Cabin height	35 m
Boom height	39 m
Height of raised boom	94 m
Max. range of boom	47 m
Max. range of rear boom	18 m 50
Max lifting capacity	70 T (at hook) 50 T (under 10t spreader)
Lifting capacity boom	45 T at 47 m (at hook) 40 T at 47 m (under spreader)
Lifting capacity Rear boom	45 T at 18,50 m (at hook) 40 T at 18,50 m (under spreader)
Hauteur sous spreader	33 m

CHAPTER III. The simulator

Module III.1 Bases

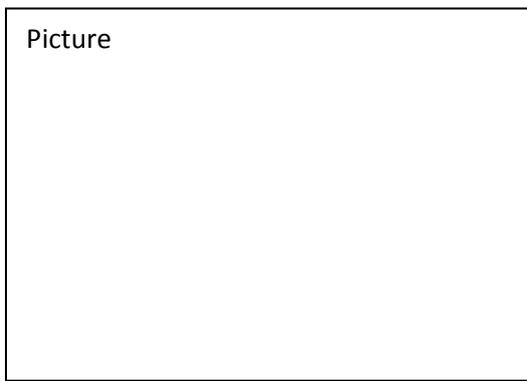
1- Description of the different movements

- *Translation*

The translation is the movement of the gantry along the quay. This movement is made by a system of translation of 24 engines.

- *Lifting*

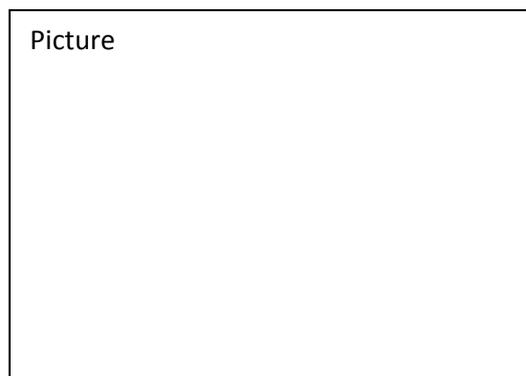
The movement is divided in two actions: taking down the charge and raising the charge.



This movement is ensured by a lifting winch (*see picture below*).

- *Direction*

The direction movement is described by the translation of the truck (*see picture above*) from the rear boom to the boom, and vice-versa.



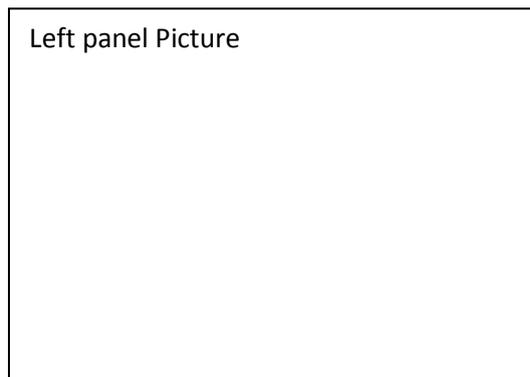
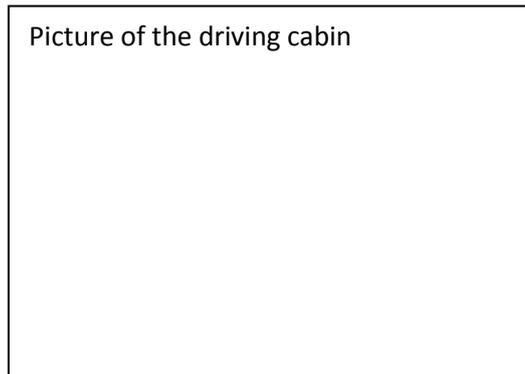
- *Raising*

This movement is divided into two actions: masting and unmasting of the boom.

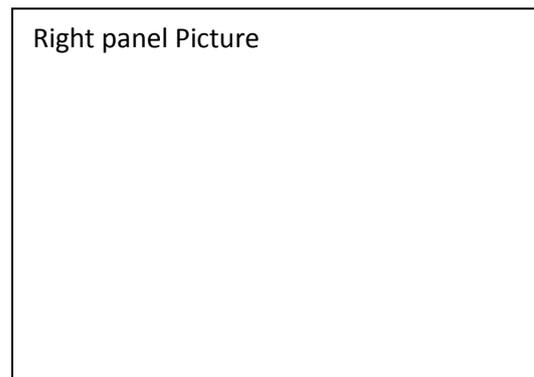
CHAPTER III. The simulator

Module III.1 Bases

2- The driving cabin and its commands

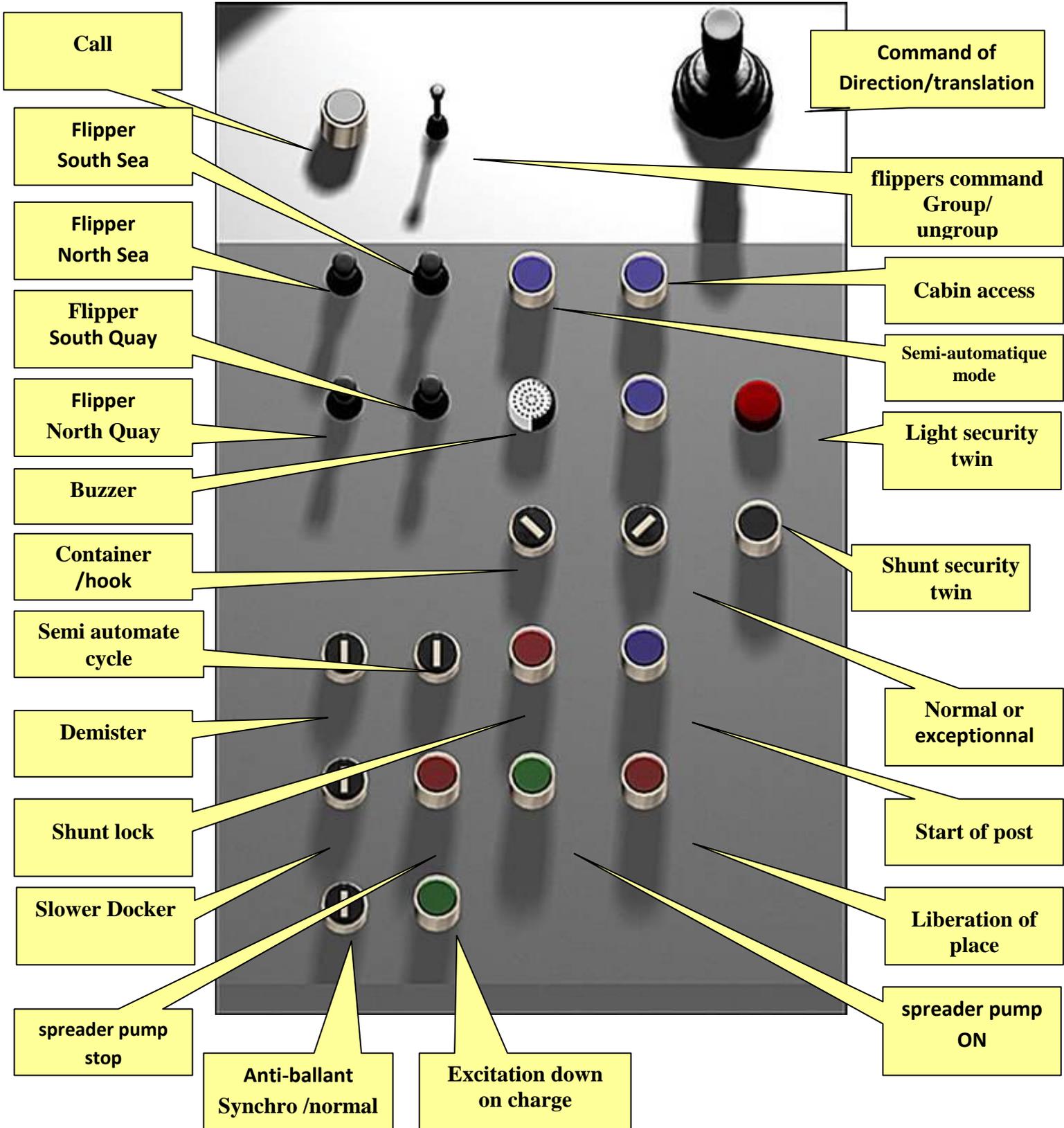


Left panel

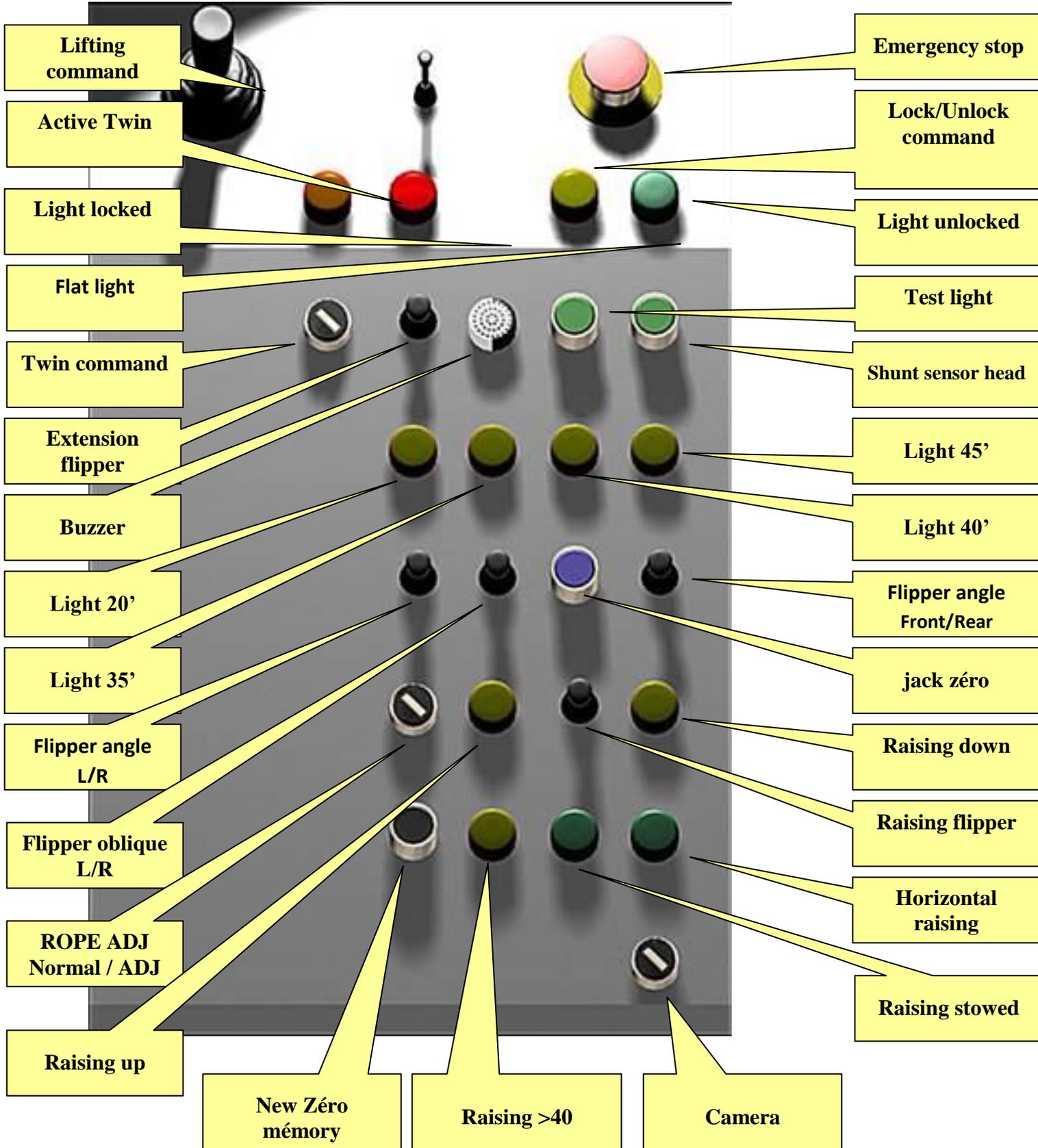


Right panel

DETAILED LEFT PANEL



RIGHT PANEL



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