



FALCON's Proposal to Saudi Post for the Supply of Dual Deck Cross Belt Sorter (Phase 1 & Phase 2)

September 3, 2025

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



Kind Attention –

Mr. Abdullah F. AlDalgan

M/s Saudi Post Logistics

Offer Ref: F25-00254; Date: 03-09-2025

Subject – Techno -Commercial Offer for Sortation System (Phase 1 & Phase 2)

We are pleased to submit our Techno-Commercial Offer in response to your RFP.

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.

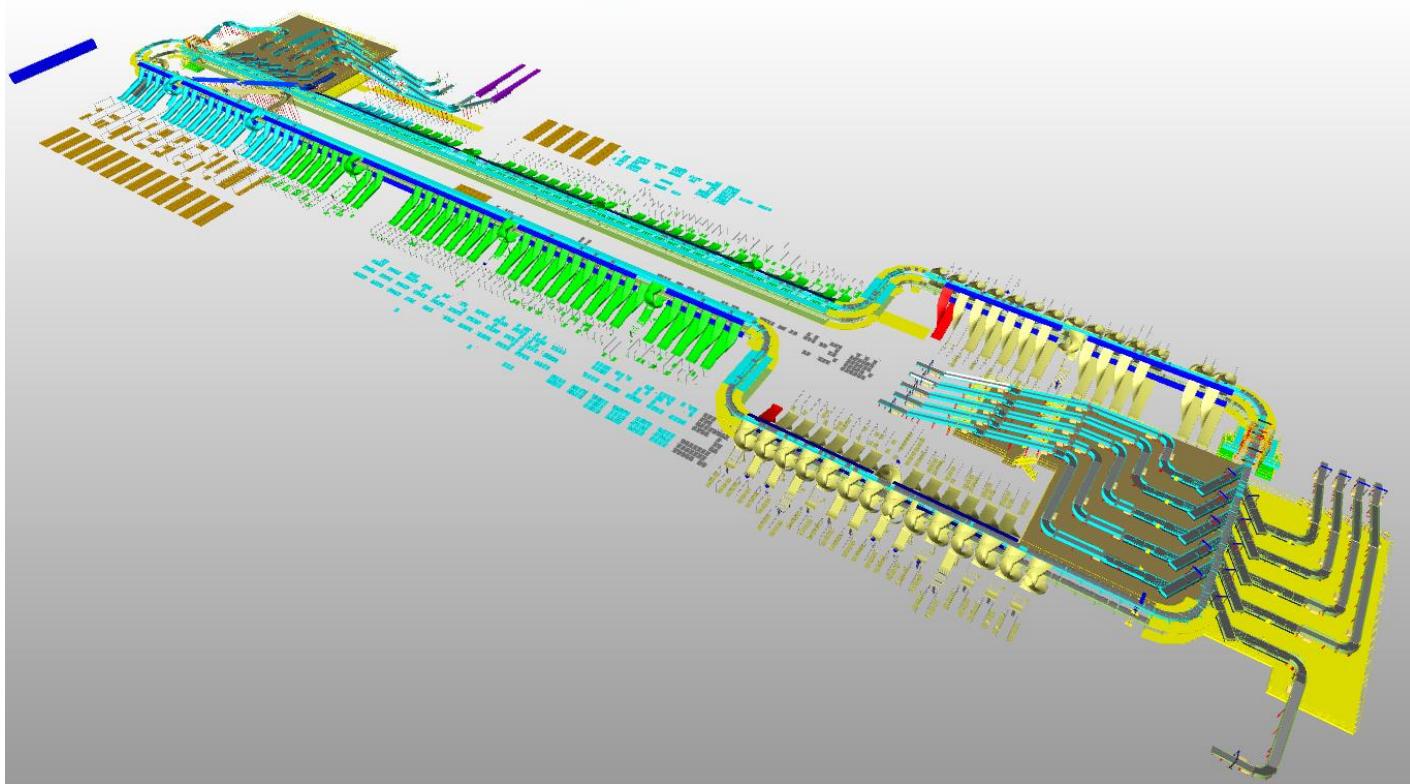
In subsequent sections, we have highlighted the capabilities and experiences of Falcon Autotech with sections on our Intra-logistics Automation Technologies and references.

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 RFI for Sorting Technology, Riyadh Facility, Saudi Arabia**Proposal Reference – F24-00254**

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1. Glossary

S. No.	Term	Description
1	SPL	Saudi Post Logistics
2	RFQ/ RFP	Request For Quotation/ Proposal
3	PPH	Shipments Per Hour
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	TAT	Turn Around Time
26	DAP	Design Approval Phase
27	ICR	Intelligent Character Recognition

2. Executive Summary

Falcon Autotech is pleased to confirm its great interest in responding to this SPL RFQ of Loop CBS and for Riyadh, Saudi Arabia. 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 Riyadh, Saudi Arabia 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:

Dual Deck Loop Cross Belt Sorter 18k PPH (phase-1) & 38K PPH (phase-2)

- *Infeed System for Phase 1 Consists of:*
 - 10 Auto-Induct lines
 - Conveyor Inbound Lines
- *Infeed System for Phase 2 Consists of:*
 - 10 Auto-Induct lines
 - Conveyor System at Inbound

The above induct lines are directly connected to one of the infeed zones equipped with Auto-induct Lines.

- *The Auto-Induct Lines consist of the following components:*
 - Spacing Conveyor
 - Receiving Conveyor
 - Buffer Conveyor
 - Weighing Conveyor
 - Intelligent Merge Conveyor
- *The overall system has 147 outbound chutes.*
- *Each Outbound is divided into three categories: Line Haul Outbound, Post Office Outbound and Last Mile Outbound.*
- *Packing line from G+1 floor to ground floor and returns conveyor line from ground to G+1 floor is also planned for the shipments.*
- *Oversize Parcel handling Provision.*
- *The system is also planned with 904 Put to Light systems for Secondary sorting the shipments into roller cages and 160 Put to Light system for sorting of the documents at G+1 Level.*

This solution has been crafted especially keeping SPL'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.

The Falcon Autotech Cross Belt Sorter incorporates in-house designed and developed system components and associated peripherals.

1. Falcon's reliable Shipment sortation systems

Falcon Autotech has over 50+ Cross belt sorter loops installed globally which are used by most innovative brands such as Flipkart, Amazon, Delhivery, Aramex, Asendia, Fastway and many more. The main and critical components of the Falcon Autotech sorter building blocks, like wheels, motors, belts, bearings, Bus Bars, Communication platforms, PLCs etc., are sourced from industry leading suppliers in the world, such as SEW, Siemens, SICK, Vahle, Forbo etc. This strategic baseline of sourcing policy allows Falcon's customers to be fully confident in the systems' robustness and reliability.

2. Commitment to quality systems

Demonstrating Falcon's clear commitment to the SPL satisfaction, the sortation system, parts and services will be under warranty for 24 months from installation go-live.

Our expertise in executing world-class, projects across the MENA region has been thoroughly demonstrated and validated. We offer:

- A proven history of success and broad experience in implementing and maintaining automated systems.
- ISO 9001 Quality Assurance certification, ensuring consistent quality across our products, processes, and outcomes.
- Falcon Warehouse Control System (WCS) is designed to meet the real-time operational needs of automated materials handling systems. WCS can be molded based on the client's requirements to enhance operations.
- Comprehensive service and warranty programs. We deliver both operational and emergency support with unmatched responsiveness and availability throughout the region.
- Strong financial stability, backed by a long-standing track record.

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 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	Flipkart	amazon	Lazada	ugnoon
CEP	aramex	BLUE DART	DELHIVERY	Ecom Express
Distribution & Others	G	SWIGGY	TITAN	Hindustan Unilever Limited

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.

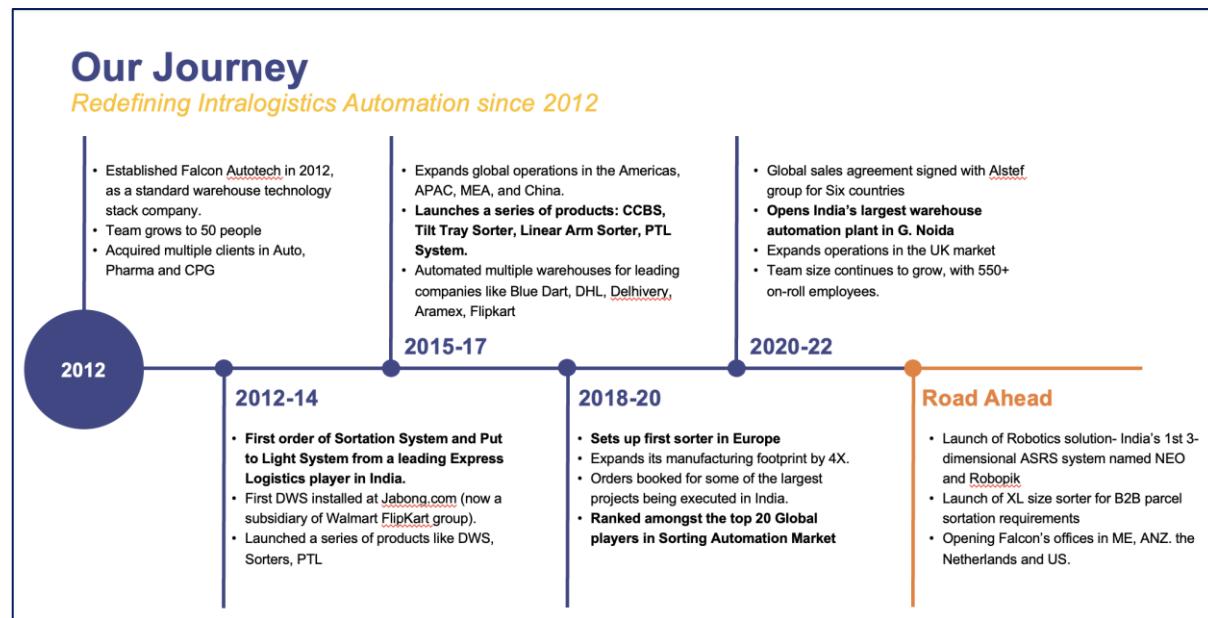
FALCON AND ALSTEF GROUP ANNOUNCE GLOBAL TECHNOLOGY PARTNERSHIP
Falcon Autotech and Alstef Group Announce Global Technology Partnership for Parcel Sortation Solutions
Published - Sept 2022

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 intra-logistics 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
 - Racks
 - Conveyors
 - Hand Scanners
 - Printers
 - Peripheral Displays



- DIMENSIONS & WEIGHT SCANNING SYSTEMS**
- Cubizion Series
 - R, 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
 | |

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 In house 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.

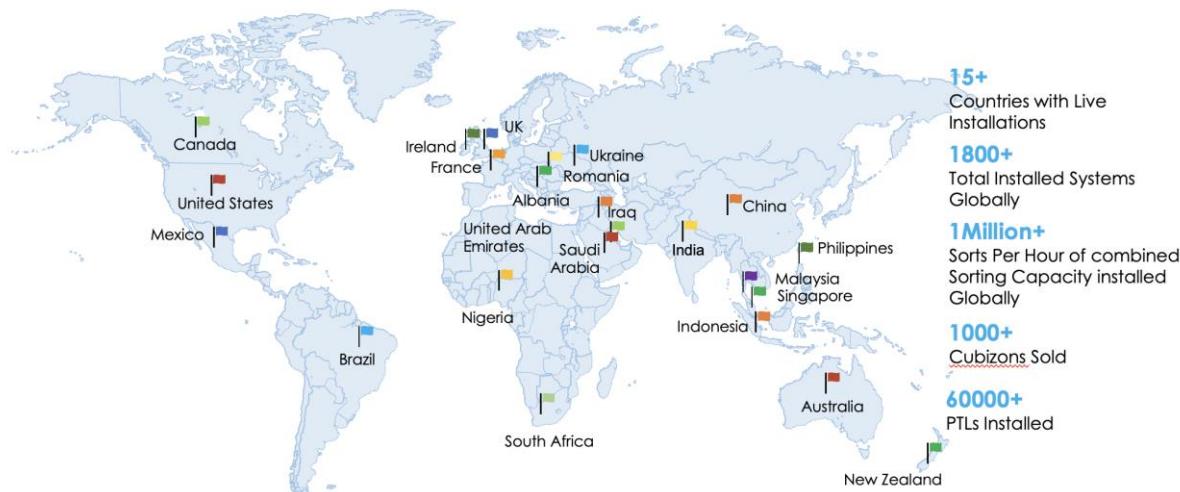
Select Key Clients

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



3. 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



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

4. 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 –

4.1 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.

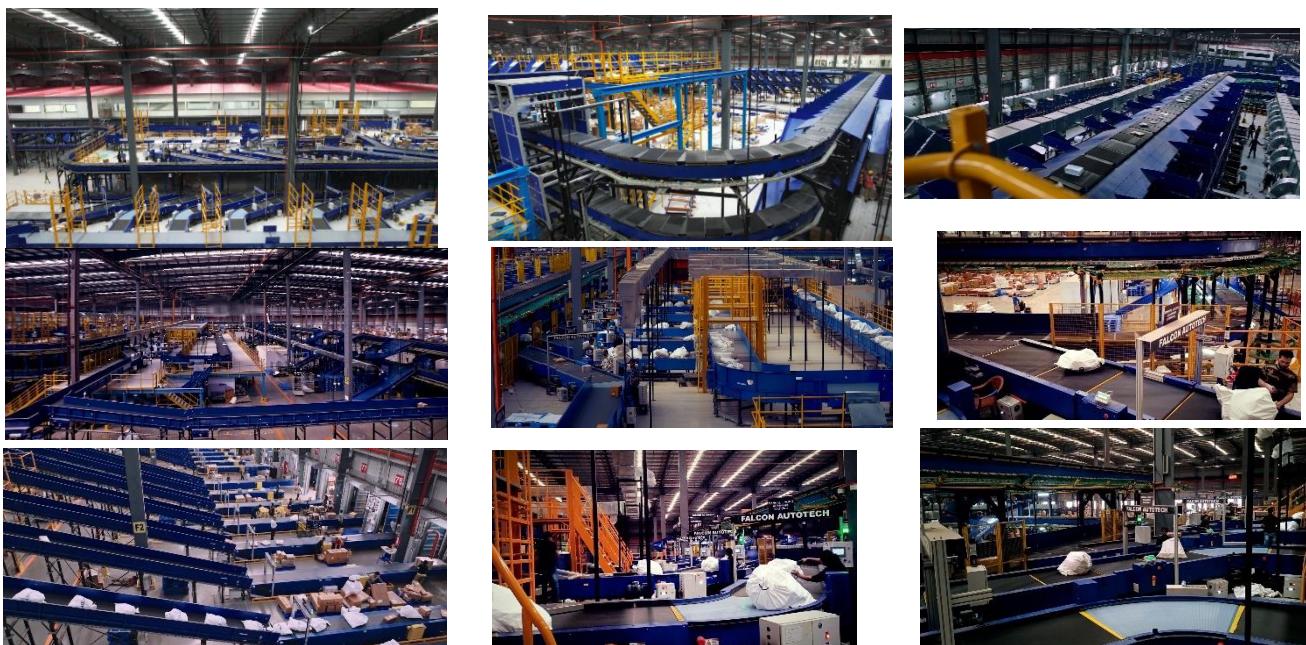
Solution Specifications – <https://youtu.be/Qk2Ejt9QhJ0> (YouTube Video Link)

- 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

Site Pictures –



4.2 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.

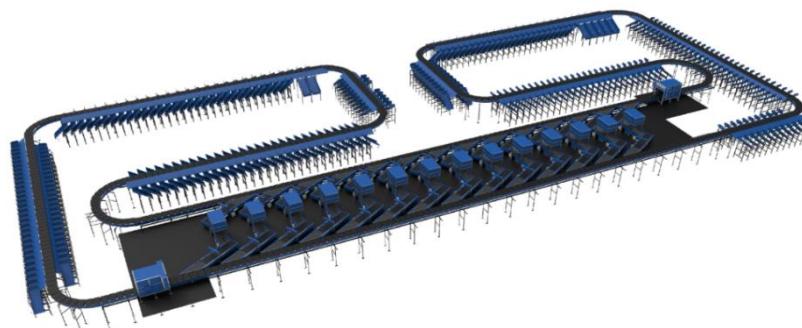
The customer chose Falcon Autotech based on its unique design which could cater to all their pain points, capability of seamless integration with WMS and life cycle support services.

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.



4.3 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.

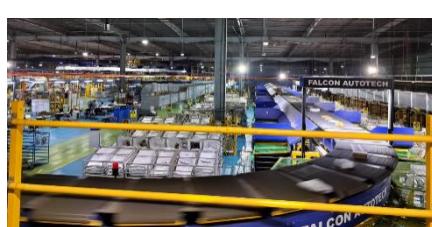
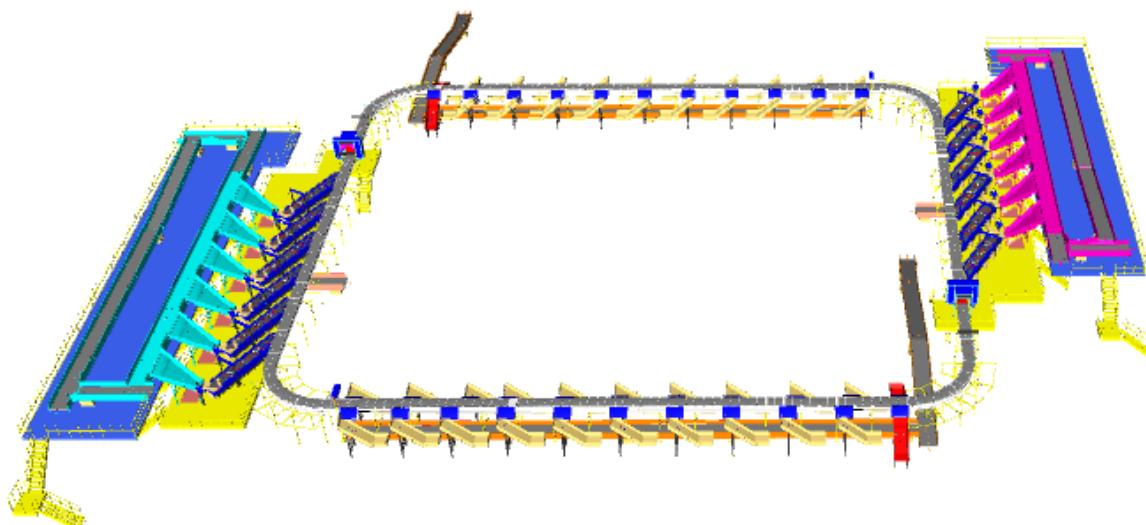
Solution Specifications –

- 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 -



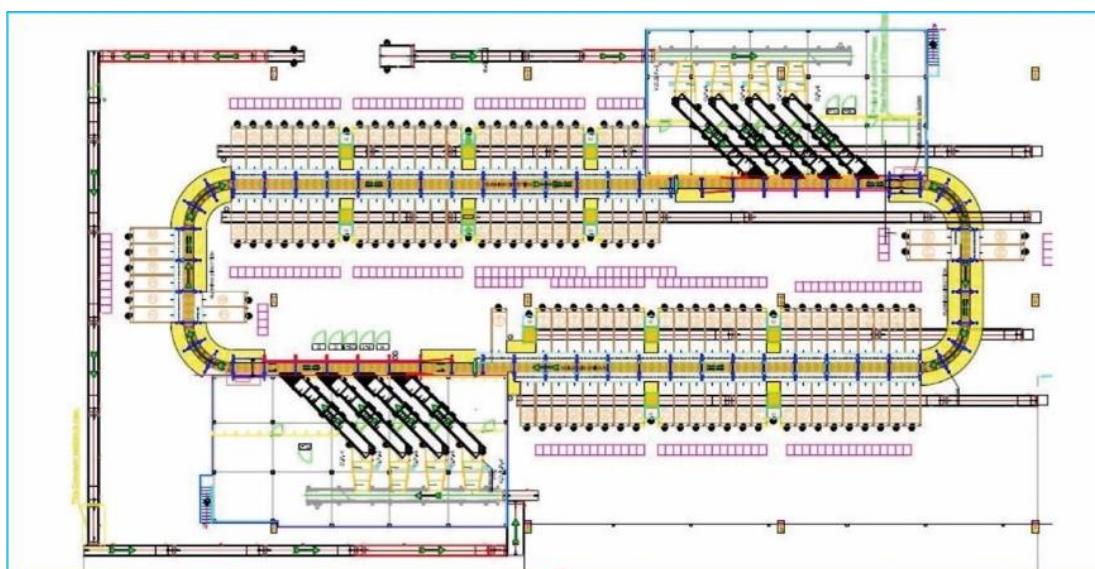
4.4 Project 4- (Client – E-Commerce, India) Use Case - Destination Sorting of Packed Shipments

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 -



4.5 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 –



YouTube Video Link: https://youtu.be/jh_5jwSpw68

4.6 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.

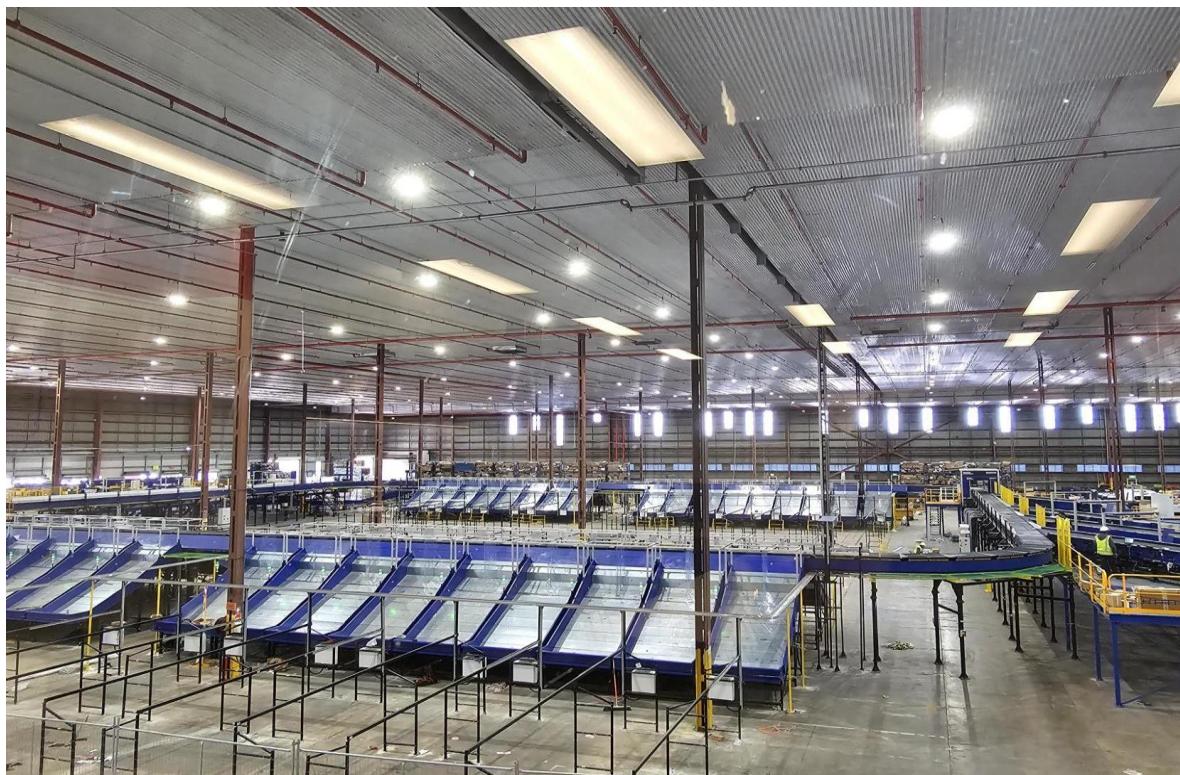
Solution Specifications –

- 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 –



4.7 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 –



YouTube Video Link: <https://youtu.be/WkPFRqas6Ms>

4.8 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 –



5. Handled Shipment Spectrum

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

Falcon purposes to use its “Dual Belt Regular Configuration” for the sorter to provide the maximum benefits to SPL in-terms of handling various sizes and weight.

5.1 Shipment size loadable on the shipment sorter

Falcon's Dual belt regular Cross belt sorter has a capability to handle the below mentioned shipment sizes and weight.

Parcel-

Specification	Unit	Value
Max Length	mm	800
Max Width	mm	760
Max Height	mm	760
Max Weight	Kg	30
Min length	mm	250
Min Width	mm	150
Min Height	mm	100
Min Weight	gm	100

Totes-

Specification	Unit	Value
Length	mm	600
Width	mm	400
Height	mm	400
Max Weight	Kg	30

5.2 Shipments to be loaded on Sorter 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)

5.3 Shipment not loadable on the sorter

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.

5.4 Barcode Specifications

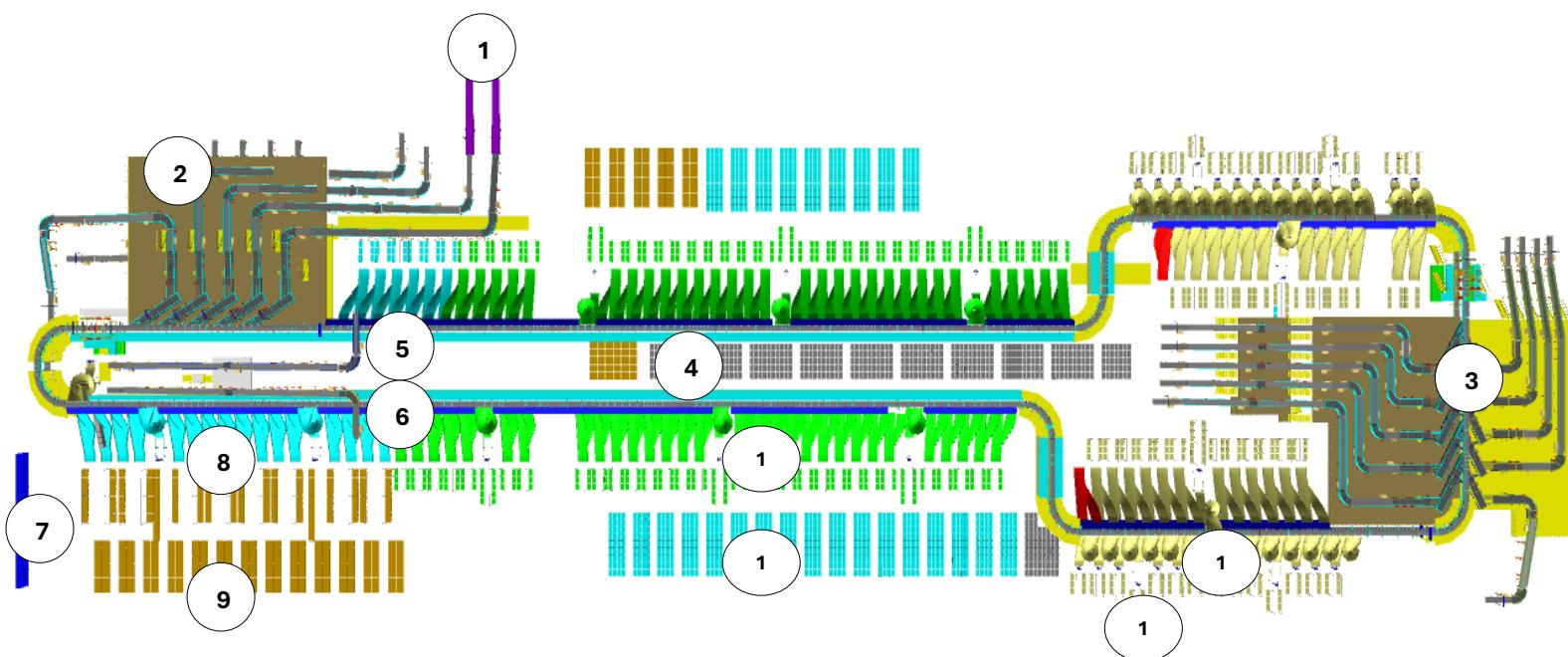
- Min. Code Resolution for 1D codes to be 0.25 mm or higher and Min. 1D Code Height to be 10 mm.
- Quiet zone of 1D barcode to be at least ten times to the width of smallest bar.
- Min. Code Resolution for 2D codes to be 0.50 mm or higher and 2D code size of 30 X 30 mm or higher.
- Barcode quality must be in accordance with ANSI Grade A or B standards for the camera solution.
- Codes are visible for the ident system (not crumpled, shadowed, no direct reflection or hidden by objects, etc.)

6. Proposed System Description

6.1 Objective

The purpose of this proposal is to present the design, manufacturing, installation, commissioning, testing, and acceptance testing of the Loop CBS for sorting shipment, as per SPL's requirements.

6.2 Layout View of the System



LEGEND:

1. Telescopic belt Conveyor Inbound Lines
2. Infeed Zone - 1
3. Infeed Zone - 2
4. Dual Deck Loop Cross belt Sorter
5. G+1 Packing Line
6. Returns Line
7. Put to Light wall for Document sorting
8. Line Haul outbound chutes
9. Line Haul Secondary sorting into Roller Cages
10. Post office Outbound Chutes
11. Post Office secondary sorting into Roller Cages
12. Last Mile Outbound Chutes
13. Last Mile secondary sorting into Roller Cages

6.3 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.

7. Proposed System Capacity Calculations

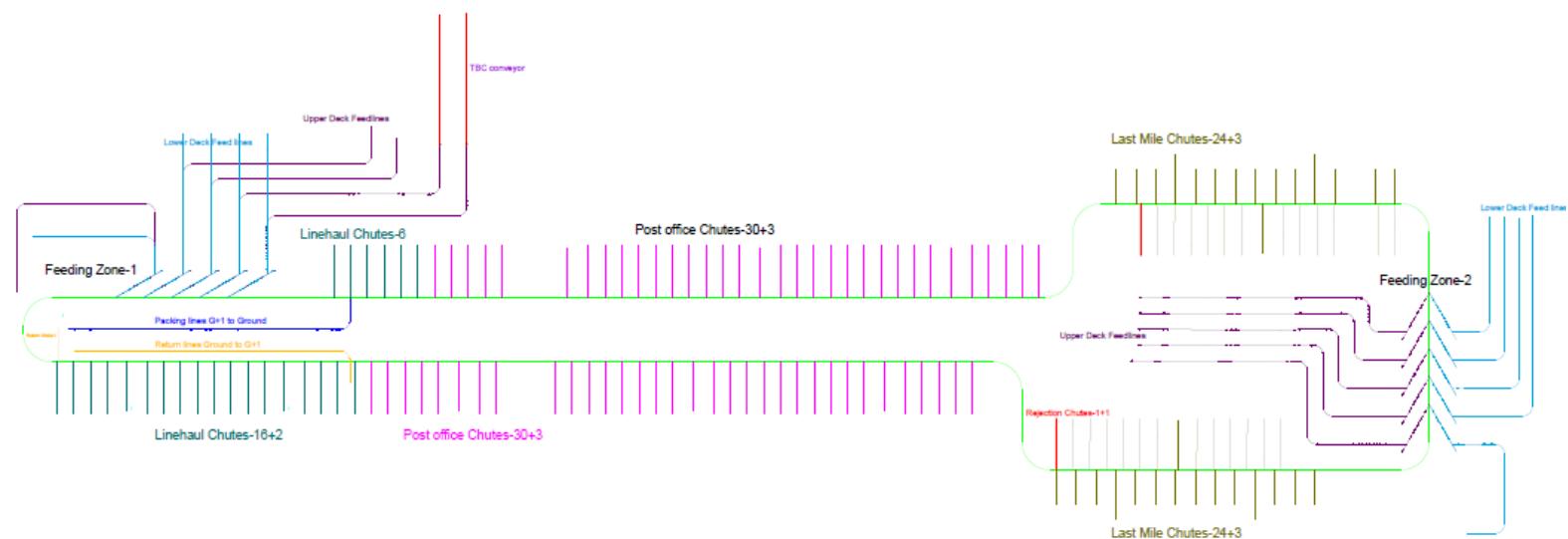
7.1 Sorter System Capacity

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

Specifications	Upper Deck	Lower Deck	Unit
Sorter Type	CBS_Heavy Duty	CBS_Heavy Duty	Type
Max Product Size (LxBxH)	800x760x760	800x760x760	mm
Min Product Size (LxBxH)	100x100x10	100x100x10	mm
Max Product Weight	30	30	Kg
Min Product Weight	100	100	gram
Single Belt Worth Shipments	90	90	%
Dual Belt Worth Shipments	10	10	%
Sorter Speed	>2.1	>2.1	m/s
Sorter Carrier Pitch	1.175	1.175	m
TPH per Feedline (Boxes)	2400	2400	PPH
Design Throughput	23397	23397	PPH
Feedlines in Induct Zone 1	5	5	Nos
Feedlines in Induct Zone 2	5	5	Nos
Infeed TPH in Induct Zone 1	12000	12000	PPH
Infeed TPH in Induct Zone 2	12000	12000	PPH
All Belt Conveyor width(induct)	1000	1000	mm
Sorter Running Height	5800	3300	mm

***Note:** Above calculation is basis the assumption that 10% parcels will fall on Dual belt. If parcel dimension exceeds 600 x 400 x 400 mm and weight exceeds 15Kg, it will go on Dual belt.

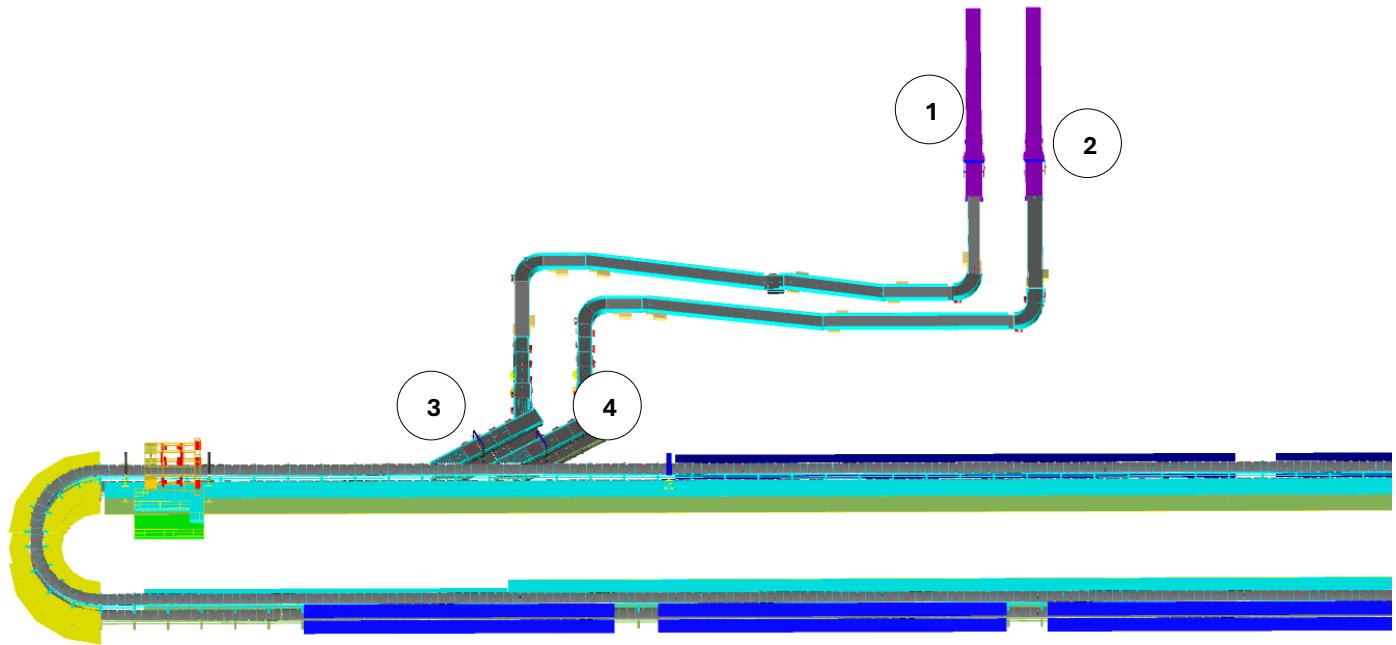
7.2 Material Flow Diagram



1. ■ Loop CBS
2. ■ Zone-1 Upper Deck Feed Lines
3. ■ Zone-1 Lower Deck Feed Lines
4. ■ Linehaul Chutes
5. ■ Post office Chutes
6. ■ Rejection Chutes
7. ■ Last Mile Chutes
8. ■ Packing Line
9. ■ Return Line

8. Process Flow of the System

8.1 Inbound from Telescopic Belt Conveyor:

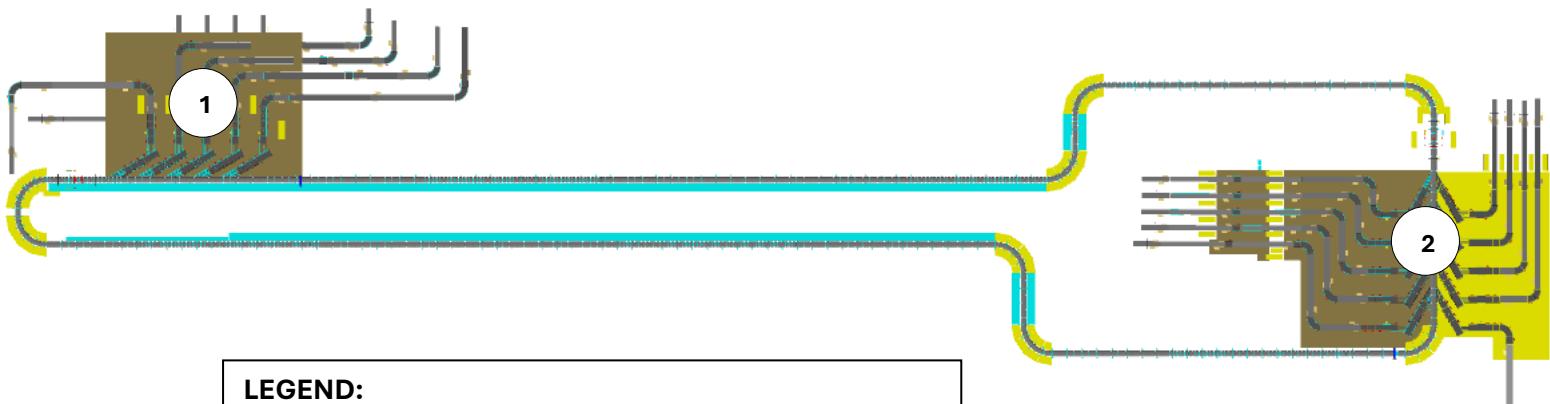


LEGEND:

1. Telescopic Belt Conveyor - 1
2. Telescopic Belt Conveyor - 2
3. Auto Induct Line - 1
4. Auto Induct Line - 2
5. Dual Deck Loop Cross belt Sorter

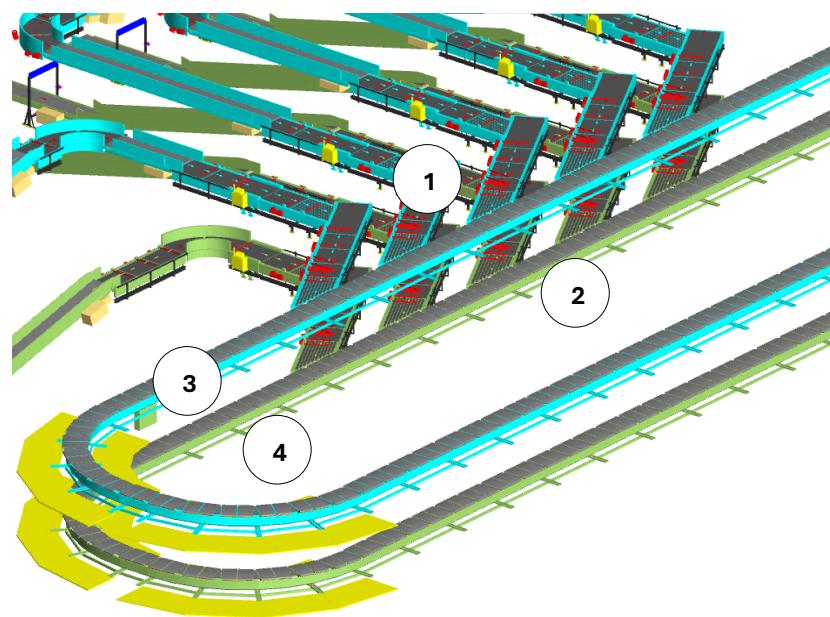
- *The Vehicles arrive at the unloading dock. Parcels are unloaded directly on the telescopic belt conveyors positioned inside the vehicles.*
- *Shipments are unloaded directly on the Telescopic Belt Conveyors.*
- *These telescopic belt conveyors are directly connected to the auto induction lines in infeed zone -1.*
- *Once, on the induction lines, these parcels will get loaded on the Upper deck of the Loop cross belt sorter.*

8.2 Infeed Zones 1&2



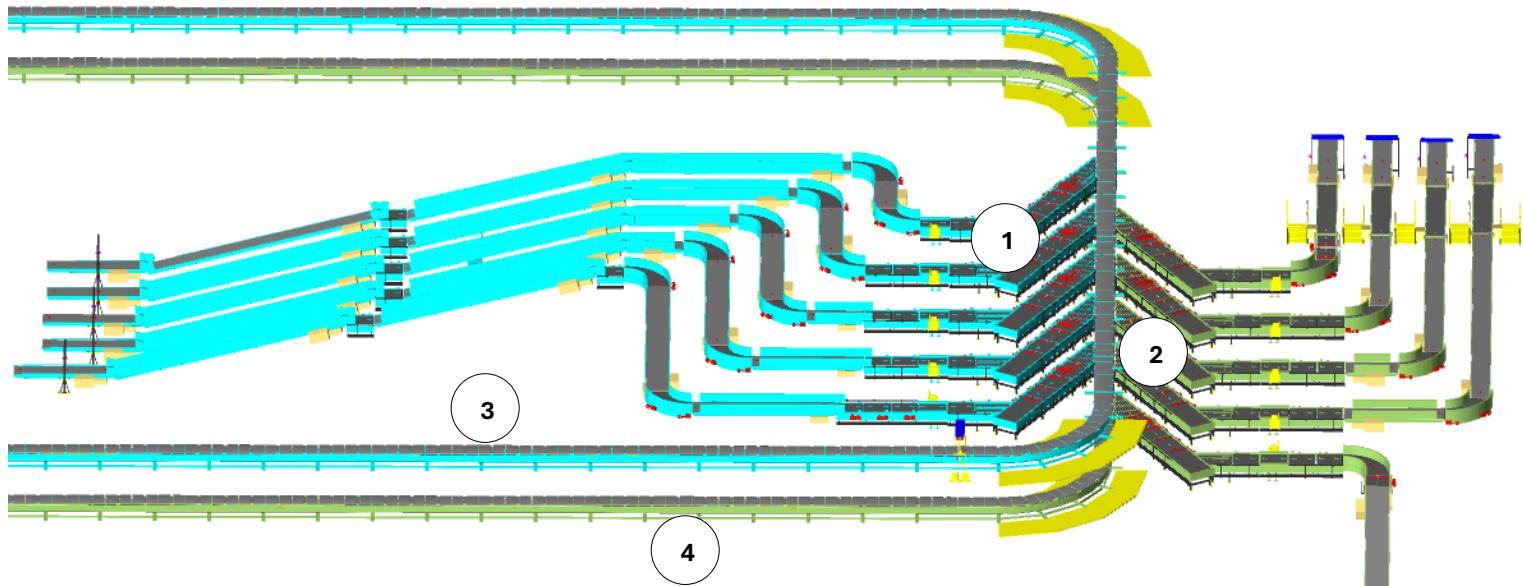
LEGEND:

1. Infeed Zone - 1
2. Infeed Zone - 2



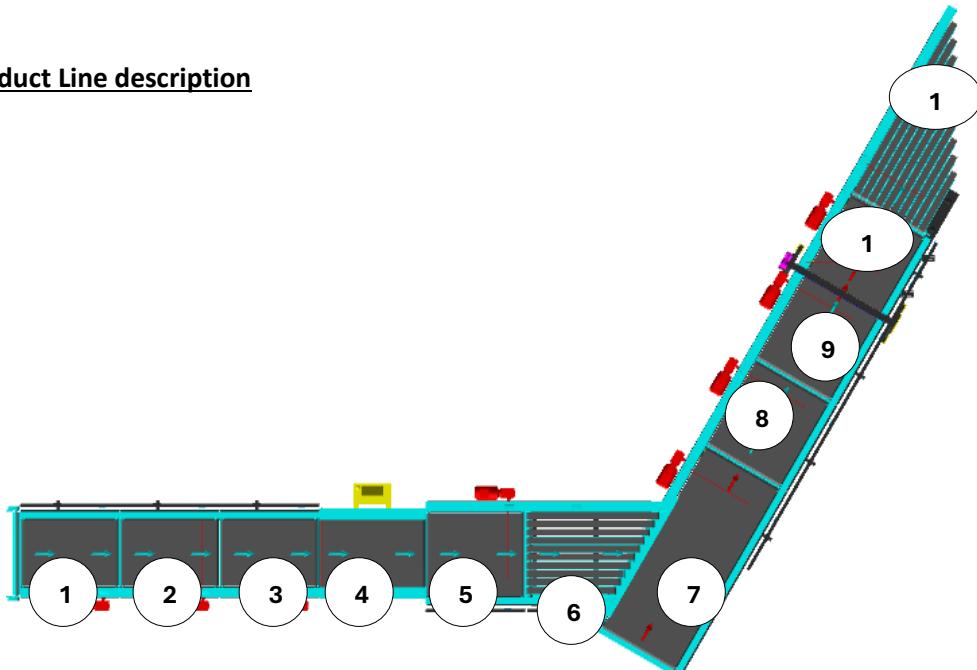
LEGEND:

1. Upper Deck Induct Lines (Infeed Zone – 1)
2. Lower Deck Induct Lines (Infeed Zone – 1)
3. Upper Deck of the Loop CBS
4. Lower Deck of the Loop CBS

Infeed Zone – 2

LEGEND:

1. Upper Deck Induct Lines (Infeed Zone – 2)
2. Lower Deck Induct Lines (Infeed Zone – 2)
3. Upper Deck of the Loop CBS
4. Lower Deck of the Loop CBS

- *The whole system is equipped with 2 zones for feeding with Auto-Induct Lines.*
- *Zone 1 & 2 consists of 10 Auto-induct lines. 5 for Upper deck of the loop and 5 for lower deck of the loop.*
- *Each Induct line is connected with conveyor connections with every feeding zone in the system.*

Auto-Induct Line description


LEGEND:

1. PVC Belt Conveyor
2. Spacing Conveyor - 1
3. Spacing Conveyor - 2
4. Weighing Conveyor
5. Buffer Conveyor – 1
6. Angle Merge Conveyor – 1
7. Receiving Conveyor
8. Spacing Conveyor – 3
9. Spacing Conveyor – 4
10. Buffer Conveyor – 2
11. Angle Merge Conveyor - 2

8.2.1 Feedline Component Description

8.2.2 Spacing Conveyor

A spacing conveyor, also referred to as a gaping 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 products as well as regulates feeding on the downstream systems.



8.2.3 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.

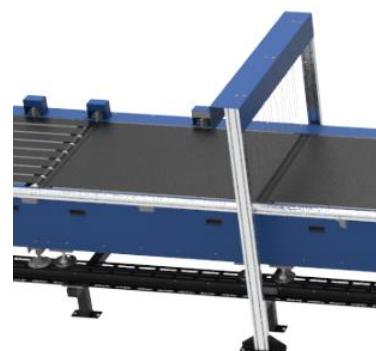
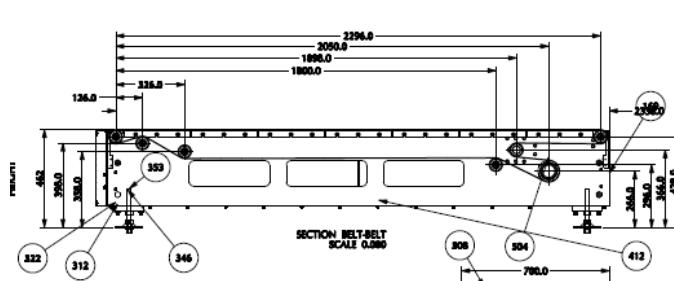
Make- Bizerba/ Mettler Toledo



8.2.4 Buffer Conveyors

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.

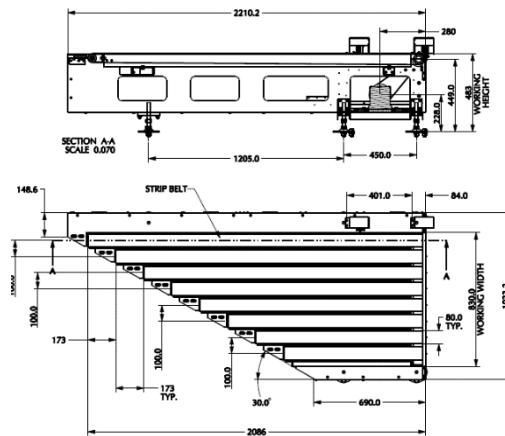
This Conveyors required to maintain the Throughput of Line.



8.2.5 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.

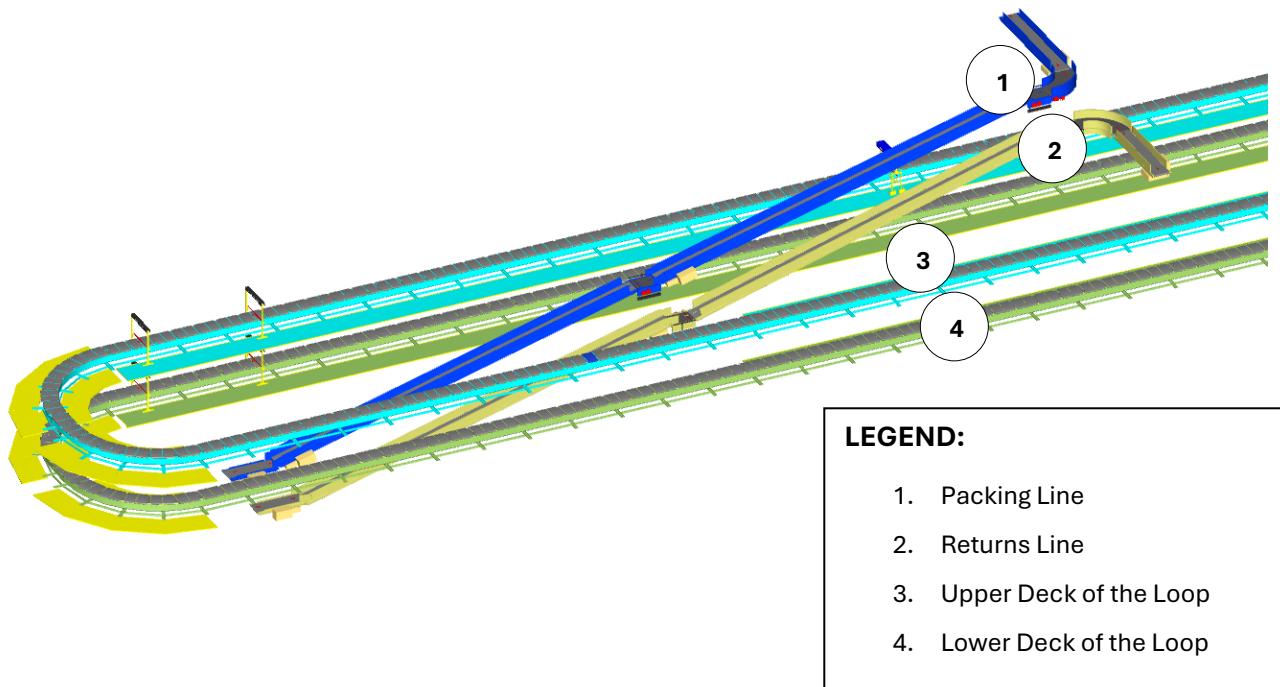


8.2.6 Orientation/ Loading Conveyor/Receiving Conveyor –

An Orientation conveyor is used to align and release the products for induction onto CBS. It serves as the initial point of entry where products are aligned and conveyed to subsequent conveyor modules. Associate aligns the parcels to the fixture mounted on loading conveyor and releases them. Irregular are dropped into nearby chutes to take them out of the system.

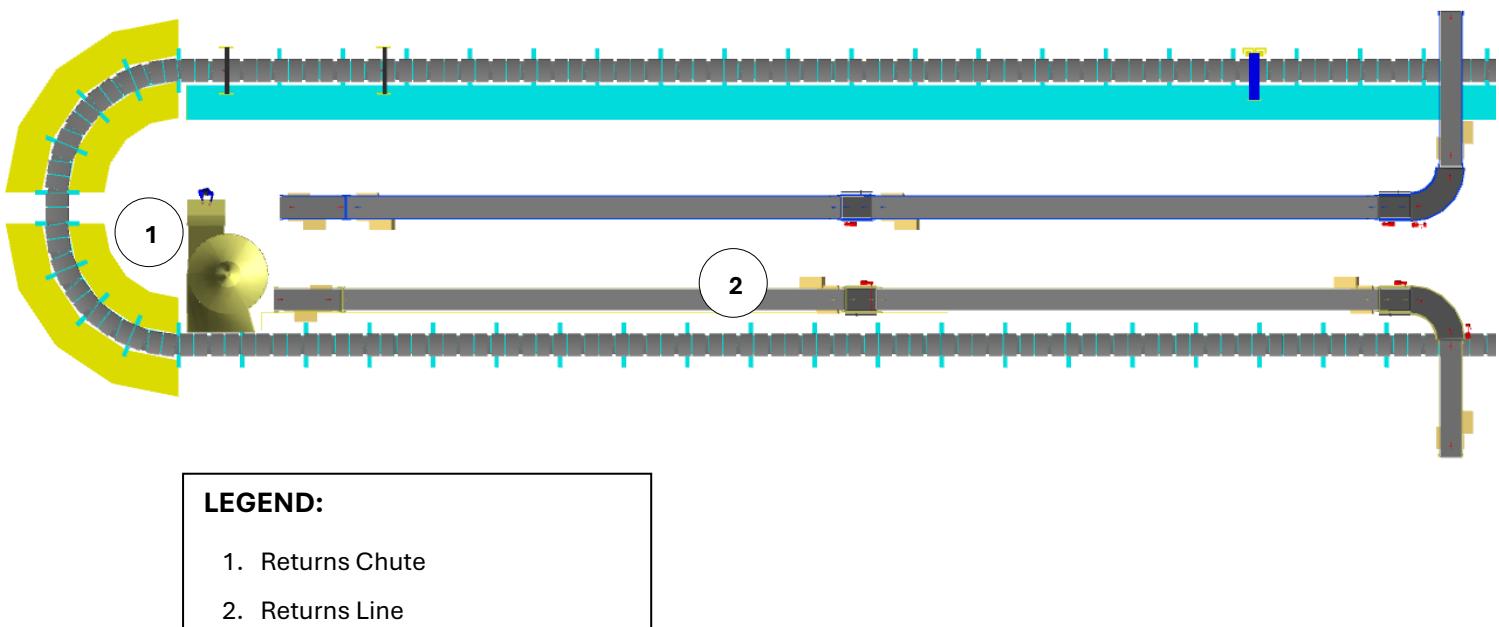


8.3 Packing Line and Returns Line at G+1



Packing Line Process

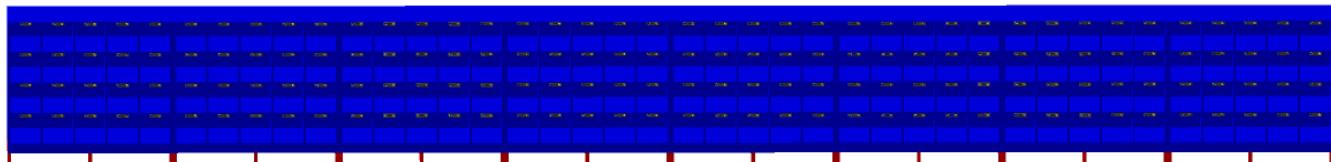
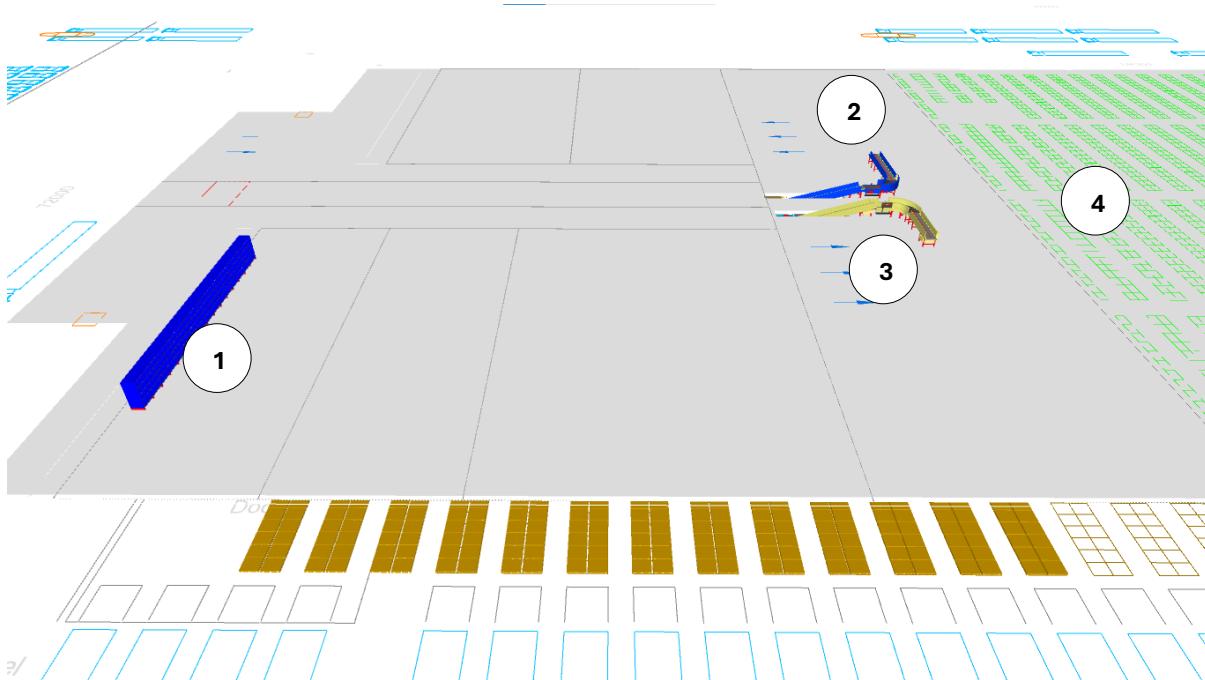
- All the material on the mezzanine at G+1 level are packed at the same level.
- Packed shipments are moved to the packing line conveyor on G+1.
- The packing line conveys these shipments down to the ground floor drop-off point.
- Ground floor operators pick the shipments from the drop point.
- They load them into trolleys and move them to Infeed Zone 1 conveyors.
- From here, shipments are inducted into the cross-belt sorter for further sortation.



Returns Process

- Returns shipments will be loaded on the sorter from the inbound area.
- There is a dedicated chute in which the shipments will get sorted.
- The operators will pick the shipments from the chute and load them on the returns line at the ground floor.
- The conveyor will convey the shipments to the G+1 level where the shipments will get processed further.

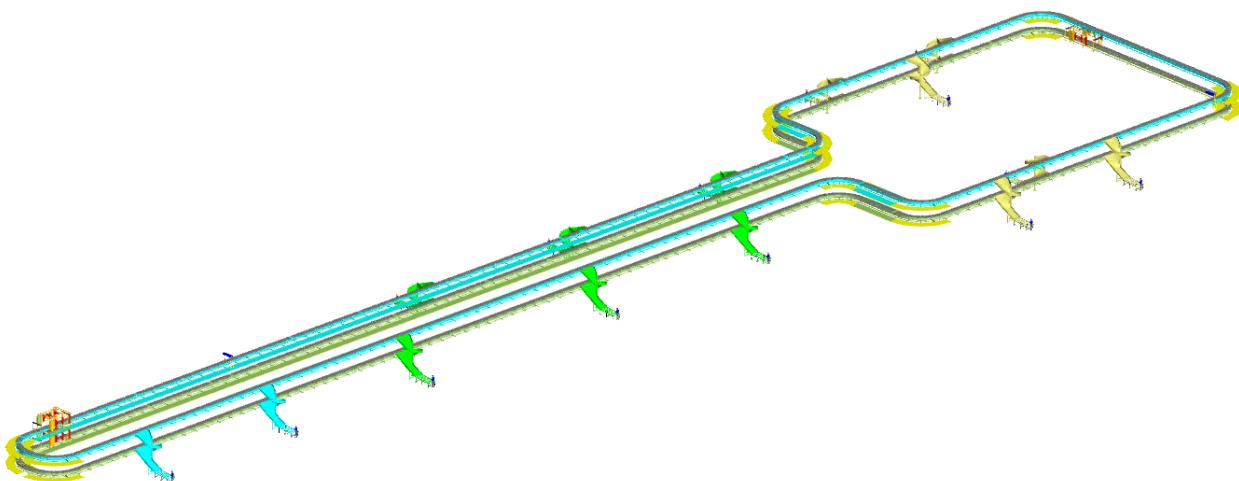
8.4 Put to Wall at G+1 Level

**LEGEND:**

1. Put to Light wall for Mail Sorter (G+1 Level)
2. Packing Line (G+1 Level)
3. Returns Line (G+1 Level)
4. Shelving at G+1 Level

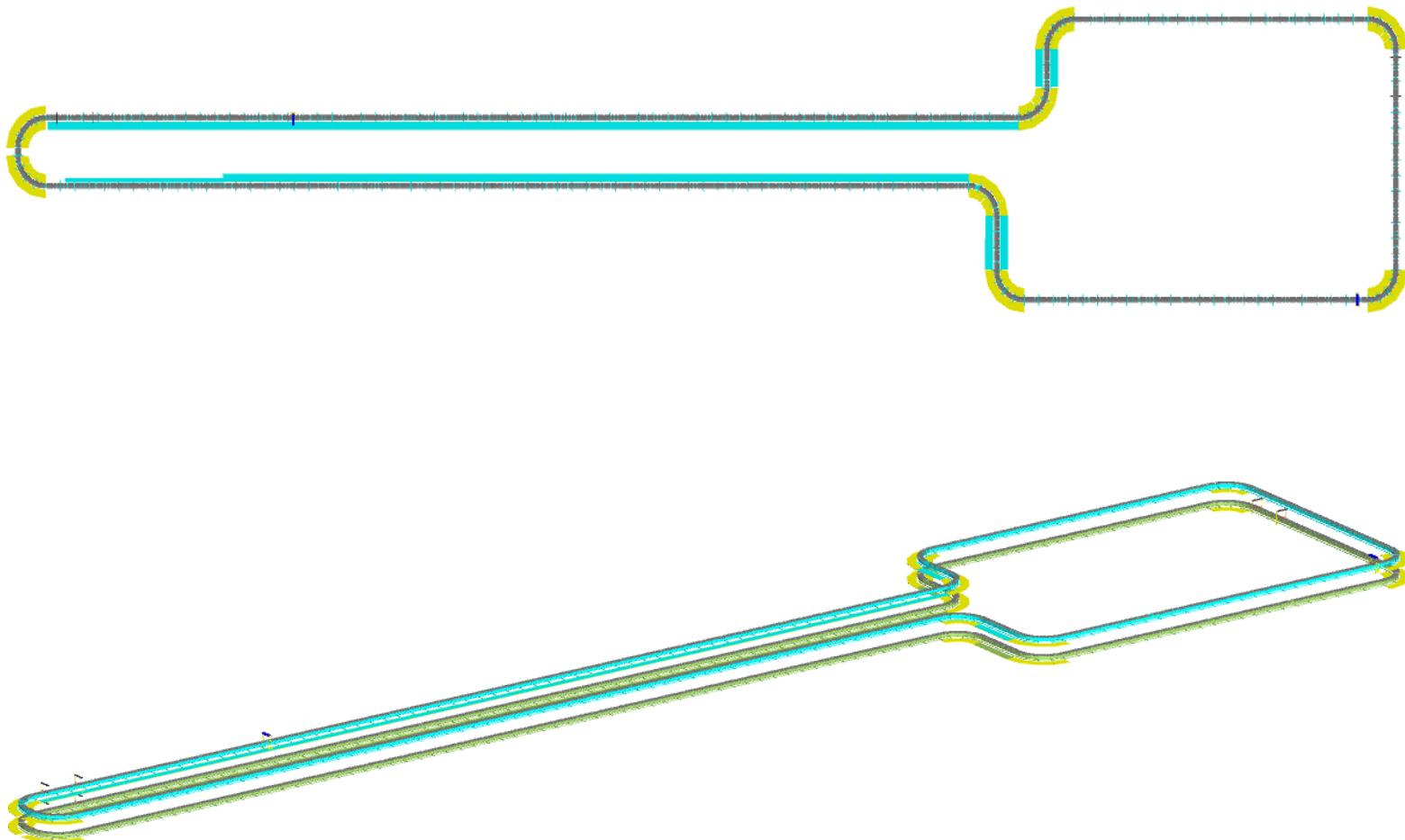
- *Documents stored on the G+1 shelving will be picked by the operators.*
- *The operators will carry the documents to the Put-to-Light (PTL) wall and scan their respective barcodes.*
- *Upon scanning, the corresponding indicator light on the PTL wall will illuminate, guiding the operator to place each document into the correct pigeonhole.*
- *Once all documents are sorted, operators will retrieve the documents from the pigeonholes, pack them, and consolidated inside totes.*
- *The totes will then be placed on the packing line for further sortation and dispatch processing.*

8.5 Documents Sorting



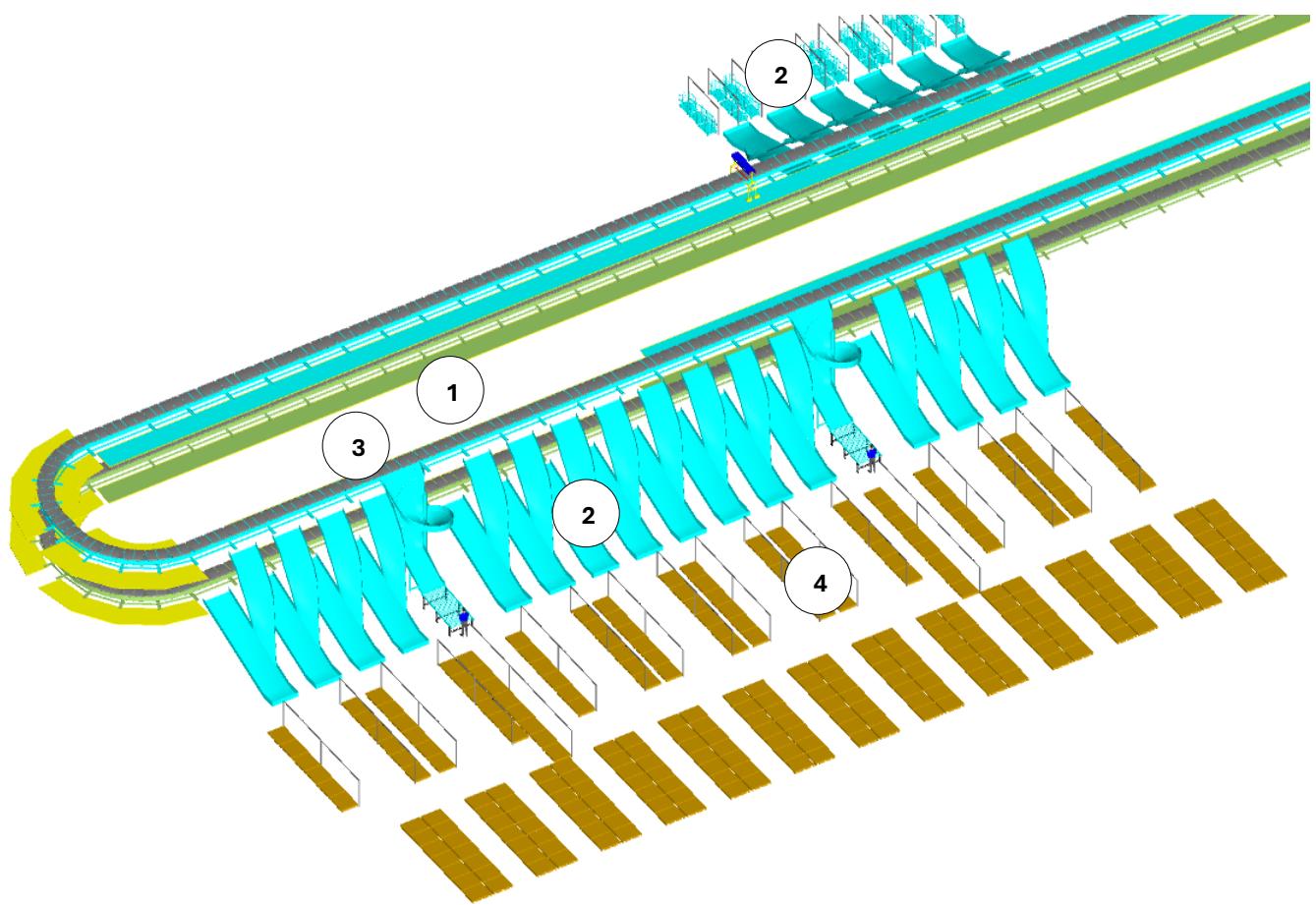
- *After the documents are consolidated inside the totes, they are transferred from the packing line at the G+1 level to the ground floor, where operators pick them up and direct them to one of the infeed zones of the sorter.*
- *Once at the infeed zone, the totes are loaded onto the sorter, and as they pass through the 5-side barcode scanning tunnel, both their image and barcode are captured.*
- *Following the scanning and imaging process, the totes are automatically sorted into specially designed gravity roller spiral chutes.*
- *After sorting, operators manually collect the totes and stage them on pallets that are equipped with a Put-to-Light (PTL) system for subsequent handling and dispatch.*

8.6 Dual Deck Loop Cross Belt Sorter



The proposed CBS Sorter has two Decks; the upper deck is running at a height of 5797mm from Ground Level and lower deck is running at a height of 3297mm from Ground Level. We have provided loop with Dual Belt Carriers with 1200 mm pitch and Belt Size of 495 x 1200mm.

8.7 Line Haul Chutes and Staging

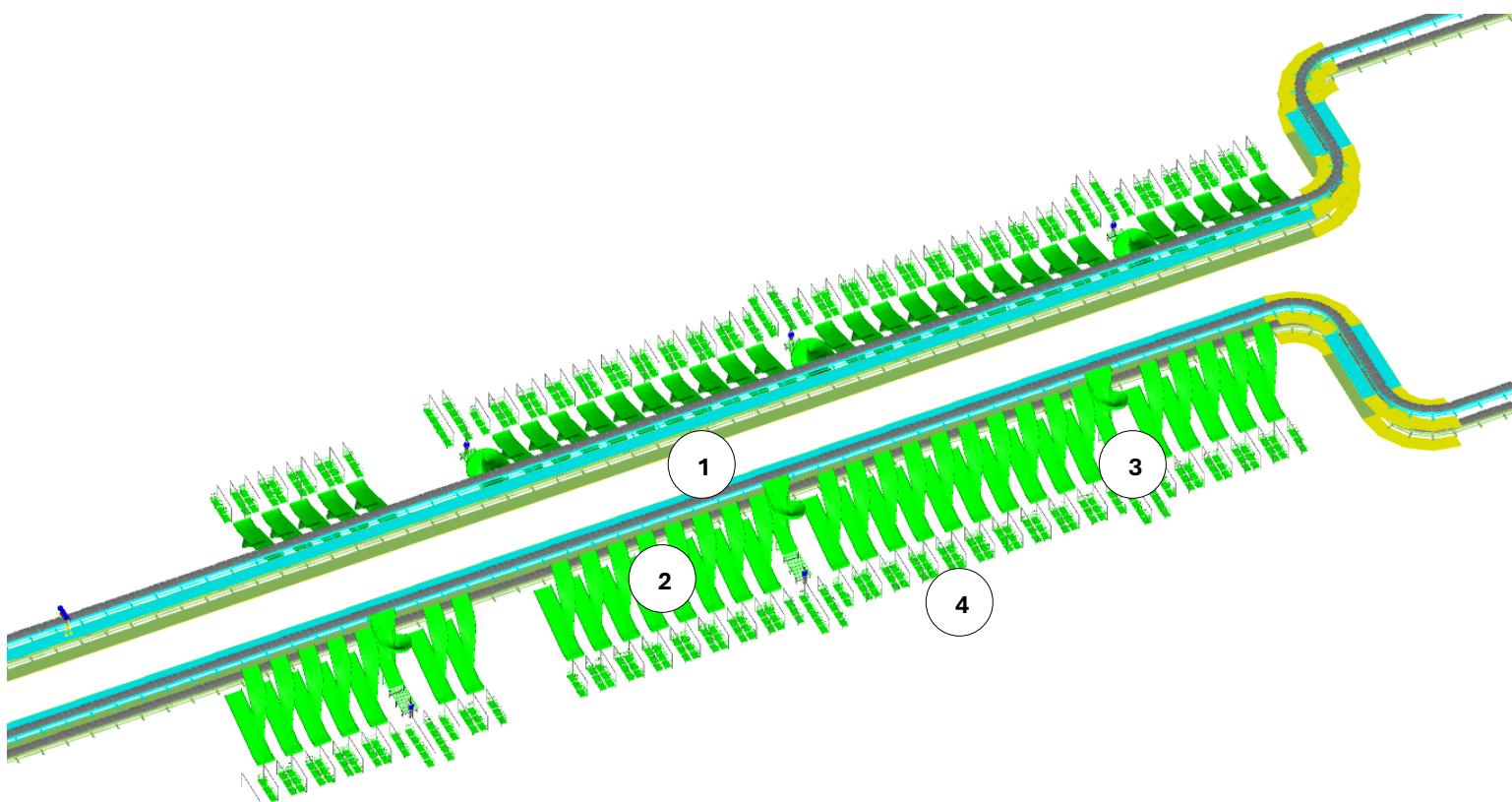


LEGEND:

1. Dual Deck Loop Cross Belt Sorter
2. Line haul Collection Chutes
3. Spiral Chutes for Totes
4. Pallet Staging with PTL System

- *The system is equipped with **22 collection chutes** designated for line-haul shipments and **2 spiral chutes** for line-haul material totes.*
- *After sorting the shipments/totes into the respective line-haul chutes, the pallet staging area is equipped with **148 Put-to-Light (PTL) modules** mounted on pallets to facilitate efficient and accurate dispatching.*

8.8 Post Office Chutes and Staging

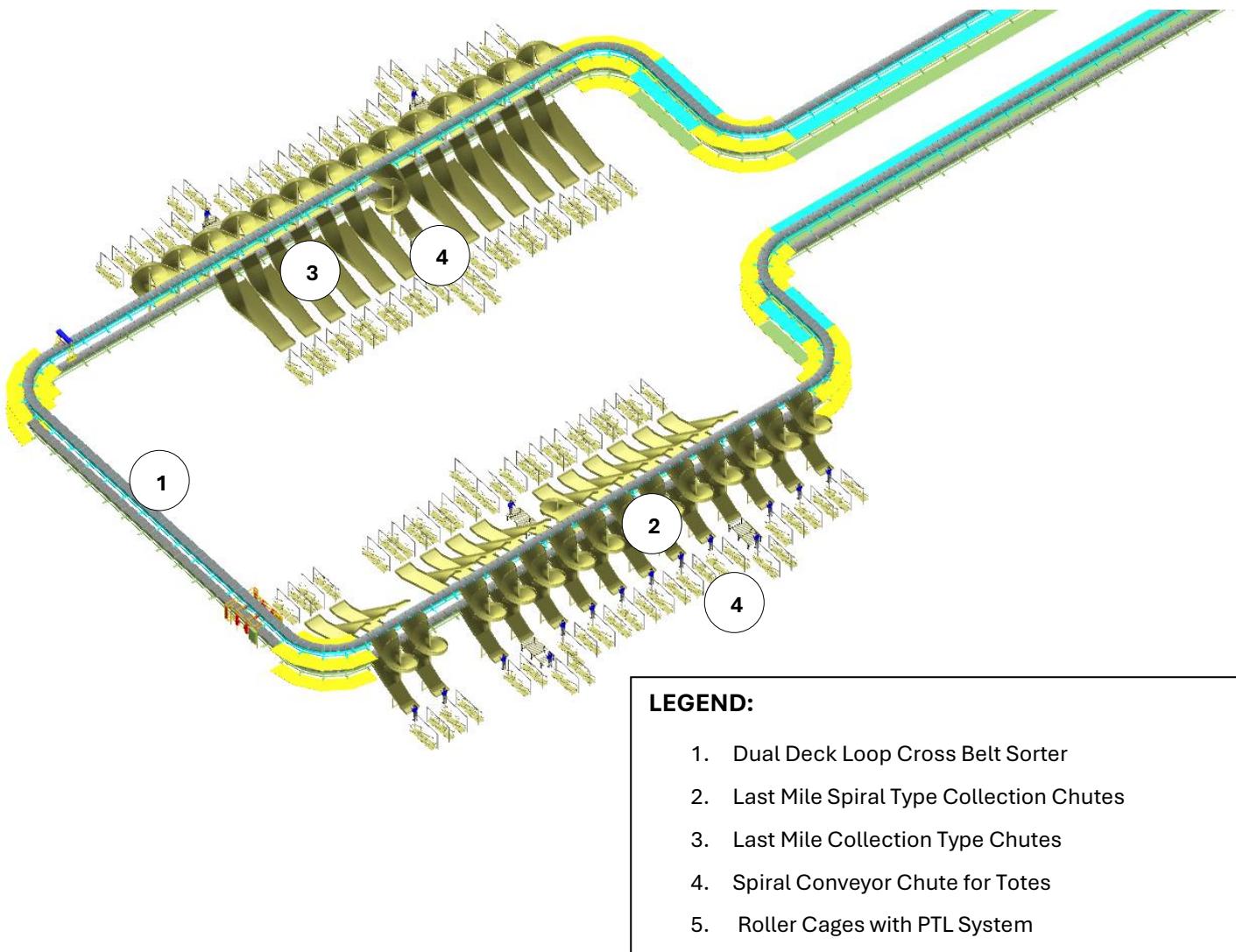


LEGEND:

1. Dual Deck Loop Cross Belt Sorter
2. Post Office Shipments Collection Chute
3. Spiral Chutes for Post office Shipment Totes
4. Roller Cages with Put to Light System

- *The system is equipped with **60 collection chutes** designed for Post Office shipments and **6 spiral chutes** for Post Office Shipment totes.*
- *After sorting the shipments/totes into the respective line-haul chutes, the Roller Cages are equipped with **420 Put-to-Light (PTL) modules** mounted on cages to facilitate efficient and accurate dispatching.*

8.9 Last Mile Chutes and Staging

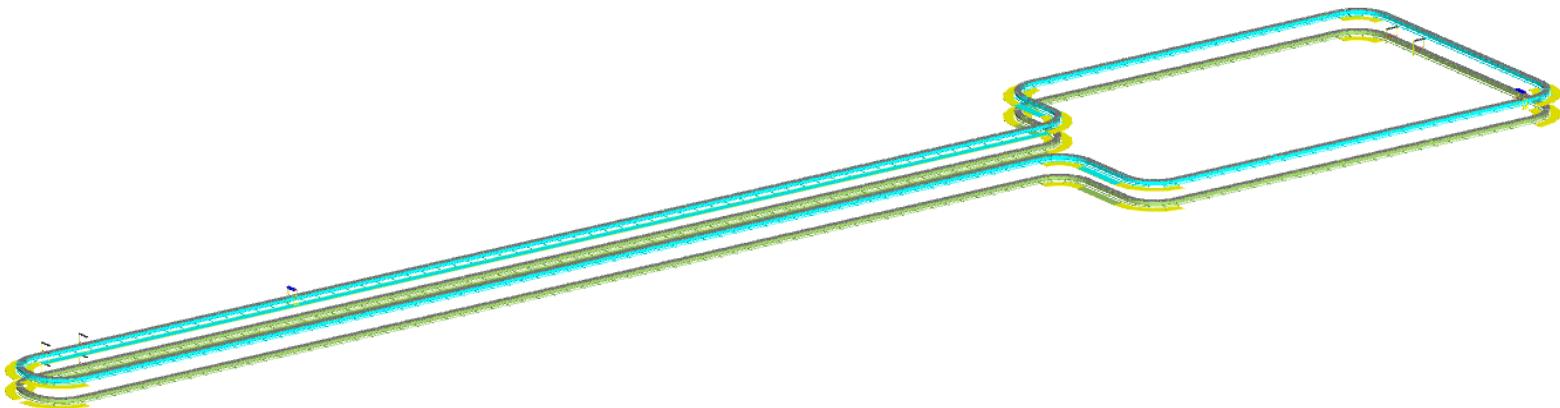


- The system is equipped with **24 collection chutes**, **24 Spiral Type Chutes** designated for Last Mile shipments and **6 gravity spiral chutes** for Last mile Shipment totes.
- After sorting the shipments/totes into the respective Last mile chutes, the Roller Cages are equipped with **336 Put-to-Light (PTL) modules** mounted on cages to facilitate efficient and accurate dispatching.

*Note: All the above chutes are equipped with tower lamps and Chutes full sensors.

9. System Components

9.1 Main Loop

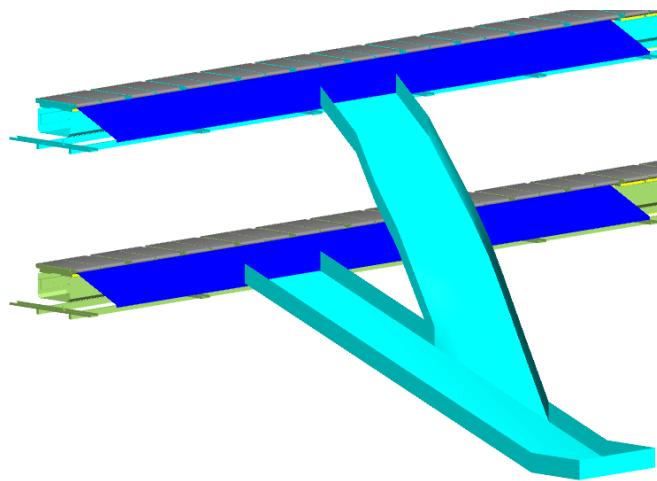


1. The proposed CBS Sorter has two Decks; the upper deck is running at a height of 5797 mm from Ground Level and lower deck is running at a height of 3297 mm from Ground Level.
2. We have provided loop with Dual Belt Carriers with 1200 mm pitch and Belt Size of 495 x 1200mm.
3. Dual Deck loop CBS with Upper deck and Lower Deck length of 522.9 meters & 445 Carriers.
4. As Shipments pass through the Barcode Scanning Tunnel on the Loop, their barcodes are scanned, and chutes are assigned. Once the shipment reaches the respective chute, the carrier carrying the shipment for the chute will actuate and drop the shipment in the assigned chute.
5. The System is equipped with 5-side barcode scanning tunnel.

9.2 Output Chutes

9.2.1 Collection Chute

Collection Chute has capacity to accumulate 148 shipments based on the average parcel size, The sorted shipments will directly deposit into the collection portion of the chute

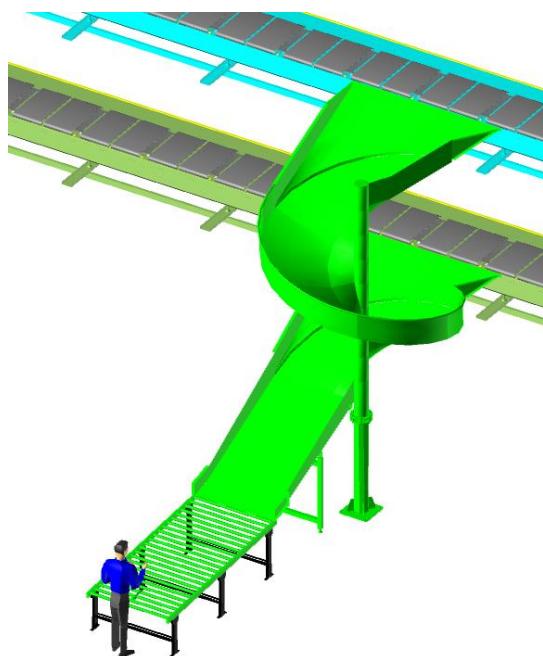


Chute I/Os	Description
Chute Full Sensor	To alert the system that the chute is full and mark that chute unavailable for further sortation
Four Colour Tower Lamp	To indicate the chute status
Push Button	To Start/Stop Sorting Operations

9.2.2 Gravity Spiral Chute for Totes

These chutes are specifically designed for handling totes. Each chute is equipped with gravity rollers that reduce the speed of the totes, helping to prevent any potential damage during descent.

Gravity Roller conveyor is attached to the outfeed point of the chute for the collection of the shipments.



**Image for reference only*

9.2.3 Non-Powered Spiral Chute

Non-powered Spiral Chute is used for smooth transfer of the shipments from certain height to the ground level without changing the orientation of the shipments.



10. Description of Components of Equipment

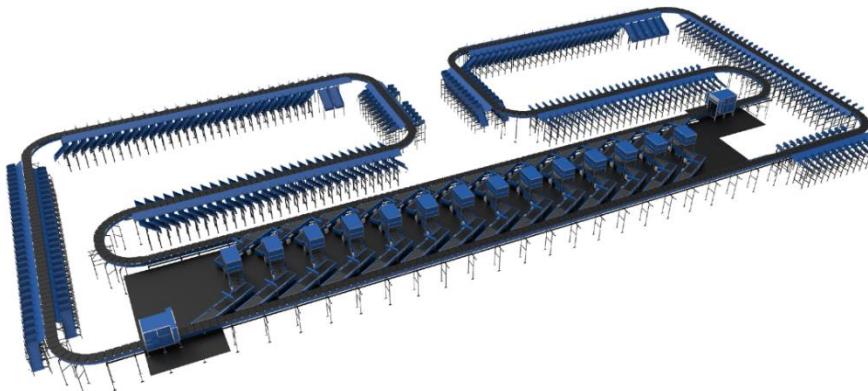
Elements of the sorting system

1. Cross Belt Sorter
2. Scanning & Sensing on Sorter
3. Other Components of the System
4. Steel Works- Mezzanine & Staircases

10.1 Cross Belt Sorter -

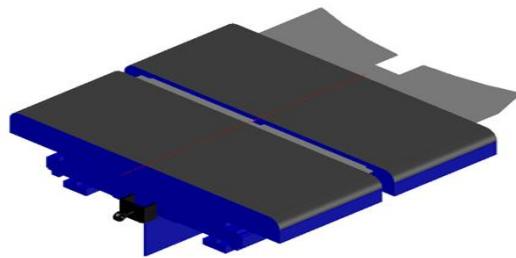
Cross Belt Sorter is capable of sorting extremely high volume of versatile products in a gentle manner.

Falcon's Cross belt sorter is powered by high efficiency linear motors and is based on 100% non-touch actuation technology leading throughput capabilities with extremely low noise levels. Falcon's Cross belt sorter is modular in design. It can be easily extendable as per future requirements



10.1.1CBS Carrier

Falcon's CBS offers one of the highest Belt widths to Carrier Pitch Ratio in the market today. This additional belt width makes the system capable of handling larger product sizes without compromising on throughput. This also means reduced "dead area" between Carrier belts which drastically reduces the amount of "inbetweeners" and non-sortable shipment recirculation.



10.1.2Servo Roller

High Powered DC Drive Servo Roller are used to actuate the carrier belts, thereby eliminating the need for complicated drive transfer mechanism, and simplifying the system installation and maintenance.



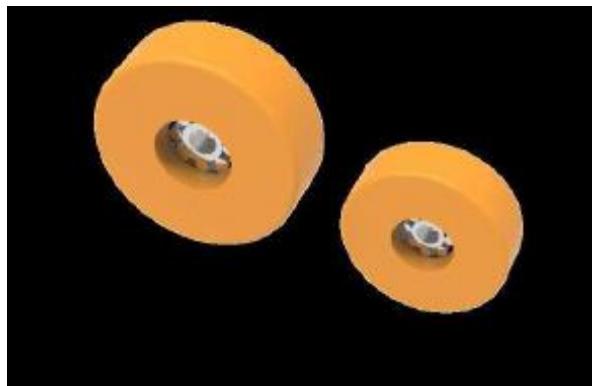
10.1.3 Chassis

Falcon Autotech's Cross Belt Carrier Chassis is made of light yet sturdy material which makes them light yet sturdy. This reduced weight leads to substantial "Power Savings" over a considerable period of usage.



10.1.4 Carrier Wheels

Carrier wheels with large diameter are used which reduces number of revolutions for the same Track Length, thereby reducing wear and tear



10.1.5 Non-contact based Linear motor drive

Extremely High Energy Efficient Linear Induction Motors that can be configured at variable speeds depending upon the operational requirements giving you the maximum flexibility when needed.



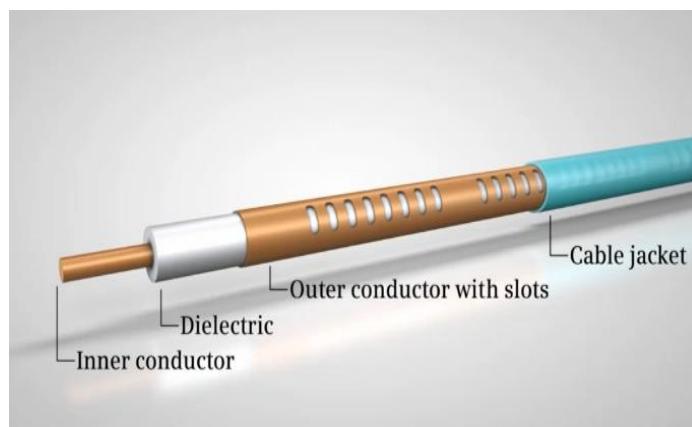
10.1.6 Power Transmission

Power transmission to Carriers over sliding contacts that require low maintenance and offer high levels of reliability.



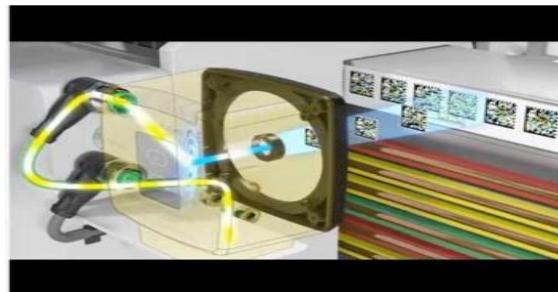
10.1.7 Data Transmission

The R-Coax cable is used for data distribution in the sorter. This is a leaky wave cable, that runs throughout the sorter length transmitting the data. There is one antenna present in the super master carriage, which keeps on receiving the signal from this cable while on the move, wirelessly.



10.1.8 Carriers positioning System.

Positioning system determines the exact location of each carrier in the loop at any given point in time. There is a plastic tape strip of barcodes (QR Codes) that is running along the sorter loop, which is continuously scanned by scanners placed on a Carrier (Master Carrier)



10.1.9 Technical specifications of Sorter

Items	Make
Sorter Carrier Type	Dual Deck Loop CBS
Sorter Speed in m/s	> 2.1 m/s
Sorter Loop Length (Upper Deck)	~522.9 m
Sorter Loop Length (Lower Deck)	~522.9 m
Sorter Actuation Technology	Electric
Chutes	
Collection Type Chutes	108 Nos
Gravity Spiral Chutes for Totes	14 Nos
Spiral Collection Chutes	25 Nos
Rejection Chutes	2 Nos
Carrier Design	
Carrier Motor Make	Falcon
Carrier Pitch	1200 mm
No. of Carriers	445 Nos
Drives	
Motor/Drive type	LIM
Automatic Feedlines	20 Nos
Power and Data Transmission	
Power Transmission	Over Continuous Bus Bar
Empty Carrier Detection System (Camera Based)	02 Nos
Maintenance Speed of the Sorter- Jog Mode	0.8 m/s
Area Requirement (L x B)	Refer Layout

10.2 Scanning & Sensing on Main Sorter Loop

10.2.1 Automatic Barcode Scanning & Dimensioning System

5 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. System is equipped with 3 side and 6 side barcode scanning tunnels.



10.2.2 Shipment Positioning System.

Falcon Cross Belt Sorter is equipped with Multiple shipment positioning Scan Tunnels. A tunnel comprises of a series of high Precision Laser Scanners that detect the absolute position of the Shipment on the Cross-Belt Carrier and prepares the Carrier for discharging the product accurately into the chute (virtual centring) and physically bring the product to the centre of cross belt carrier (Physical centring).



10.2.3 Empty Carrier Detection System

This system detects the empty carriers on the sorter and prepares the Feedlines to load the shipments on the empty carriers. (Camera based)



10.3 Conveyor BOQ (Phase 1 + Phase 2)

S No.	Name	Conveyor Length (m)	Conveyor width (mm)	Set
1	PVC belt conveyor	4.3	810	1
2	PVC belt conveyor	4.3	810	1
3	PVC belt conveyor	4.3	810	1
4	PVC belt conveyor	4.3	810	1
5	PVC belt conveyor	4.3	810	1
6	PVC belt conveyor	13.4	1010	1
7	PVC belt conveyor	4.3	810	1
8	PVC belt conveyor	6.7	1010	1
9	PVC belt conveyor	2.4	1010	1
10	PVC belt conveyor	3.4	1010	1
11	PVC belt conveyor	1.9	1010	1
12	PVC belt conveyor	3.4	1010	1
13	PVC belt conveyor	4.8	1010	1
14	PVC belt conveyor	2.9	1010	1
15	PVC belt conveyor	13.2	1010	1
16	PVC belt conveyor	2.4	1010	1
17	PVC belt conveyor	10.3	810	1
18	PVC belt conveyor	4.3	810	1
19	PVC belt conveyor	4.3	1010	1
20	PVC belt conveyor	2.8	1010	1
21	PVC belt conveyor	4.3	810	1
22	PVC belt conveyor	4.3	810	1
23	PVC belt conveyor	4.3	810	1
24	PVC belt conveyor	6.7	810	1
25	PVC belt conveyor	15.8	810	1
26	PVC belt conveyor	19.6	810	1
27	PVC belt conveyor	4.3	810	1
28	PVC belt conveyor	5.8	810	1
29	PVC belt conveyor	4.3	810	1
30	PVC belt conveyor	4.3	1010	1
31	PVC belt conveyor	7.2	810	1

32	PVC belt conveyor	6.2	1010	1
33	PVC belt conveyor	4.8	810	1
34	PVC belt conveyor	8.2	1010	1
35	PVC belt conveyor	2.4	810	1
36	PVC belt conveyor	10.1	1010	1
37	PVC belt conveyor	4.3	810	1
38	PVC belt conveyor	4.3	810	1
39	PVC belt conveyor	4.3	810	1
40	PVC belt conveyor	4.3	810	1
41	PVC belt conveyor	10	810	1
42	PVC belt conveyor	10.5	810	1
43	PVC belt conveyor	10.5	810	1
44	PVC belt conveyor	10.5	810	1
45	PVC belt conveyor	10.5	810	1
46	PVC belt conveyor	13.4	1010	1
47	PVC belt conveyor	2.2	1010	1
48	PVC belt conveyor	19.2	810	1
49	PVC belt conveyor	19.7	810	1
50	PVC belt conveyor	4.3	1010	1
51	PVC belt conveyor	10	810	1
52	PVC belt conveyor	10	810	1
53	PVC belt conveyor	10	810	1
54	PVC belt conveyor	10	810	1
55	PVC belt conveyor	10.5	810	1
56	PVC belt conveyor	6.2	1010	1
57	PVC belt conveyor	4.8	1010	1
58	PVC belt conveyor	2.4	1010	1
59	PVC belt conveyor	9.6	810	1
60	PVC belt conveyor	10.3	1010	1
61	PVC belt conveyor	2.4	810	1
62	PVC belt conveyor	19.6	810	1
63	PVC belt conveyor	2.4	810	1
64	PVC belt conveyor	11	810	1
65	PVC belt conveyor	10.3	810	1
66	PVC belt conveyor	10.3	810	1
67	PVC belt conveyor	10.3	810	1
68	PVC belt conveyor	4.3	810	1
69	PVC belt conveyor	8.7	1010	1
70	PVC belt conveyor	7.3	1010	1
71	PVC belt conveyor	6.2	810	1
72	PVC belt conveyor	13.3	1010	1
73	PVC belt conveyor	7.3	1010	1
74	PVC belt conveyor	4.8	810	1
75	PVC belt conveyor	13.3	1010	1
76	PVC belt conveyor	7.3	1010	1
77	PVC belt conveyor	4.3	810	1
78	PVC belt conveyor	13.3	1010	1
79	PVC belt conveyor	9.1	1010	1

80	PVC belt conveyor	7.2	810	1
81	PVC belt conveyor	4.8	1010	1
82	PVC belt conveyor	10.3	810	1
83	PVC belt conveyor	10.3	810	1
84	PVC belt conveyor	10.3	810	1
85	PVC belt conveyor	10.3	810	1
86	PVC belt conveyor	10.3	810	1
87	90 Degree Belt Turn	-	-	13
88	45 Degree Belt Turn	-	-	32
89	Spacing Conveyor	-	-	24
90	TBC Conveyor (4/12)	-	-	2
91	Gravity Roller Conveyor	3	1350	14

11. Description of other system components

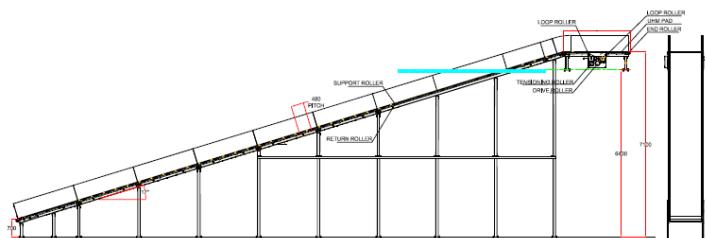
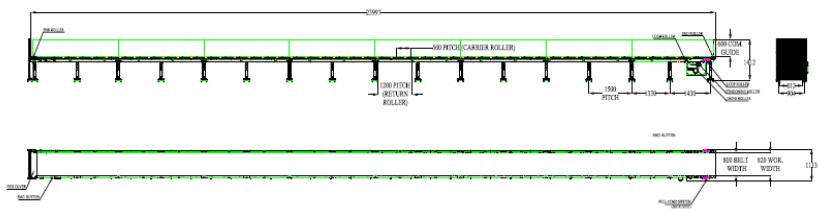
11.1 Straight and Inclined Powered Belt Conveyor

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	810/1010
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 Bradly
Insulation Class	Type	Yes
Conveyor Speed	m/s	Variable speed to meet TPH requirements
Type of Mounts	Type	Fixed Heights Legs with Grouting Provisions

11.2 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.



11.3 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
- Comes with an MS frame.



Specification	UOM	Remark
Manufacturer Name	Name	Falcon Autotech
Material of Roller	Type	MS Rollers with Zinc Plating
Overall Width	Mm	1000
Conveyor Height	Mm	As per Layout requirement
Drive Power Rating	Watt	40
Type of Motor	Type	DC Rollers (MDR)
Ingress Protection	Type	IP 54
Type of Drive System	Type	Round/Poly V Belt Drive
Insulation Class	Type	Yes
Conveyor Speed	m/s	Variable speed to meet TPH requirements
Load capacity per unit length of Conveyor	kg/m	50

Roller Span	Mm	Approx. 600
Roller Diameter	Mm	Approx. 50
Pitch of Rollers	Mm	75
Zone Length	Mm	825
Type of Mounts	Type	Fixed Heights Legs with Grouting Provisions
Type of Guides	Type	Steel guides at 50mm height basis the position of conveyor on both sides from Conveyor Belt Surface.

11.4 Curve Conveyor

Falcon's curve conveyors are robust and easily maintainable. The uniquely designed curve and belts provides smooth environment to parcels for making the turns. The metal frames of the belts are not deformable to prevent belt misalignment. The belt guide assembly will include removable parts to allow quick replacement in case of damage.



11.5 Put to Light System

PTL system is Falcons in house developed modular light hardware modules and a connected software platform to ensure a flexible, robust, seamless, and easy to setup PTL solution which is fully integrated with Client's WMS/ERP Systems.

The Software platform is powered by a deep artificial intelligence engine that continually mines the data generated by operations and keeps on altering the PTL configuration to increase the system productivity and give you an extra competitive edge.

The System involves a collection of physical sorting location representing the destination and is mapped to a light module which glows on the event of scan of a product for that sorting location.

It is a paperless technology that provides high throughput with a single operator with high accuracy.



S. No.	Specification	UOM	Remark
1	Manufacturer Name	Name	Falcon Autotech
2	Dimensions	Mm	165 X 50
3	PTL location	Nos	As per Layout requirement
4	LED Display	Type	3 Digit Alpha numeric Rotating Display
5	LED Size	Mm	~ 25 x 20
6	LED Indicator	yes/no	YES
7	Acknowledgment Button	yes/no	YES
8	Function keys	yes/no	4 Keys
9	Power Requirements	Type	3 Phase UPS Power
10	Communication	Type	TCP/IP and Serial
11	Software Interface	Type	Over APIs or other methods
12	Type of mount	Type	Clip On Type on Rails

12. Steel Works – Induct Platform, Staircases



Infeed Zone-1 Induct Platform
Total Area ~ 1,185 Sqm



Infeed Zone-2 Induct Platform
Total Area ~ 1,185 Sqm



Total No. of Stairs - 38

13. Proposed System Technical Details

a. Mechanical equipment (Phase 1 + Phase 2)

Pos.	Qty.	Description	Value
1	1	Infeed System (Upper Deck + Lower Deck) <ul style="list-style-type: none"> PVC belt Conveyor- 656 m; 86 Modules Belt Turn 45 degree Belt Turn 90 degree Spacing Conveyor Telescopic Belt Conveyor 	Included 32 Nos 13 Nos 24 Nos 2 Nos
2	1	Feedlines (Upper Deck of the Loop) Consists of <ul style="list-style-type: none"> Receiving Conveyor Buffer Conveyor Spacing Conveyor Weighing Conveyor Angle Merge 	10 Nos 20 Nos 40 Nos 10 Nos 20 Nos
3	10	Feedlines (Lower Deck of the Loop) Consists of <ul style="list-style-type: none"> Receiving Conveyor Buffer Conveyor Spacing Conveyor Weighing Conveyor Angle Merge 	10 Nos 20 Nos 40 Nos 10 Nos 20 Nos
6	1	Sorter (Upper Deck) Loop Cross Belt Sorter <ul style="list-style-type: none"> Sorter Height Sorter Length Sorter Speed Sorter Drive Carrier Pitch Including: <ul style="list-style-type: none"> Standard Sorter Supports Empty Carrier Detection System Product Centering System Dimension Scanning System E-Stops Hooter Fencing 	5797 mm ~523 m ~2 m/s Linear Motor 1175 mm
7	1	Sorter (Lower Deck) Loop Cross Belt Sorter <ul style="list-style-type: none"> Sorter Height Sorter Length 	3297 mm ~523 m

		<ul style="list-style-type: none"> • Sorter Speed • Sorter Drive • Carrier Pitch <p>Including:</p> <ul style="list-style-type: none"> • Standard Sorter Supports • Empty Carrier Detection System • Product Centering System • Dimension Scanning System • E-Stops • Hooters • Fencing 	>2.1 m/s Linear Motor 1200 mm
		PTL System	
		<ul style="list-style-type: none"> • PTL wall (G+1) Level (Document consolidation) • PTL Modules/Frames (Line Haul Docks) • PTL Modules/Frames (Post Office) • PTL Modules/Frame (Last Mile) • PTL Modules/Frames for Pallets (Oversized) • PTL Control Box (Total) 	160 Nos 148 Nos 420 Nos 336 Nos 18 Nos 149 Nos
9	1	Outputs	
		<ul style="list-style-type: none"> • Collection Type Chutes • Gravity Spiral Chute for Totes • Spiral Collection Chute • Rejection chutes 	108 Nos 14 Nos 25 Nos 2 Nos
10	1	Steel Works	~2481 sqm. 38 Nos

b. Electrical Equipment

Electricals			
1	1	Consists of	Included

Main Power Distribution panel
Main Control Panel
Feedline Control Panels
Sorter Drive Panels
Field Cabling

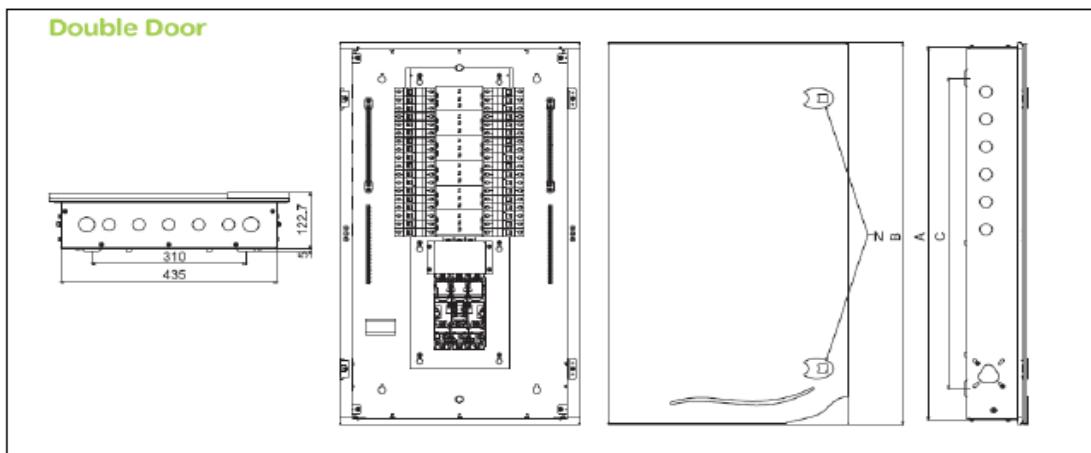
c. Control System

Components			
1	1	Consists of Siemen's PLC based Control System Industrial Switch	1 Nos. As per requirement

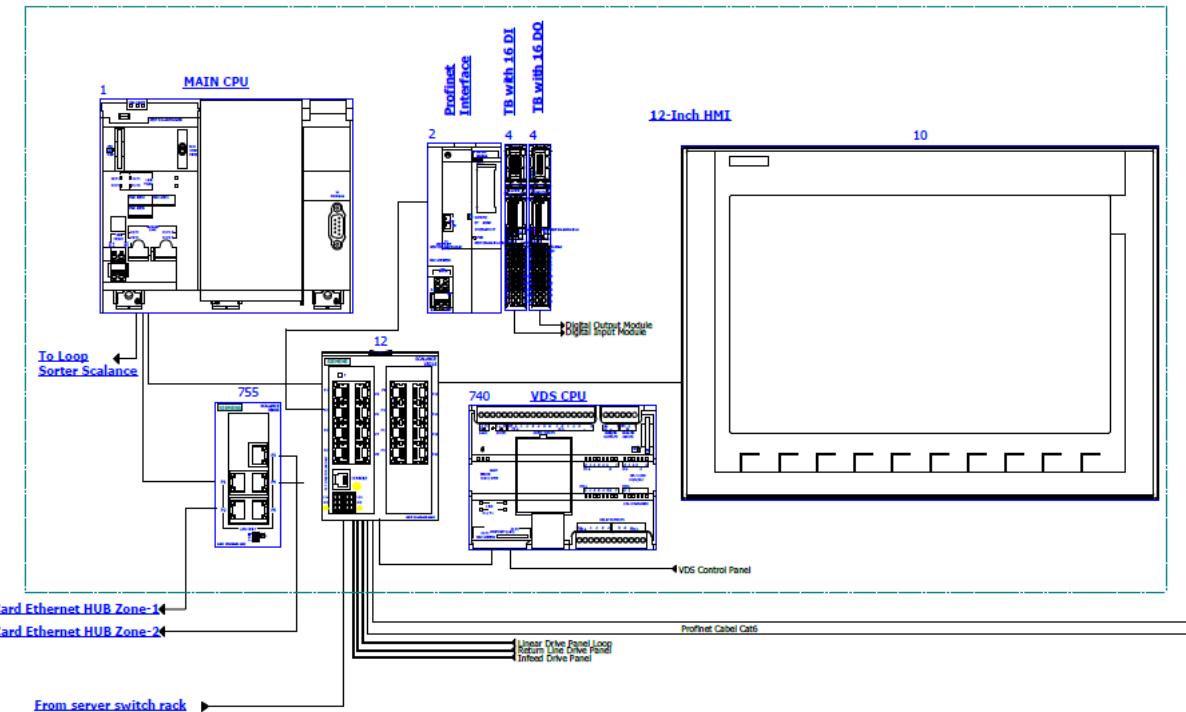
14. Electrical System

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

14.1 Reference Picture of Power Distribution Panel

14.2 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.

14.3 Power Consumption

The system requires 3 Phase with Neutral 400/415 V and frequency 50Hertz. Dedicated Double Electrical Earthing and Single Electronic Earthing should be provided for the system.

UPS Power- CBS Loop, Feedlines and System Panels should on UPS power. The UPS power requirement will be shared at later stage.

Raw Power- Rest all system modules will be on Raw power. The system RAW power requirement will be shared at later stage.

14.4 Energy Efficient System

Sorter- If the load is less, system to be operated with less no of feedlines. If feeding is not happening on any feedline for set time, it will stop running.

Conveyors – All conveyor modules are equipped with power saving sensors. If the conveyor module is not operational for desired time, the trigger will be given, and module will stop working.

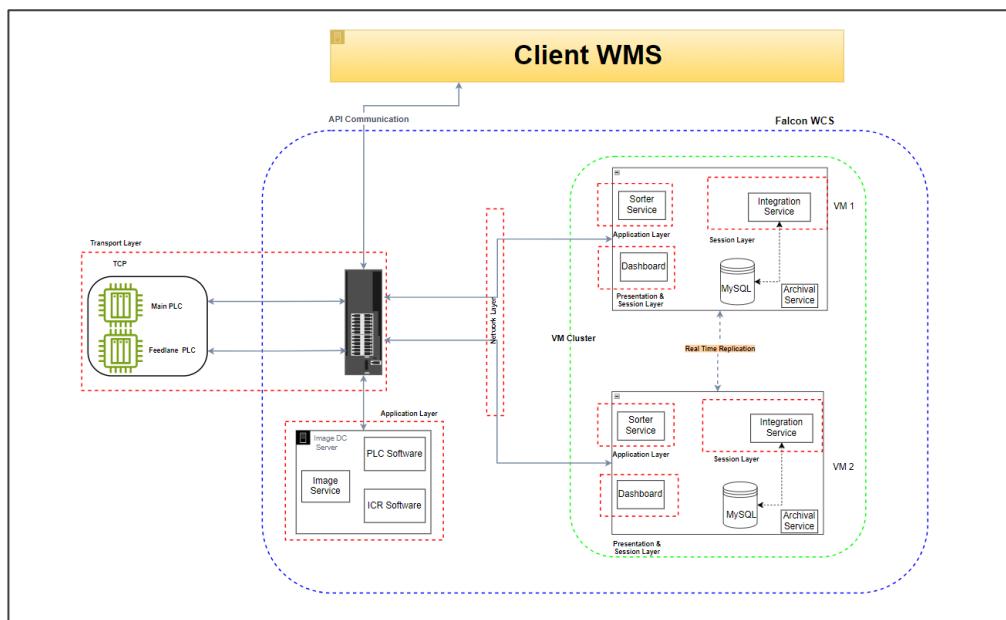
15. Falcon's WCS CONTROLIT

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.

15.1 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.



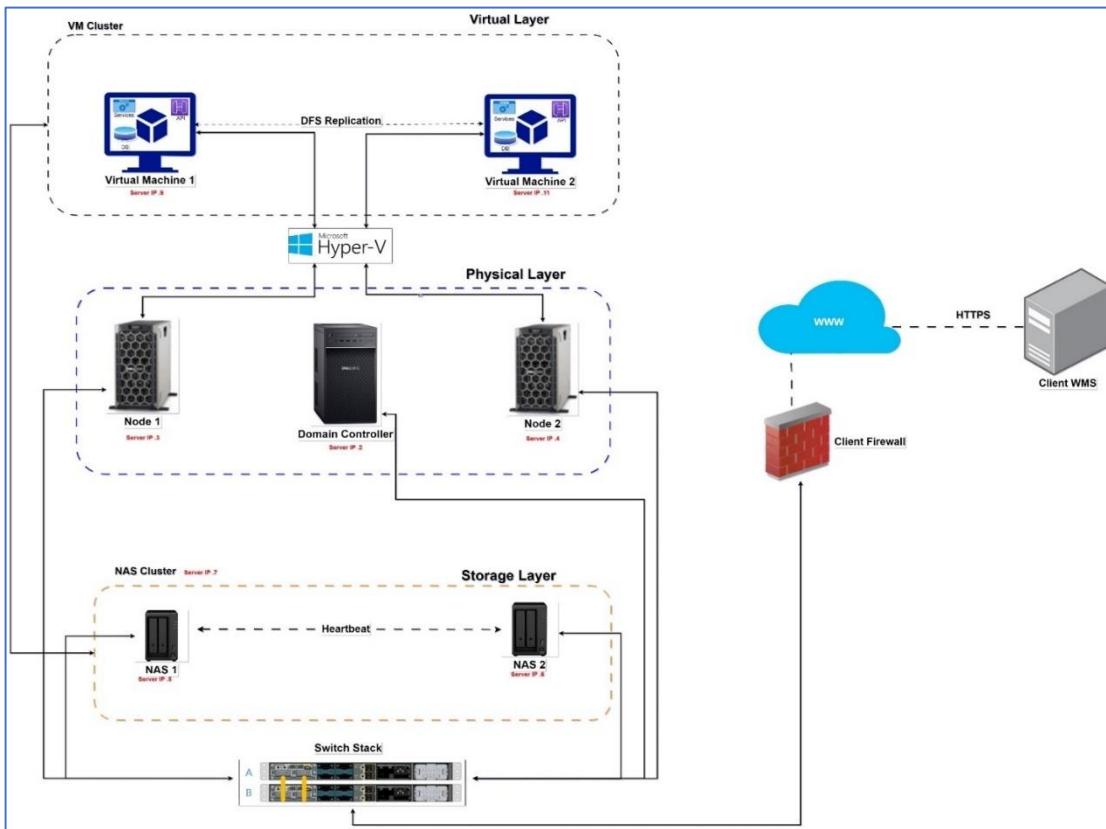
Key Components:

- **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.

15.2 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.
- Analyses 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.

15.3 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.

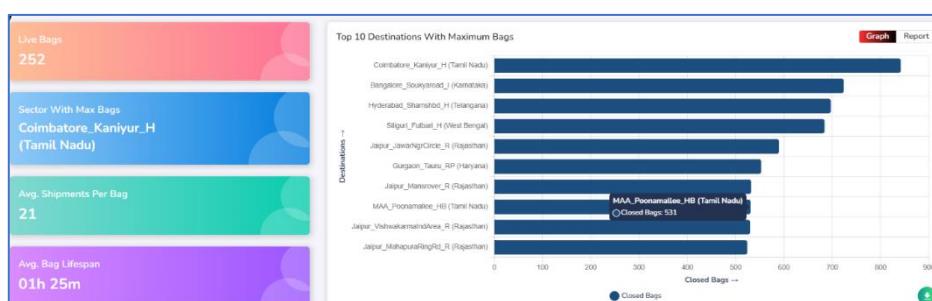


Figure 2 Live Bags

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

Bay Status					
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	

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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.

Search Processed Packages									
Start Date *	End Date *	Start Time *	End Time *	AWB Number	Package ID	Package Status *	Scanning Mode	All Processed Packages	
3/2/2023	3/2/2023	13:36	13:51			All	All		
				Enter AWB Number Here ...	Enter Package ID Here ...				
								Search	

PACKAGE AWB	PACKAGE ID	BARCODES SCANNED	SCANNING MODE	INDUCTED LANE	BAY NUMBER	SORTING ERROR INFO	STATUS	PACKAGE LENGTH	PACKAG
14908426999533	20842624	14908426999533	AU	F2	Bay-45	ACC	SUCCESS	32.4	28.1
14908427094112	20842625	--	AU	F2	Bay-24	ACC	SUCCESS	29.6	11.3
14908426999583	20842626	14908426999583	AU	F2	Bay-6	ACC	SUCCESS	29.3	12.7
149084230013766	20842627	149084230013766	AU	F2	Bay-30	ACC	SUCCESS	24.4	28.9
28449268952372	20842628	28449268952372,HDIN23FO1017	AU	F2	Bay-28	ACC	SUCCESS	32.4	28.1
5983675551880	20842629	25833895323059HKGEND000RSFA5.50H3675551880	AU	F1	Bay-28	ACC	SUCCESS	33.5	44.3
148094221770814	20842630	--	AU	F2	Bay-60	DNF	FAILED	24.5	20.6
5983675847133	20842631	FMP91574230289.5963678847131.2C-5478299670DELYK80D09595A	AU	F1	Bay-28	ACC	SUCCESS	20.2	15.4
6323812000924	20842632	634812000924,6323812000924	AU	F1	Bay-16	ACC	SUCCESS	14.6	9.9
1490842498856	20842633	1490842498856	AU	F2	Bay-60	DNF	FAILED	21.7	19.4

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Figure 4 Processed Package

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

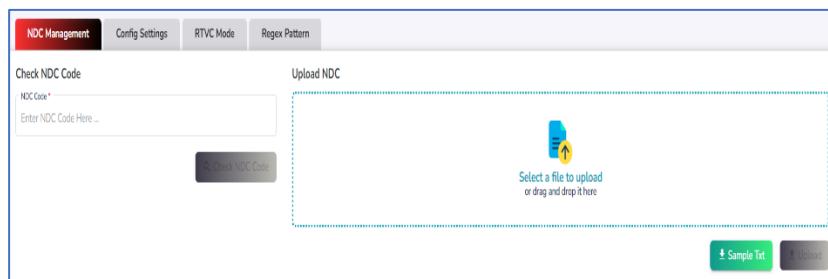


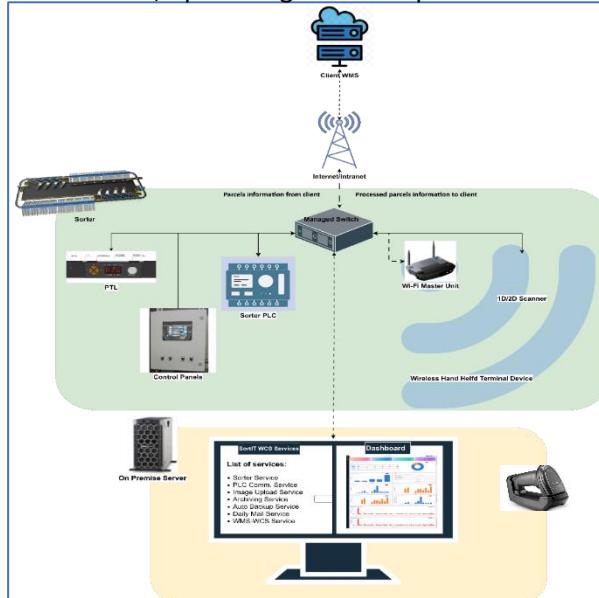
Figure 5 Configuration Settings

- **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.

15.4 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.

15.5 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)**.

15.6 HAA Server Specifications (In Client'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 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	2
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 Year Onsite NBD,480 GB SSD,1 Gbe Dual Lan Card Extra	1
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 SPL for Servers-

- SPL 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, ensure high availability and minimize 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.

16.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 SPL Dubai Hub. This SCADA system receives from each monitored sub-system all information on their operating status in real time.

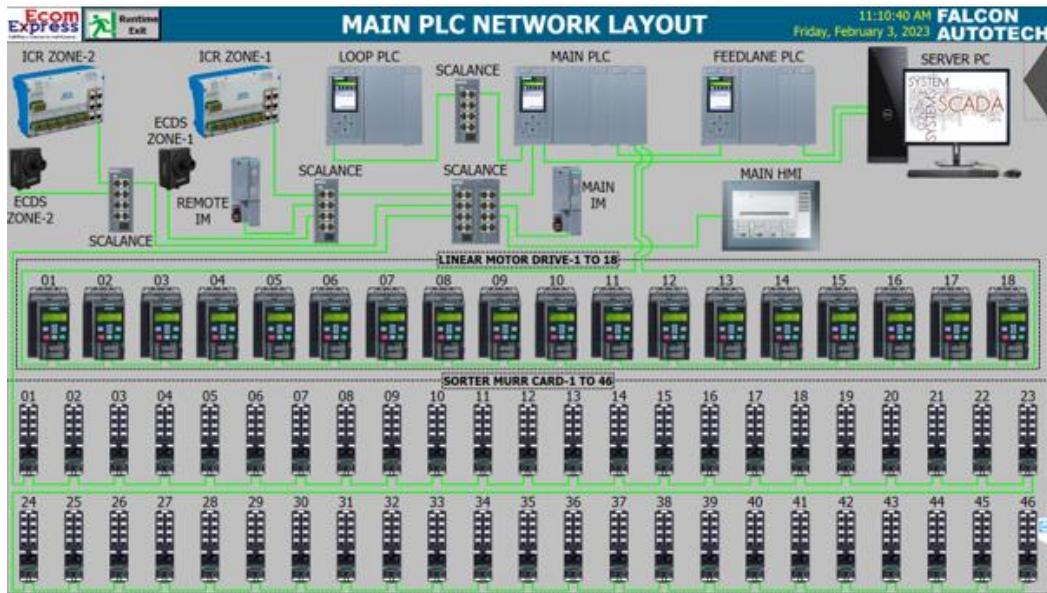
At the system monitoring level, the functions performed are:

- 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.

16.1 Field Data Acquisition

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

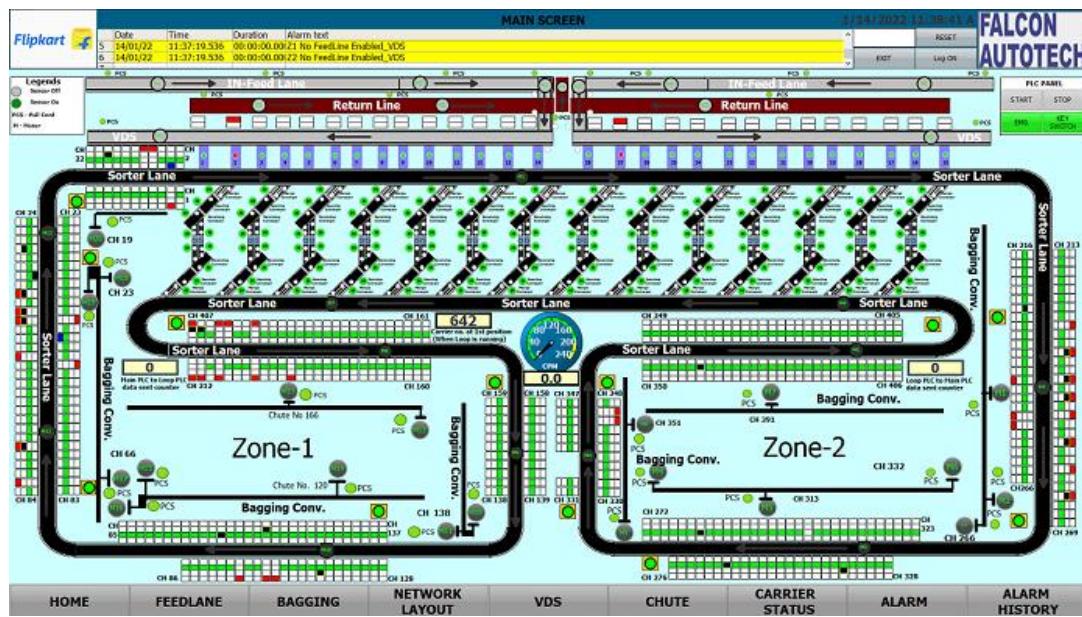
The communication with the PLCs is done using equipped CPU cards that are able to manage the communication with the PLC on the Industrial Ethernet network, without overloading the server. The acquisition of signals from external systems is carried out via the PLC, using dry contacts.



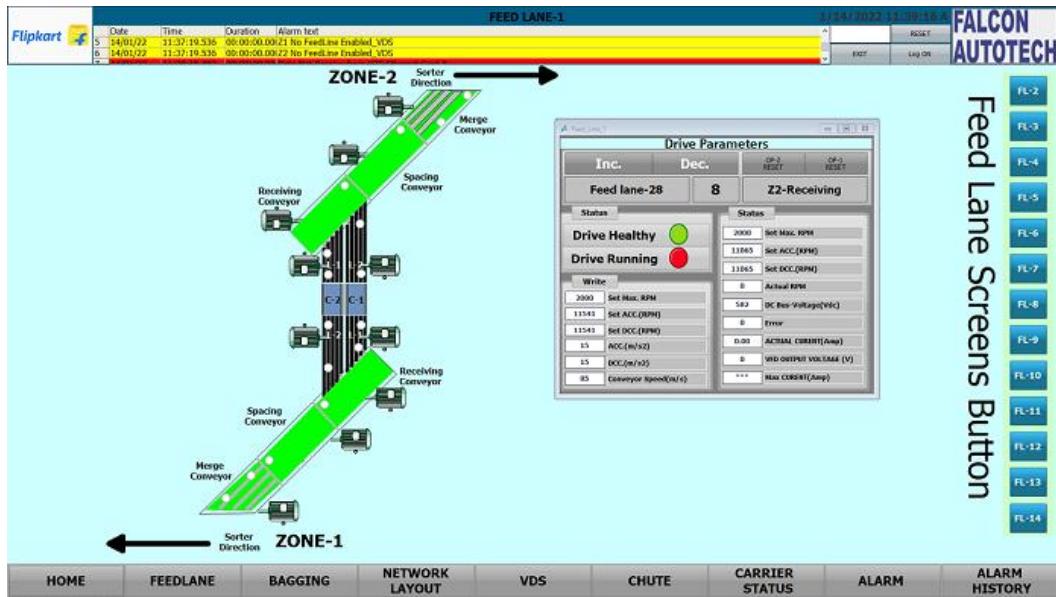
16.2 Animated system visualization

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



16.3 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.

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

17. Key Components Make

Items	Make
Belts	Forbo/ Dero
Rollers	Falcon
Cross Belt Carriers	Falcon
LIM	Falcon
Induction Motors	SEW/ Lenze/ Nord
Volume Scanners	Not Applicable
Weighing Scales (Optional)	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	Schneider/Equivalent
Bearings	NTN/SKF (Excluding Bearing of Rollers. Bearings will be FAPL /OEM standard)
Power Transmission Systems	Vahle
HMs	Siemens
Main load break switch	Schneider/ Siemens
IO module	Siemens / MurrCard
Push-Buttons & Lamps, SW	Schneider/ L&T
Male /Female Connectors	Wago / Similar superior
Power Cables	LAPP / Similar
Ethernet Cable	Siemens / Phoenix
Phase Failure relay	Selec

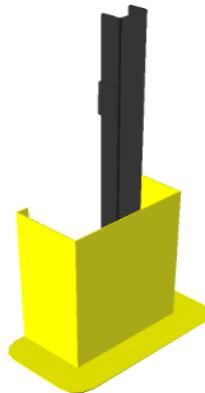
Door Limit Switch	Salzer
Cable Glands & Conduits	Flexicon / Teknic
Power Distribution Connectors	Wago / Similar superior
Ethernet switch	Siemens / Phoenix / D-Link

18.Principle of Safety

Pull cords and Leg Guards will be provided in the system as per Falcon Standards.

18.1 Leg Guards / Toe Guards of CBS and Chutes

Leg / Toe guards are protective components designed to enhance safety and functionality in systems. These guards are typically installed around the legs or supports of a conveyor to shield workers from potential hazards such as sharp edges, moving parts, or accidental contact.



18.2 Pull Cords Switch-



19. Infrastructure

19.1 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.

19.2 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.

19.3 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.

19.4 Estimated Floor Load-

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

19.5 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.

19.6 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.

19.7 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.

20. Program Organisation

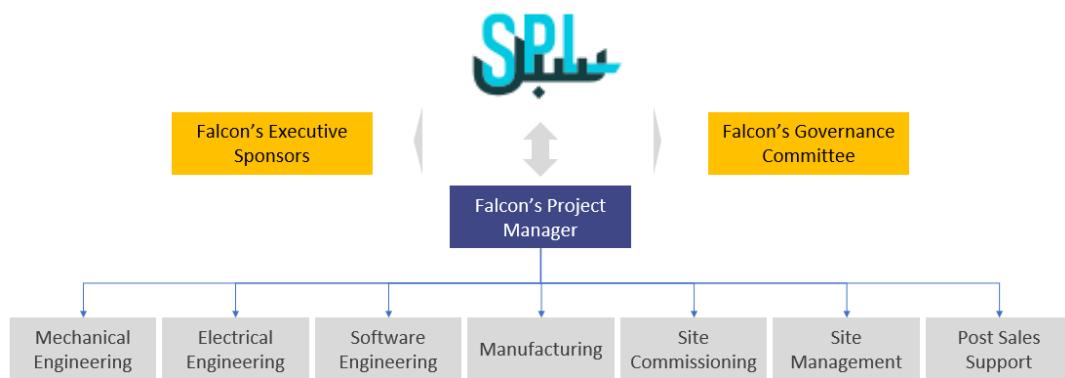
20.1 Project Management

For this program, proposed approach covers the following aspects:

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

20.2 Project Team

Team of 5 to 6 experienced members from Projects team will co-ordinate on regular basis with SPL and Internal stakeholders for smooth execution of the project.



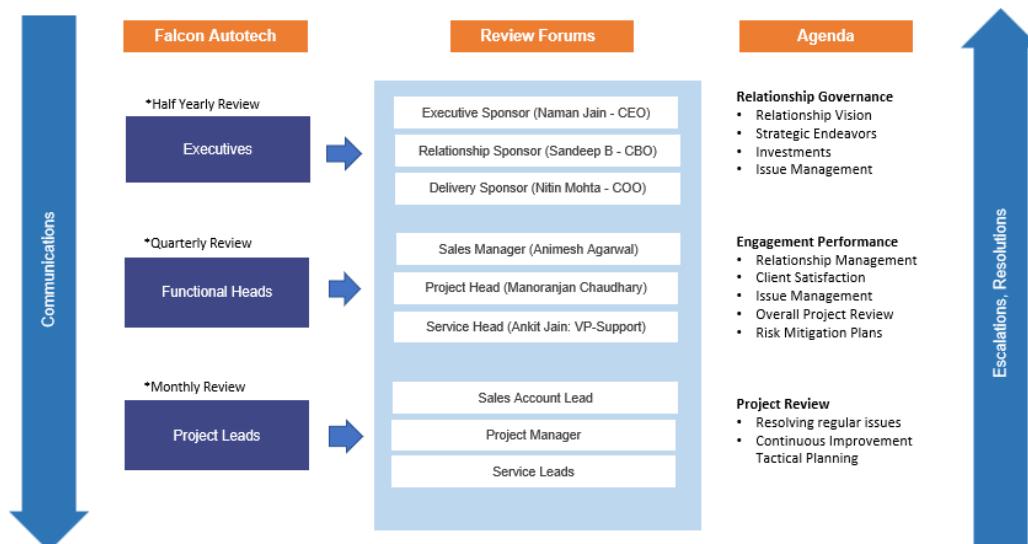
Falcon Project Manager is overseen and supported by Executive Sponsors. The Project Manager leads a multi-disciplinary team of members from all Falcon departments necessary to deliver the project, as shown in the diagram above.

20.3 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



20.4 Program/ Project Schedule

24-26 weeks ex-works from the date of PO & Advance and 10 weeks for installation after receiving the material on site.

During the project execution, any delay which cannot be attributed to Falcon shall be excluded from the calculation and a corresponding extension shall be provided to Falcon.

21. SPL's Responsibility

SPL Responsibilities During the Assembly and Commissioning Phase

- Provision of the site complex and office area facilities.
- The possibility of authorizing access to the site and the execution of the installation works up to 7 days a week and 24 hours a day if deemed necessary and if requested by FALCON.
- SPL to provide HPT/ Forklift (8 nos.) for material movement for complete duration.
- SPL to provide Reach Truck 1 Nos for project duration.
- SPL to provide Hydra (1 Nos.) project duration.
- SPL to provide Aluminium Scaffolding with extended height of 6 metres – Qty: 4 Nos. (2 nos. Scaffolding & 2 nos. for complete project duration)
- 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 shipment sorting 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 makes arrangements 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 SPL During the Tests

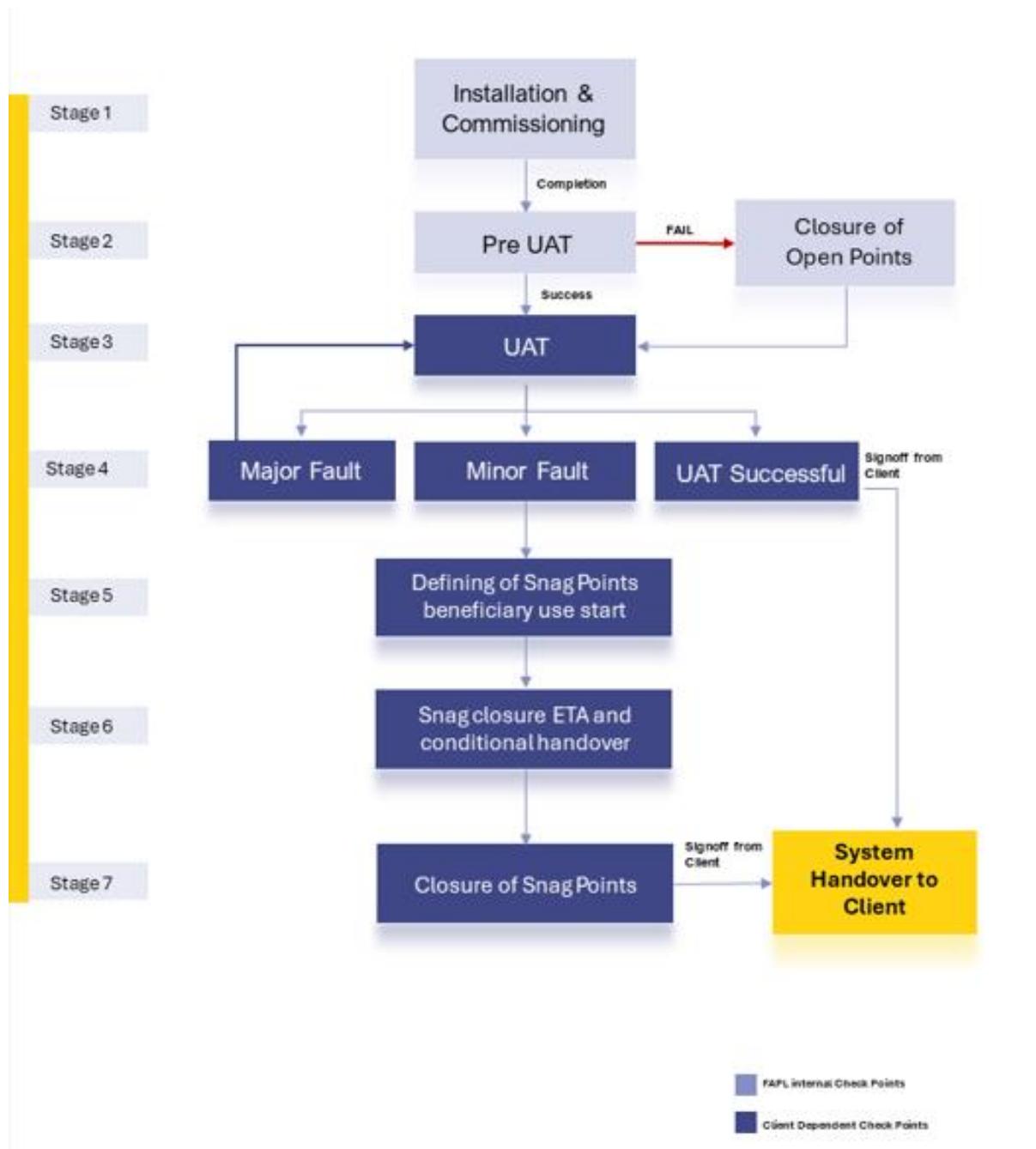
- Provision of the test loads and barcode labels required for the tests.
- Provision of personnel required for test activities (loading and unloading operations).
- Provision of the necessary information to sort the shipments correctly.
- Verify with Falcon the quality and conformity of the test loads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

SPL 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 SPL.

22. 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.

23. Training

Training for the recently installed material handling system at SPL'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 SPL's installation and application of their systems.

- **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.

- **Maintenance Training**

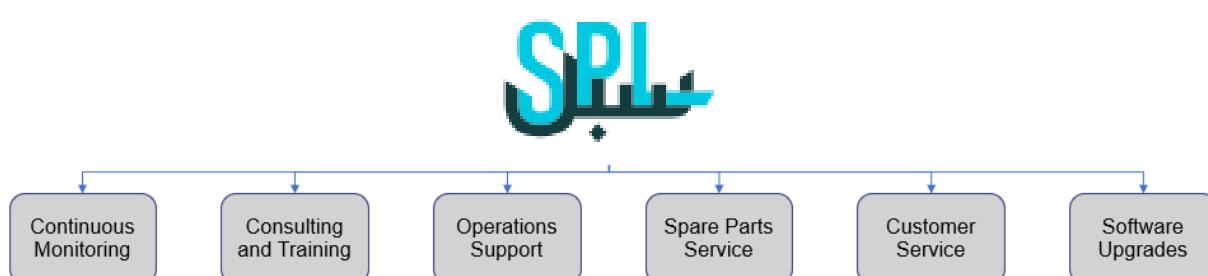
The Maintenance Training curriculum encompasses mechanical, electrical, and controls aspects of the installed system. Topics include safety, system construction and installation, system operation, maintenance and repair procedures, and technical documentation.

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.

- **Information System Training**

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

24. 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 SPL. To maintain the required uptime spares will be maintained at site.

- **On Site Support (Optional)**

To adhere to the high System uptime, dedicated Falcon's on-site engineers should be available at site covering all shifts. (Not included in the proposal, can be quoted upon request)

- **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 SPL personnel shall be contacted within the time frame described in the service level. The Falcon qualified engineer will support SPL maintenance personnel by using a remote access (via VPN) to the equipment/systems.

25. System Maintenance

- **Daily Check-**

Detailed maintenance scheduled will be shared with SPL and daily checks to be performed by SPL's site technicians.

- **Preventive Maintenance**

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

- **Corrective Maintenance**

Corrective maintenance will be performed in conjunction with preventive maintenance activities. Any required corrective actions will be communicated to SPL 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.

26.Commercial Terms

26.1 Price Sheet

Phase 1				
S/no	Description	Value	UOM	Price (USD)
1	Loop Cross Belt sorter + Inducts + 5 Side Scanning	1	Set	\$2,837,087
2	Conveyor System	1	Set	\$929,572
3	Destination + PTL System	1	Set	\$1,119,908
4	Steelworks	1	Set	\$445,383
5	Software + SCADA + IT integration	1	Set	\$38,434
6	Installation and Supervision	1	Set	\$596,032
7	Project Management and Engineering	1	Set	\$156,207
Grand Total				\$6,122,621

Phase 2				
S/no	Description	Value	UOM	Price (USD)
1	Loop Cross Belt sorter + Inducts + 5 Side Scanning	1	Set	\$2,667,798
2	Conveyor System	1	Set	\$354,227
3	Destinations	1	Set	\$369,890
4	Steelworks	1	Set	\$163,794
5	Installation and Supervision	1	Set	\$585,195
6	Project Management and Engineering	1	Set	\$66,946
Grand Total				\$4,207,849

**Note- Above price is with Falcon standard colour (Falcon Blue) and if SPL opts for its standard colours, it will lead to the impact of 3% to 4% on the equipment value.*

Our price is excluding VAT/GST and local taxes such as withholding tax, corporate tax

Dismantling and re-installation of the existing system is not considered and is not in Falcon's scope if any.

Custom Duties are not in Falcon's scope

26.2 Freight Cost

Phase 1				
S/no	Description	Value	UOM	Price (USD)
1	Freight (40FT Container)	1	Set	\$294,800

Phase 2				
S/no	Description	Value	UOM	Price (USD)
1	Additional Price for Phase 2 Containers	1	Set	\$265,320

26.3 Comprehensive Maintenance Contract for Warranty year

Phase 1				
S/no	Description	Value	UOM	Price (USD)
1	CMC for Warranty Year	1	Set	\$78,120

Phase 2				
S/no	Description	Value	UOM	Price (USD)
1	Additional Price for CMC – Phase 2	1	Set	\$52,080

26.4 On Site Spares

The complete spare list will be shared during detailed designing phase.

S/no	Description	Value	UOM	Price (USD)
1	Critical Spares Kit Phase 1 + Phase 2	1	Set	\$477,546

26.5 Insurances

Component	Set	Price (USD)
Insurances	1	On Actuals

The Total Price is to be understood.

- Inco Terms- Delivery at Site (Duties and taxes are not in Falcon's Scope)
- Installation & Commissioning- Included.
- Taxes & duties as actual- In SPL's Scope
- Price is valid for 120 days from the date of proposal.

26.6 Payment Terms (Phase 1 and Phase 2)

Payment Percentage	Stage
30%	Advance along with LOI/ PO
50%	Before Dispatch
10%	Against Installation
10%	Against Handover

27. Warranty Period

Falcon offers Comprehensive warranty for 1 year (Starts from the date of beneficiary use).
Falcon

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.
- Items damaged during transport to Falcon due to the use of unsuitable packaging.

28. 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:

- **Mobile Carts**
- **Construction Power**
- **UPS Power**
- **Collection trolleys**
- **Fans at chutes & inducts**
- **HPT/BOPT/Forklift/Hydra/Scaffoldings required for Installation**
- **Lightning**
- **Server**
- **Consumables**
- 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.