

PART 2

MHS AND OTHER ITEM SPECIFICATIONS

CONTENTS	PAGE
1. General Information	2
2. <u>10 FT LOWERABLE WORKSTATION</u>	
2.1 Warehouse 10 FT Lowerable Workstation	3
3. <u>GENERAL TECHNICAL REQUIREMENTS FOR POWERED ROLLER DECKS</u>	
100 Dolly Interface Conveyor	10
200 Lifting Roller Deck	12
300 Aiside Bypass Lanes	15
400 Interface Deck to Dolly Interface Coneyor	17
4. <u>GENERAL TECHNICAL REQUIREMENTS FOR CASTOR DECKS</u>	13
5. <u>GENERAL TECHNICAL REQUIREMENTS FOR 20-FT LOWERABLE WORKSTATION (SCISSOR LIFT)</u>	
5.1 Warehouse 20 FT Lowerable Workstation.....	14
6. <u>GENERAL TECHNICAL REQUIREMENTS FOR MISCELLANEOUS ITEMS</u>	
6.1 5/10 tonne Scale Platform on lowerable workstation.....	18
6.2 Guard rail	19
6.3 Dolly Transfer Bumper	20
6.4 Signage.....	21
6.5 Slave Pallets	21
6.6 Trucdock Leveller	22

PART 2 – MHS AND OTHER ITEM SPECIFICATIONS**1 GENERAL INFORMATION**

This Part 2 shall be read in conjunction with all other parts of the Contract Documents including all the proposed MHS drawings:

In event of inconsistencies, errors and omissions in this Contract Documents, the Company in consultation with its advisors, shall reserve the right to interpret specification requirements affected by such inconsistencies, errors and omissions, etc. in its most stringent form to the benefits of this project

The Contractor shall comply with the project milestones.

1.1. DESCRIPTION OF OPERATION

1.1.1 The terminal shall be for international and domestic cargo operations.

1.1.2 The MHS must be equipped with provisions to allow it to handle import and export cargo interchangeably without any modifications or enhancement done to the MHS. In other words, the MHS shall have bi-directional capabilities to process either Import or Export cargo.

1.1.3 ULDs are transported in dollies at 508 mm high (roll plane elevation). 10-ft ULDs shall be conveyed and stored in NEL fashion while 5-ft ULDs (i.e. AKE) shall be conveyed and stored in WEL fashion.

1.1.4 The MHS shall be designed to work predominantly with ULD dollies, which interface with the roller deck interface on the airside.

1.2 EQUIPMENT LIST

No	Description	Qty
1	Import	
a	Castor Decks	1
b	12ft Lowerable Workstation	2
c	Workstation Decks	4
d	Lowerable Roller Deck (508mm to 208mm)	2
e	Dolly Interface Conveyor and Interface to Castor Deck	6
f	Bypass Lane (for 20ft)	1
g	Dolly Interface Conveyor for Bypass Lane	1
g	20 ft lowerable workstation	1
2	Export	
a	Powered Roller Deck (12ft)	1
b	Dolly Interface Conveyor	1
c	Lowerable Roller Deck (508mm to 208mm) with weigh scale	1
e.	Dolly Interface Conveyor	
f.	12ft workstation Deck	1
3	Perishable Room	
a	Powered roller Deck (3m)	1
b	Dolly Interface Conveyor and interface to Castor Deck	2
c	Lowerable Roller Deck	1
d	Workstation Decks	2
E	12ft Lowerable Workstation	1

2. TECHNICAL REQUIREMENTS FOR 12-FT LOWERABLE WORKSTATION (SCISSOR LIFT)

2.1 WAREHOUSE 12 FT LOWERABLE WORKSTATION

2.1.1 DESCRIPTION

- 2.1.1.1 To provide a lowerable workstation to facilitate the buildup and breakdown of the various type of ULDs, especially main deck units. Cargo buildup/breakdown activities shall be possible at all three sides of the workstation.
- 2.1.1.2 To allow interface with ULD dollies to buildup and breakdown ULDs and slave pallets.
- 2.1.1.3 To allow cargo traffic (e.g. forklifts and dollies) to drive over or stop on top of the workstation for buildup and breakdown purposes, when the workstation is aligned with the adjacent floor elevation.
- 2.1.1.4 To provide a scale for weighing of ULDs.

2.2 LOAD REQUIREMENTS

- 2.2.1 Operational Capacity:
 - Half Size Lower Deck Units: Two (Wide Edge Leading)
 - Full Size Lower Deck Units: One
 - Main Deck Units: One
 - Winged Units: One
- 2.2.2 The lift shall be capable of receiving, supporting, transferring and lifting a live load of up to a 6,800 kg. main deck ULD container, and all kind of ULDs as specified in the latest IATA ULD Handling Manual. The lift shall be designed up to a maximum capacity of 8500 kg and should be tested to this load.
- 2.2.3 The lift shall also be capable of supporting forklifts with cargo when the roll plane of the workstation is aligned with the adjacent floor elevation, for the purposes of cargo build-up activities.
- 2.2.4 Vertical speed shall be 3m/min for fast movement and 1.5m/min for slow movement.

2.3 CONFIGURATION

- 2.3.1 The Contractor shall install the equipment in a prepared pit. The detailed requirements on the pit (dimensions, accuracy and pit edge protection) shall be submitted by Contractor as part of its tender submissions.

2.4 CONVEYOR SURFACE AND GUIDES

- 2.4.1 The conveyor surface and guides shall conform to the "Part 2 – General Technical Specifications" and Section 100 - Powered Rollerdecks, as applicable, as well as the requirements outlined in this document.

- 2.4.2 The conveyor deck shall be designated as "Narrow Edge Leading" with ULDs allowed to come into deck from dollies at both NEL ends unless otherwise specified.
- 2.4.3 Walkways between roller/wheels are required and must be strong enough to withstand the warehouse traffic moving or stopping over them.
- 2.4.4 The conveyor surface must be designed to allow forklifts to drive over and/or stop on top of the workstation deck, when the roll plane of the workstation is aligned with the adjacent floor elevation.
- 2.4.5 The conveyor surface shall be designed to be anti-slip / anti-skid so that no persons on the workstation shall slip during any normal build-up and/or breakdown activities. More importantly, especially when the deck is aligned with the floor, it must continue to serve its anti-skid function to prevent slippage when personnel or warehouse traffic move over it.
- 2.4.6 The conveyor surface must be designed to be strong and able to withstand the abrasive conditions it is subjected to.
- 2.4.7 In addition, it must be designed to minimize trapping of dirt, debris and oil common in the warehouse while providing ease of maintenance access to remove the accumulated dirt and debris. To this aspect, individual sections of the conveyor surface shall allow for easy removal for maintenance purposes, if required.

2.5 SUPPORT

- 2.5.1 The lift shall be designed to support the conveyor deck in a level and rigid manner through all vertical movements and elevations and under all ULD and warehouse traffic conditions on the deck. No "yawing", permanent yielding and deformation of the lift and deck shall occur as a result of the intended loadings described here.
- 2.5.2 The vertical function of the workstation is predominantly used to facilitate build-up of main deck ULDs. Beside this function, when the deck is aligned with the adjacent floor elevation, it must be strong and rugged enough to withstand mobile traffic like forklifts that drive over and/or stop on top of the workstation deck, for the purpose of cargo build-up activities.
- 2.5.3 Subsequent to shimming and leveling, the base frame shall be grouted under the frame where no footplates exist to provide additional stability and support.
- 2.5.4 Conveyor decks connections to all types of support structures shall be by bolted connections only. Welding of decks to support members is prohibited to allow removal of conveyors as modular units.

2.6 SCISSOR LIFT ASSEMBLY

- 2.6.1 The "Floor" position shall be at the adjacent floor elevation unless otherwise specified. In this position the maintenance struts should be extended to support the platform.
- 2.6.2 The scissor lift shall maintain vertical position with power off under all loading conditions without creeping or deflection. Where required, physical locks or auto-leveling equipment shall be provided to ensure this requirement is complied with.
- 2.6.3 The scissor lift shall be capable of taking horizontal loads imparted by a fully loaded

ULD hitting stops, and by impact of mobile equipment such as fork lifts and loaded ULD dollies hitting the exposed framing elements during normal cargo processing activities, without deformation, jamming or any adverse effect on its functions or safety provision.

- 2.6.4 Maintenance support struts shall be provided for safety when the lift is being maintained. It shall be possible to actuate these struts without exposure to risk of injury (i.e., sudden lift descent). Support struts shall be painted "safety yellow" to assure easy recognition. Support strut deployment is preferably initiated from the top of the conveyor without the need to enter the pit area.
- 2.6.5 The scissor lift shall be designed to be fail safe, i.e. failure of a component shall in no case allow uncontrolled rapid descent of the lift platform.
- 2.6.6 The scissor lifts shall be capable of accepting drive-over loading as applied by warehouse mobile equipment like forklifts. Typically, forklifts (up to 5-ton capacity) and other mobile warehouse equipment will be utilized during build-up and breakdown of containers/pallets. Concentrated wheel loads shall be accommodated in the design of the lift to account for the following conditions (but not limited to):
- Impact on rollers or wheels during access
 - Gross weight of fully laden vehicle
 - Forces transmitted to and through the structure and anchoring system
 - Stability and eccentric load conditions
 - Structure and roller/wheel deflection under full load (including maximum ULD allowable loads) shall not be excessive to affect normal operation in any way.
- 2.6.7 In order to provide sufficient support for the lift under the extreme loading as described previously, the lift may be support by strong struts when the workstation is at the "FLOOR" elevation.
- 2.6.8 Provision should be made for attachment points on the deck to lift the deck in case the platform has sunk into the pit. The point could be an attachment for eye bolts.
- 2.6.9 Cylinder rods should be chrome plated

2.7 VERTICAL MOVEMENT

- 2.7.1 Vertical speed shall be a minimum of 3 meters per minute, both raising and lowering, and shall remain constant regardless of applied load.
- 2.7.2 The lift assembly shall maintain vertical position with power off under all idling conditions without creeping.
- 2.7.3 The lift assembly shall be designed such that the lift deck shall automatically lock in position in the event of electrical or hydraulic power failure.
- 2.7.4 The lift shall be provided with maintenance support struts, which shall permit the lift to be supported when in the raised position, to permit safe maintenance access. These props must be able to be deployed by a maintenance worker without risk exposure (i.e. preferably without need to enter the area below the lift platform).

- 2.7.5 The lift assembly and the conveyor deck shall be capable of taking horizontal loads impacted by fully loaded ULDs hitting stops, and by impact from mobile equipment such as fork lifts and/or loaded ULD dollies during normal cargo operation, without deformation, jamming or any adverse effect on its functions or safety provisions.
- 2.7.6 Physical end limit (travel) stops shall limit vertical movement to the specified elevations.
- 2.7.7 Vertical movement shall be smooth and linear, without vibration or shuddering or excessive noise, throughout travel range.
- 2.7.8 The vertical lift range shall be at least from +508 mm (above adjacent floor to interface with dolly roll plane height) to -1,500 mm (below adjacent floor) or more.
- 2.7.9 There shall be a Floor position selectable via a pushbutton to bring the deck to flush to floor level for easy loading of ULDs.
- 2.8 STOPS
- 2.8.1 The stops on the deck ends shall be "Power retraction, Spring Return" type.
- 2.9 HYDRAULIC POWER PACK AND CONNECTIONS
- 2.9.1 The hydraulic power pack shall be mounted to the floor of the pit in the dedicated recess area adjacent to the main lift pit area unless otherwise indicated. The following features shall be included in the design of the hydraulic unit but not limited to:
- Safety Shut-Off Valve(s)
 - Drip Pan
 - Oil Reservoir and Site Gauge (w/shut-off valve(s))
 - Pressure and Return Line Filters
 - Pressure Gauge with Shut-Off Valve
 - Pressure Relief Valve
- 2.9.2 The power pack configuration shall ensure that hydraulic oil may be easily drained and replaced. The reservoir shall be located with the drain plug at a convenient location and elevation to allow oil removal without using a pump or special low-profile drain pans.
- 2.9.3 Hydraulic lines and connections shall be properly protected and not exposed to operations or personnel traffic. Anchoring and clamping provisions shall be spaced according to accepted practice and on-site requirements.
- 2.9.4 Flexible hydraulic lines shall only be permitted where relative movement precludes the use of rigid piping and may only be used in shortest lengths possible.
- 2.9.5 Provide precautionary measures to avoid condensation in the hydraulic system resulting in hydraulic fluid contamination, corrosion, etc.
- 2.9.6 Hydraulic cylinders shall have positive internal mechanical stops to stop the vertical movement at both ends of travel, even in the event of failure of the sensor controlling the normal vertical travel range of the unit.
- 2.9.7 Power packs and any floor mounted control devices shall be mounted on platforms

located 75 mm above pit floor.

- 2.9.8 Lighting, maintenance changeover switch, power isolator should be provided in the pit.
- 2.9.9 There should be a low oil level switch to cutoff the pump if the oil level is low. There should be safety valve in case of hydraulic hose or tube connection break which will allow the platform to remain in position.

2.10 MAINTENANCE PROVISIONS

- 2.10.1 Access covers shall be provided with hinges for easy maintenance access to pit. Such covers shall be flushed with the adjacent floor elevation and be able to withstand mobile warehouse traffic driving over it.
- 2.10.2 The conveyor deck shall be designed with provisions to allow a forklift truck to raise the lift for maintenance access to the lift assembly and its components (e.g. by means of lifting lugs or similar). Eye-bolts for the oil tank and motor shall be provided too.
- 2.10.3 Where pit dimensions are oversized and equipment parameters do not necessitate use of the complete area as provided (accounting for the specified clearances), non-skid steel infill plates shall be installed. Sufficient support for mobile warehouse traffic may be required as dictated by the individual design.
- 2.10.4 Plug-in socket shall be provided inside pit to receive portable maintenance control panel so that maintenance personnel can use it inside pit for maintenance functions, which include lifting, lowering, conveying, stop functions, E-stop, etc. One portable maintenance control panel shall be provided that could work with any of the lowerable workstations.
- 2.10.5 A fixed E-stop shall be located inside pit where maintenance personnel is likely to be presence.
- 2.10.6 At least 2 fixed power sockets shall be provided inside pit for maintenance work, which include supporting powered tools and portable lightings.
- 2.10.7 A hand mode switch should be provided to allow release of maintenance struts and allow movement of the strut manually.
- 2.10.8 The pit should be 2m deep and access ladder to be provided with sufficient handholds to enter the pit.
- 2.10.9 Remote control for maintenance should be provided.
- 2.10.10 Lifting Points for the scissor lift roller deck to lift up the deck when the deck is fully lowered and there is hydraulic failure so that maintenance staff can lift the deck and access the area under the deck.

2.11 INTERFACE TO SLAVE PALLET

- 2.11.1 The workstation should be designed to interface with slave pallet, provision should be made for impact of slave pallets. The workstation should be sufficiently protected for this.

- 2.11.2 There should be a "Home" position which would be the height corresponding to transfer to slave pallets. There must also be the ability for the user to move the scissor lift to any level through up and down switches.

2.12 LOWERABLE ROLLER DECK

2.12.1 DESCRIPTION

- 2.12.1 To provide a roller deck to interface with castor decksts.
- 2.12.3 To lift ULDs to dolly level
- 2.12.4 Equipped with weigh scale and printer for Export

2.12 CONFIGURATION

- 2.12.2 The length of the deck should be 12 ft minimum

2.13 LOAD REQUIREMENTS

Operational Capacity:

- Half Size Lower Deck Units: Two (Wide Edge Leading)
- Full Size Lower Deck Units: One
- Main Deck Units: One
- Winged Units: One

3. GENERAL TECHNICAL REQUIREMENTS FOR POWERED ROLLER DECKS

The rollerdecks should be capable of supporting and conveying a load of 8,500kg for testing and certification purposes.

3.1 CONTENTS

<u>Item</u>	<u>Description</u>
100	Dolly Interface Conveyor
101	Lifting Roller Deck
102	Airside Bypass Lanes
103	Interface roller deck to dolly interface Conveyor
104	Workstation Decks

3.2 LOAD REQUIREMENTS

- 3.2.1 All powered conveyor decks shall be capable of receiving, supporting and transferring a live load of up to a 6,800 kg main deck container with + 25% overload.

3.3 CONVEYOR SURFACE AND GUIDES

- 3.3.1 The conveyor surface and guides shall conform to the "Part 2 - General Technical Specifications", as well as the requirements outlined in this section.
- 3.3.2 The rollers shall be full-width with a minimum outside diameter of 130 mm and mounted on a maximum centerline to centerline spacing of 305 mm. Circular eccentricity (or out-

of-roundness) shall not exceed 3 mm anywhere along the span of the roller. The difference in elevation between any two rollers shall not exceed 3 mm.

- 3.3.3 Full-width, non-skid walkways shall be located between the rollers at an elevation of 13 to 20 mm below the roll plane. The walkway shall not exhibit "oil-can" effect under any expected load on it, e.g. personnel movement over it. Where walkways prevent access to clutches, motors, brakes, torque limiters or any field devices that require maintenance, etc., they shall be easily removable.
 - 3.3.4 All rollers shall be chain-linked so that the entire conveyor surface is powered when the deck drive is actuated. Conveyors shall be capable of forward and reverse mode operation and shall move all containers in either direction at a speed of 18 meters per minute.
 - 3.3.5 Drive motors and other components requiring maintenance or repair servicing must be carefully located to ensure the support structure does not interfere with maintenance access. For those conveyor decks supported by solid concrete floors, convenient maintenance access from above and/or from the side must be provided for.
 - 3.3.6 Side guides shall be part of the frame or side structure of the conveyor. Frame members shall be extremely rugged with a minimum thickness of 6 mm. Side guides shall extend 50 mm above the roll plane and shall be generously flared at the interfacing end(s) of the conveyor deck. Adjacent decks shall be installed such that the side guides of both decks are aligned within 3 mm of each other.
 - 3.3.7 The powered conveyors designated as Narrow Edge Leading shall have an inside-to-inside guide width of 2540 mm.
 - 3.3.8 All motors must allow manual disengagement from rollers so as to free rollers in the event that motor is unserviceable.
 - 3.3.9 Walkways shall be provided between rollers. A walkway is required on both sides of the conveyor which protrude out from the queue lane group.
 - 3.3.10 Conveyors designed as 'Narrow Edge Leading' shall have a distance between side guides of 2,540 mm.
 - 3.3.11 Rollers shall be of at least 130 mm diameter and 5 mm wall thickness. Roller shaft and bearing diameter shall be 40 mm.
- 3.4 CONVEYOR DECK SUPPORT
- 3.4.1 The conveyor shall be fixed in position and supported by steel support legs, fabricated from heavy duty structural steel material, incorporating a foot plate welded to the base of the leg for attachment to the floor or structural steel members, and a support plate welded to the top of the leg for attachment to the rollerdeck.
 - 3.4.2 Conveyor deck connections to all types of support structures (if any) shall be by bolted connection only. Welding of decks to support members is prohibited to allow removal of conveyors as modular units.
- 3.5 STOPS
- 3.5.1 Retractable stops when raised, shall restrain a fully loaded container traveling in a slightly skewed position at 18 meters per minute with no permanent deformation or loss of function. Stops, when raised shall be 60 mm above the roll plane elevation.

Stop plate thickness shall be a minimum of 13 mm.

3.5.2 Fixed stops shall restrain a fully loaded container traveling in a slightly skewed position at 18 meters per minute with no permanent deformation. Stops shall project a minimum of 60 mm above roll plane elevation.

3.5.3 The stops at the dolly interface ends shall also be designed and built such that it can be used to align fully loaded ULD by having the ULD (stored on the first deck position, adjacent to the dolly) traveling in a skewed position at 18 meters per minutes against these stops, under operator control via the OCP.

3.6 SENSORS

3.6.1 Sufficient and appropriate sensors shall be provided to accurately track the exact positions of each ULD regardless of the inconsistency in the width of gap between ULDs, which are expected especially as a result of ULDs being introduced into the system from dollies.

3.7 MAINTENANCE REQUIREMENTS

All conveyors shall require visual inspection and lubrication (if necessary) once every 8 weeks at the most.

3.8. DOLLY INTERFACE CONVEYOR (ITEM 100)

This shall conform to the General Technical Requirements of Powered Rollerdecks, as applicable, as well as those set forth below.

3.8.1 DESCRIPTION

3.8.1.1 To interface with ULD transport dollies.

3.8.1.2 Sufficient guards should be installed to prevent overhang ULD from hitting any part of the MHS, builder of doors (where the ULD is overhang)

3.8.1.3 The front of the deck interfacing the dolly shall be lowerable to allow easy transfer to/from dollies of different heights

3.8.2 LOAD REQUIREMENTS

Operational Capacity: Each deck should be able to support all ULDs for conveying.

3.8.3 CONVEYOR SURFACE AND GUIDES

3.8.3.1 The conveyor deck shall be designated as "Narrow Edge Leading".

3.8.3.2 Walkways shall be provided between rollers.

3.8.4 CONVEYOR DRIVES

3.8.4.1 One motor is required for the conveyor section. The number of motors, controls and sensor locations shall permit the above operational capacity.

3.8.4.2 The conveyors should be able to function bi-directionally i.e. Import and export

directions can be interchanged.

3.8.5 STOPS

3.8.5.1 The stops on the dolly interface deck end shall be “Cam Down Entering Load, Power Retraction, Manual Retraction, Spring Return.

3.8.5.2 The Contractor is responsible to provide sufficient quantity of stops and suitable types of stop to meet the requirements in the specifications.

3.8.6 CONTROL PROVISION

3.8.6.1 At each dolly end, each deck shall have its own Operator Control Panel (OCP) to allow operator to move ULDs from queue conveyor onto abutting dollies, or to move in ULDs from dollies onto queue conveyor. Each conveyor shall be configurable to be either an Outgoing or Incoming conveyor via the OCP.

3.8.6.2 OCPs shall be recessed sufficiently away from the dolly traffic to keep OCP operators and the OCPs terminals away from the path of incoming AAU type of ULD sitting on dolly.

3.8.6.3 At the dolly end, the operator can depress the “ULD Align” button on the OCP, to move the ULD sitting on the first deck position adjacent to the dolly, against the stop at the dolly end to align the ULD. Upon release of the “Align ULD” button, the ULD shall automatically move forward to “join” up with the other ULDs already on the deck when ‘Go’ button is pressed.

3.8.6.4 The front of the deck interfacing the dolly should be adjustable via joystick to bring the deck to dolly height for easy unloading of ULDs from the dolly.

3.8.7 PROTECTION FROM ULD MOVEMENT

3.8.7.1 Vertical ULD guides shall also be provided at dolly end, to prevent any part of incoming ULDs to hit the building columns (if any), OCP or the operator in front of the OCP.

3.8.7.2 At the dolly interface, AAU stored on the conveyor shall stop away from the deck end so that it will not interfere with another AAU sitting on dolly being towed in to interface with this conveyor.

3.9 BYPASS LANE FOR 10 AND 20FT PALLETS (200)

This item shall conform to the General Technical Requirements of Powered Rollerdecks, as applicable, as well as those set forth below.

3.9.1 DESCRIPTION

To provide a single level powered queue positions for containers and pallets (10 and 20ft) comprising of 10ft roller decks which could be accessible from the dollies and can be relocated.

3.9.2 LOAD REQUIREMENTS

3.9.2.1 Operational Capacity: Each deck should be able to support on of the following:

Half Size Lower Deck Units:

Full Size Lower Deck Units:

Main Deck Units:
Winged Units:
20ft Pallets

3.9.3 CONVEYOR SURFACE AND GUIDES

3.9.3.1 The conveyor deck shall be designated as "Narrow Edge Leading".

3.9.3.2 Walkways shall be provided between rollers.

3.9.6 CONVEYOR DRIVES

3.9.6.1 At least one drives are required for 10ft conveyor section. The number of motors, controls and sensor locations shall permit the above operational capacity and maximization of ULD storage.

3.9.6.2 The conveyors should be able to function bi-directionally i.e. Import and export directions can be interchanged.

3.9.7 STOPS

3.9.7.1 The stops on the dolly interface deck end shall be "Cam Down" Entering Load, Power Retraction, Manual Retraction, Spring Return.

3.9.7.2 The Contractor is responsible to provide sufficient quantity of stops and suitable types of stop to meet the requirements in the specifications.

CONTROL PROVISION

3.9.8.1 The bypass lane should be able to store two 10 ft ULDs or one 20 ft pallet. Storage should be maximized. It should be possible to deposit five 10 ft ULDs from the dollies with a slightly longer deck next to the door (12ft).

3.9.9 SUPPORTS

The supports should be able to support the fully loaded lanes and should have provision for extension to three levels.

3.10 LIFTING ROLLER DECK

3.10.1 DESCRIPTION

The roller deck is meant to lift the ULD from 208mm height to 508 mm (dolly level) so that it can interface to the castor or rolled deck and vice versa to interface with the workstation decks. It should be motorised so that the ULD can be conveyed to the castor or roller deck or workstation decks.

3.10.2 LOAD REQUIREMENTS

Operational Capacity: Each deck should be able to support on of the following:

Half Size Lower Deck Units:
Full Size Lower Deck Units:
Main Deck Units:
Winged Units:
20ft Pallets

All lifting decks and conveyor decks shall be capable of lifting, receiving, supporting and transferring a live load of up to a 6,800 kg main deck container with + 25% overload.

3.10.3 HYDRAULIC.AND VERTICAL MOVEMENT

Hydraulic components shall conform to specifications for scissor lifts.
Vertical movements shall conform to specifications of scissor lift movements

3.10.3 POWERED ROLLER DECK

The powered roller deck shall conform to specifications for powered roller decks.

3.10.4 CONTROL RPROVISIONS

The lifting and conveying movement shall be control for a control panel. This can be combined with the controls for the adjacent workstation. Control for two lifting decks should not be combined.

3.11 INTERFACE ROLLER DECK (400)

3.10.1 DESCRIPTION

The roller deck is meant interface the castor deck to the Airside dolly interface deck and also be a buffer before the roller shutter door to prevent ULDs from hitting the door.

3.10.3 POWERED ROLLER DECK

The powered roller deck shall conform to specifications for powered roller decks.

3.12 WORKSTATION DECKS (500)

3.12.1 DESCRIPTION

The workstation decks are used for build up and breakdown of ULDs and includes all interfacing decks to conveyor the ULD to the decks and lowerable workstations

3.12.2 POWERED ROLLER DECK

The powered roller deck shall conform to specifications for powered roller decks. It should be equipped with sensors to stop ULDs.

3.12.3 BUILD UP AND BREAKDOWN DECKS

The decks shall be motorised and be at the height of 208,. It should be protected with a bumper barrier to prevent damage from warehouse traffic. It should be equipped with sensors to stop ULDs

4 GENERAL SPECIFICATION FOR CASTOR DECKS

4.1 DESCRIPTION

To provide a queuing/storage area for ULDs.

4.2 LOAD REQUIREMENTS

- 4.2.1 All non powered roller decks shall be capable of receiving, supporting and transferring a live load of up to a 6800 kg main deck ULDs
- 4.2.2 All castors shall be capable of rotation of 360 degrees and shall be Colson design or equivalent .

4.3 CASTOR SURFACE AND GUIDES

- 4.3.1 The conveyor surface and guides shall allow for easy walkover
- 4.3.2 Side guides shall be part of the frame or side structure of the Deck. Frame members shall be extremely rugged with a minimum thickness of 6 mm. Side guides shall extend a minimum of 60 mm above the roll plane and shall be generously flared at the interfacing end(s) of the conveyor deck.
 - 4.3.2.1 Castor decks shall allow for easy transfer to and from powered roller decks.
 - 4.3.2.2 At the fixed end of the castor deck where the ULD overhang protrude beyond the fixed end stop, the footprint area of the protruding ULD overhang shall be covered by walkways covers to ensure no falling through of personnel.

4.4 STOPS

- 4.4.1 Retractable stops and fixed stops, when raised, shall restrain a fully loaded ULD impact with no permanent deformation or loss of function. Stop plate thickness shall be a minimum of 12 mm.
- 4.4.2 All positions shall be for ALL types of ULDs including overhang ULDs.
- 4.3.3 All stop mechanisms shall be easily dismantled for repair, if damaged. Adjustment of components, such as gas springs and absorbers, shall not be necessary more than once every six months. (Company prefers to use only gas springs instead of mechanical ones)
- 4.3.4 Stoppers should be provided before interface to the powererd lanes

5 TECHNICAL REQUIREMENTS FOR 20-FT LOWERABLE WORKSTATION (SCISSOR LIFT)

5.1 WAREHOUSE 20 FT LOWERABLE WORKSTATION

5.1.1 DESCRIPTION

- 5.1,2 To provide a lowerable workstation to facilitate the buildup and breakdown of the 10 or 20ft ULDs, especially main deck units. Cargo buildup/breakdown activities shall be possible at all three sides of the workstation.
- 5.1.3 To allow interface with ULD dollies to buildup and breakdown ULDs and slave pallets.
- 5.1.4 To allow cargo traffic (e.g. forklifts and dollies) to drive over or stop on top of the workstation for buildup and breakdown purposes, when the workstation is aligned with

the adjacent floor elevation.

5.2 LOAD REQUIREMENTS

5.2.1 Operational Capacity:

Half Size Lower Deck Units: Four (Wide Edge Leading)
Full Size Lower Deck Units: Two
20 ft Main Deck Units: One
Winged Units: One

5.2.2 The lift shall be capable of receiving, supporting, transferring and lifting a live load of up to a 13,500 kg. main deck ULD container, and all kind of ULDs as specified in the latest IATA ULD Handling Manual. The lift shall be designed up to a maximum capacity of 13,500 kg and should be tested to 125% of max load.

5.2.3 The lift shall also be capable of supporting forklifts with cargo when the roll plane of the workstation is aligned with the adjacent floor elevation, for the purposes of cargo build-up activities.

5.2.4 Vertical speed shall be 3m/min for fast movement and 1.5m/min for slow movement.

5.3 CONFIGURATION

5.3.1 The Contractor shall install the equipment in a prepared pit. The detailed requirements on the pit (dimensions, accuracy and pit edge protection) shall be submitted by Contractor as part of its tender submissions.

5.4.1 CONVEYOR SURFACE AND GUIDES

5.4.2 The conveyor surface and guides shall conform to the "Part 2 – General Technical Specifications" and Section 100 - Powered Roller decks, as applicable, as well as the requirements outlined in this document.

5.4.3 The conveyor deck shall be designated as "Narrow Edge Leading" with ULDs allowed to come into deck from dollies at both NEL ends unless otherwise specified.

5.4.4 Walkways between roller/wheels are required and must be strong enough to withstand the warehouse traffic moving or stopping over them.

5.4.5 The conveyor surface must be designed to allow forklifts to drive over and/or stop on top of the workstation deck, when the roll plane of the workstation is aligned with the adjacent floor elevation.

5.4.6 The conveyor surface shall be designed to be anti-slip / anti-skid so that no persons on the workstation shall slip during any normal build-up and/or breakdown activities. More importantly, especially when the deck is aligned with the floor, it must continue to serve its anti-skid function to prevent slippage when personnel or warehouse traffic move over it.

5.4.7 The conveyor surface must be designed to be strong and able to withstand the abrasive conditions it is subjected to.

5.4.8 In addition, it must be designed to minimize trapping of dirt, debris and oil common in the warehouse while providing ease of maintenance access to remove the

accumulated dirt and debris. To this aspect, individual sections of the conveyor surface shall allow for easy removal for maintenance purposes, if required.

5.5 SUPPORT

- 5.5.1 The lift shall be designed to support the conveyor deck in a level and rigid manner through all vertical movements and elevations and under all ULD and warehouse traffic conditions on the deck. No "yawing", permanent yielding and deformation of the lift and deck shall occur as a result of the intended loadings described here.
- 5.5.2 The vertical function of the workstation is predominantly used to facilitate build-up of main deck ULDs. Beside this function, when the deck is aligned with the adjacent floor elevation, it must be strong and rugged enough to withstand mobile traffic like forklifts that drive over and/or stop on top of the workstation deck, for the purpose of cargo build-up activities.
- 5.5.3 Subsequent to shimming and leveling, the base frame shall be grouted under the frame where no footplates exist to provide additional stability and support.
- 5.5.4 Conveyor decks connections to all types of support structures shall be by bolted connections only. Welding of decks to support members is prohibited to allow removal of conveyors as modular units.

5.6 SCISSOR LIFT ASSEMBLY

- 5.6.1 The "Floor" position shall be at the adjacent floor elevation unless otherwise specified. In this position the maintenance struts should be extended to support the platform.
- 5.6.2 The scissor lift shall maintain vertical position with power off under all loading conditions without creeping or deflection. Where required, physical locks or auto-leveling equipment shall be provided to ensure this requirement is complied with.
- 5.6.3 The scissor lift shall be capable of taking horizontal loads imparted by a fully loaded ULD hitting stops, and by impact of mobile equipment such as fork lifts and loaded ULD dollies hitting the exposed framing elements during normal cargo processing activities, without deformation, jamming or any adverse effect on its functions or safety provision.
- 5.6.4 Maintenance support struts shall be provided for safety when the lift is being maintained. It shall be possible to actuate these struts without exposure to risk of injury (i.e., sudden lift descent). Support struts shall be painted "safety yellow" to assure easy recognition. Support strut deployment is preferably initiated from the top of the conveyor without the need to enter the pit area.
- 5.6.5 The scissor lift shall be designed to be fail safe, i.e. failure of a component shall in no case allow uncontrolled rapid descent of the lift platform.
- 5.6.6 The scissor lifts shall be capable of accepting drive-over loading as applied by warehouse mobile equipment like forklifts. Typically, forklifts (up to 5-ton capacity) and other mobile warehouse equipment will be utilized during build-up and breakdown of containers/pallets. Concentrated wheel loads shall be accommodated in the design of the lift to account for the following conditions (but not limited to):
- Impact on rollers or wheels during access

- Gross weight of fully laden vehicle
- Forces transmitted to and through the structure and anchoring system
- Stability and eccentric load conditions
- Structure and roller/wheel deflection under full load (including maximum ULD allowable loads) shall not be excessive to affect normal operation in any way.

5.6.7 In order to provide sufficient support for the lift under the extreme loading as described previously, the lift may be support by strong struts when the workstation is at the "FLOOR" elevation.

5.6.8 Provision should be made for attachment points on the deck to lift the deck in case the platform has sunk into the pit. The point could be an attachment for eye bolts.

5.6.9 Cylinder rods should be chrome plated

5.7 VERTICAL MOVEMENT

5.7.1 Vertical speed shall be a minimum of 3 meters per minute, both raising and lowering, and shall remain constant regardless of applied load.

5.7.2 The lift assembly shall maintain vertical position with power off under all idling conditions without creeping.

5.7.3 The lift assembly shall be designed such that the lift deck shall automatically lock in position in the event of electrical or hydraulic power failure.

5.7.4 The lift shall be provided with maintenance support struts, which shall permit the lift to be supported when in the raised position, to permit safe maintenance access. These props must be able to be deployed by a maintenance worker without risk exposure (i.e. preferably without need to enter the area below the lift platform).

5.7.5 The lift assembly and the conveyor deck shall be capable of taking horizontal loads impacted by fully loaded ULDs hitting stops, and by impact from mobile equipment such as fork lifts and/or loaded ULD dollies during normal cargo operation, without deformation, jamming or any adverse effect on its functions or safety provisions.

5.7.6 Physical end limit (travel) stops shall limit vertical movement to the specified elevations.

5.7.7 Vertical movement shall be smooth and linear, without vibration or shuddering or excessive noise, throughout travel range.

5.7.8 The vertical lift range shall be at least from +508 mm (above adjacent floor to interface with dolly roll plane height) to -1,500 mm (below adjacent floor) or more.

5.8 STOPS

5.8.1 The stops on the deck ends shall be "Power retraction, Spring Return" type.

5.9 HYDRAULIC POWER PACK AND CONNECTIONS

- 5.9.1 The hydraulic power pack shall be mounted to the floor of the pit in the dedicated recess area adjacent to the main lift pit area unless otherwise indicated. The following features shall be included in the design of the hydraulic unit but not limited to:
- Safety Shut-Off Valve(s)
 - Drip Pan
 - Oil Reservoir and Site Gauge (w/shut-off valve(s))
 - Pressure and Return Line Filters
 - Pressure Gauge with Shut-Off Valve
 - Pressure Relief Valve
- 5.9.2 The power pack configuration shall ensure that hydraulic oil may be easily drained and replaced. The reservoir shall be located with the drain plug at a convenient location and elevation to allow oil removal without using a pump or special low-profile drain pans.
- 5.9.3 Hydraulic lines and connections shall be properly protected and not exposed to operations or personnel traffic. Anchoring and clamping provisions shall be spaced according to accepted practice and on-site requirements.
- 5.9.4 Flexible hydraulic lines shall only be permitted where relative movement precludes the use of rigid piping and may only be used in shortest lengths possible.
- 5.9.5 Provide precautionary measures to avoid condensation in the hydraulic system resulting in hydraulic fluid contamination, corrosion, etc.
- 5.9.6 Hydraulic cylinders shall have positive internal mechanical stops to stop the vertical movement at both ends of travel, even in the event of failure of the sensor controlling the normal vertical travel range of the unit.
- 5.9.7 Power packs and any floor mounted control devices shall be mounted on platforms located 75 mm above pit floor.
- 5.9.8 Lighting, maintenance changeover switch, power isolator should be provided in the pit.
- 5.9.9 There should be a low oil level switch to cutoff the pump if the oil level is low. There should be safety valve in case of hydraulic hose or tube connection break which will allow the platform to remain in position.
- 5.10 MAINTENANCE PROVISIONS
- 5.10.1 Access covers shall be provided with hinges for easy maintenance access to pit. Such covers shall be flushed with the adjacent floor elevation and be able to withstand mobile warehouse traffic driving over it.
- 5.10.2 The conveyor deck shall be designed with provisions to allow a forklift truck to raise the lift for maintenance access to the lift assembly and its components (e.g. by means of lifting lugs or similar). Eye-bolts for the oil tank and motor shall be provided too.
- 5.10.3 Where pit dimensions are oversized and equipment parameters do not necessitate use of the complete area as provided (accounting for the specified clearances), non-skid steel infill plates shall be installed. Sufficient support for mobile warehouse traffic may be required as dictated by the individual design.

- 5.10.4 Plug-in socket shall be provided inside pit to receive portable maintenance control panel so that maintenance personnel can use it inside pit for maintenance functions, which include lifting, lowering, conveying, stop functions, E-stop, etc. One portable maintenance control panel shall be provided that could work with any of the lowerable workstations.
- 5.10.5 A fixed E-stop shall be located inside pit where maintenance personnel is likely to be presence.
- 5.10.6 At least 2 fixed power sockets shall be provided inside pit for maintenance work, which include supporting powered tools and portable lightings.
- 5.10.7 A hand mode switch should be provided to allow release of maintenance struts and allow movement of the strut manually.
- 5.10.8 The pit should be 2 m deep and there should be an access ladder with sufficient handholds to enter the pit.
- 5.10.9 Remote panel for maintenance to be provided.
- 5.10.10 Lifting Points for the scissor lift roller deck to lift up the deck when the deck is fully lowered and there is hydraulic failure so that maintenance staff can lift the deck and access the area under the deck.

6. TECHNICAL REQUIREMENTS FOR MISCELLANEOUS ITEMS

CONTENTS

<u>Item</u>	<u>Description</u>
601	10-tonne Scale
602	5-tonne Scale
603	Guard Rail
604	Dolly Transfer Bumper
605	Signage
606	Slave Pallets
607	Truckdock Levellers

6.1 ITEM 601/602 – 5/10-TONNE FLUSH FLOOR SCALE

Item 601/602 shall comply with “Part 2 - General Specifications”, as applicable, as well as those set forth below.

6.2 DESCRIPTION

- a. To provide a means of weighing ULDs on the floor up to 10 tonnes load.
- b. To provide a means of weighing up to skidded cargo up to 5 tonnes load.
- c. To provide a means of weighing loose (non-unitized) cargo shipments.

6.3 CONFIGURATION

- 6.3.1 Item 601/602 shall be installed in a pit with the platform flush with the floor and be able to withstand frequent movement of ULDs, warehouse traffic (such as forklift vehicles, etc) travelling over the scale without need for readjustment or calibration to maintain accuracy or cause damage to scale and platform.
- 6.3.2 There shall be access for servicing of components. Such access shall be well protected against the warehouse traffic.

6.4 WEIGH SCALE

- 6.4.1 Provision for determining weight shall utilize a load cell sensing, digital electronic read-out system. It shall comprise a minimum of four load cell units appropriately located to conform to all conditions of cargo loading configurations within the specified limits.
- 6.4.2 Accuracy shall be plus or minus one half of one percent of scale reading (+/-2 kg for 10 ton scale, +/- 1kg for 5 ton scale).
- 6.4.3 The load cells shall come with overload protection. Hence, scale shall not require any frequent adjustment and calibration though it is subject to drive-over by warehouse traffic.
- 6.4.4 The digital indicator, control panel and printer shall be located at a convenient location to be determined by Company where not specifically located. This location shall be protected with sufficient guard rails, if necessary to protect the digital indicator/control panel/printer and its associated components as well as the operator in front of the control panel, from warehouse traffic in the vicinity.
- 6.4.5 The scale shall have provisions for future connections to other cargo IT systems.
- 6.4.6 A remote large weight display device shall be provided with the displayed weight clearly visible and legible at a distance of up to 10 m away.
- 6.4.7 The platform shall come with access panels for maintenance of the load cells

6.5 WEIGH SCALE PRINTER

- 6.5.1 All weigh scales should be connected to a printer. The printer should be able to print weight information on ULD tags. It should be a label printer where the label can be peeled off and stuck to the ULD and come with a print button to start the printing.
 - 6.5.1.1 The information required to be printed is the ULD no, Flight no, Destination, date and time, Net and gross weight. The font size should be adjustable. The printout must be clear and legible and be large enough for the tags.
 - 6.5.1.2 The date and time should be updated automatically. There must be a feature to set the time if the date and time printed is incorrect.

6.6 ITEM 603 - GUARD RAIL

Item 403 shall conform to "General Specifications", as applicable, as well as those set forth below.

6.6.1 DESCRIPTION

6.6.1.1 To protect MHS equipment (and its associated components) and warehouse personnel operating such equipment from damage or injury caused by mobile equipment impact or collision. Especially at the end of the TV aisles and the sides of the first level storage queue and dolly interface lanes.

6.6.1.2 To prevent warehouse equipment and personnel from inadvertently entering a vehicle aisle.

6.6.2 DESIGN STANDARDS

6.6.2.1 The Guard Rail shall be made up of vertical posts made of 150 mm side flange rolled steel members welded to a 300 mm x 300 mm floor plate. Horizontal rails made from 150 mm x 75 mm rolled steel channel.

6.6.2.2 The Guard Rail shall be painted in safety yellow finish or another color specified by Company.

6.6.2.3 Drawing showing layout of impact protection is provided as a guide only. Contractor is responsible to provide adequate guard rails whenever necessary in order to achieve the intended purposes for equipment (esp. operator control consoles) and personnel protection throughout the MHS.

6.7 ITEM 604 - DOLLY TRANSFER BUMPER

Item 604 shall conform to "Part 2 - General Specifications", as applicable, as well as those set forth below.

6.7.1 DESCRIPTION

6.7.1.1 To protect the adjacent conveying surface from damage caused by mobile equipment (such as dollies and tractors) impact during loading/unloading of ULD to/from adjacent conveyor decks. These should be installed at all dolly interface conveyors and landside of Q lanes and storage lanes.

6.7.1.2 To act as guide rail to help dolly to position and interface accurately with selected conveyor deck to perform ULD load/unload functions.

6.7.2 CONFIGURATION

6.7.2.1 The entire face of the dolly transfer bumper shall provide a smooth surface free of any protrusions that may affect the dolly positioning operation.

6.7.2.2 There shall be one full length roller above the bumper to facilitate the transfer of ULDs across the bumper onto adjacent conveyor deck, with minimum effort by operator.

6.7.2.3 The dolly transfer bumper shall be made of heavy duty steel construction. Flared ULD guides shall be provided at both ends of the top free roller. Such flared guides shall coincide with the adjacent roller conveyor guides. Generous flaring and rounding of the bumper ends shall be provided.

6.7.2.4 The dolly transfer bumper shall be mounted onto the floor by chemical anchor bolts with sufficient strength to withstand the impact by loaded ULD dollies and tractors, without permanent deformation/displacement or damage. The base of the bumper shall be grouted after installation to give added stability and strength as well as to keep the base plate above ground elevation to fight against erosion due to possible water

accumulation on the warehouse floor.

6.7.2.5 A roller to be provided on top of the bumper to facilitate easy transfer of ULDs

6.7.2.6 Contractor must submit detailed design drawings for the dolly transfer bumper for Company's approval prior to fabrication.

6.8 SIGNAGE

6.8.1 DESCRIPTION

6.8.1.1 To provide identification for operating personnel and staff for the Material Handling System

6.8.1.2 To provide machine related identification code for positioning, location, interface etc that may be required for individual items and subsystems coordination

6.8.1.3 To provide personnel with safety and hazard warning Signage as required

6.8.1.4 To provide SATS logo signage on moving vehicles

6.8.1.5 Signage shall be configured so as to:

- a. Be visible to appropriate personnel
- b. Be clear simple and direct in meaning
- c. Be of sufficient size and contrast
- d. Be protected from damage by personnel and equipment
- e. Be safely positioned

6.8.2 APPROVALS

6.8.2.2 All signage must be approved by the Company

6.8.2.3 All signs for the purpose of advertising of manufacturers name must be approved by Company.

6.9 SLAVE PALLET

6.9.1 The slave pallet should be able to transfer and support all types of fully loaded ULDs without deformation and permanent damage.

6.9.2 Forklift Tyne channels for the fork prongs should be provided at the WEL and NEL side to allow transfer of the pallet by forklift

6.9.3 Rollers are to be provided on the top surface to facilitate the transfer of ULDs

6.9.4 Manually activated stops are required to prevent the ULD from rolling off the pallet when being transported on the slave pallet

6.9.5 Fork lift prong access is required to allow the forklift to access the ULD on the pallet in the event that it is required to fork the ULD from the slave pallet. This should be available on the short as well as the long side of the slave pallet.

6.9.6 The weight of the slave pallet should not exceed 1000kg.

6.9.7 A quantity of 10 slave pallets is required.

6.9.8 The slave pallet must stackable on top of each other for easy storage.

6.9.9 The rollers shall be narrow edge leading

6.10 TRUCKDOCK LEVELLERS

6.10.1 DESCRIPTION

To provide a ramp to the truck to facilitate easy unloading of trucks.

6.10.2 LOAD REQUIREMENTS

Must be able to support a forklift carrying a 1 ton load

6.10.3 CONFIGURATION

Hydraulic Operated Dock Leveller with 2 side Lips and 1 center lip
To be installed in a pit

Dimensions 3.5m length x 2.5m Width x 0.5mm high
Operating Range -150mm/500mm

6.10.4 CONTROL

To be operated from a control panel mounted on the wall.

Electrcial interlock with roller shutter so that it canno operate when the roller shutters are closed.

6.10.5 MAINTENANCE

To provide a maintenance strut so that maintenance staf can enter the pit safely.
To provide with lifting point for lifting the whole assembly or the top platform for access.

Lifting Points for the scissor lift roller deck to lift up the deck when the deck is fully lowered and there is hydraulic failure so that maintenance staff can lift the deck and access the area under the deck.