

FALCON'S response to Dnata for the requirement of Conveyor Automation – Detailed Technical Proposal

February 24, 2025

Doc. No. - Sales/FR/PT/007/R0



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M/s Dnata

Offer Ref: F24-00109; Date: 24-02-2025

Subject – Detailed Technical Proposal for Conveyor Automation_Dnata

We are pleased to submit our Technical Offer in response to your requirement of conveyor automation.

As you will note, we have done an in-depth data analysis and evaluated various solution options best suited for your requirements, along with the information collected during the meetings and discussions with you, we have put together a detailed technical proposal laid out in various sections and sequenced to enable you to understand our proposed solution and to re-enforce our commitment to being your partner in this strategic initiative.

In subsequent sections, we have highlighted the capabilities and experiences of Falcon Autotech with sections on our Intra-logistics Automation Technologies and references.

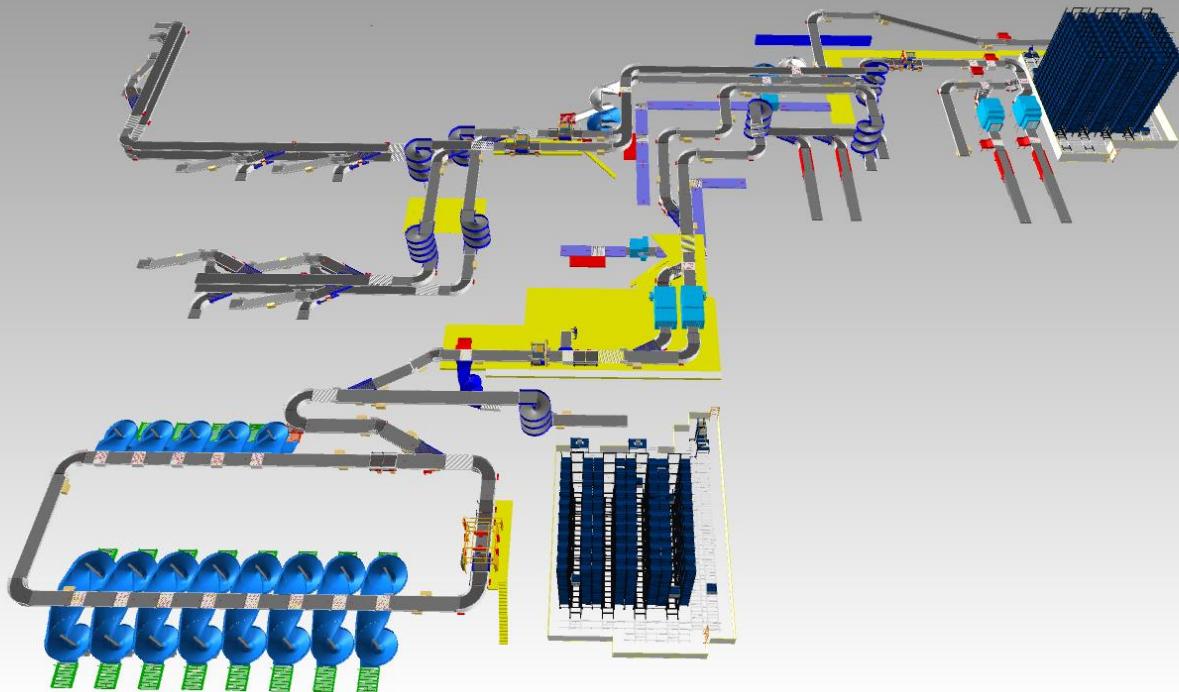
To conclude, I would like to add my personal commitment on behalf of Falcon Autotech. As we move through the RFP process, please do not hesitate to contact me and my team. We will be pleased to assist you with any further information or clarifications that you might have.

Best Regards,

Sandeep Bansal

Chief Business Officer

Response to requirement for Conveyor Automation



Proposal Reference – F25-00109

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Table of Content

1. Glossary	8
2. Executive Summary.....	9
3. Company Profile.....	10
4. Falcon's Experience and Achievements in Sortation Space Globally.....	14
5. Reference Projects	17
5.1 Project 1- (CEP Client, India)	17
5.2 Project 2- (Client – E-Commerce, India)	18
5.3 Project 3- (Client – E-Commerce, India)	19
5.4 Project 4- (Client – E-Commerce, India)	20
5.5 Project 5- (CEP Client, UK).....	21
5.6 Project 6- (CEP Client, Sydney)	22
5.7 Project 7- (CEP Client, Riyadh)	23
5.8 Project 8- (Client – E-Commerce, UAE & Saudi Arabia)	24
6. Handled Shipment Spectrum.....	25
6.1 Shipment size loadable on the System	25
6.2 Shipments to be loaded shall have the following characteristics:.....	26
6.3 Shipment not loadable on the system	26
7. Proposed System Description.....	27
7.1 Objective	27
7.2 Layout Overview	27
7.3 Process Flow of the System	28
7.3.1 Acceptance for Import	28
7.3.2 Pick/Put to Light Sorting	29
7.3.3 NEO Storage for Import Shipments	30
7.3.4 Outbound for Import	31
7.3.5 Inbound for Export	32
7.3.6 X-ray and Police Inspection Process	33
7.3.7 NEO Storage for Export	34
7.3.8 Outbound for Export Shipments	35
7.3.9 Oversize Cargo Conveyors	36
7.3.10 Pallet Roller Conveyor for Oversize Cargo	37
7.3.11 Pallet Roller Turntable for Oversize Cargo	38
7.3.12 Pallet 90-Degree Popup Conveyor for Oversize Cargo	39
7.4 Main benefits of the proposed solution	39
8. Proposed System Capacity Calculations.....	40

9. System description.....	41
9.1 Straight and Inclined Powered Belt Conveyor	41
9.2 Powered Roller Conveyor	43
9.3 Powered Belt Turns.....	44
9.4 Intelligent Merge Conveyor	44
9.5 Aligning Conveyor	45
9.6 Buffer Conveyor	45
9.7 Weighing Conveyor	46
9.8 Spacing Conveyor.....	46
9.9 Telescopic Belt Conveyor	47
9.10 Automatic Barcode Scanning and Dimensioning System	48
9.11 Side Barcode Scanner.....	48
9.12 Swivel Wheel Divert Unit.....	49
9.13 Gravity Roller Conveyor.....	50
9.14 Spiral Conveyor	51
9.14.1 For Import.....	51
9.14.2 For Export	51
10. ULD Handling System.....	52
10.1 Layout	52
10.2 Equipment Description	52
10.2.1 Castor Deck.....	52
Frame	53
Stops	53
10.2.2 Powered Roller Deck.....	53
10.2.3 20ft Truck Dock	54
Safety Equipment	54
Elevating Ram Protection	54
10.2.4 Ram Protection	55
10.2.5 Staircase	56
10.2.6 Floor Scale	56
Scale Indicator	57
Certification.....	57
10.2.7 Empty ULD storage (bulk rack)	57
10.2.8 Elevating Workstation	58
Skirt Protection	59
Base Frame	59
Hydraulic Lifting Cylinders	59

Hydraulic Power Pack	59
Triangular Ram Protection.....	60
10.2.9 Technical Data of EWS 10ft.....	60
11. Proposed System Technical Details.....	61
11.1 Mechanical equipment	61
11.2 Electrical Equipment	62
11.3 Control System.....	62
11.4 Electrical System	62
11.5 Reference Picture of Power Distribution Panel	62
11.6 Main Control Panel (Reference)	63
12. Falcon's WCS CONTROLIT	64
A. System Architecture.....	64
B. High Availability Architecture.....	65
C. WCS User Interface	67
D. Communication Architecture	70
E. Client Communication	71
F. HAA Server Specifications (In Dnata's Scope).....	72
13. Falcon's Visual Inspection System (SCADA)	73
12.1 Field Data Acquisition	73
12.2 Animated system visualization.....	74
12.3 Alarm management	75
14. Key Components Make	76
15. Principle of Safety	76
a. E-Stops.....	76
b. Pull Cords Switch-.....	76
16. Infrastructure	77
16.1 Fire Protection-	77
16.2 Power Supply-	77
16.3 Floor Requirements-	77
16.4 Estimated Floor Load-	77
16.5 Staging, Laydown and Assembly Area-.....	77
16.6 Site Access and Unloading-.....	77
16.7 Lightning-.....	77
17. Program Organisation	78
a. Project Management	78
b. Project Team	78
c. Program and Account Management	78

d.	Program/ Project Schedule	79
18.	Dnata Responsibility	79
19.	System Testing	81
	User Acceptance Test Parameters	82
20.	Training	84
i.	Operations Training	84
ii.	Maintenance Training	84
iii.	Information System Training	84
21.	Service Support	84
22.	System Maintenance	85
23.	Warranty Period	86
24.	Exclusions	87

1. Glossary

S. No.	Term	Description
1	RFQ	Request For Quotation
2	PPH	Shipments Per Hour
3	ICR	Intelligent Character Recognition
4	MEZZ	Mezzanine
5	FWD	Friction Wheel Drive
6	ECDS	Empty Carrier Detection System
7	AC	Alternating Current
8	DC	Direct Current
9	PLC	Programmable Logic Controller
10	IT	Information Technology
11	BOQ	Bill Of Quantity
12	I/O	Input/ Output
13	PDP	Power Distribution Panel
14	PC	Personal Computer
15	UPS	Uninterrupted Power Supply
16	CBS	Cross Belt Sorter
17	MDR	Motor Driven Roller
18	VDS	Volume Distribution System
19	IPP	Individual Productivity Potential
20	VM	Virtual Machine
21	MENA	Middle East North Africa
22	FOC	Free of Cost
23	CBS	Cross Belt Sorter
24	CEP	Courier Express Parcel
25	DAP	Design Approval Phase
26	LIM	Linear Induction Motor
27	LSM	Linear Synchronous Motor

2. Executive Summary

Falcon Autotech is pleased to confirm its great interest in responding to this Dnata RFQ of Conveyor Automation for Dubai Location. Our team has been working closely with the relevant stakeholders, with a clear commitment to listening, understanding your needs, and ensuring this project's success.

Following the same objective for the Dubai CBS system, we are happy to offer a compliant solution meeting all technical and operational requirements at competitive price, delivering key results.

Our solution is based on the following key characteristics:

- *Conveyor Automation for Handling Shipments of Boxes and Bags of the Import and Export Operations*
- *3D ASRS (NEO) System for Storage of the shipments*
- *Spiral Conveyors for smooth material flow*
- *Outbound sorter with Swivel Wheel Divert Units for faster TAT and TPH*
- *ULD Handling System (Castor Deck)*
- *Oversize Cargo Pallet Conveyor Automation*

This solution has been crafted especially keeping Dnata's technical and operational requirements, as listed in the RFP document, making it a tailor-made solution delivering a faster TAT and an efficient material flow.

3. Company Profile

Falcon Autotech (Falcon) is a global intralogistics automation solutions company. With over 12 years of experience, Falcon has worked with some of the most innovative brands in E-Commerce, CEP, Fashion, Food/FMCG, Auto and Pharmaceutical Industries. With our proprietary software and robust hardware integration capabilities, Falcon designs, manufactures, supplies, implements, and maintains world-class warehouse automation systems globally. Falcon's strong research and development team and the continuous focus on innovation reflect our strong solution line around Sortation, Robotics, Conveying, Vision Systems and IOT. Falcon has done over 1,800 installations across 15 countries on four continents.

Falcon 2.0



 Operational since in 2012, Falcon is a global intra-logistic automation solution provider handling parcels, bags, cartons and pieces

 Falcon has five key solution lines: 3D Robotics, Sortation systems, Dimensions & Weight Systems, Put/pick To Light & Conveyors, along with rapidly scaling proprietary software called FACTS

 Work with leading E-Commerce, CEP, Fashion, Food/FMCG, Auto and Pharmaceutical brands

5 Product Lines
15+ Countries with Live Installations
1800+ Total Installed Systems Globally
1Million+ Sorts Per Hour
600+ Employees

Long-standing Relationships with industry leaders

Ecom/ Retail				
CEP				
Distribution & Others				

News & Articles



FALCON AUTOTECH EXPANDS PRESENCE IN THE MIDDLE EAST WITH NEW OFFICE OPENING
Falcon Autotech is pleased to announce the opening of its new office in Dubai, UAE, marking a significant milestone in the company's expansion into the Middle East market.



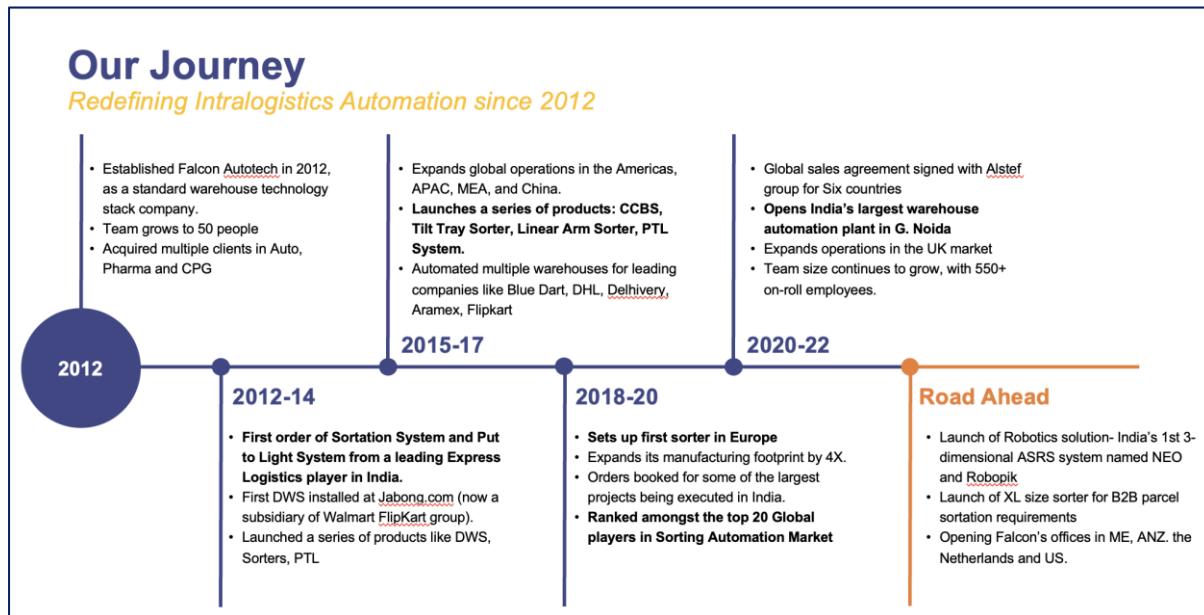
FALCON AND ALSTEF GROUP ANNOUNCE GLOBAL TECHNOLOGY PARTNERSHIP
Falcon Autotech and Alstef Group Announce Global Technology Partnership for Parcel Sortation Solutions
Published - Sept 2022

Falcon Autotech is currently among the top 15 intralogistics automation company; our vision is to become top 10 intralogistics automation company in our focused product lines.

Our Vision

To be amongst the Top 10 global intralogistics automation companies in our focused product lines

The team started out in 2004 solving special purpose automation problems for clients and later established Falcon Autotech in 2012 with strong focus on building standard technology stack spanning across Hardware, Firmware and Software to tackle bigger Supply Chain problems around warehouse automation and material handling. Over the decade, Falcon has made rapid strides and has carved out a niche in some of the world's most cutting-edge technologies: Sortation, Robotics, Conveying, Vision Systems and IOT.



As a leading player in the intra-logistics automation space, Falcon continuously strives to improve the operational efficiencies and accuracies for its clients through its domain knowledge and experience in addition to its wide range of products and solutions. In order to be able to live up to the high expectations set forth by our clients, the team at Falcon realizes the importance of taking up selective applications in focused Industries and delivering world class projects in return.



Product and Solutions

With 100% focused on Parcels, Eaches, Totes, Bags, Cartons



SORTATION SOLUTIONS

- Cross Belt Sorter
- Linear Arm Sorter
- Swivel Divert Sorter
- Tilt Tray Sorter
- Popup Sorter
- Sweep Sorter
- Pusher Sorter



PICK/PUT TO LIGHT SYSTEMS

- PTL Module
- Rocks
- Conveyors
- Hand Scanners
- Printers
- Peripheral Displays



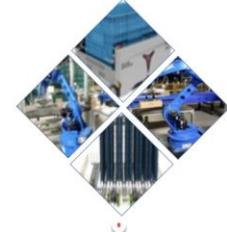
DIMENSIONS & WEIGHT SCANNING SYSTEMS

- Cubizon Series
 - R-Eco, R-Thru, R-Cross
- Dynamic Profilers
 - Mini (600MM)
 - Jumbo (1200MM)



CONVEYOR SOLUTIONS

- Belt Conveyors
- Roller Conveyors
- Modular Conveyors
- Special Application Solutions



ROBOTICS

- NEO
- Robopick

Powered by

FACTS | **SORT IT** | **Control IT**

Falcon Autotech has successfully delivered warehouse automation solutions based on smart and innovative combinations of above product lines for effective materials handling, sortation and movement. The process is controlled in real-time by our inhouse WCS applications. These solutions considerably cut the need for manual operations, improve working conditions and ensure the highest accuracy of the entire process up to final delivery to the recipient.

Over the last 10 years, Falcon has worked with some of the most innovative brands worldwide and has established long standing partnerships. These brands are testimony of our strong focus on delivering superior customer satisfaction and offering end-to-end intralogistics solutions.

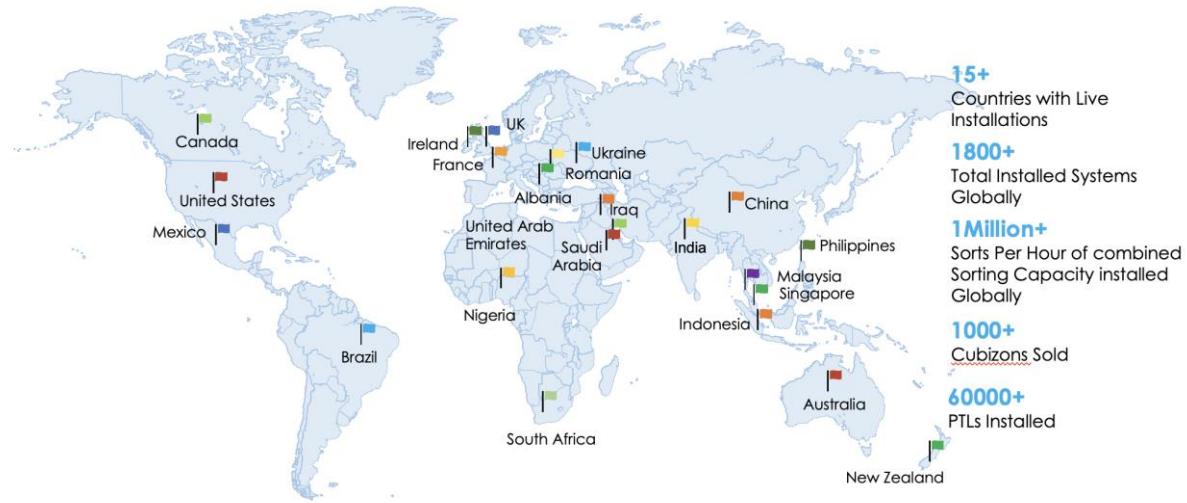
Select Key Clients

Some of world's most innovative brands trust us with their intra-logistics warehouse automation requirements



With over 1,800 installations, today Falcon's systems are used all over the globe. Falcon has highly motivated team of 600+ employees supported by over 15 global partners who help us design, manufacture, deliver and maintain automation solutions globally.

Global Market Presence



Customer Engagement Model

Engaging and supporting the customer throughout the solution lifecycle



4. Falcon's Experience and Achievements in Sortation Space Globally

- Ranked among **Top 20 Sortation System Suppliers** globally.
- Currently possess one of **the World's largest portfolios in Sortation Technologies**: 7 In-house technologies.
- Total installed capacity of **10 million Shipments per day** worldwide.
- Only company to be able to offer a **Fully Integrated AMS**.


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FALCON AUTOTECH

Falcon Autotech expands its wings by opening its office in The Netherlands, Europe

April 15, 2024 03:32 ET | Source: [Falcon Autotech Private Ltd](#)

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NEW DELHI, India and AMSTERDAM, April 15, 2024 (GLOBE NEWSWIRE) -- Falcon

[**f**](#) Autotech (Falcon), a leading global intralogistics automation solutions provider, opens its



Breaking Barriers and Optimizing Efficiency – Journey of Delivering India's Largest Sortation System

"It was a bold decision. If it didn't work, our company would have shut down," says Naman Jain, founder and CEO of warehouse automation startup Falcon Autotech, referring to a big gamble he had taken more than a decade ago. The year was 2013, Jain and his team were negotiating a deal with a major e-commerce logistics company that had just placed an updated order for a sorter with a capacity of 6,000 parcels per hour. That was 4x the specification earlier agreed upon.

"All the founders came together, and we took a calculated risk," recalls Jain. At the time, Falcon did not have the technology to develop such sorters, and hence, the said client refused to pay any money upfront and offered to pay the machine's price in monthly installments. However, there was a caveat: if it failed even once, Falcon would simply take the machine back and refund the entire amount. Falcon's 'calculated risk' paid off. The machine worked flawlessly and was handed over to the parcel company after 36 months. "We are now doing projects worth INR100 crore. That was unthinkable 10 years back," says Jain.

Falcon Autotech has covered a lot of ground since that big bet. Last month, it installed India's largest sortation equipment at



Economic Times Features Falcon Autotech

Naman Jain
Chief Executive Officer

From sorters to conveyors & robot based systems, here's the top tech warehouses are investing in

India's warehousing industry has travelled a long distance from "godowns" to modern storage facilities called Grade A warehouses.

Warehouse automation is a gradual process. India started off late, but that may actually help it bypass some of the mid-age technologies and adopt the latest ones. While several players are still warming up to automation, which are the



Falcon Announces Successful Go-Live of Automated Parcel Sortation Solution at DTDC's Chennai Facility

New Delhi, India – 2nd Aug 2023: Falcon Autotech, a leading supplier of intralogistics automation solutions, has been selected by DTDC Express Ltd, one of India's leading integrated express logistics company, to automate its parcel sorting operations at its super hub of 1,75,000 sq ft in Chennai, Tamil Nadu. Using its cross belt sorter technology, Falcon has designed DTDC's parcel sorting system, which can handle 6,000 parcels per hour, operate in a 24 X 7 environment, and can be expanded to cater to future growth.

The new linear cross-belt solution leverages cutting-edge technology to automate key sorting processes in DTDC's warehouse, including parcel profiling and sorting. This solution is designed to optimize the space requirements for sorting operations, increase efficiency, and reduce operational costs.

"We are thrilled to see our warehouse automation solution go live with DTDC, this solution is a testament to our commitment to providing innovative intra-logistics solutions that meet the evolving needs of our customers," said Falcon's CEO Naman Jain.



Transforming Indian Retail: The Impact of ASRS on Warehousing Operations

In recent years, the Indian retail industry has experienced unprecedented growth, propelling the nation to become the fifth-largest global retail destination. The industry, marked by its resilience and adaptability, went through significant transformations during the pandemic. While online shopping saw a remarkable surge, the reopening of physical stores ushered in a resurgence of the multi-sensory shopping experience. As a testament to this growth, shopping malls now encompass an astonishing 23.25 million square feet of retail space. However, the evolving consumer preferences have placed substantial pressure on businesses, necessitating the seamless integration of e-commerce and in-store experiences, which, in turn, has led to complex logistics challenges. The traditional warehousing systems struggled to cope with the demand for faster processing and the requirement for expanded storage capacities.

Historically, retailers had heavily relied on manual labor for their warehousing operations. However, the dynamism of today's retail market demands a shift towards automation. Enter Automated Storage and Retrieval Systems (ASRS), a technological

5. Reference Projects

Falcon has a strong legacy in **Warehousing Automation** solutions and references-

1. Expertise in Shipment Sortation, Piece Picking and Handling, Case Picking and Handling.
2. Lifecycle services (maintenance, spares supply chain, support).
3. Full **in-house** expertise (Hardware/Software).
4. Turn-key **tailored** solutions.

The references list presented below focuses on Sortation Solution –

5.1 Project 1- (CEP Client, India)

The System is equipped with two fully automated and interconnected Sub-systems. Sub-System 1 is designed for handling large B2B boxes and E-commerce shipment bags while the Sub-System 2 is designed to handle Small E-commerce packages.

Solution Specifications –

- 48,000 PPH (Double Deck CBS- Shipment Sorter)
- 17,000 PPH (Double Deck CBS- Bag Sorter)
- Building Size: 700,000 Sq. Ft

Key Technology Modules –

- 2 Sets of Double Decker CBS Sorters
- Mezzanine Structures
- Automated Singulators
- Fully Automatic Inductions
- Semi-Automatic Inductions
- Telescopic belt conveyors
- PVC Belt Conveyors
- Modular Belt Conveyors
- Spiral Chutes with Braking rollers
- 5-Sided Scanning Tunnels
- High speed weighing conveyors
- Direct Bagging Chutes
- Put to Light Chutes
- Volume Distribution systems
- High Availability Server Systems
- WCS



5.2 Project 2- (Client – E-Commerce, India)

Use Case – Destination Sorting of Packed Shipments.

In 2019, Client was looking for a potential automation partner for design and development of a new automated sortation system for B2C shipments. The system should be able to provide maximum uptime with reduced dependency on skilled manpower, and space optimization.

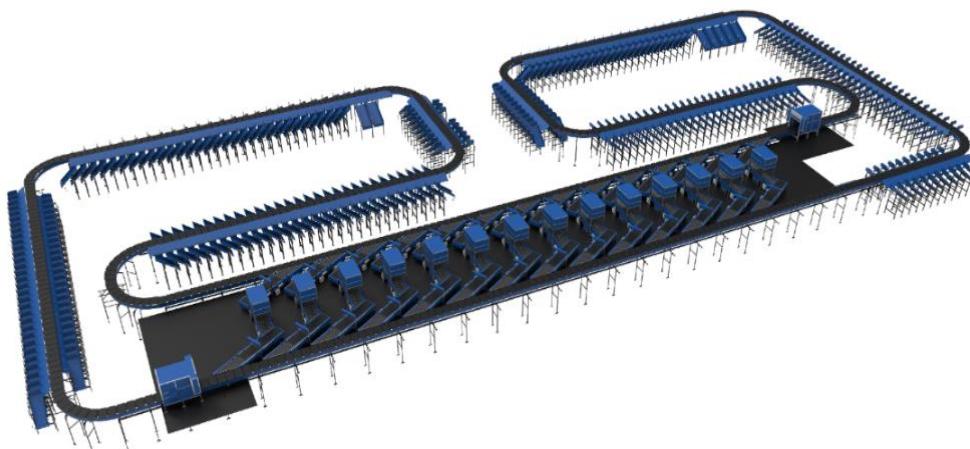
The customer chose Falcon Autotech based on its unique design which could cater to all their pain points, capability of seamless integration with WMS and life cycle support services.

Solution Specifications –

- Throughput: 27,600 PPH
- End Destinations: 410 Direct Outputs
- Building Size: 200,000 Sq Ft

Key Technology Modules –

- Bulk Infeed Conveyors.
- ARB based Volume Distribution System
- Integrated Presort System.
- Irregular Ejection System.
- Automatic Induct Lines.
- Automatic Barcode Scanner with Image Capture.
- Automatic Weight & Volume Measurement System.
- Loop Cross Belt Sorter.
- Smart Sliding Chutes for Direct bagging and Cage Sorting.
- Bag take out system.
- WCS Software System.



5.3 Project 3- (Client – E-Commerce, India)

Use Case – Destination Sorting of Packed Shipments.

The customer chose Falcon Autotech based on its unique design, capability of seamless integration with WMS and life cycle support services.

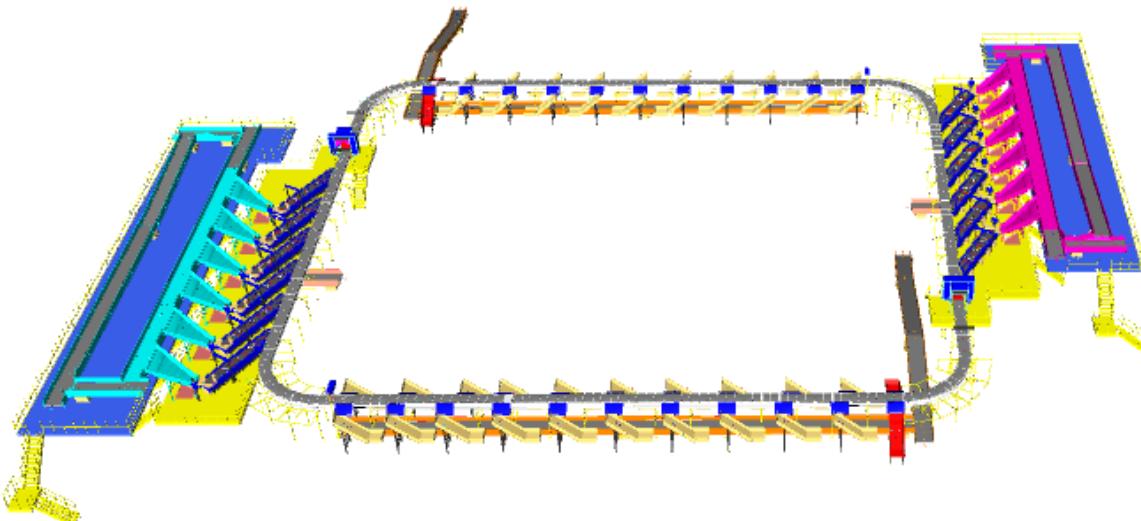
Solution Specifications –

- Throughput: 24,000 PPH
- End Destinations: 40 Collection Type Chutes

Key Technology Modules –

- Bulk Infeed Conveyors.
- ARB based Volume Distribution System.
- Irregular Ejection System.
- Automatic Induct Lines.
- Automatic Barcode Scanner with Image Capture.
- Automatic Weight & Volume Measurement System.
- Loop Cross Belt Sorter.
- Smart Collection type chutes
- Bag take out system.
- WCS Software System.

Layout and Site Pictures -



5.4 Project 4- (Client – E-Commerce, India)

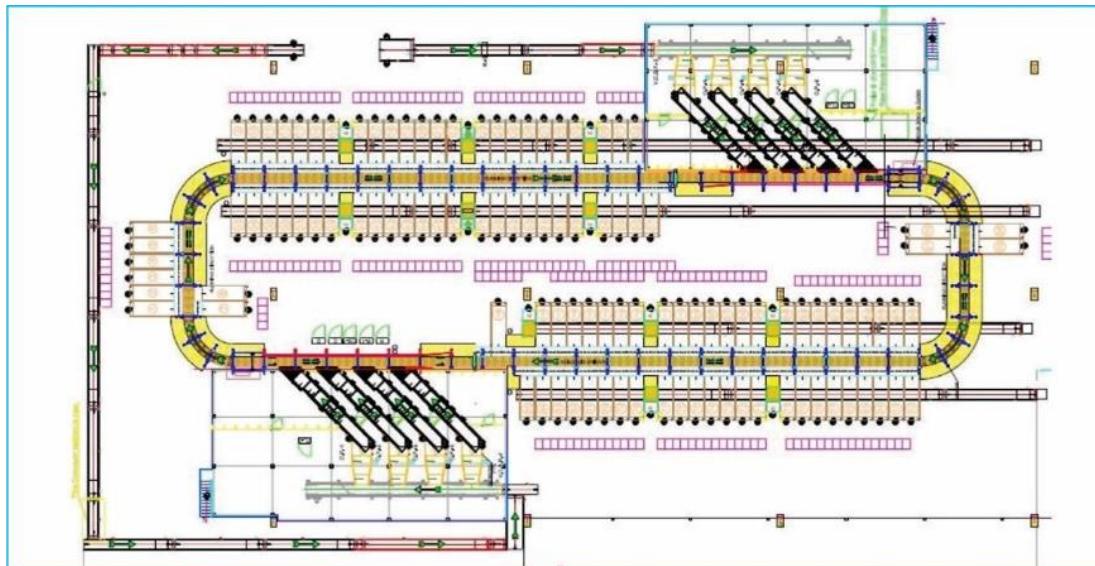
Use Case - Destination Sorting of Packed Shipments

Solution Specifications –

- Throughput: 24,000 PPH
- End Destinations: 110
- Building Size: 200,000 Sq. Ft

Key Technology Modules - Loop Cross Belt Sorter with a cell size of 900 x 500 mm

Layout and Site Pictures -



5.5 Project 5- (CEP Client, UK)

This Solution is designed to handle a volume of 7200 shipments per hour. The system is equipped with three infeed conveyors integrated with an automatic label applicator before shipments enter the sortation system. The shipments are sorted using Falcon's Loop Cross Belt Sorter equipped with automatic barcode scanning, dimensioning, weighing and image capture capabilities. The sorter is installed on the mezzanine floor and sorts directly to 58 end destinations.

Solution Specifications –

- Throughput: 7200 PPH
- End Destinations: 58 Nos

Key Technology Modules –

- Powered Belt Conveyors.
- Automatic Induct Lines.
- Automatic Barcode Scanner with Image Capture.
- Automatic Weight & Volume Measurement System.
- Loop Cross Belt Sorter.
- WCS Software System.

Site Picture –



5.6 Project 6- (CEP Client, Sydney)

Solution is designed for handling a throughput of 16,000 shipments per hour with the help of Falcon's Loop Cross Belt Sorter. The system consists of 2 feeding zones with a total of 10 feedlines. Sorter design enables the van drivers to directly drop the shipments at the dock doors. It has a total of 369 end destinations that are achieved with a combination of direct drops and PTLs. System is integrated with 5 side automatic barcode scanning, weight and volume measurement and automatic detection of oversize and overweight shipments.

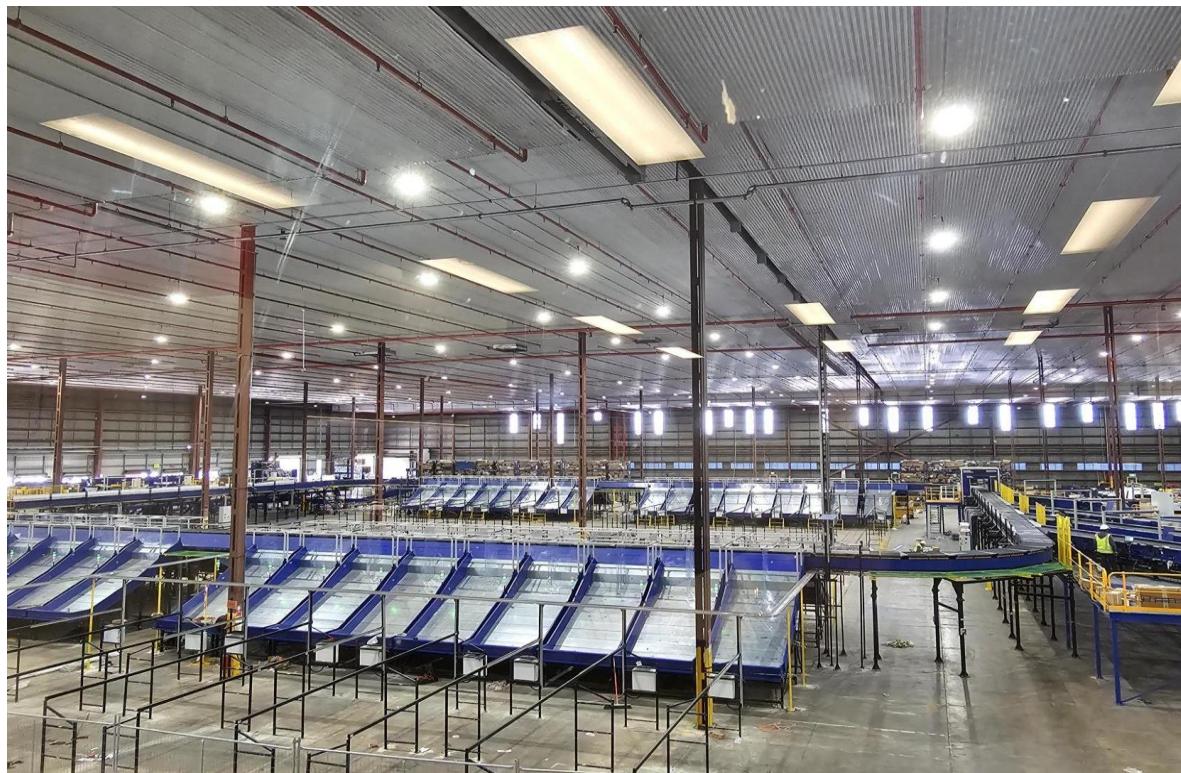
Solution Specifications –

- Throughput: 16000 PPH
- End Destinations: 369 Nos

Key Technology Modules –

- Powered Belt Conveyors.
- 2 Induct zone.
- 5 side Automatic Barcode Scanner.
- Automatic Weight & Volume Measurement System.
- Automatic detection of oversize shipment.
- Loop Cross Belt Sorter.
- WCS Software System.

Site Picture –



5.7 Project 7- (CEP Client, Riyadh)

In 2019, customer selected Falcon Autotech as a preferred supplier for its airport hub to supply linear cross belt sorter for processing of shipments arriving via Air from different states and countries to distribute them locally. The customer chose Falcon Autotech based on its strong track record of success in providing intralogistics automation solutions, optimized design, software integration capabilities and life cycle support services.

Solution Specifications –

- Throughput: 4800 PPH
- End Destinations: 52 Nos

Key Technology Modules –

- Powered Belt Conveyors.
- Automatic Induct Lines.
- Automatic Barcode Scanner with Image Capture.
- Automatic Weight & Volume Measurement System.
- ARB Conveyor.
- Automatic Label Applicators.
- Linear Cross Belt Sorter.
- Specialized Chutes for Gentle Shipment handling.
- FOCR Engine.
- WCS Software System.

Site Picture –



5.8 Project 8- (Client – E-Commerce, UAE & Saudi Arabia)

This Solution is designed to handle the bulk volumes through Launchpads and induct them into Falcon's Linear Arm Sorter. This system is designed for a throughput of 3000 shipments per hour equipped with automatic barcode scanning, dimensioning, weighing and image capture capabilities to into a total of 480 end destinations with a combination of primary and secondary sortation system. The secondary sortation is achieved by integrating put to light system.

Solution Specifications –

- Throughput: 3000 PPH
- End Destinations: 480 Nos

Key Technology Modules –

- Powered Belt Conveyors.
- Linear arm sorter.
- Automatic Barcode Scanner.
- Automatic Weight & Volume Measurement System.
- WCS Software System.

Site Picture –



6. Handled Shipment Spectrum

As per the shipment spectrum data provided in the RFP documents, Falcon has studied and analysed the shipment spectrum in detail.

Falcon purposes to use its Conveyor Automation for shipment to provide the maximum benefits to Dnata in-terms of handling various sizes and weight.

6.1 Shipment size loadable on the System

For Conveyor Automation (Boxes/Bags) -

Specification	Unit	Value
Max Length	mm	1000
Max Width	mm	1000
Max Height	mm	1000
Max Weight	Kg	40
Min length	mm	150
Min Width	mm	150
Min Height	mm	5
Min Weight	gm	100

For 3D ASRS system (Bin Size) -

Specification	Unit	Value
Max Length	mm	760
Max Width	mm	520
Max Height	mm	410
Max Weight	Kg	40

6.2 Shipments to be loaded shall have the following characteristics:

1. Centre of Gravity of item must not move during conveyance or sorting.
2. Item must not have magnetic content, otherwise behavior of shipment cannot be guaranteed.
3. Liquid or fragile material, to avoid breaking, spillage or leakage, such as wine bottles, metal cans of paint are designated as non-conveyable items.
4. Shipments should be perfectly and safely packaged: protrusion or open surfaces are not allowed.
5. Plastic ropes shall be perfectly adherent to the surface of the package.
6. All items with the risk of being damaged during the transport on an automatic sorting system or damaging the sorting system, they must be robust enough to avoid disintegration of container material and loose of contents in the sorting process.
7. Item packaging shall have enough grip to be handled on the belts during the acceleration and referencing phases.
8. Items shall not have slippery surfaces and must be able to withstand acceleration of the items on the belt during the start-stop phases (accelerations up to 0.5 g shall be assured without any sliding or tumbling of the items on the conveyor belt items).
9. The shipments must have at least one flat and regular surface providing enough stability during delivery.
10. All shapes are permitted except spherical, cylindrical, or alike unstable items & shapes.
11. All usual packaging materials are permitted (including paper, carton, plastics, plastic foil, rope, tape, textile, and wood)

6.3 Shipment not loadable on the system

All products that are not within the range as described here, are considered non- conveyable products, and must be taken out of the main sorter flow by the operators.

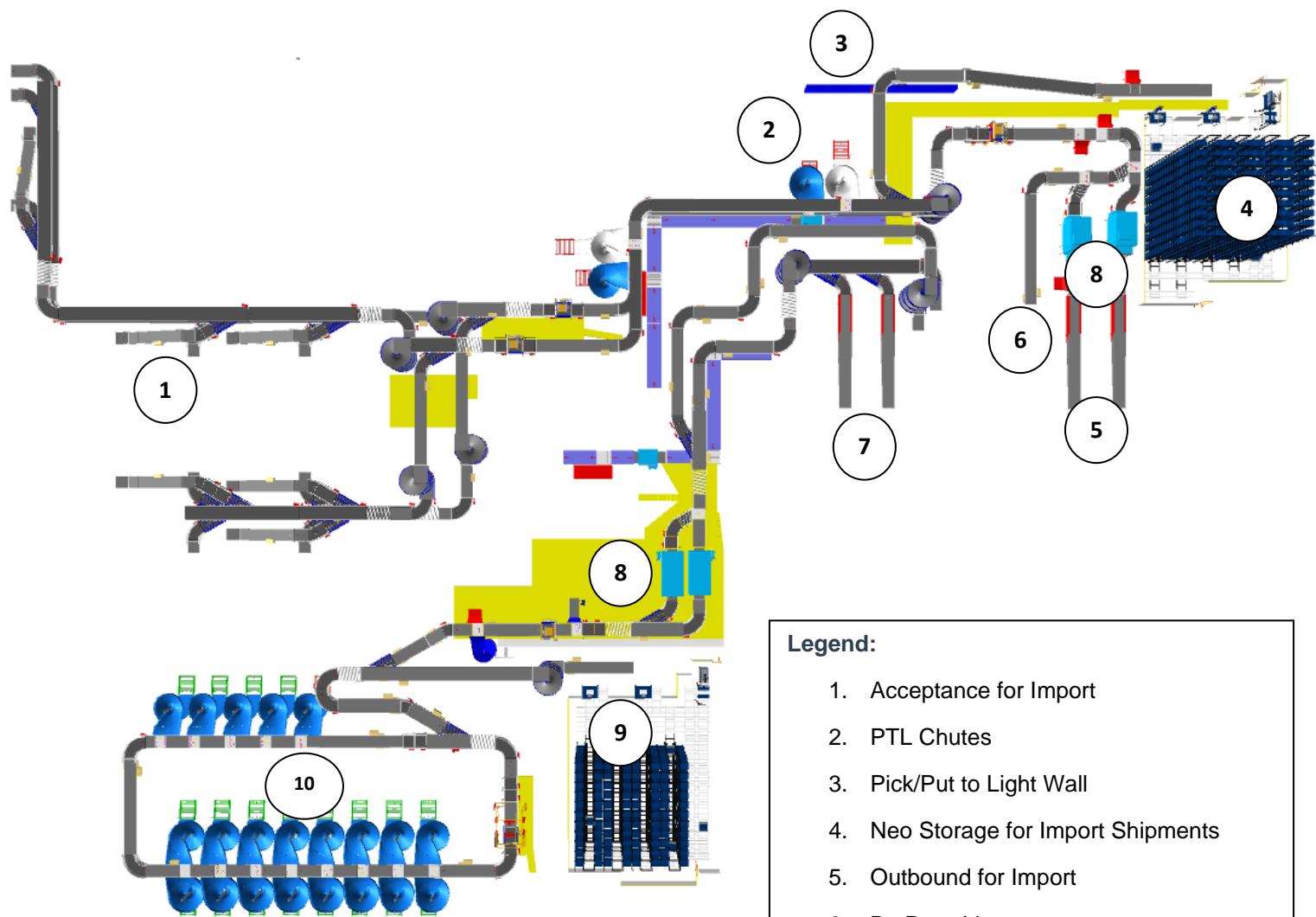
1. Unstable items with a risk to roll or tumble on the sorting system, such as spherical or cylindrical items.
2. Items that have a spherical or cylindrical shape.
3. Items that are packed in material that can damage the conveyors or the sorter.
4. Items that have sharp points (e.g., Nails) or sharp edges, that can damage the conveyors or the sorter.
5. Fragile shipments with contents not sufficiently secured.
6. Items that have been classified as dangerous are designated.
7. Wet items are designated.
8. Items with anti-slip treatment.
9. Items with protruding parts.
10. Items with sharp edges.
11. Inadequately packed items that could be damaged during automatic transportation.
12. Electrostatically loaded items.
13. Loose parts on loads and load carriers, such as adhesive tape, stickers, slips of paper, straps, wrap foil etc. are designated as non-conveyable items.

7. Proposed System Description

7.1 Objective

The purpose of this proposal is to present the design, manufacturing, installation, commissioning, testing, and acceptance testing of the Conveyor Automation, as per Dnata's requirements.

7.2 Layout Overview

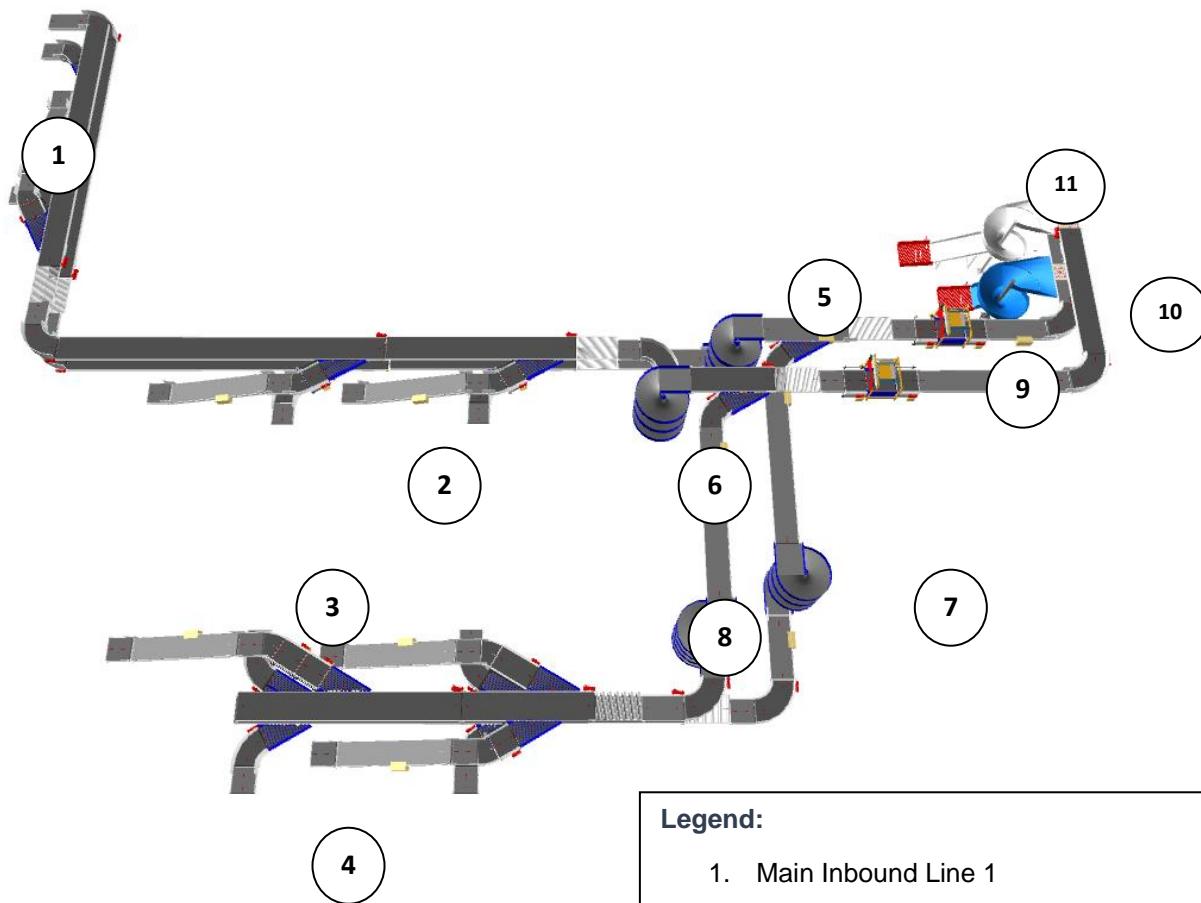


Legend:

1. Acceptance for Import
2. PTL Chutes
3. Pick/Put to Light Wall
4. Neo Storage for Import Shipments
5. Outbound for Import
6. By-Pass Line
7. Acceptance for Export
8. X-ray and Police Inspection
9. Neo Storage for Export Shipments
10. Outbound Sorter for Export

7.3 Process Flow of the System

7.3.1 Acceptance for Import

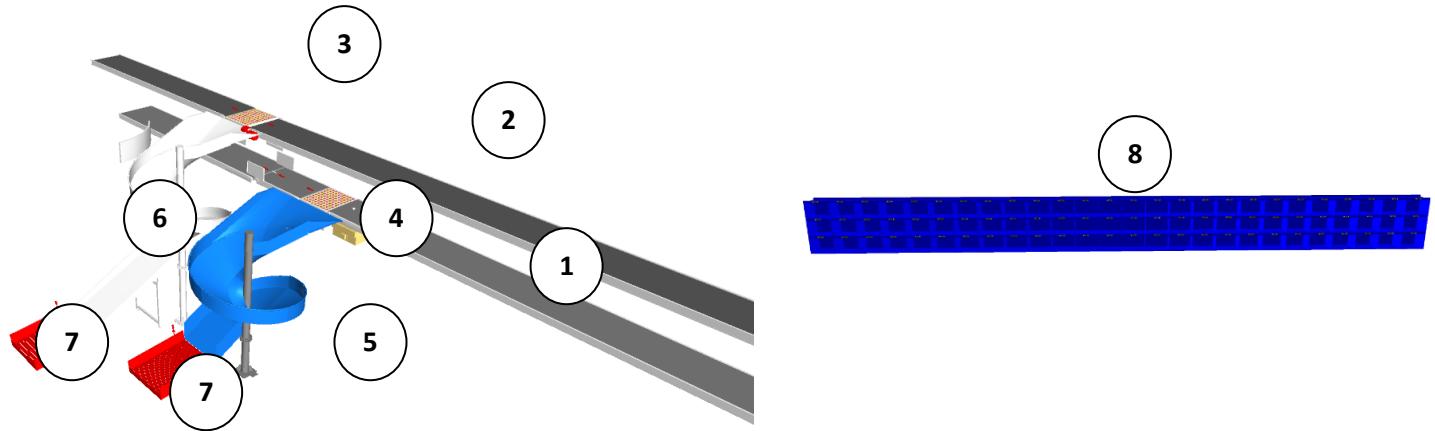


Legend:

1. Main Inbound Line 1
2. Contingency Inbound 1
3. Contingency Inbound 2
4. Main Inbound Line 2
5. Contingency Line Spiral Conveyor 1
6. Main Inbound Line Spiral Conveyor 1
7. Contingency Line Spiral Conveyor 2
8. Main Inbound Line Spiral Conveyor 2
9. Barcode Scanning, Weighing and VMS tunnel
10. Rejection Chute
11. Contingency Rejection Chute

Import shipments will be loaded onto inbound conveyor lines from multiple sides. Two conveyors are in operation: the primary inbound conveyor and a contingency conveyor positioned above it. Each conveyor is linked to its respective spiral. Once shipments enter the spiral, they are automatically aligned, scanned for their top-side barcode, and measured for weight and volume. If no discrepancies are detected, they proceed to the next stage; otherwise, they are diverted to the rejection chute.

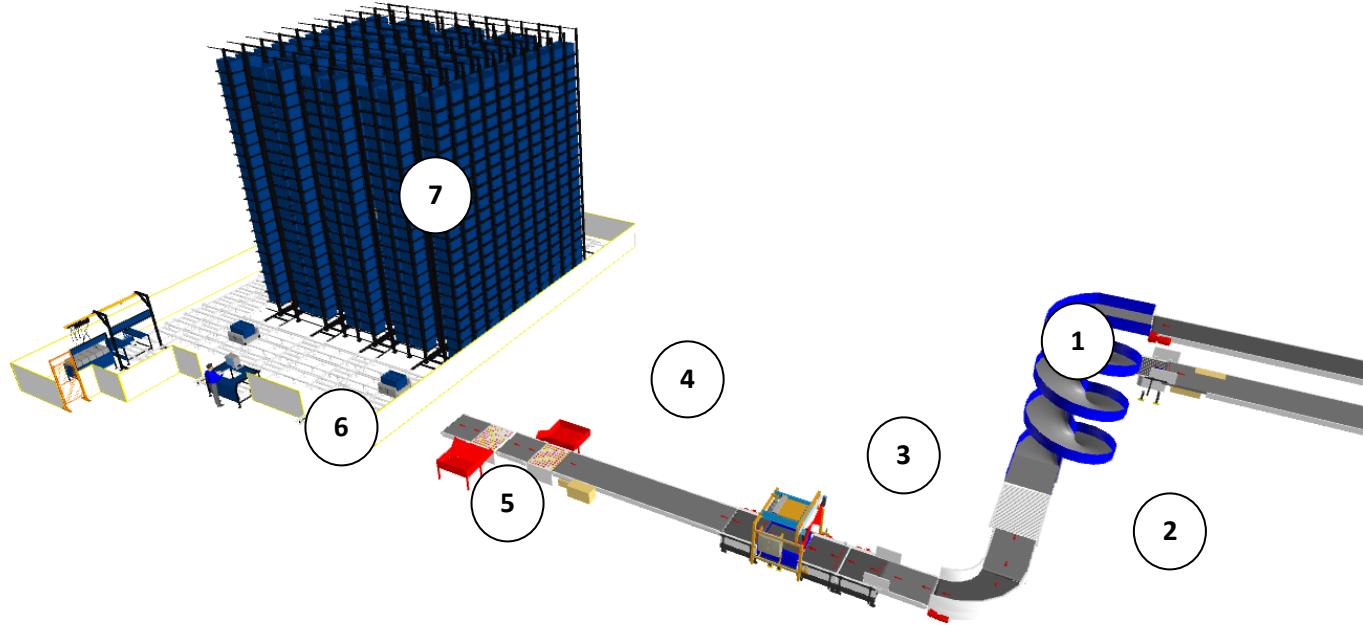
7.3.2 Pick/Put to Light Sorting

**Legend:**

1. Main Inbound Conveyor Line
2. Contingency Conveyor Line
3. Swivel Wheel Divert Unit for Inbound Conveyor Line
4. Swivel Wheel Divert Unit for Inbound Contingency Line
5. PTL Chute for Inbound Line
6. PTL Chute for Contingency Line
7. Gravity Roller Chute
8. Pick/Put to Light Wall

Boxes with scanned barcodes that require sorting into PTL chutes will be redirected to their designated chutes via the swivel wheel divert. This process occurs on both conveyor lines. Once sorted, operators will retrieve the boxes, open them, and scan the product barcodes using a handheld scanner. After scanning, a light will illuminate on the PTL wall, indicating where the product should be placed in its assigned pigeonhole.

7.3.3 NEO Storage for Import Shipments

**Legend:**

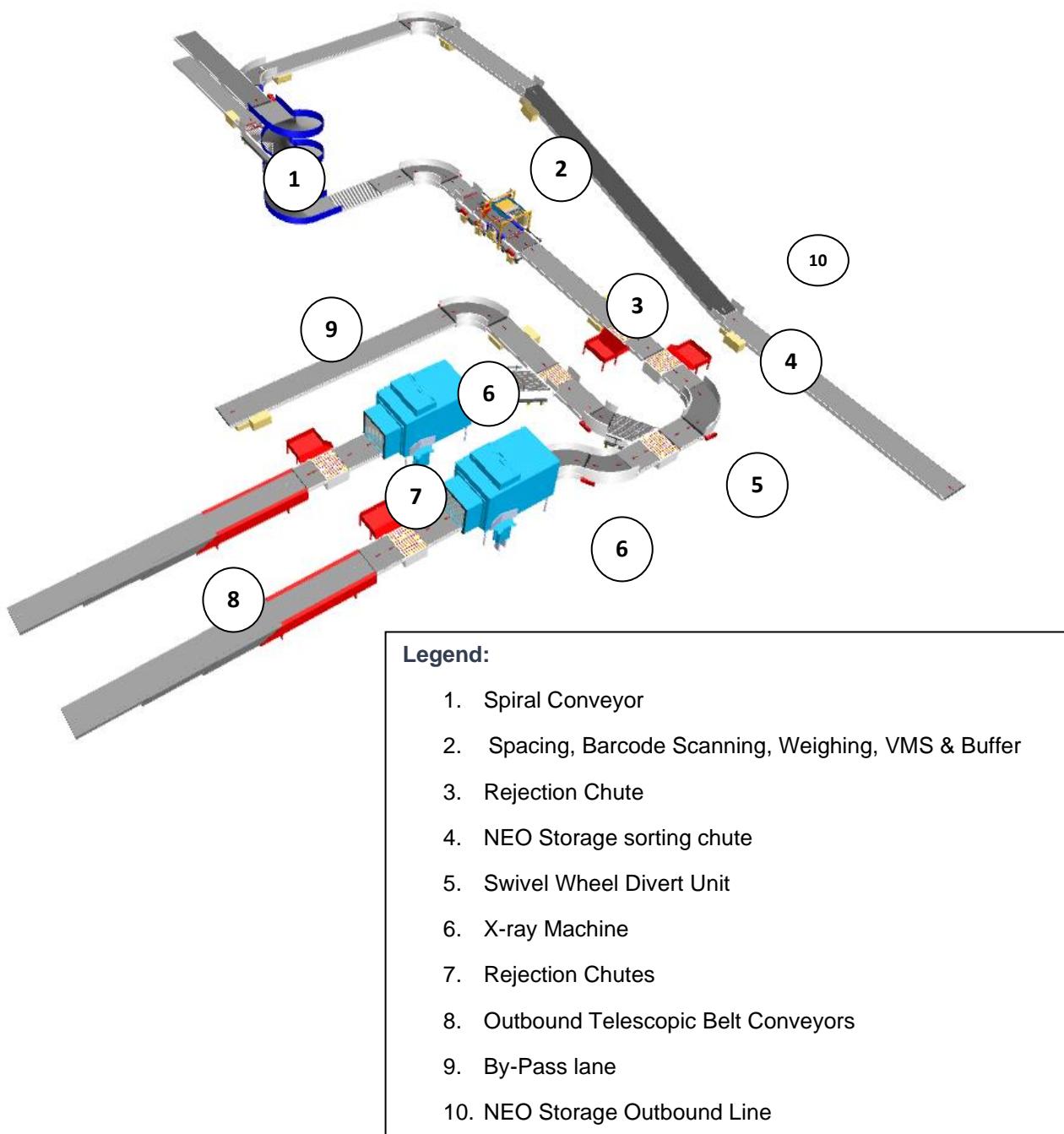
1. Spiral Conveyor
2. Aligning Conveyor
3. Spacing, Barcode Scanning, Weighing, VMS & Buffer
4. Rejection Chute
5. NEO Storage sorting chute
6. NEO Stations
7. NEO Storage

Boxes arriving for NEO will enter through the spiral via the inbound lines. They will first undergo automatic centre alignment, will get equally Spaced, Barcodes will get scanned from the top side, weighing, volume measurement, and buffering. Any boxes with barcode discrepancies will be directed to the rejection chute, while the remaining ones will be sorted into NEO storage.

Operators will then retrieve the boxes from the NEO chute and place them into storage.

***Note:** Only the boxes/bags with dimensions 760 x 520 x 410 mm and weight of 40 kgs will be stored in NEO storage.

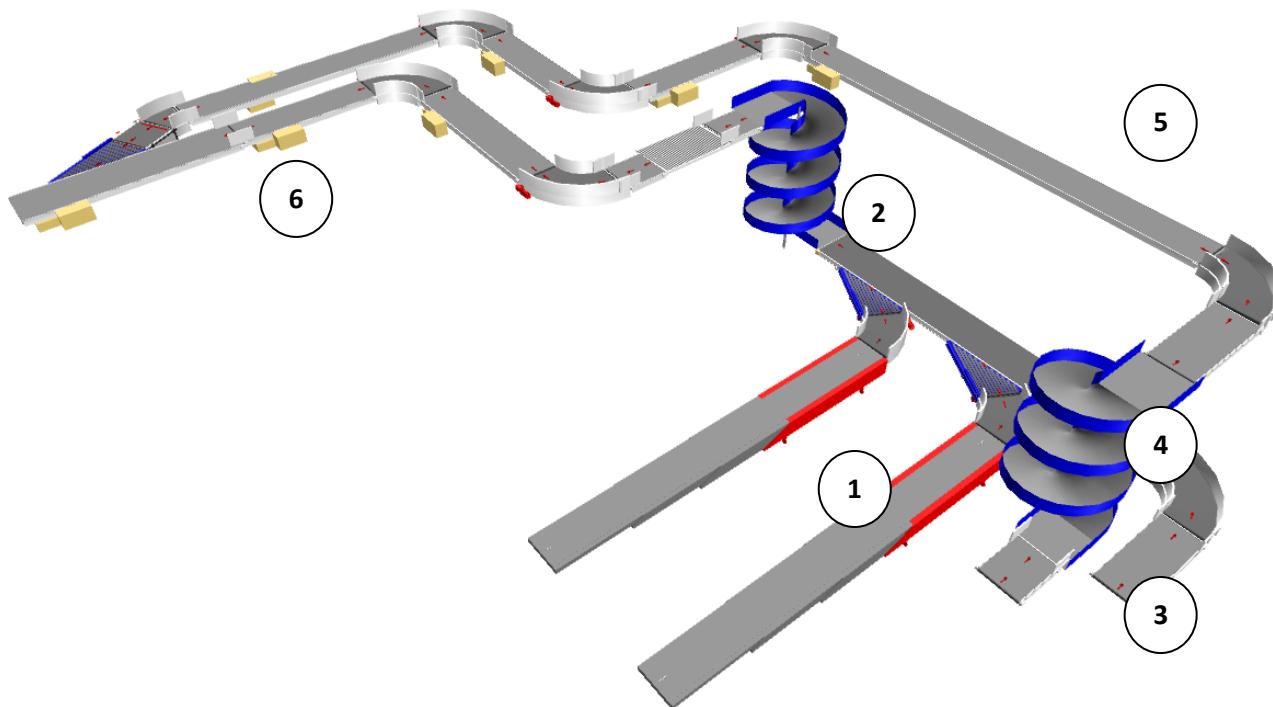
7.3.4 Outbound for Import



Outbound lines are linked to inbound lines via the spiral, allowing shipments to move through it to reach the outbound line. Along the way, shipments will be equally spaced, barcode will be scanned from topside, weight will get captured, volume will be scanned, and buffering is done. Based on barcode scanning results, boxes will be directed to their designated outbound lines using the swivel wheel divert unit. Boxes requiring X-ray scanning will be routed to a dedicated line, while others will be directed to the bypass line.

To streamline loading, telescopic belt conveyors are planned at the end of the outbound line. Additionally, a NEO outbound line is designated for shipments headed to the storage area, which is also connected to the outbound line through the spiral.

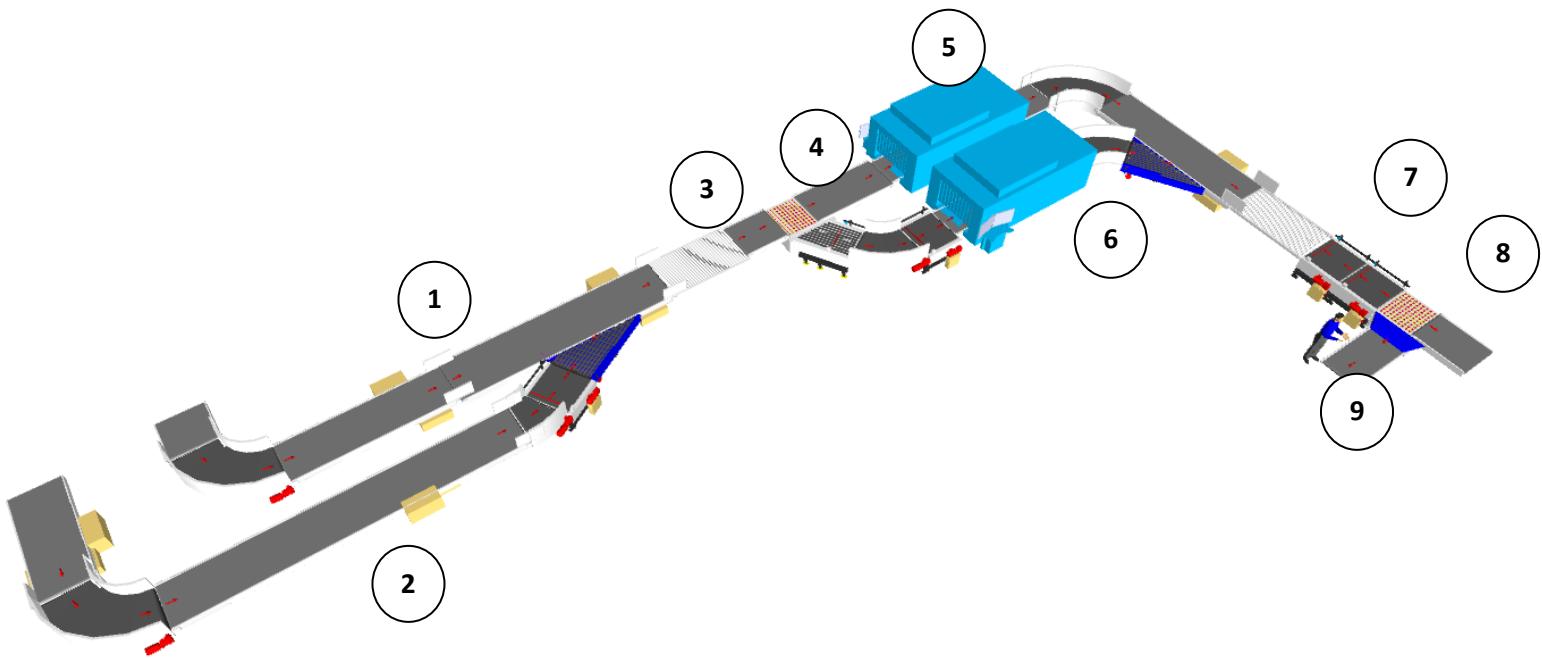
7.3.5 Inbound for Export

**Legend:**

1. Main Inbound Line for Export
2. Main Inbound Spiral Conveyor
3. Contingency Inbound Line
4. Contingency Spiral Conveyor
5. Contingency Takeaway Conveyor line
6. Main Inbound Takeaway Conveyor Line

Export shipments will be loaded through the main inbound line or the contingency inbound line. Both lines are connected to their respective spiral conveyors, which are further connected to the main takeaway line for further processing.

7.3.6 X-ray and Police Inspection Process

**Legend:**

1. Main Inbound Takeaway Line
2. Contingency Inbound Takeaway Line
3. Side Aligning Conveyor – 1
4. Swivel Wheel Divert Unit for Volume Distribution
5. X-Ray Line 1
6. X-Ray Line 2
7. Side Aligning Conveyor -2, Spacing Conveyor
8. Swivel Wheel Divert Unit for Sorting
9. Police Inspection Collection Conveyor

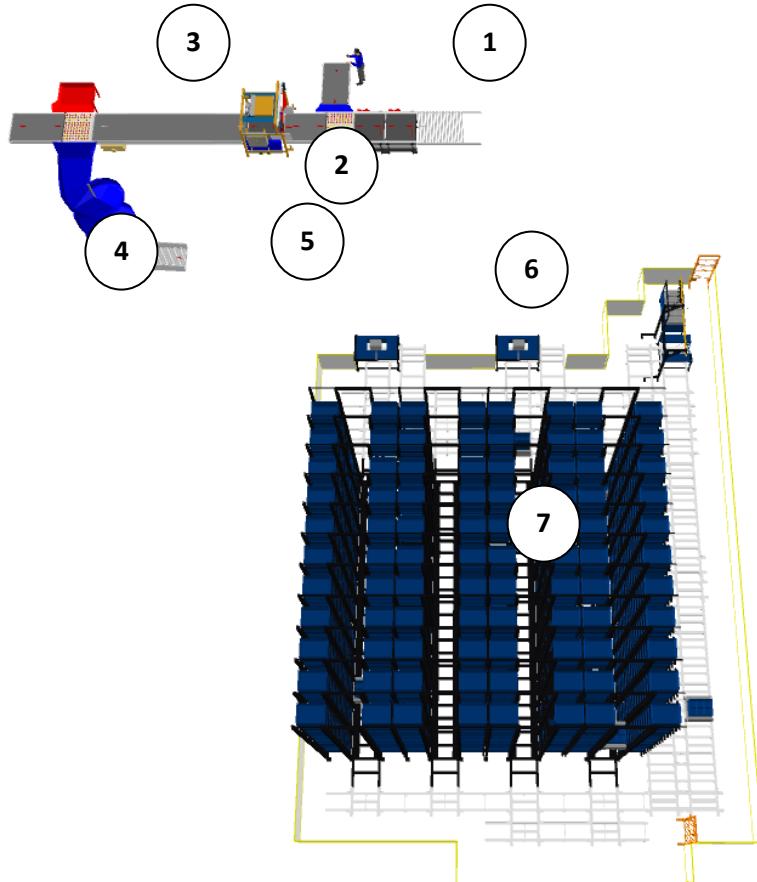
***Note: X-ray machines are not in Falcon's Scope.**

Shipments arriving via the export inbound lines will be automatically aligned using a side-aligning conveyor and distributed based on volume through a swivel wheel diverter. They will then proceed through X-ray machines on their designated lines.

After the X-ray screening, shipments will be realigned and evenly spaced. Those requiring police inspection will be directed to the police inspection conveyor using the swivel wheel diverter, following sortation logic provided by the X-ray machines.

An operator will then process these shipments and re-induct them to the main conveyor line.

7.3.7 NEO Storage for Export



Legend:

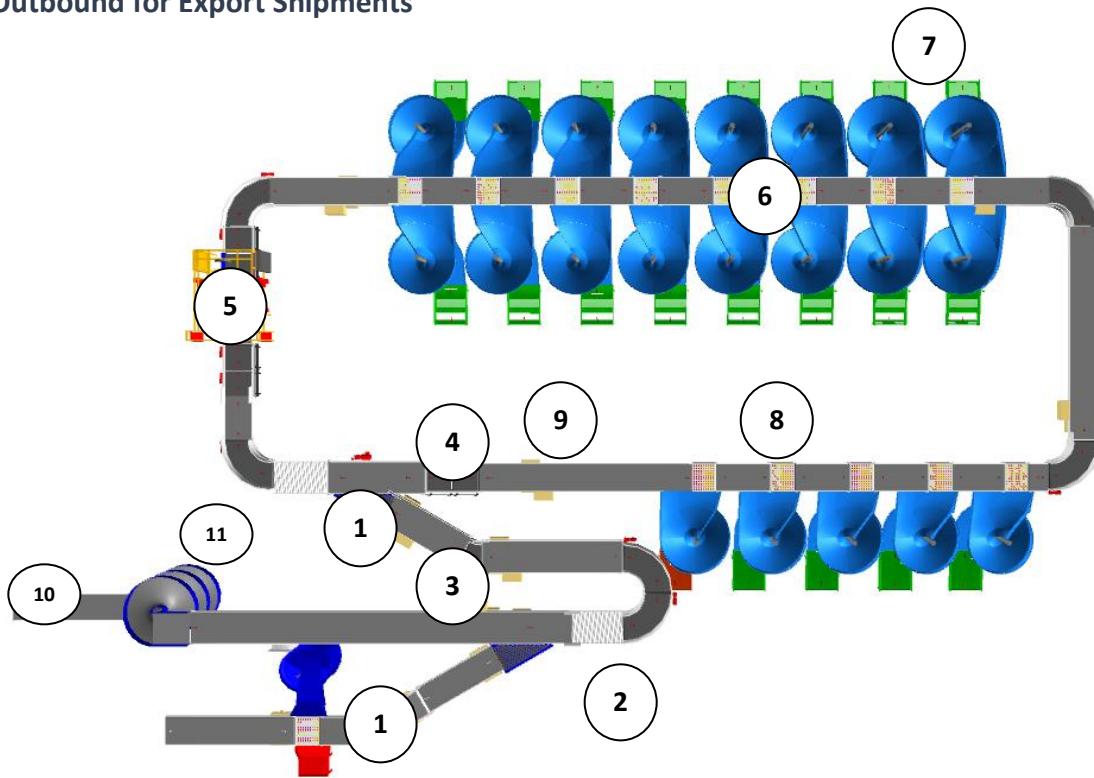
1. Police Inspection Line
2. Barcode Scanning, Weighing and VMS Tunnel
3. Rejection Chute
4. Spiral Chute for NEO Storage
5. Gravity Roller Conveyor
6. NEO Stations
7. NEO Storage for Export Shipments

After the X-ray and police inspection process, shipments will undergo barcode scanning, weight scanning, and volume measurement. Based on barcode scanning, shipments that need to be sorted into NEO storage will be diverted to their respective chutes using Swivel Wheel Divert Unit. Shipments with barcode discrepancies will be sorted into the rejection chute.

Operators will pick the shipments from the NEO spiral chute and put them away into storage using the NEO bot.

***Note:** Only the boxes/bags with dimensions 760 x 520 x 410 mm and weight of 40 kgs will be stored in NEO storage.

7.3.8 Outbound for Export Shipments

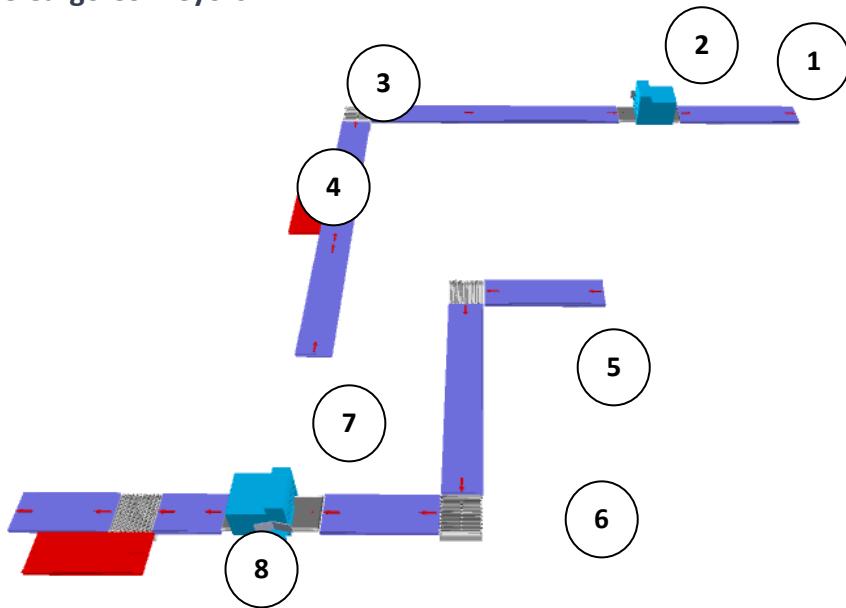
**Legend:**

1. Spiral Chute for NEO Storage
2. Merging onto Highway Conveyor
3. Highway Conveyor
4. Merging onto Sorter Loop
5. Barcode Scanning, Dimensioning, Weighing and Volume Measurement Tunnel
6. Swivel Wheel Divert Sorter
7. Outbound Collection Chutes
8. Rejection Chute
9. Spacing Conveyors
10. NEO export shipments loading Conveyor
11. Spiral Conveyor

Shipments that are not directed into the NEO spiral chute will be transferred onto the highway conveyor, which subsequently merges with the Swedi sorter loop. Once on the Swedi sorter loop, shipments will go through top-side barcode scanning, dimensioning, weighing, and volume measurement. Based on the barcode scan, the Swedi sorter will activate and direct shipments into their designated chutes, while rejected shipments will be sent to rejection chutes.

Additionally, a dedicated line has been provided for NEO storage export parcels. Shipments exiting NEO storage will be manually loaded onto the NEO export shipments loading conveyor by operators. These shipments will then merge onto the highway conveyor via the spiral conveyor and continue to the outbound sorter for export processing.

7.3.9 Oversize Cargo Conveyors

**Legend:**

1. Oversize Cargo Conveyor for Import
2. X-ray Machine for Import
3. Pop Up Diverter
4. Rejection Conveyor
5. Oversize Cargo Conveyor for Export
6. Pop Up Diverter
7. X-Ray Machine
8. Rejection Conveyor

The solution includes automation for oversize cargo conveyors, which operate beneath the main conveyor automation system. Operators will place oversize and overweight shipments on these conveyors to facilitate easier handling.

7.3.10 Pallet Roller Conveyor for Oversize Cargo



For heavy-load applications, our roller conveyors offer a reliable and energy-efficient material movement solution to seamlessly navigate pallets around turns, rotations, and transfers.

Specification	UOM	Remark
Max Load Capacity	Kg/m	700
Conveyor Speed	m/s	0.1-0.3
Rollers	Type	Dia80/89 mm Zn Plated Sprocket Welded rollers
Ambient Temperature	Celsius	0-45
Pallet Specifications	mm	800 x 1200 / 1000 x 1200 / 1200 x 1200
Conveying Height	mm	400 – 1200
Module Length	meters	1.5 – 3

7.3.11 Pallet Roller Turntable for Oversize Cargo



Designed for heavy-duty applications, our pallet turntables effortlessly enable pallet rotation, streamlining material handling and positioning within warehouse and logistics operations.

Specification	UOM	Remark
Max Load Capacity	Kg	1000
Conveyor Speed	m/s	0.1-0.3
Rollers	Type	Dia80/89 mm Zn Plated Sprocket Welded rollers
Ambient Temperature	Celsius	0-45
Pallet Specifications	mm	800 x 1200 / 1000 x 1200 / 1200 x 1200
Conveying Height	mm	500
Diameter of Encircle	mm	2100

7.3.12 Pallet 90-Degree Popup Conveyor for Oversize Cargo



For efficient pallet transfer at 90-degree angles, our pop-up conveyor systems seamlessly move materials, enhancing operational flow and flexibility in various industrial applications.

Specification	UOM	Remark
Max Load Capacity	Kg	1000
Conveyor Speed	m/s	0.1-0.3
No. of Chain	Nos	2 or 3
Pallet Specifications	mm	800 x 1200 / 1000 x 1200 / 1200 x 1200
Conveying Height	mm	400 - 1000
Module Length	mm	1600 - 3000

7.4 Main benefits of the proposed solution

The proposed solution has the following advantages:

1. High operational throughput.
2. Improved Productivity.
3. Ability to serve entire range of conveyable Shipments with a sorter's speed of up to 2 m/s.
4. Low occupancy of floor space in the building.
5. Narrow discharge centers for the increased number of splits in limited space.
6. Designed for minimal upkeep, ensuring consistent reliability and ease of support.
7. Life Cycle Value.
8. Falcon's CBS can adapt to changing business requirements by adjusting its speed. to match the operational throughput requirement, thereby leading to Power Savings and reduced system Wear & Tear.

8. Proposed System Capacity Calculations

The following table shows the throughput calculation for the sortation system designed based on Dnata's RFP requirements.

Import		
TPH at Acceptance	1000	PPH/ Main Induct Line
Conveyor speed at Inbound	35	m/min
TPH at Acceptance	1000	PPH/Contingency Line
Sorting to PTL	1000	PPH/ Main Induct Line
Sorting to PTL	1000	PPH/Contingency Line
Swivel Wheel Unit Speed	96	m/min
Rejection chute	2	Nos
TPH at Outbound	2000	PPH
Max Parcel Size	1000x1000x1000	mm*mm*mm
Min Parcel Size	150x150x5	mm*mm*mm
Min weight	100	gm
max Weight	40	Kgs
Scanning	Top Side Only	
VMS	Yes	
Weighing	Yes	
No of Bin Location Neo	1760	Nos
No. of GTP	2	Nos
Clear Height	12	mtr

Export		
TPH at Acceptance	1000	PPH/ Main Induct Line
Conveyor speed at Inbound	35	m/min
TPH at Acceptance	1000	PPH/Contingency Line
TPH at X-Ray	1000	PPH/machine
Sorter TPH	2000	PPH
Swivel Wheel Unit Speed	96	m/min
No. of Destination	20	Nos
Rejection chute	1	Nos
Max Parcel Size	1000x1000x1000	mm*mm*mm
Min Parcel Size	150x150x5	mm*mm*mm
Min weight	100	gm
max Weight	40	Kgs
Scanning	Top Side Only	
VMS	Yes	
Weighing	Yes	
No of Bin Location Neo	1408	Nos
No. of GTP	2	Nos
Clear Height	9	Mtr

Oversize Cargo Export

TPH at Acceptance	TBD	PPH/ Main Induct Line
TPH at X-Ray	TBD	PPH/Unit
Rejection point	1	Nos
Max Parcel Size	1200x1000x1650	mm*mm*mm
max Weight	500	Kgs
Scanning	Side Scan Only	
Weighing	Yes	
VMS	No	

*Note: The above is the detailed throughput calculation on how we will achieve the throughput for the system and Simulation results will be shared after order confirmation but before installation.

9. System Components

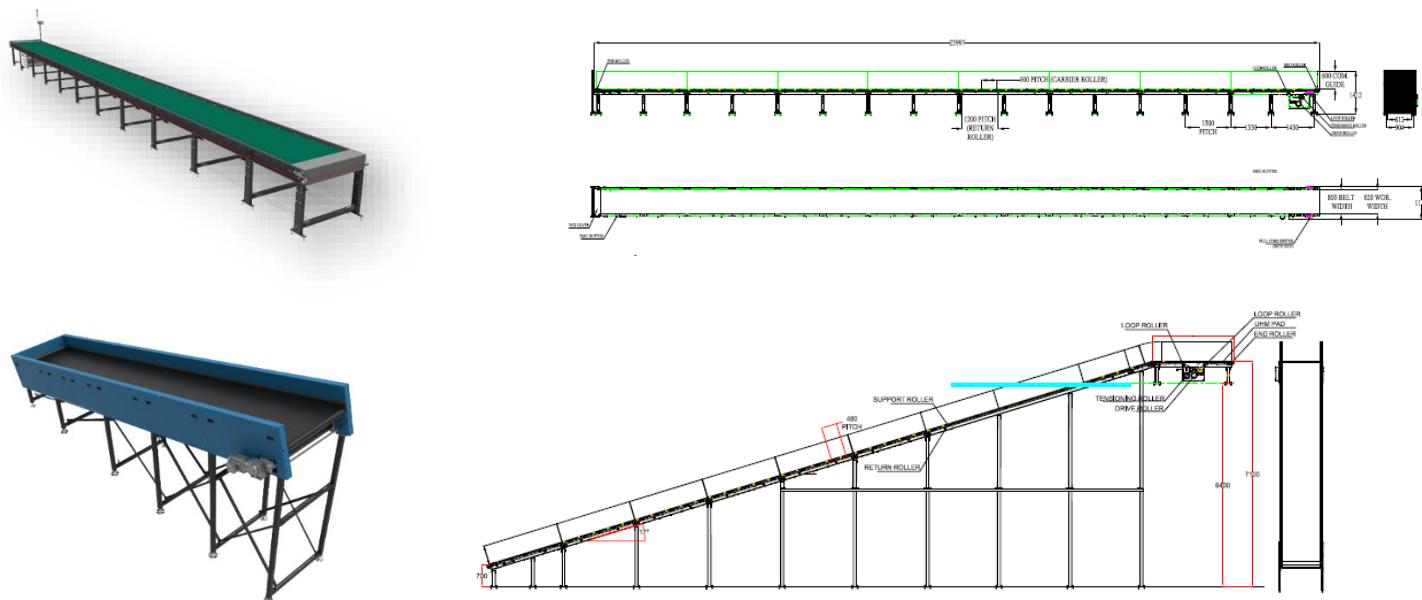
9.1 Straight and Inclined Powered Belt Conveyor

Falcon's Belt Conveyors are modular & robust in design, used for smooth conveying of products over Straight, inclined and declined paths. MS profile is used to build conveyor frame.

The conveyors are supplied with the necessary supports and bolts to fix them to the supporting plane, as well as with the junction elements allowing easy and jam-free passage from one conveyor to the other.

Some Silent Features of Falcon's Belt conveyor:

- Low Noise
- Maximum uptime.
- Minimal maintenance
- High safety standards.
- Fastest ROI.



Specification	UOM	Remark
Manufacturer Name	Name	Falcon Autotech
Material of Roller	Type	MS Rollers with Zinc Plating
MOC of Belt	Type	PVC
Belt Thickness	mm	3
Belt Finish	Type	Matt Finish
Belt width	mm	1210/1410
Belt Joint Type	Type	Vulcanized, Endless Belts
Belt Make/Model No.	Make	FORBO/DERCO
Chassis	mm	MS, 3mm Thick, Powder Coated-75 Microns
Idler Roller Pitch on running side (Top)	mm	480
Idler Roller Specs	Spec	Dia.50.8, shaft-12 mm, bearing-6301
End Rollers	Spec	Dia 81.2 x 2.85 Thick, 30mm Shaft Dia, & Bearing Size-UCFH206D1, MOC-EN9, Zinc Plated -25 microns
Drive Rollers	Spec	OUTER Dia 178 PIPE Dia 168x5 Thick, 40mm Shaft Dia, & Bearing Size-UCF208D1, MOC(SHAFT)-EN9, NEOPRENE RUBBER COATING
Motor Shaft	MOC	EN9 Shaft material
Conveyor Under guarding	Spec	MOC-MS, 0.8 to 1mm thickness, Steel Stiffeners at every 600mm to avoid the sagging due to self-weight
Load capacity per unit length of Conveyor	kg/m	50
Type of Guides	Type	Steel guides at 50mm/400mm height basis the position of conveyor on both sides from Conveyor Belt Surface.
Drive Power Rating	kW	Motor Rating depends on Length of the Conveyor
Type of Motor	Type	AC Geared Motor
Ingress Protection	Type	IP 55
Type of Drive System	Type	Direct Shaft Mounted Motor/ Flange Mounted
Type of Drive	Type	Chain drive/Torque Arm type
Gear Motor	make	Sew/Nord
Drive	make	Lenze/Siemens/Omron/Allen Bradley
Insulation Class	Type	Yes
Conveyor Speed	m/s	Variable speed to meet TPH requirements
Type of Mounts	Type	Fixed Heights Legs with Grouting Provisions

9.2 Powered Roller Conveyor

Falcon's Roller conveyors are highly energy efficient and require negligible maintenance leading to very minimal Operating costs and thus lower cost of ownership.

Some Salient Features of Falcon's roller conveyor:

- Low Noise
- Maximum uptime.
- Minimal maintenance
- High safety standards.
- Fastest ROI
- It comes with
- MS frame.



Specification	UOM	Remark
Manufacturer Name	Name	Falcon Autotech
Material of Roller	Type	MS Rollers with Zinc Plating
Overall Width	mm	1400
Conveyor Height	mm	Variable as per design shared
Drive Power Rating	Watt	40
Type of Motor	Type	DC Rollers (MDR)
Ingress Protection	Type	IP 54
Type of Drive System	Type	Poly V Belt Drive
Insulation Class	Type	Yes
Conveyor Speed	m/s	Variable speed to meet TPH requirements
Load capacity/unit length of Conveyor	kg/m	50
Roller Span	mm	Variable
Roller Diameter	mm	50
Pitch of Rollers	mm	75/100
Type of Mounts	Type	Fixed Heights Legs with required Grouting Provisions

9.3 Powered Belt Turns

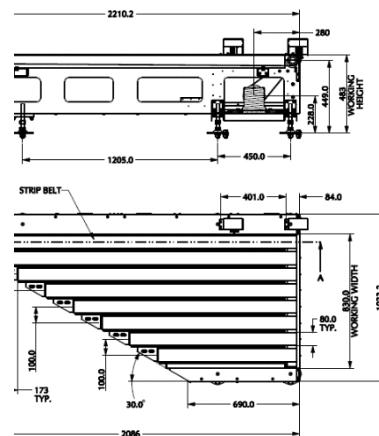
Powered belt turns based 90 degree, and 180 turns are used for transport of boxes and shipments.



9.4 Intelligent Merge Conveyor

An intelligent merge conveyor incorporates advanced automation and control technologies to intelligently merge stream of materials into a single unified flow. It optimizes the merging process by dynamically adjusting the speed and position of items to ensure a smooth and efficient merge.

In the proposed solution this is 30° triangular high-speed conveyor used for inducting shipment/boxes directly on to the sorter. The Belts are Strip Belts for smooth shipment movement.



9.5 Aligning Conveyor

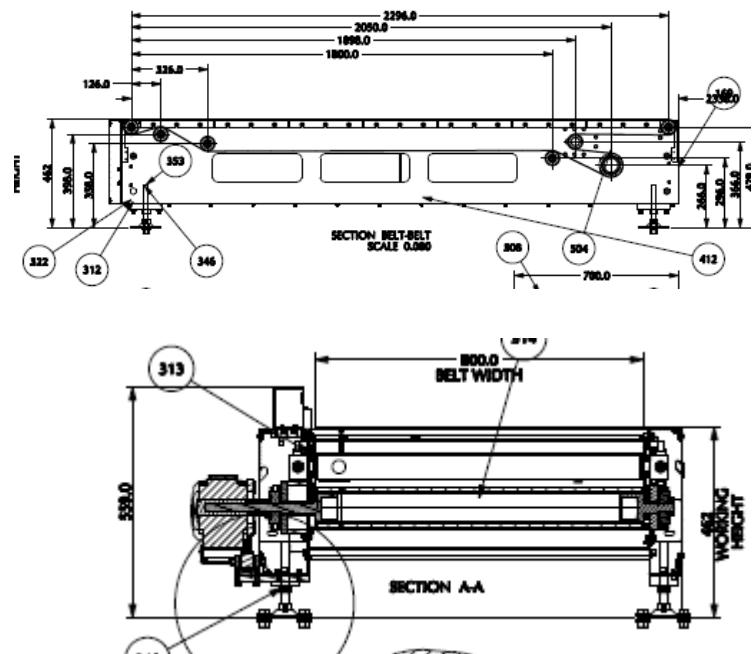
An Aligning conveyor is used to align the shipments to a particular side of the conveyor. This Conveyors required to maintain the product alignment on the line.



9.6 Buffer Conveyor

A buffer conveyor, also known as a buffering conveyor or accumulation conveyor, is a type of conveyor system used to temporarily store or hold items in a controlled manner. Its primary purpose is to manage the flow of items between different stages of a production or handling process when there is a mismatch in the speeds or capacities of the upstream and downstream equipment.

This Conveyors required to maintain the Throughput of Line.



9.7 Weighing Conveyor

A weighing conveyor, also known as a weigh belt conveyor, is a type of conveyor system specifically designed to measure the weight of materials as they move along the conveyor belt. It combines the functions of conveying and weighing into a single integrated process.

Weighing Conveyors equipped with high precision Load Cells to capture the weight of Shipments.

Make- Bizerba/ Mettler Toledo



9.8 Spacing Conveyor

A spacing conveyor, also referred to as a gapping conveyor or gap optimizer, is a type of conveyor system used to create and maintain consistent gaps or spacing between items as they move along the conveyor line. Its primary purpose is to regulate the flow and spacing of products to ensure smooth operation and efficient downstream processes.

This conveyor is a variable speed special purpose module that creates space between parcels as well as regulates feeding on the Weighing conveyor.



9.9 Telescopic Belt Conveyor

A telescopic belt conveyor, also known as an extendable conveyor or telescoping conveyor, is a type of conveyor system that features a telescoping mechanism to extend or retract the conveyor length as needed. It is commonly used in applications where flexible and adjustable conveying solutions are required, such as loading and unloading trucks or containers in warehouses, distribution centres, and shipping facilities.

In the proposed solution, Parcels from the Truck are transferred to infeed conveyors through Telescopic Belt Conveyors in singulated manner.



Specification	UOM	Remark
Manufacturer Name	Name	Falcon Autotech/Equivalent
Suitable Carton Size	MM	Min: 1000 x 1000 x 1000 Max: 150 x 150 x 5
Suitable Carton Weight	Kg	Min 0.1, Max 40
Base Length	Mm	6000
Extended Length (Total Length)	Mm	12000
Conveyor Belt Running Speed	m/min	18-30
Motor Rating	Type	0.75 Kw, 415V AC, 50 Hz
Load Capacity	Kg/m	50
Communication	Mm	2 x RS243, 1 x USB2.0, Ethernet

9.10 Automatic Barcode Scanning and Dimensioning System

Top Sided Barcode Scanner to scan shipment 1D codes and 2D codes. The Scanner is also capable of Archiving Shipment Images in Real time.

In the same tunnel Volume scanners are installed to capture the dimensions of the parcels.



9.11 Side Barcode Scanner

The system is integrated with automated inline side barcode scanning system capable for scanning 1D barcodes with high accuracy.



Specification	UOM	Remark
Manufacturer Name	Name	Cognex/Sick
Barcode Type	Type	1D
Module Size	Mils	TBD
Tote Sizes	Mm	Min: 300 x 300 x 150 Max: 610 x 400 x 400
Number of Codes	Nos	1
Location	Side	Left/Right/Front
Orientation	Type	Omnidirectional
Colour of bars	Colour	Black
Under Foil	yes/no	No
Code Length	Mm	50
Code Height	Mm	15

9.12 Swivel Wheel Divert Unit

Falcon's Swivel wheel divert is used in system for the smooth transfer of products.

Some Salient Features of Falcon's Swivel Wheel Divert:

- Low Noise
- Maximum uptime.
- Electric based rotation of wheels.
- Minimal maintenance
- High safety standards.



Specification	UOM	Remark
Manufacturer Name	Name	Falcon Autotech/Similar Superior
Swedi Units	Nos	19
Type - Equipment	Type	Sorting
Type - Operation	Type	Sorting
Mechanism for Swivel	Type	Electric servo motor
Roller drive	kW	Powered smart wheel
Roller pitch (L x W)	Type	110 x 120
No. of divert sections	Nos	2
Max. product weight (kg)	kg/m2	40
Throughput	PPH	Up to 2000
Type of Mounts	Type	Fixed Heights Legs with required Grouting Provisions

9.13 Gravity Roller Conveyor

Falcon's Roller conveyors require negligible maintenance leading to very minimal Operating costs and thus lower cost of ownership.

Some Salient Features of Falcon's idler roller conveyor:

- Low Noise
- Maximum uptime.
- Minimal maintenance
- It comes with MS frame.



Specification	UOM	Remark
Manufacturer Name	Name	Falcon Autotech
Material of Roller	Type	MS Rollers with Chrome Plating
Overall Width	mm	1500
Conveyor Height	mm	As per Layout requirement
Load capacity per unit length of Conveyor	kg/m	50
Roller Span	mm	To Suit
Roller Diameter	mm	approx. 50
Pitch of Rollers	mm	75
Type of Mounts	Type	Fixed Heights Legs with required Grouting Provisions
Type of Guides	Type	Yes
End Stopper	yes/no	Yes

9.14 Spiral Conveyor



9.14.1 For Import

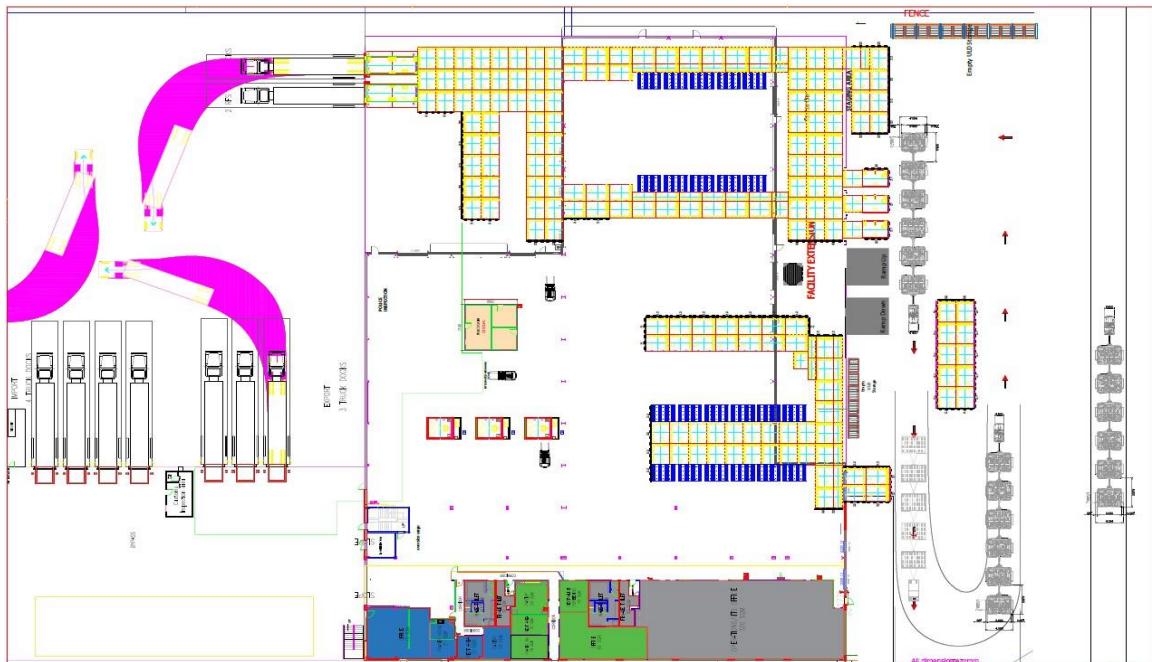
Specification	UOM	Remark
Manufacturer Name	Name	Apollo
Lower end height	Mm	800
Upper end height	Mm	2300 / 4800 / 5300
Transport direction	Type	Up and down
Belt Width	Mm	To be specified during DAP
Central Diameter	Mm	To be specified during DAP
Number of Windings	Nos	To be specified during DAP
Material Configuration	Type	S (Dry use) colour coated steel frame.
Nominal belt Speed	m/min	17

9.14.2 For Export

Specification	UOM	Remark
Manufacturer Name	Name	Apollo
Lower end height	Mm	800
Upper end height	Mm	4800 / 5300
Transport direction	Type	Down
Belt Width	Mm	To be specified during DAP
Central Diameter	Mm	To be specified during DAP
Number of Windings	Nos	To be specified during DAP
Material Configuration	Type	S (Dry use) colour coated steel frame.
Nominal belt Speed	m/min	17

10.ULD Handling System

10.1 Layout



10.2 Equipment Description

10.2.1 Castor Deck

The Castor Deck (CD) enables the operator to move ULDs manually. The decks can be adjusted by +/- 50mm in height.



Description	Data	Unit
Capacity	6800	kg
Standard length	3315	mm
Standard Width	2600	mm
Custom Deck Size - As per layout	-	-
System height (floor to top of roller plane) – Subject Detailed Design	508 / 203	mm

Frame

A framework of standard sections and bent profiles forms the base of a CD. The castors, walkways and legs are integrated into the frame.

Stops

Manual Finger stops protruding above the conveying level to prevent ULDs from rolling off the castor deck position. Stops are paint coated.

10.2.2 Powered Roller Deck

The Powered Roller Deck (PRD) is used to transfer ULDs within the system. The deck is designated narrow edge presenting and is powered by an AC motor. The deck can handle one 10ft ULD or equivalent.

The main roller deck components are:

- Frame
- Rollers
- Drive
- Chain covers
- Sprockets & Chains
- Safety and Control Equipment



Description	Data	Unit
Capacity	6800	kg
Standard length	3600	mm
Standard Width	2700	mm
Width Between Guides	2540	mm
Roller diameter	133	mm
Roller Wall	4	mm
Guidance Height Above Roller Plane	50	mm
System height (floor to top of roller plane) – Subject Detailed Design	508	mm

10.2.3 20ft Truck Dock

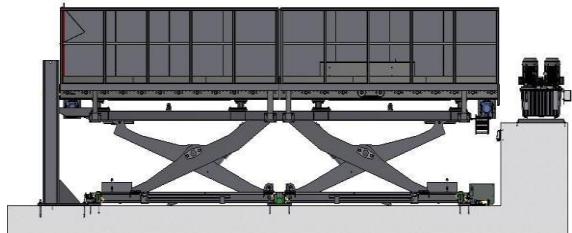
The Truck Dock (TD) is used to bridge the gap between the lorry to be loaded / unloaded and the system. The unit can handle up to two 10ft ULD or equivalent. All ULDs up to and including 20ft units can be handled.

The TD consists of two 10ft Powered Roller Decks mounted on a tandem scissor lifting assembly. Steel skirts provide protection from shear edges to the ramp on warehouse side.

The lifting assembly functions as a single 20ft unit only.

The scissor lift assembly consists of the following main components:

- Platform, incorporating the horizontal transfer decks
- Sets of scissor arms
- Base frame
- Hydraulic cylinders
- Hydraulic power pack



Safety Equipment

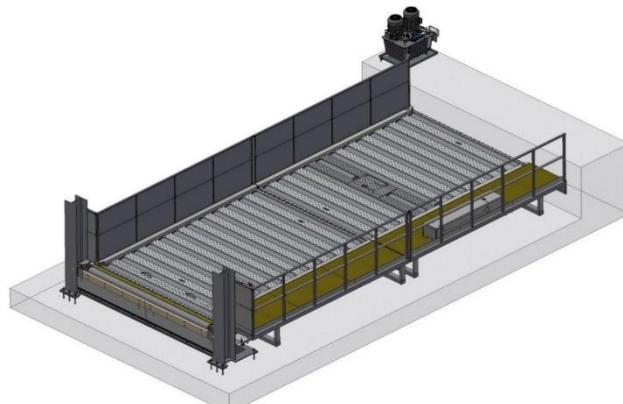
The front and rear edges of the Truck Dock are equipped with safety trip bars to eliminate shear edges which could endanger personnel.

Safety fencing is provided to sides of Truck Dock.

Elevating Ram Protection

The ram protection consists of vertical and horizontal "I"-beams and a roller. A full-length roller is positioned in the top section of the "I" horizontal cross beam. The vertical beams act as guides for the horizontal cross beam.

The horizontal cross beam rests on two extension arms that protrude out from the Truck Dock platform. The vertical posts are bolted to the concrete floor.



Description	Data	Unit
Capacity	13,600	kg
Collapsed height	900	mm
Horizontal Transfer Deck		
Length (approximate)	7,200	mm
Width (approximate)	2,700	mm
Width between guides	2,540	mm
Guide height	50	mm
Roller diameter	133	mm
Standard roller wall thickness	4.0	mm
Lead roller wall thickness	7.1	mm
Distance between rollers	304.8	mm
Deck drive (per deck)	AC	kW
Transfer speed	18	m/min

Lift System		
Elevation in lowest position (approximate)	900	mm

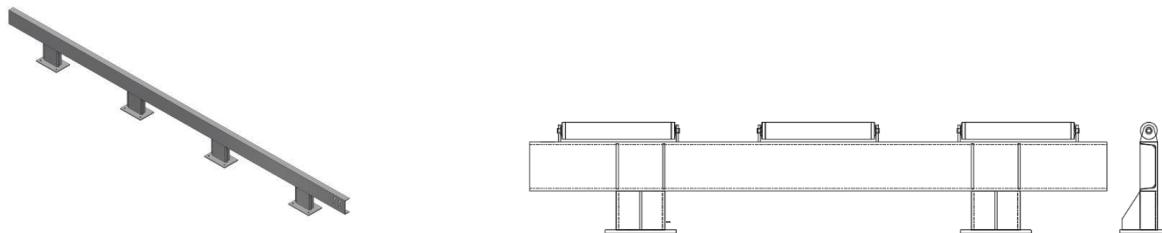
Description	Data	Unit
Elevation in top position (approximate)	2,100	mm
Lifting stroke (approximate)	1,200	mm
Hydraulic power pack	2x 7.5 kW	S1 100%
Lifting speed	3.0	m/min

10.2.4 Ram Protection

ULD handling equipment is protected from collisions and impact damage by RAM protection. The RAM protection is installed in all areas where collision with warehouse traffic is possible.

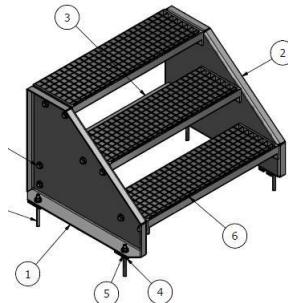
RAM protection consists of steel vertical posts welded to steel base plates anchor bolted to the floor. A horizontal rail consisting of steel channel is attached to the vertical posts with brackets and bolts.

RAM protection can be equipped with a non-driven roller to support the ULD transfer process to or from the dolly. It will be adjusted to a suitable height with guiding edges to assist with incoming loads.



10.2.5 Staircase

Staircase allow access to the castor deck operational area. A framework of standard sections and bent profiles forms the base of the walkway and staircase.



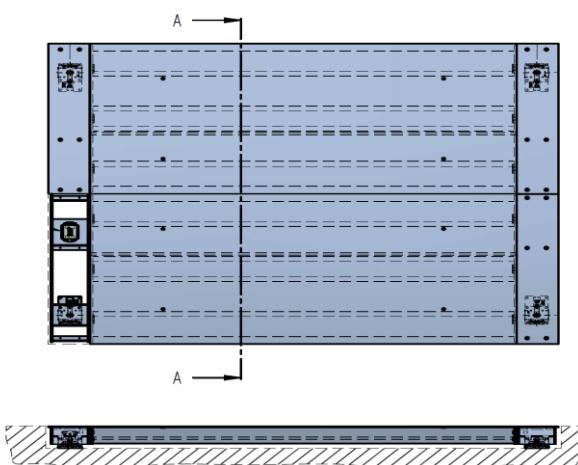
10.2.6 Floor Scale

The model SBM-5T load cell and mount consist of a shear beam load cell of 3 Tonne capacity (10 with a 100% overload capability). The Loadcell is mounted in a special industrial mount with a self-aligning cup and ball arrangement with horizontal travel restraint and vertical uplift restraint, thereby negating the need for external travel stops to be installed on-site.

The floor scales are of the low-profile type and are in pits so that the upper surface is flush with the floor. The weighing system is provided by load cells incorporated into a base frame. Steady measurement results will be provided independently from location of positioning the goods on the scale.

The floor scale consists of the following main components:

- Steel frame
- Load cells incl. mount
- Feet
- Deck plate
- Maintenance covers
- Junction box
- Read out unit



Scale Indicator

The CDI-1600 is a modern state-of-the-art digital weight indicator with easy installation and maintenance. The CDI-1600 displays weights using a large 800 x 480-pixel TFT colour display. Configuration and calibration of the indicator can be accomplished using the integral keypad and screen. No special software is required. The CDI-1600 has a robust stainless-steel enclosure.

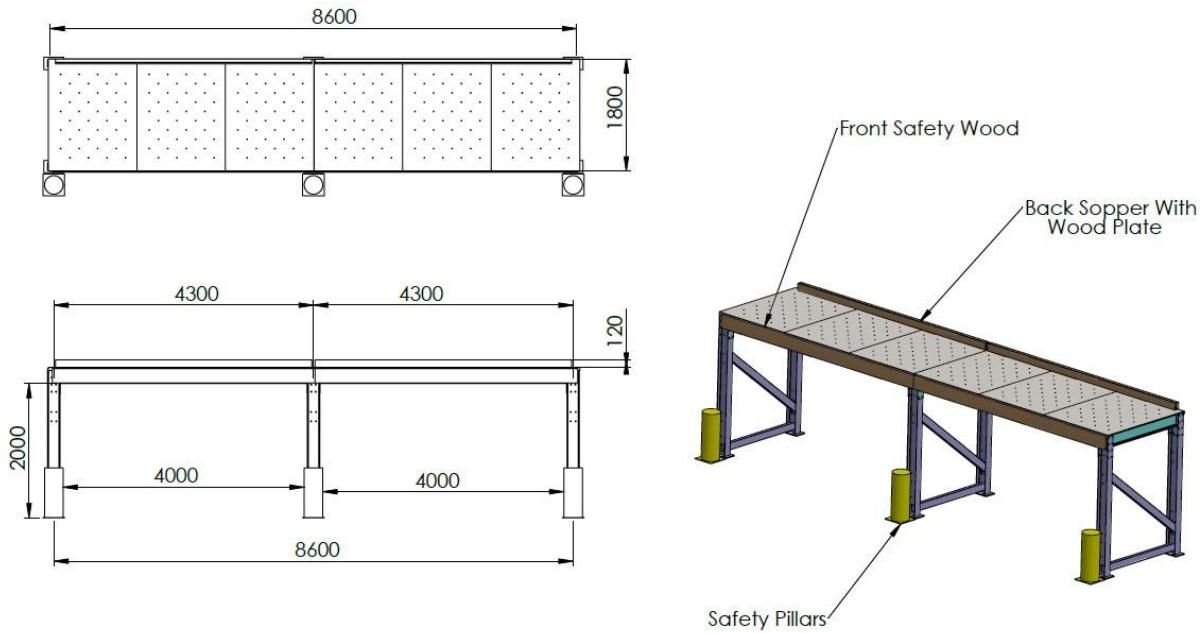
Certification

The certification is out of scope and must be performed by the customer with an independent 3rd party to meet local codes of practice and approved standards.

10.2.7 Empty ULD storage (bulk rack)

Storage racks suitable to store 64" high ULD under and with platform on top.

- Rack legs are spaced suitable to accommodate 2 x AKE containers or 1 ALF container under storage with Slave Pallet.
- I-beam steel structure in handling 1tn / m² load capacity.
- Rear edge of rack has a raised edge to act as an edge guard for upper-level cargo.
- Front vertical edge bar to act as a bumper for incoming storage operations on upper level.



10.2.8 Elevating Workstation

The Elevating Workstation (EWS) is used to build-up and break-down ULDs. EWSs provides warehouse personnel with the optimum working height for loading or unloading ULDs. The 10ft unit can handle one 10ft ULD.

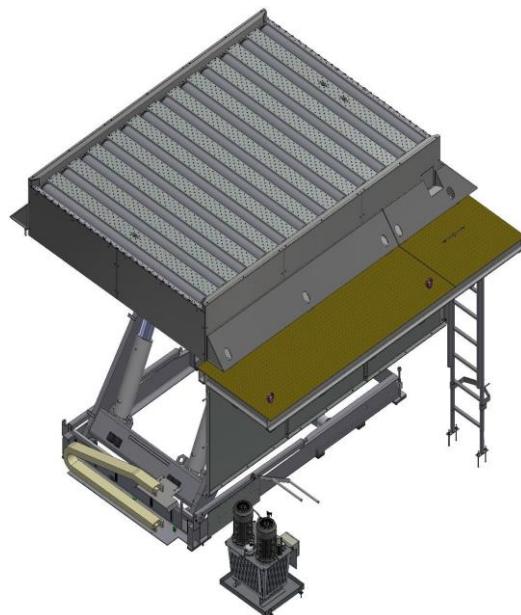
The EWS consists of a powered roller deck mounted on a scissor lifting assembly set in a pit. Steel skirts provide protection from shear edges.

Sensors in the walkways of the roller deck are used to position ULD containers or pallets on the deck in all configurations required.

The EWS is equipped with inductive sensors to reliably stop the platform at two different heights.

The scissor lift assembly consists of the following main components:

- Platform, incorporating the horizontal transfer deck
- Roller Deck / Metal plate
- Scissor arms with top frame.
- Base frame
- Hydraulic lifting cylinders
- Hydraulic power pack



ULDs are held stationary by brakes applied to the motor. The brake is able to stop a ULD with maximum pay load within 150 mm. All drive chains are covered with easily removable guard plates.

Skirt Protection

All open sides of the elevating workstation are provided with steel safety skirts to eliminate shear edges. The steel skirts are of sufficient length to ensure that even in the highest position there are no shear edges which could endanger operating personnel.

Base Frame

The base frame serves to direct the reactionary vertical forces through the base plates. The base frame itself consists of a steel sectional frame incorporating two bearings in which the fixed ends of the scissor arms are mounted, and two elevated channel sections in which the rollers of the non-fixed scissors arm ends can run. The base frame is attached to the floor using anchor bolts.

Hydraulic Lifting Cylinders

The lifting process is achieved through two high quality plunger type cylinders. The cylinders are made of seamless steel tube. The hard chromium-plated pistons run in wear-resistant, low friction guide bushes preventing metal to metal contact.

Stiffening rings on the piston rod side prevents ingress of dirt. The cylinder is sealed using a double seal.

The cylinder suspension is accomplished at the cylinder base by a ball socket of anti-friction bearing steel, and at the piston head by means of an eye joint and bolt embedded in synthetic bushings. In this way universal movement is achieved.

As a safety precaution, both cylinder ports are fitted with pipe rupture valves which prevent uncontrolled descent of the platform should one of the hoses or pipes become ruptured through mechanical damage.

Hydraulic Power Pack

The oil pressure is supplied by a hydraulic power pack situated next to the elevating workstation frame and connected to the cylinders by means of high precision steel tubing.

The power pack consists of a standard 3-phase electric motor, a high-pressure hydraulic gear pump, oil flow control valves and pressure relief valves. In addition, the power pack has an oil filter, air filter, oil level indicator (low oil switch), oil drain screw with magnet and oil tank with drip pan.

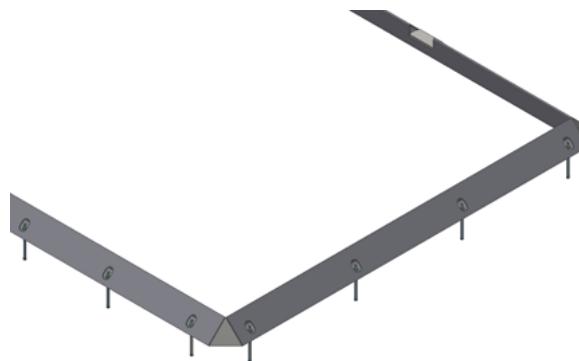
Triangular Ram Protection

Triangular Ram Protection is located at all open sides of the Elevating Workstation to prevent mobile warehouse vehicles, e.g. forklift trucks, from driving onto the Workstation.

A heavy-duty angle steel and a steel plate form the triangular shape of the ram protection. The steel plate is welded to the angle steel at an angle of 45° to form a sloped surface facing away from the equipment it protects.

Height of the ram protection will be approx. 180 mm. The ram protection will be securely anchored to

the warehouse floor by chemical anchor bolts. To protect warehouse personnel from harm, the ends and the corners of the ram protection will be closed and beveled.



10.2.9 Technical Data of EWS 10ft

Description	Data	Unit
Live load capacity:	6800	kg
Collapsed height approx.	900	mm
Horizontal Transfer Deck		
Length approx.	3600	mm
Width approx.	2700	mm
Width between guides:	2540	mm
Guide height:	50	mm
Roller diameter:	133	mm
Standard roller wall thickness:	4	mm
Interfacing roller wall thickness:	7.1	mm
Distance between rollers:	304.8	mm
Transfer speed:	18	m/min

Lift system		
Elevation in top position:	203	mm
Elevation in lowest position approx.	-1400	mm
Lifting stroke approx.	1608	mm
Lifting speed	0.05	m/s

11. Proposed System Technical Details

11.1 Mechanical equipment

S/No	Component	Value	UOM
1	PVC Belt Conveyor (1210mm Width)	395	meters
2	PVC Belt Conveyor (1410mm Width)	215	meters
3	Powered Roller Conveyor (1400mm Width)	14	meters
4	30 Degree Belt Turn	11	Nos
5	60 Degree Belt Turn	17	Nos
6	90 Degree Belt Turn	28	Nos
7	Aligning Conveyor	14	Nos
8	Angle Merge 30 Degree	23	Nos
9	Angle Merge 60 Degree	3	Nos
10	Buffer Conveyor	16	Nos
11	Gravity Roller Conveyor	26	Nos
12	Pop-Up Units	5	Nos
13	Side Barcode Scanner	2	Nos
14	Spacing Conveyor	8	Nos
15	Spiral Conveyor	8	Nos
16	Telescopic Belt Conveyor	4	Nos
17	Weighing Conveyor	6	Nos
18	X-Ray Machine (Client's Scope)	6	Nos
19	Swivel Wheel Divert Unit	26	Nos
20	PTL Racks Bin Type	78	Nos
21	PTL Modules	78	Nos
22	PTL Control Box	2	Nos
23	Extra control Card	2	Nos
24	PTL hand barcode scanner 1D	2	Nos
25	Spiral Chute	25	Nos
26	ULD Handling System (Caster Deck)	1	Set
27	Oversize Cargo Pallet Conveyor	1	Set

11.2 Electrical Equipment

Electricals		
1	1	Consists of
		Main Power Distribution panel Main Control Panel Feedline Control Panels Sorter Drive Panels Network Switches Field Cabling

Included

11.3 Control System

Components		
1	1	Consists of
		Siemen's PLC based Control System with SCADA Industrial Switch

1 Nos.
As per requirement

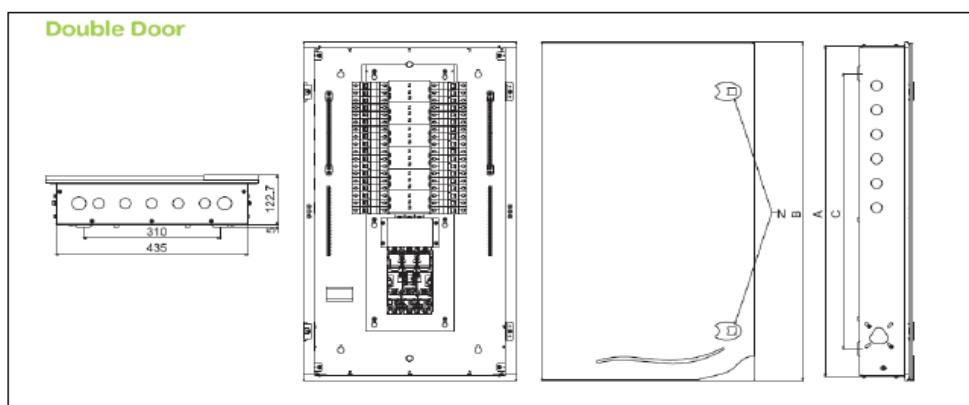
11.4 Electrical System

Main power supply will supply Falcon's PDP (Power Distribution Panels) electrical cabinets.

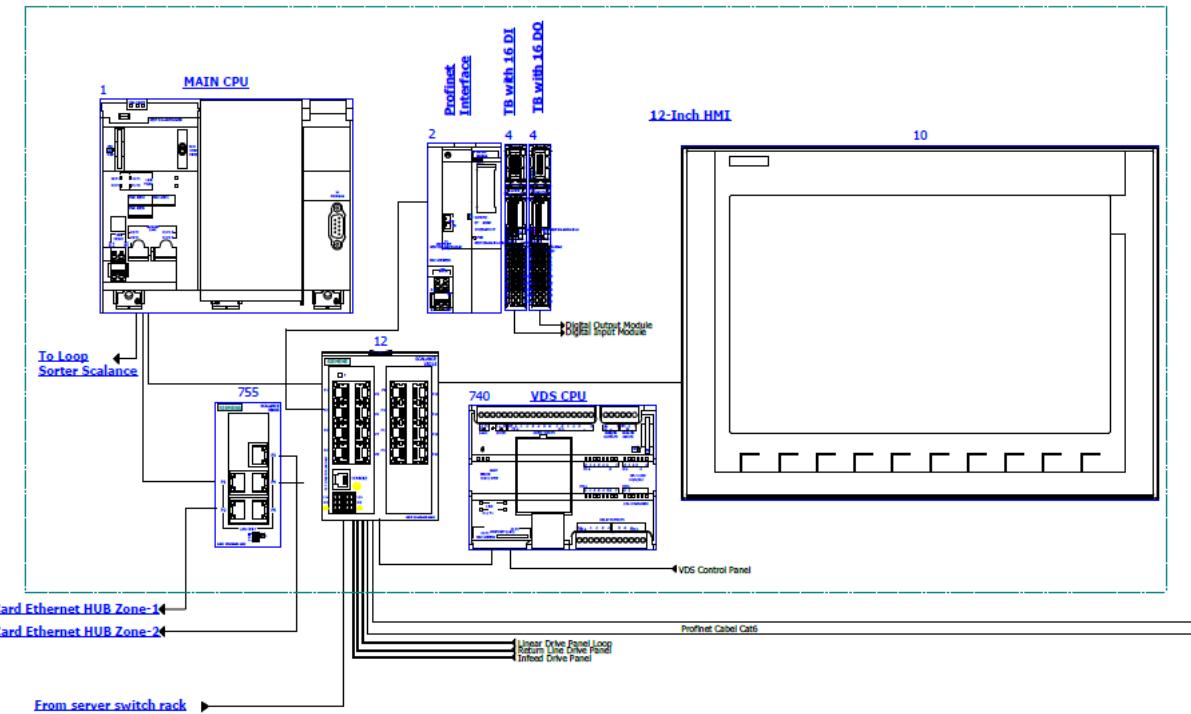
PDP cabinets supply the entire system via secondary cabinets:

- Main Control Cabinet
- Induct Control Panels
- Remote Cabinets for Sorter I/O
- Scanner Control cabinets

11.5 Reference Picture of Power Distribution Panel



11.6 Main Control Panel (Reference)



Engines

Three-phase alternating current motors (Induction) will be used through a frequency converter. The engines will be coupled with a converter to improve consumption and reduce the carbon footprint.

All motors will have appropriate IP ratings

Sensors

The sensors will be supplied, standardized by type, with connector, with a cable length suitable for easy extraction, suitably protected from possible impacts.

Control command

The proposed solution is based on SIEMENS Programmable Logic Controller technology (PLC) platform. The entire system will be logically divided into Zones (Sorter/ Feed Line/ Loop), each managed by a PLC. The planned primary communication protocol is going to be Profinet.

Conveyor interface

The frequency converter of each conveyor allows the acquisition of the signals of the sensors/actuators/GIos associated with it (e.g. conveyor end detection photocells, blockage detection photocells). Each frequency converter will be connected in series by means of the Profinet field bus.

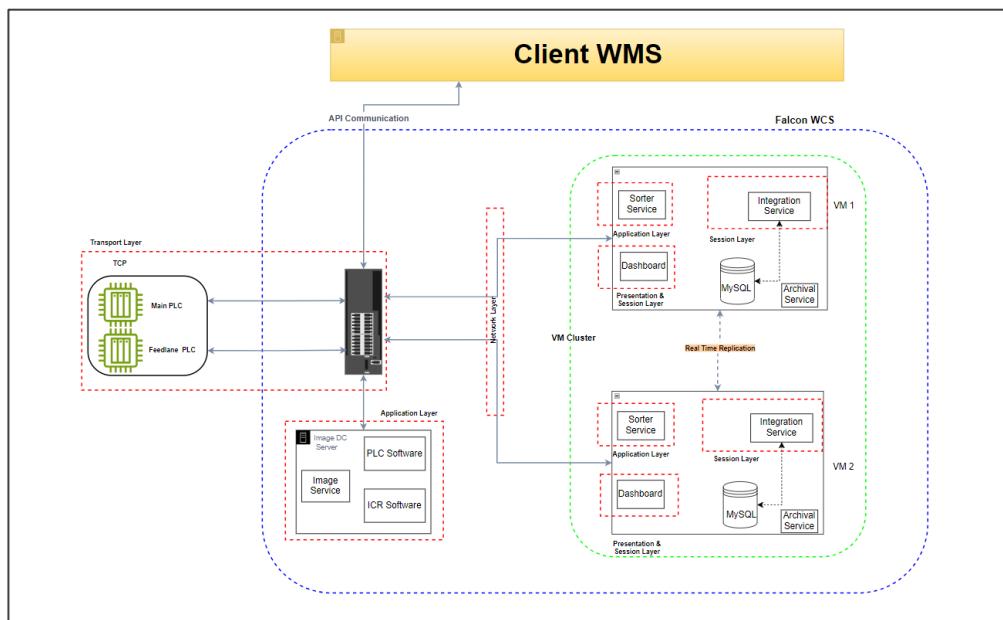
12.Falcon's WCS CONTROLIT

Falcon WCS (Warehouse Control System) is an in-house developed IT solution by Falcon Autotech, serving as the brain behind the company's sortation solutions. It manages the real-time movement of goods and data across the system, ensuring efficient operations in high-throughput warehouses. Falcon WCS integrates seamlessly with Warehouse Management Systems (WMS), Transport Management Systems (TMS), and other external applications via APIs to enhance operational efficiency.

A. System Architecture

High-Level Design (HLD) Overview

The Falcon WCS integrates with external systems like the Warehouse Management System (WMS) and Transport Management System (TMS). Communication occurs via **APIs/WSDL/MQ Communication Protocol etc.** ensuring smooth data flow for order management, shipment tracking, and other critical operations.



Key Components:

- **Presentation and Session Layer:**
 - MySQL Database: Stores operational data, shipment details, and sortation instructions.
 - Sorter Services: Responsible for managing sorting logic and directing parcels to appropriate destinations.
 - Dashboard: Provides a user interface for real-time monitoring of warehouse operations and performance metrics.
 - Integration Services: Handles communication with external systems (e.g., WMS, TMS) and ensures data consistency across platforms.

- **Application Layer:**

- Image Services: Processes and manages images captured during the sortation process.
- ICR Software: Utilizes Image Character Recognition to read parcel labels and identify shipment information.
- PLC Software: Interfaces with Programmable Logic Controllers to manage the physical movement of parcels and control sortation equipment.

- **Transport Layer:**

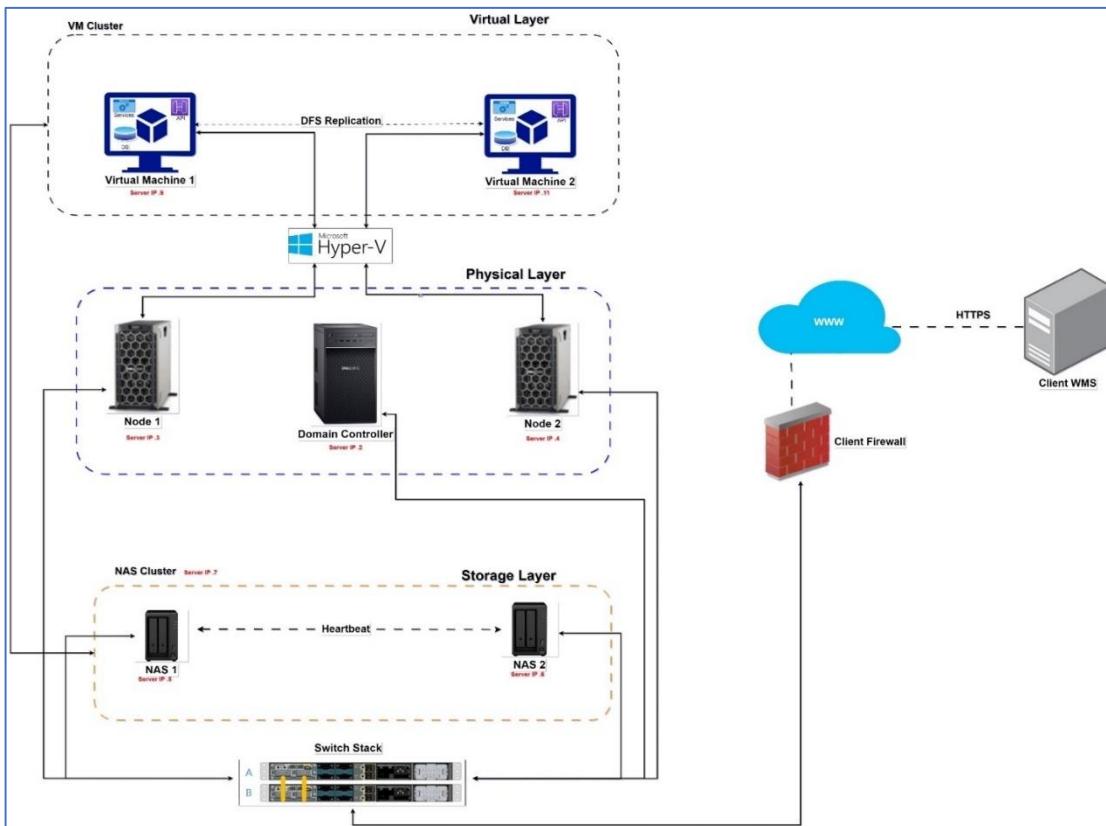
- Sorter PLCs: Receive commands from the session layer (Sorter Services) and execute sorting operations based on real-time data.

- **System Communication:**

All layers are connected via a Stacked Switch, which provides internet and intranet connectivity. Communication between the sortation system and external systems for results or shipment data occurs through this switch.

B. High Availability Architecture

The Falcon WCS architecture ensures uninterrupted operations using a **High Availability (HA) Server setup**. The system is designed to handle both planned and unplanned downtime, providing robust mechanisms for failover, replication, and data redundancy.



Key Components and Features of the High Availability Architecture:

1. Stacked Switch:

- Centralizes data exchange between **NAS, Nodes, Domain Controller (DC)**, and peripherals.
- Analysis packet headers to reduce unnecessary data transmission, enhancing LAN efficiency.

2. Domain Controller:

- **Heartbeat Monitoring:** Tracks the status of nodes and initiates VM failover when necessary.
- **Image Hosting:** Stores and manages images received from the ICR (Image Character Recognition).

3. NAS (Network Attached Storage):

- Centralized data storage providing access to connected devices and Virtual Machines.
- **Redundancy:** Two NAS boxes with mirrored drives ensure data protection and availability, offering a failsafe against hardware failure.

4. Node:

- **Hyper Terminals:** Nodes host and manage Virtual Machines (VMs) to run the warehouse control systems and related applications.
- **Clustering:** Nodes are clustered using **Microsoft Windows Cluster** to enable failover protection, ensuring continuous operation even in case of hardware failure.

5. Virtual Machine & InnoDB Cluster:

- **Primary VM:** Hosts Falcon WCS services, while a secondary backup on the node ensures failover through **Network Load Balancing (NLB)**.
- **InnoDB Cluster:** Ensures data replication using a **Master-Slave-Slave** setup for MySQL databases, maintaining consistency and availability.

6. NAS Cluster:

- **Unified File System:** NAS nodes share files across the cluster, ensuring no data loss during failover or disaster recovery.
- **Backup NAS:** Provides redundancy by replicating data between two NAS boxes, further safeguarding against failures.

Disaster Handling:

- **Recovery Time Objective (RTO) & Data Loss Objective (RPO):**
 - **VM Cluster Failure:** RTO = 1 hour; RPO = 1 hour.
 - **Node Failure:** No impact with a single failure; RTO = 4 hours if both nodes fail.
 - **NAS Failure:** Backup NAS available with no downtime, ensuring continued operation.

C. WCS User Interface

Overview

The Falcon WCS features a robust, user-friendly **Dashboard** that provides real-time visibility into warehouse and sortation operations. The Dashboard serves as the primary interface for monitoring key system metrics, tracking performance, and ensuring smooth operations.

Dashboard Overview

The WCS Dashboard offers real-time data visualization, helping warehouse operators and IT teams make data-driven decisions. Users can monitor system health, performance, and detect anomalies through an intuitive graphical interface.

Key Features of the Dashboard:

1. **System Health Monitoring:** Displays metrics such as CPU utilization, memory usage, disk performance, and system load across the infrastructure.
2. **Real-Time Sortation Monitoring:** Shows the real-time movement of parcels within the sortation system, including chute assignments and shipment statuses.
3. **Error Reporting:** Notifies users of system errors, network disruptions, and potential failures in real-time, allowing for quick resolution and minimal downtime.
4. **Performance Metrics:** Provides detailed reports on sortation throughput, parcel handling times, and system efficiency to ensure that warehouse targets are met.
5. **User Role Management:** The dashboard allows different levels of access based on user roles, ensuring that the right personnel can view or manage the system as needed.

In the context of this IT dashboard, the following user interactive screens are provided

- **Dashboard (Home Screen):** Provides an overview of important metrics, data visualizations, and summary information related to the IT system or processes.



Figure 1 Dashboard

- Live Bags:** Displays real-time information and status updates regarding bags or parcels currently in transit or being processed.

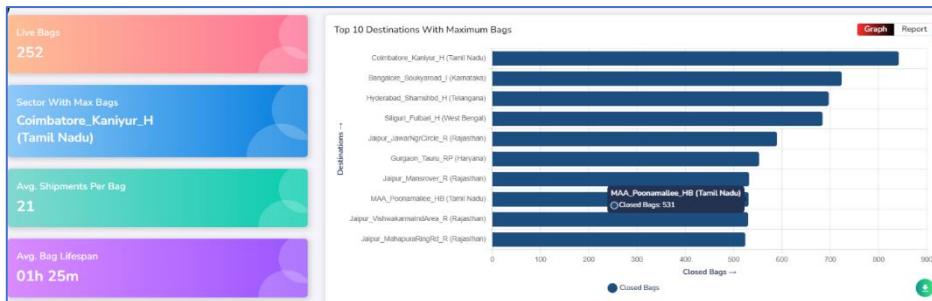


Figure 2 Live Bags

- Bay Status:** Offers insights into the status and availability of different processing bays or areas within the system.

Bay Status					
Search Keywords Here...					
BAY ID	BAY STATUS	BAY TYPE	BAGGING MODE	SHIPMENTS SORTED IN BAY	
Bay-1	ACTIVE	REGULAR	DIRECT	0	
Bay-2	ACTIVE	REGULAR	DIRECT	0	
Bay-3	ACTIVE	REGULAR	DIRECT	0	
Bay-4	ACTIVE	REGULAR	DIRECT	0	
Bay-5	ACTIVE	REGULAR	PTL	19	
Bay-6	ACTIVE	REGULAR	DIRECT	0	
Bay-7	ACTIVE	REGULAR	PTL	27	
Bay-8	ACTIVE	REGULAR	PTL	7	
Bay-9	ACTIVE	REGULAR	PTL	4	
Bay-10	ACTIVE	UNMAPPED	DIRECT	0	

Figure 3 Bay Status

- Processed Packages:** Shows details and statistics related to packages or items that have been successfully processed or handled by the system.

The screenshot shows a search interface titled 'Search Processed Packages'. It includes fields for 'Start Date' (3/2/2023), 'End Date' (3/2/2023), 'Start Time' (13:36), 'End Time' (13:51), 'AWB Number' (Enter AWB Number Here...), 'Package ID' (Enter Package ID Here...), 'Package Status' (All), and 'Scanning Mode' (All). A red 'Search' button is at the bottom right. Below the search bar is a table titled 'All Processed Packages' with columns: PACKAGE AWB, PACKAGE ID, BARCODES SCANNED, SCANNING MODE, INDUCTED LANE, BAY NUMBER, SORTING ERROR INFO, STATUS, PACKAGE LENGTH, and PACKAGE. The table lists several entries with details like AU, F2, Bay 45, ACC, SUCCESS, 32.4, 28.1, etc.

Figure 4 Processed Package

- Configuration Setting:** Enables users to configure and customize various settings and parameters within the IT system or dashboard.

The screenshot shows a 'NDC Management' tab in a dashboard. It has tabs for 'NDC Management' (selected), 'Config Settings', 'RTVC Mode', and 'Regex Pattern'. Under 'NDC Management', there is a 'Check NDC Code' section with an 'NDC Code' input field (Enter NDC Code Here...) and a 'Check NDC Code' button. To the right is an 'Upload NDC' section with a 'Select a file to upload or drag and drop it here' input area and a 'Sample Txt' button.

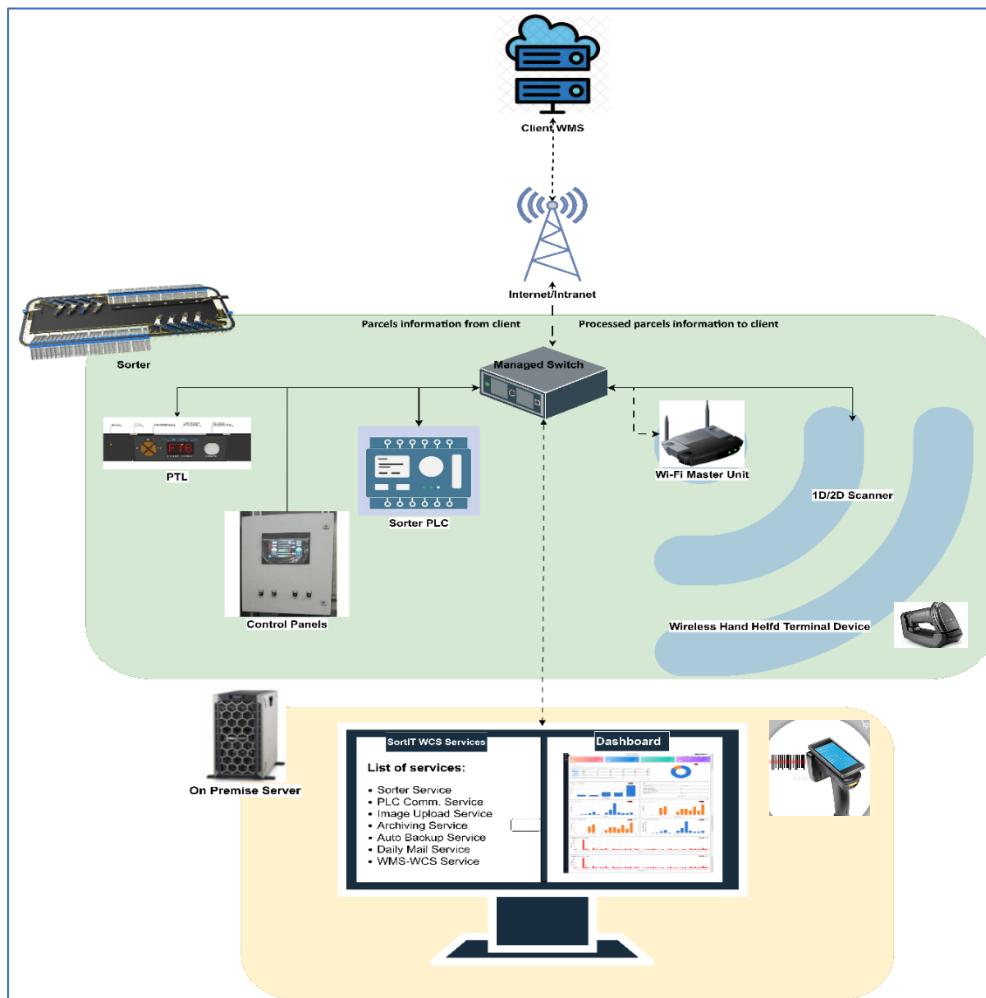
Figure 5 Configuration Settings

- Report & Analysis:** Allows users to generate and access comprehensive reports, analytics, and insights based on the data collected by the IT dashboard.
- Rejection Bay Mapping:** Provides functionality to map and manage rejection bays or areas where packages are deemed unsuitable for processing.
- Alarms:** Displays alerts, notifications, or alarms related to system events, errors, or anomalies that require attention or investigation.
- Calibration Settings:** Allows users to adjust and calibrate system settings, parameters, or sensors to ensure accurate and reliable performance.
- Operator Management:** Offers features and tools to manage and monitor the operators or personnel responsible for operating the IT system.
- User Management:** Provides functionality to manage user accounts, permissions, roles, and access levels within the IT dashboard.
- User Guide:** The "User Guide" page offers comprehensive documentation and instructions on how to use the IT dashboard effectively. It serves as a reference guide for users.

D. Communication Architecture

Overview

Falcon WCS operates within a highly interconnected system, ensuring seamless communication between the WCS server, on-premises devices (such as Sorter PLCs, PTL devices, 1D scanners, and HHT devices), and client systems. This communication architecture facilitates real-time data exchange and operational control, optimizing sortation processes and warehouse efficiency.



On-Premises Communication

Sorter PLC Devices:

- **Protocol:** Falcon WCS communicates with Sorter PLCs using either the **Siemens S7** protocol or the **Omron communication** protocol.
- **Functionality:** The Sorter PLC devices receive sortation instructions from the WCS and execute the sorting process by directing parcels to the appropriate chute based on the system's real-time data.

PTL (Pick-to-Light) Devices:

- **Protocol:** PTL devices communicate with Falcon WCS using the **TCP/IP protocol**.

- **Functionality:** The system sends commands to the PTL devices for guiding manual picking operations by lighting up indicators at the appropriate bins or shelves, improving operational accuracy and speed.

1D Scanners:

- **Protocol:** These barcode scanners also use the **TCP/IP protocol** to communicate with the WCS.
- **Functionality:** The scanners capture barcode data from the parcels, and this information is sent to the WCS for processing, such as determining sorting destinations.

HHT (Handheld Terminal) Devices:

- **Protocol:** The wireless **HHT devices** communicate with Falcon WCS over **Wi-Fi**.
- **Functionality:**
 - The HHT devices send scan input data (e.g., barcodes) to the server over Wi-Fi.
 - The WCS processes this data and sends the required output instructions back to the HHT device and associated PTL devices.
 - The HHT device executes these instructions, facilitating real-time decision-making and execution for operators.

E. Client Communication

Data Transfer Methods:

- **API:** Falcon WCS can communicate processed data to client systems through **API** calls, allowing for seamless integration with external software.
- **MQ (Message Queuing):** Falcon WCS can also send data via **message queues**, ensuring reliable delivery of messages even during network downtime.
- **WSDL/XML:** For structured data exchanges, Falcon WCS supports **WSDL** and **XML** formats for client communication.
- **Other Protocols:** Additional methods for data transfer may include customized protocols depending on client requirements.

Purpose:

- The data sent to the client can include sortation results, system performance reports, and operational analytics, which can be used for further processing or reporting within external systems like **Warehouse Management Systems (WMS)** and **Transport Management Systems (TMS)**.

F. HAA Server Specifications (In Dnata's Scope)

SN	Description	Qty
20Core Config with 128 GB RAM in T440 and 64 GB RAM in T40		
1	Synology_storage_DS723+ 2.6 GHz AMD Ryzen R1600 Dual-Core, 2 x Gigabit Ethernet Ports, 2GB ECC DDR4 RAM, 2 x 3.5/2.5" Bays 2 x M.2 2280 Slots E10G22-T1-Mini 10GbE RJ-45 network upgrade module for compact Synology servers.	2
2	Dell Tower Model T440 -PowerEdge T440 Xeon Gold 6148 2.4GHz/20C/27.5MB/150 W 16 DIMMS 4 x32GB RDIMM Up to 8 3.5"" Hot Plug Hard Drives Tower Configuration 2 x 1.2TB 10K RPM SAS 12Gbps 512n 2.5in	2
	Hot-plug Hard Drive PERC H750 Adapter Full Height 8GB Cache Dual Hot-plug PS495W iDRAC9Enterprise 3YR ProSupport Next Business Day Onsite/Dual Port Lan	
3	Dell PowerEdge T40 Intel Xeon E-2224G Processor 3.5GHz 8M Cache,4C/4T,Turbo,71W,TPM, 4*16 GB RAM (4 DIMM), 2x1TB SATA 3.5" 7.2k rpm HDD (3 Bay), 1Gbe LOM ,DVD Writer, Onboard RAID 01, Inbuilt PSU Standard (Max 1), 3	1
	Year Onsite NBD,480 GB SSD,1 Gbe Dual Lan Card Extra	
4	Windows Server 2019	3
5	Monitor	1
6	KVM Switch	1
7	Mouse	1
8	Keyboard	1
9	Lan Cable	10
10	Power Cable	8
11	VGA Cable	1
12	42 AC Server Rack	1
13	Net-gear 24 Port Giga Switch	2
14	2 TB SSD Micron	4
15	DP to VGA Convertor Cadyce Brand	1

Below pointers to be taken care by Dnata for Servers-

- Dnata should provide servers with the server operating system (OS) pre-installed (Windows Server 2019/2022).
- For optimal performance and reliability, we strongly recommend setting up Virtual Machines (VMs) over reputed VM software's like Hyper-V/VMWare etc. This will enable automatic failover, ensuring high availability and minimizing downtime in case of any issues with the primary server.
- Detailed architecture is mentioned in Server Architecture Document
By providing a server with the OS and VMs configured, the deployment process will be more seamless, and Falcon team can focus on deploying WCS within minimal timelines.

13. Falcon's Visual Inspection System (SCADA)

SCADA stands for Supervisory Control and Data Acquisition. It is a system of hardware and software components that allows for remote monitoring, control, and data acquisition of industrial processes or facilities.

The Visualization system provided by FALCON (or SCADA) allows the monitoring and control of the different systems delivered for the Dnata Dubai Hub. This SCADA system receives from each monitored sub-system all information on their operating status in real time.

At the system monitoring level, the functions performed are:

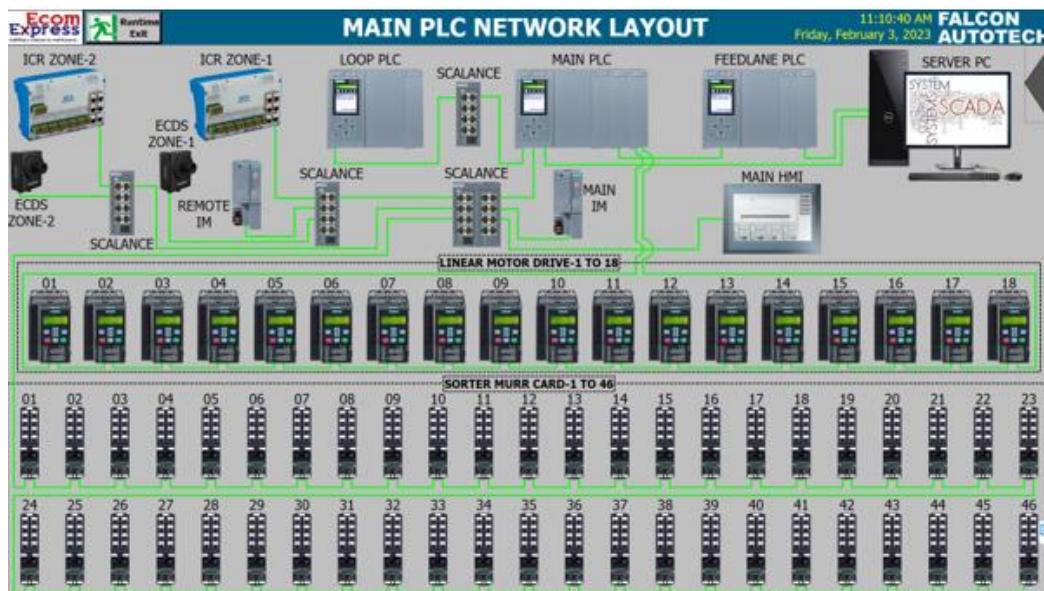
- Field data acquisition.
- Animated visualization of equipment.
- Representation of the operating mode of the system (nominal, contingency, etc.).
- Alarm management.
- Alarm history management.
- Diagnostic help.
- Failure detection.
- Equipment control.
- Statistics on equipment operation.
- Historical Statistical Report.
- Recording and archiving.
- Safety operator interface.

12.1 Field Data Acquisition

The field data acquisition function is performed by the SCADA system connected to the sorters' PLCs.

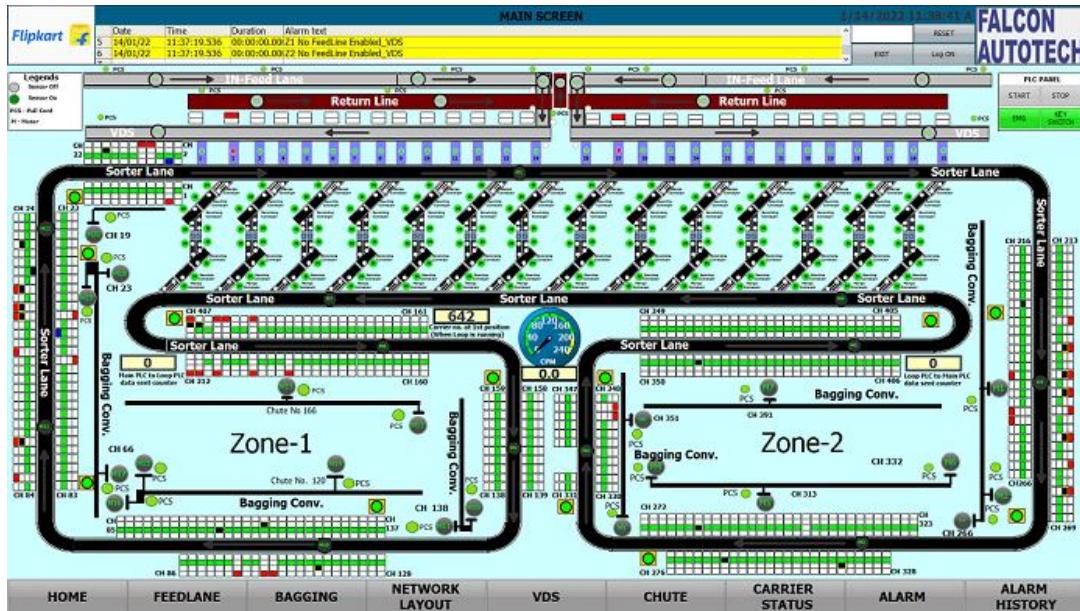
The communication with the PLCs is done using equipped CPU cards that are able to manage the communication with the PLC on the Industrial Ethernet network, without overloading the server.

The acquisition of signals from external systems is carried out via the PLC, using dry contacts.

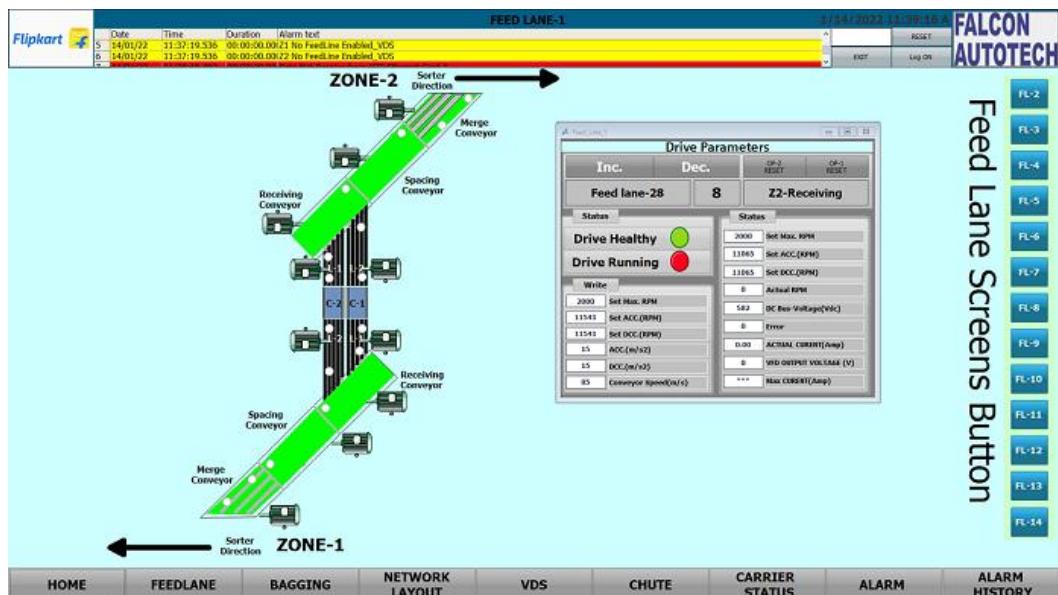


12.2 Animated system visualization

The animated view represents the dynamic graphical user interface that allows real-time monitoring of the controlled systems and the execution of their control procedures. The various states of the digital signals are displayed on the screen by graphic symbols. All views are web based with responsive capabilities when required so that various devices can be used to display status and information on PC. The types of information that can be displayed on each type of device will be discussed during the design phase of the project.



Example of Synoptic View



12.3 Alarm management

The alarm pages display a series of information to identify the nature of the alarm or event, the elements involved and the time.

The alarm management includes:

- The Alarm name.
- The date on which the above-mentioned alarm was activated.
- The moment the alarm goes off.
- The date on which the alarm is activated again.
- The moment the alarm is activated again.
- The sub-system that activated the alarm.
- The area where the alarm was triggered.
- The name of the beacon that activated the alarm.
- The alarm state.
- The alarm value.
- A complete alarm description.

The historical data of each alarm is stored in the SCADA database. This type of fault detected includes:

- ✓ Sensors.
- ✓ Drive Fault.
- ✓ Lack of monitored equipment.
- ✓ Etc.

ECOM Express **Runtimes** **Exit**

11:09:39 AM **FALCON**
Friday, February 3, 2023 **AUTOTECH**

ALARMS					
Alarm Class	No.	Time	Date	Status	Alarm Name
BAG_SORTER_ALARM	3217	11:07:24 AM	2/3/2023	I	BAG SORTER-1 STRAIGHT FL HS SOCKET ERROR--
BAG_SORTER_ALARM	3265	11:07:24 AM	2/3/2023	I	BAG SORTER-1 ANGULAR FL HAND SCANNER SOCKET ERROR--
FEEDLINE	1918	11:07:43 AM	2/3/2023	I	Feedline Stop Due to Power Save Mode
FEEDLINE	1897	11:07:43 AM	2/3/2023	I	FL_CKT TCP_Error
FEEDLINE	1898	11:07:43 AM	2/3/2023	I	FL_TCP_Disconnect_Error
FEEDLINE	1672	11:07:43 AM	2/3/2023	I	Feedline Stop Due to Power Save Mode
FEEDLINE	1626	11:07:43 AM	2/3/2023	I	Key Switch Off Error
FEEDLINE	1549	11:07:43 AM	2/3/2023	I	Feedline Stop Due to Power Save Mode
FEEDLINE	1528	11:07:43 AM	2/3/2023	I	FL_CKT.TCP_Error
FEEDLINE	1529	11:07:43 AM	2/3/2023	I	FL_TCP_Disconnect_Error
FEEDLINE	1426	11:07:43 AM	2/3/2023	I	Feedline Stop Due to Power Save Mode
FEEDLINE	1405	11:07:43 AM	2/3/2023	I	FL_CKT TCP_Error
FEEDLINE	1406	11:07:43 AM	2/3/2023	I	FL_TCP_Disconnect_Error
FEEDLINE	1303	11:07:43 AM	2/3/2023	I	Feedline Stop Due to Power Save Mode
FEEDLINE	1180	11:07:43 AM	2/3/2023	I	Feedline Stop Due to Power Save Mode
FEEDLINE	1134	11:07:43 AM	2/3/2023	I	Key Switch Off Error
BAGGING_ALARM	3829	11:07:24 AM	2/3/2023	I	Bagging Conveyor_MurrCardNode_101 Error_Zone2...

Sample Alarm History Screen

14.Key Components Make

Items	Make
Belts	Forbo/ Derco/ Habasit
ULD handling System	Lodige Industries
Rollers	Falcon
Feed Line Motors	Induction Motors – SEW/ Lenze
Volume Scanners	SICK/ Cognex/ Similar
Barcode Scanners	SICK/ Cognex/ Similar
Weighing Scales	Bizerba/ Mettler Toledo
Encoders	SICK
Sensors	Sick/Leuze/ P&F
PLC	Siemens
Control Panels	Rittal/ BCH
VFDs	Siemens/Lenze/ AB/ Omron
Cables	LAPP/ Equivalent
Switch Gear	Schenider/Equivalent
Bearings	NTN/SKF
Power Transmission Systems	Vahle
HMI	Siemens

15.Principle of Safety

E-stops, pull cords and safety fencing will be provided in the system as per Falcon Standards.

a. E-Stops



b. Pull Cords Switch-



16. Infrastructure

16.1 Fire Protection-

Falcon's scope does not cover the design or provision of fire protection infrastructure, utilities, or related services. It is expected that the customer's sprinkler contractor will design and supply the in-rack sprinkler systems, including connectors and mounting brackets. These designs should be submitted to Falcon for review during the engineering phase.

Falcon will work in coordination with the chosen sprinkler supplier to determine the appropriate locations for the sprinklers and brackets. Modifications may be required to meet local fire safety regulations, which could influence storage capacity, timelines, and costs. Any additional sprinkler systems that might affect the overall design must also undergo review.

16.2 Power Supply-

The Customer must provide temporary power for installation and permanent power for commissioning. Protected multi-gang power points for workstations and peripherals will be supplied by the Customer, with planning for their locations done with the operations and IT teams.

16.3 Floor Requirements-

The Customer must provide flooring with appropriate loading strength and space at the site. Falcon assumes that the floor slab will not contain corrosive materials that could affect standard fixings.

16.4 Estimated Floor Load-

Estimated floor loads, including distributed and point loads, will be provided during the detailed engineering phase of the project.

16.5 Staging, Laydown and Assembly Area-

The Customer is required to provide sufficient space on the same floor, adjacent to the installation site, for staging, storage, and equipment assembly. If such space is unavailable, offsite locations or areas on different floors may be utilized; however, any related costs, including additional handling or transportation, will be the Customer's responsibility. This may also result in adjustments to the project timeline. Falcon will specify the necessary requirements for these areas during the design phase as part of overall project planning and coordination.

16.6 Site Access and Unloading-

The Customer is required to allocate sufficient on-site space for parking and staging shipping containers to facilitate Falcon's delivery schedule.

Additionally, the Customer is responsible for ensuring proper access to the building for equipment unloading, including providing enough functional dock levellers on all floors during installation. It is expected that access to the site and installation areas will remain unobstructed and available around the clock, as needed, to support project operations.

16.7 Lightning-

All lighting is excluded from Falcon's scope of supply and must be provided by the Customer or their contractor. This includes lighting for service areas, operational areas, and beneath platforms and walkways.

17. Program Organisation

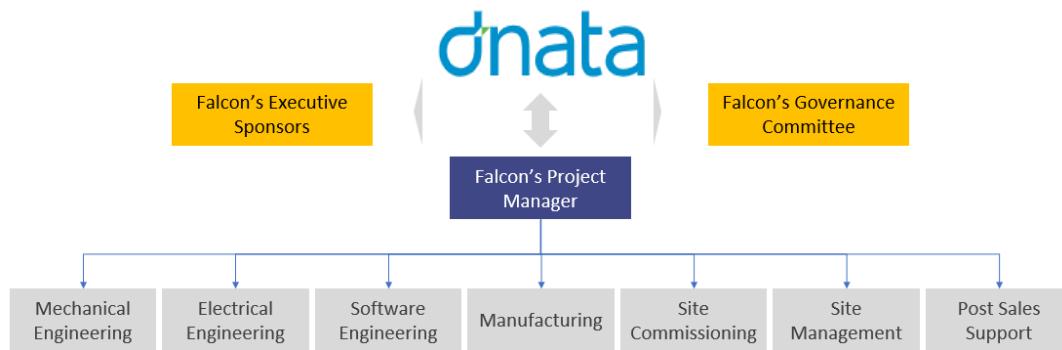
a. Project Management

For this program, proposed approach covers the following aspects:

1. Creation and monitoring of the project plan.
2. Weekly/Fortnightly Meeting Dnata to share the Project Status.
3. Scheduling resource management.
4. Management of risks and opportunities.
5. Management of the list of anomalies or reservations.

b. Project Team

Team of 3 to 4 member from Projects team will co-ordinate on regular basis with Dnata and Internal stakeholders for smooth execution of the project.



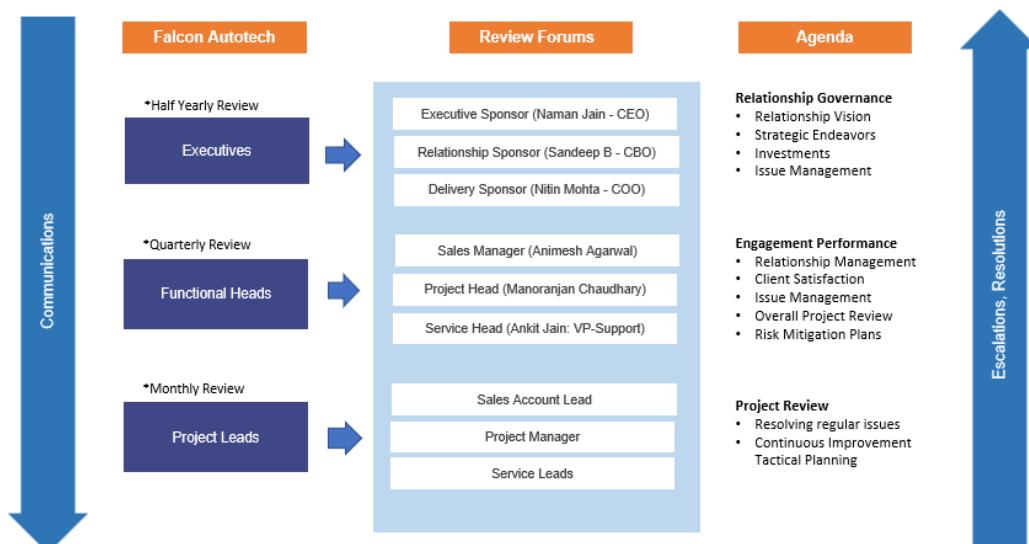
Falcon Project Manager is overseen and supported by Executive Sponsors. The Project Manager leads a multi-disciplinary team of members from all Falcon departments necessary to deliver the project, as shown in the diagram above.

c. Program and Account Management

The Project will be closely monitored under Falcon's Governance model as structured below.

Governance Model

Building strong customer relationship foundations on trust, transparency & communication



d. Program/ Project Schedule

Ex-Works 30 weeks. 6-8 Weeks Installation and Commissioning.

A detailed Program schedule will be shared along with the techno-commercial offer.

18.Dnata Responsibility

Dnata's Responsibilities During the Assembly and Commissioning Phase

- Provision of the site complex and office area facilities.
- Free provision, during the installation phase, of the power supply necessary for the installation activities (estimated at 20 kW).
- Provision, during the commissioning phase, of the power supply necessary for the operation of the shipmentsorting system free of charge at the date of FALCON need.
- Provision of the IT system functionality in accordance with the specification at the date of FALCON need.
- The customer is responsible for a safe working environment.
- The customer decides for the working area(s) to be protected against direct weather influences.
- The customer provides adequate lighting, heating, and ventilation to create a normal working environment.
- The cost of temporary storage that may be required (other than in the immediate vicinity of the installationsite) is not included in the scope of delivery of this quotation. This also applies to temporary storage that may be required because materials are ready for delivery (in accordance with the schedule) but cannot be delivered due to hold-ups on the customer's side.
- The customer is responsible for the demarcation of aisles and danger zones with floor paint.

Responsibilities of Dnata During the Tests

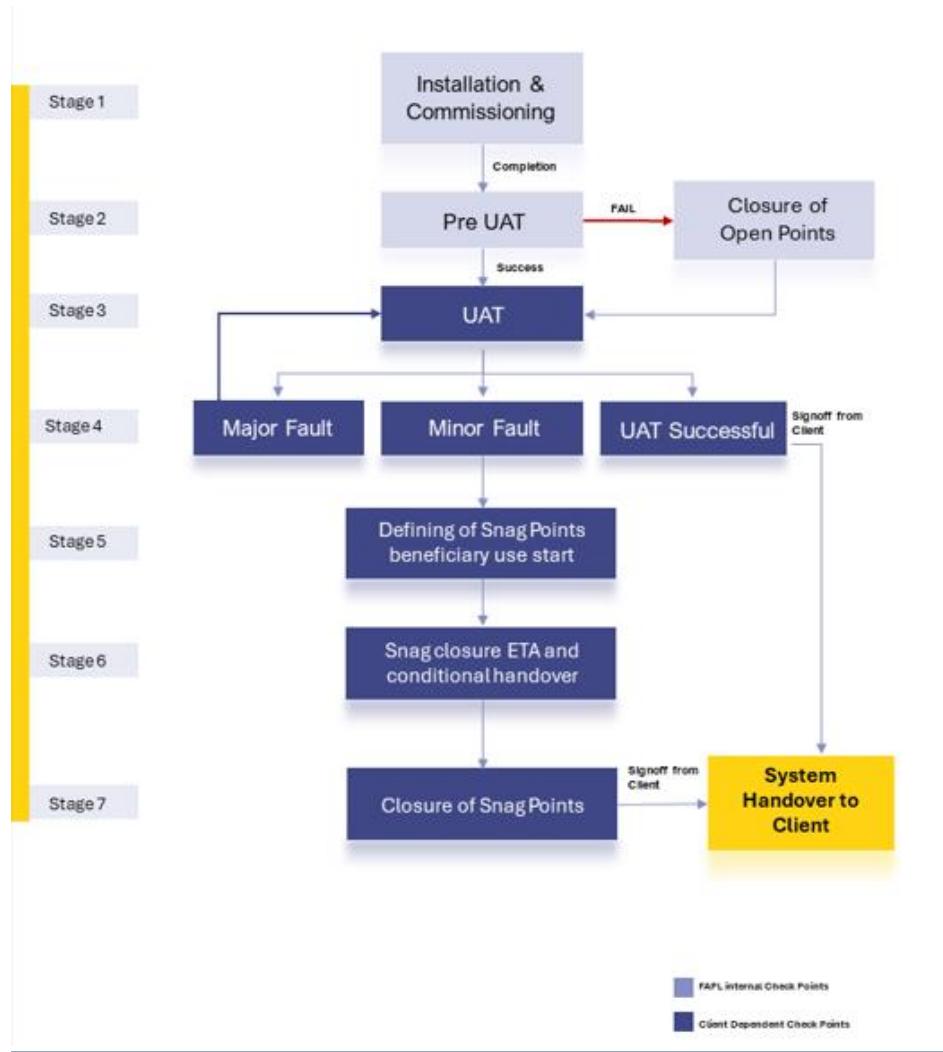
- Provision of the test loads and barcode labels required for the tests.
- Provision of personnel required for test activities (loading and unloading operations).
- Provision of the necessary information to sort the shipments correctly.
- Verify with Falcon the quality and conformity of the test loads (labels, cartons).
- Will need to provide the necessary staff to collect information on the tests and to verify and confirm test results with Falcon.

Dnata Responsibilities During the Training

- Free from their usual work, the employees participate in the training for the duration of the training.
- Provision of a list of participants for each available training course 3 days before the start of the course.
- Provision of a classroom equipped with a whiteboard, video projector, projection screen, and enough space for desks or tables and chairs for the trainer and trained staff.
- Check the prerequisites of the people who have to follow the training, e.g. the qualifications of the technical staff.
- The invitation of staff to attend the training courses will be at the expense of DNATA.

19. System Testing

The system handover will be following the shown below workflow. Each of the stages are defined in the document below.



Installation and Commissioning

Completion of all the activities to get the system up and running.

Pre-UAT

Pre-UAT (User Acceptance Testing) involves a series of preparatory steps and tests conducted before the formal UAT phase begins. This stage ensures that the system is ready for end-user testing and meets the necessary requirements and standards. Below are some key checks of Pre UAT:

- Physical Verification:** Ensure all functional and non-functional requirements are clearly defined and understood. Verify that all the necessary specifications for the sorting system are documented.

- **Integration Testing:** Conduct integration tests to ensure all components (conveyors, scanners, sorters, control systems, etc.) work together seamlessly. Validate the interfaces between the sorting system and other warehouse management systems (WMS) and databases.
- **Performance Testing:** Test the system's performance with some dummy product to ensure it can handle the expected volume of parcels or items. This test also done to identify and rectify any performance bottlenecks or inefficiencies.
- **Functional Testing:** Execute test cases to verify that the system performs all required functions correctly. Include scenarios for different types of products, error handling, and edge cases.

By thoroughly conducting pre-UAT activities, Falcon team will ensure that the system is stable, efficient, and ready for the formal UAT phase, where end-users can validate its functionality and performance in a real-world scenario.

UAT (User Acceptance Test)

User Acceptance Testing (UAT) for a Cross Belt Sorter System is the final phase in the implementation process where the end users test the system to ensure it meets their requirements and works as expected in a real-world scenario

Falcon will provide the UAT Plan to Client prior to the commencement of any tests. The UAT will include the following:

- Test prerequisites.
- Daily plan/schedule
- Personnel responsibilities
- Dashboard data and test loads required.
- Specific test procedures
- Expected test results.

User Acceptance Test Parameters

Below are the parameters/test to be done at site during the UAT:

- Sorter Throughput Test
- Sorter Accuracy Test
- Barcode Reading Test

**SOP for all tests will be shared during DAP stage. In case client require sample SOP for review, same will be shared during contract finalisation stage also.*

Note: In conducting this evaluation/UAT, Falcon team adhere to its Standard Operating Procedure

Minor & Major Faults

Any faults encountered during Testing will be categorized by Falcon as either Minor or Major faults as defined below.

- **Minor Faults** are defined as those affecting a limited area or single component that has no impact on the test. Minor Faults will be added to the System Snag point list and will not inhibit the continuation of testing.

- **Major Faults** are defined as those having impact that result in the inability to demonstrate the subject functionality. Major Faults may require re-starting of the test.

System Snag Point

Once the UAT completed, all the minor faults will be considered as snag points. Falcon team will publish Snag Point List information to the client.

System Snag Point list information will include the following:

1. Issue.
2. Date identified.
3. Area and/or unit.
4. Category (mechanical, electrical, or software).
5. Remedy responsibility (responsible person[s] or organization[s]).
6. Target completion date.
7. Snag point completion verification and signoff.

Once the snag point list information's shared with client, client can start the beneficiary use of system and also Client needs to sign off on Start of System Warranty and conditional handover.

Practice for Snag Point Sign Off:

1. Falcon personnel will maintain and distribute the System Sang List throughout UAT.
2. As each issue is corrected, Client will verify the resolution and provide sign-off for that issue on the System Snag Point List.

System Handover Letter

After successful completion of Acceptance Testing or closure of all snags, Falcon will furnish Client a letter, which will address the following:

- The subject System has been installed and accepted by Client.
- The final payment amount that is required and the designated due date.

20.Training

Training for the recently installed material handling system at Dnata's facility is an integral part of the implementation process. Falcon employs a business-linked learning approach in the design, development, delivery, and evaluation of its training programs.

Falcon adheres to a well-defined process tailored to create learning content specific to Dnata's installation and application of their systems.

i. Operations Training

System Operations Training is provided to offer participants an understanding of their area from an operational perspective. Falcon targets critical operations in the assigned functional area, covering flow control, system operation, and control devices. Discussions also emphasize the impact of individual and area performance on upstream and downstream workers.

ii. Maintenance Training

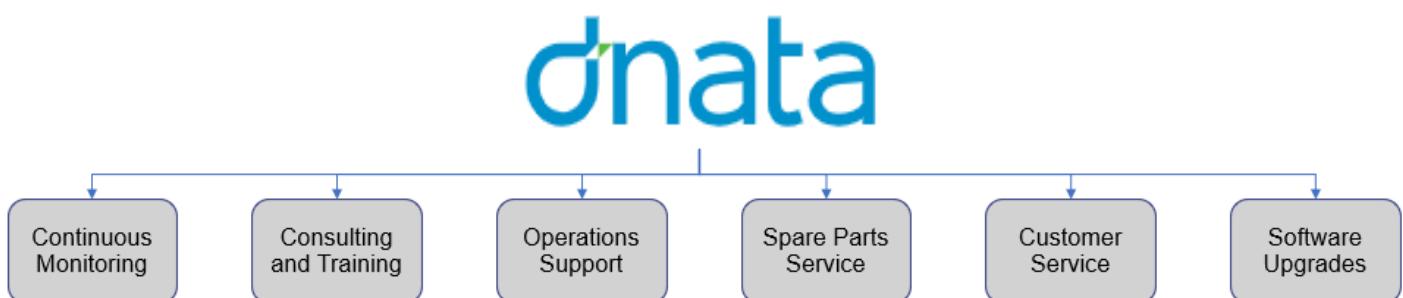
The Maintenance Training curriculum encompasses mechanical, electrical, and controls aspects of the installed system. Topics include safety, system construction and installation, system operation, maintenance and repair procedures, and technical documentation.

Falcon recommends assigning personnel responsible for system maintenance to work with the installation and commissioning crews during their final weeks on-site. Formal training courses for maintenance personnel will be conducted before system startup, featuring classroom lectures, audio-visual presentations, and hands-on demonstrations with the installed system. Site tours will be organized to highlight common operational issues affecting system uptime.

iii. Information System Training

Information System training covers the computer hardware and software aspects of the Automated Material Handling System.

21.Service Support



Benefits of Falcon's Service and Support Plan:

- 24X7 Online Support from Falcon's global central team
- Critical Spares are supplied and retained on-site to ensure continuity and productivity
- Maintenance support from Falcon-trained partner technicians
- Proactive planning to minimise downtime with preventative maintenance and anticipation of future needs through ongoing operational assessments
- Optimise system uptime, continuity of throughput and production efficiency

- **Warranty**

The system will be covered under standard **1-year comprehensive warranty**.

- **Supply and management of spare parts.**

On completion of the DAP, when the configuration will be finalized a final and detailed list, which will be extended to include all spare and wear parts, will be presented to Dnata. To maintain the required uptime spares will be maintained at site.

- **Spares Depot**

Falcon has spares depot in Riyadh and on-site spares will be replenished from this common pool.

- **On Site Support**

To adhere to the required System uptime, dedicated on- site team should be available at site covering all shifts. Falcon proposes that on site team to be on Dnata's Payroll, trained by Falcon.

- **Hotline Support**

The hotline service access is available 24 X 7. The main function is to dispatch the call to the proper qualified engineer for immediate answer. If the Falcon qualified engineer is not available, the call is transferred to a back-up qualified engineer and finally an answering machine. In the last case, the Dnata personnel shall be contacted within the time frame described in the service level. The Falcon qualified engineer will support Dnata maintenance personnel by using a remote access (via VPN) to the equipment/systems.

22. System Maintenance

22.1 Daily Check-

Detailed maintenance scheduled will be shared with Dnata and daily checks to be performed by the site technicians.

22.2 Preventive Maintenance

Regular preventative maintenance as per schedule will be conducted systematically throughout the system. Site technicians will manage all operational tasks and preventive maintenance for covered items, with additional assistance from Falcon trained local partner technicians.

22.3 Corrective Maintenance

Corrective maintenance will be performed in conjunction with preventive maintenance activities. Any required corrective actions will be communicated to Dnata for approval prior to execution, and scheduling will be coordinated accordingly. Charges will apply for any parts needed for corrective maintenance that are not covered by warranty.

23. Warranty Period

Falcon offers Comprehensive warranty for 1 year (Starts from the date of beneficiary use). After Warranty year another 2 years are covered under AMC and 24x7 Hotline.

The warranty covers the following support:

- 24 X 7 Telephonic, Email and Remote Service Support when required.
- Regular Software updates and Bug Fixes.
- Supply of Mechanical and Electrical components in case of failure (excluding damages as mentioned in the Exclusion Clause)

The warranty does not apply to the replacement or repair of:

- Normal wear and tear.
- Consumables.
- Faulty articles continued:
 - Failure to comply with the manufacturer's recommendations (logistics documentation, Technical Information Note, retrofit document) and the rules of the trade.
 - Negligence or abnormal use of equipment.
 - Anomalies produced by an environment of use, storage or transport that does not comply with the specifications or recommendations of Falcon: packaging, temperature, hygrometry, sector, insulation, etc.
 - A defect due to a cause external to the supplies and services of Falcon.
- Equipment other than that is supplied by Falcon.
- Items that can be repaired exclusively by Falcon that have been repaired or attempted repairs other than those carried out by Falcon.
- Items that fail due to normal wear and tear of one or more of its components or whose tamper-evident seals (varnish, strip, etc.) have been broken or whose serial numbers have been removed or modified.

24.Exclusions

The scope of supply includes all parts which are defined in the Supplier's quotation.

All other parts which are not defined in the Supplier's quotation do not belong to the Supplier's scope of supply and are excluded. The following parts are also excluded:

- **Server PC**
- **X-Ray Machines**
- **Mobile Carts**
- **Construction Power**
- **Steel Works- If not specified**
- **Collection Bins**
- **Fans at chutes & inducts**
- **Lightning**
- **Irregular's Provision**
- Building infrastructure; building structure, doors, fire exits, levelling devices, building extinguisher and fire alarm system, building heating and lighting system.
- Electrical power supply and wiring to the main control cabinets.
- UPS for Controls and Drives
- Network Cabling up to the Main Server Rack
- Intermediate wiring to parts which are to be supplied by the Purchaser/others.
- Emergency/Uninterruptable power supply
- Fire-alarm and fire protection devices.
- Traffic and route markings
- Unloading and Laydown Area
- Ram protection devices
- Cat walks, bridges, maintenance aisles and platforms
- Assembly tools like forklifts and hoisting machines
- All kind of network incl. Local Area Network (LAN/WLAN), exceeding the scope described in Scope of Supply
- Any Kind of Civil work
- Any adjustment of the Supplier's scope of supply to local rules and regulations
- X-Ray machines
- Roller cages/ Pallets
- Simulation and 3D animation of the sorter system
- Interface with other equipment not specified in this offer.
- Provision of facilities for the control room (furniture, air conditioning, heating, etc.).
- The supply and installation of fencing around the different corridors.
- Any item specifically indicated as not forming part of the subject matter of the Seller's supply in the offer documentation.