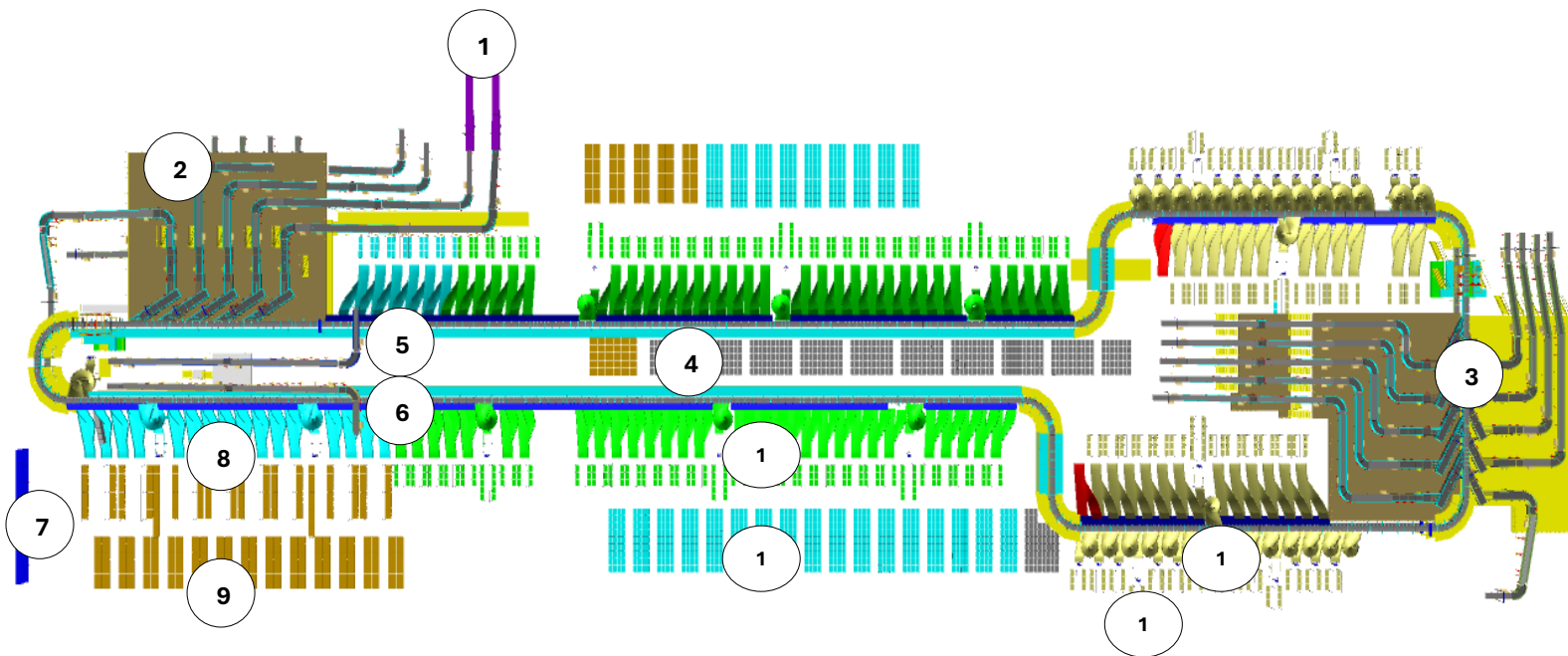### 5.4   Barcode Specifications

- 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.
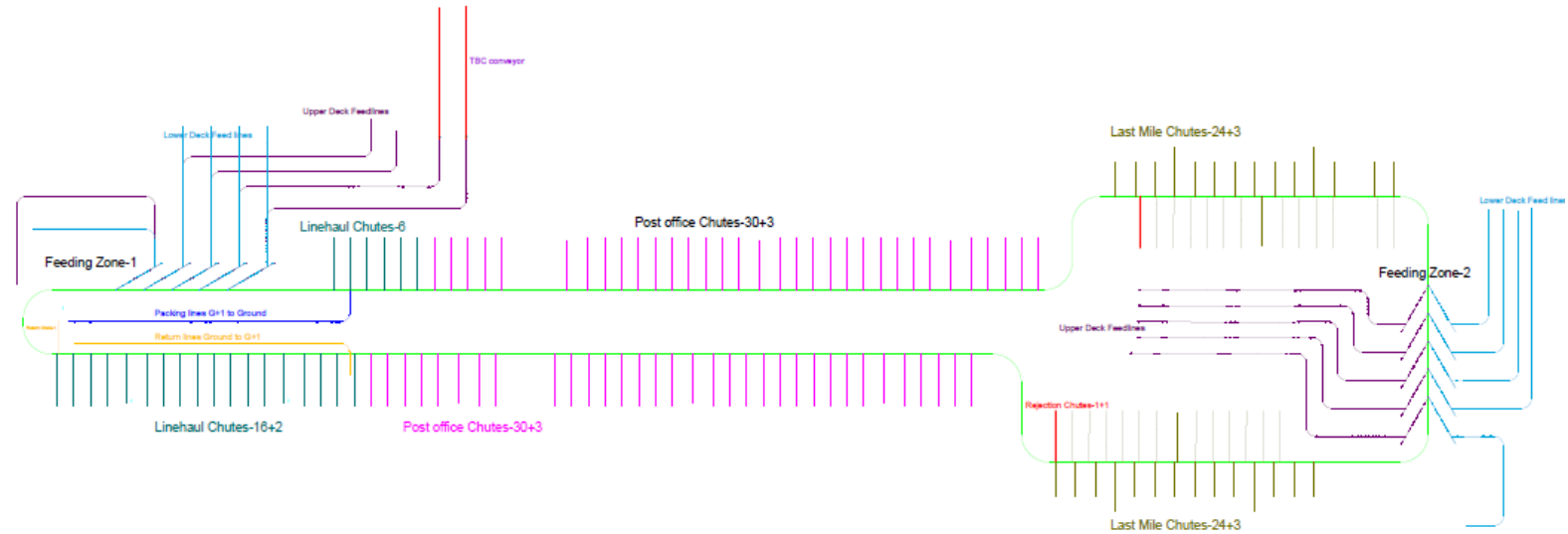
7. Proposed System Capacity Calculations

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.
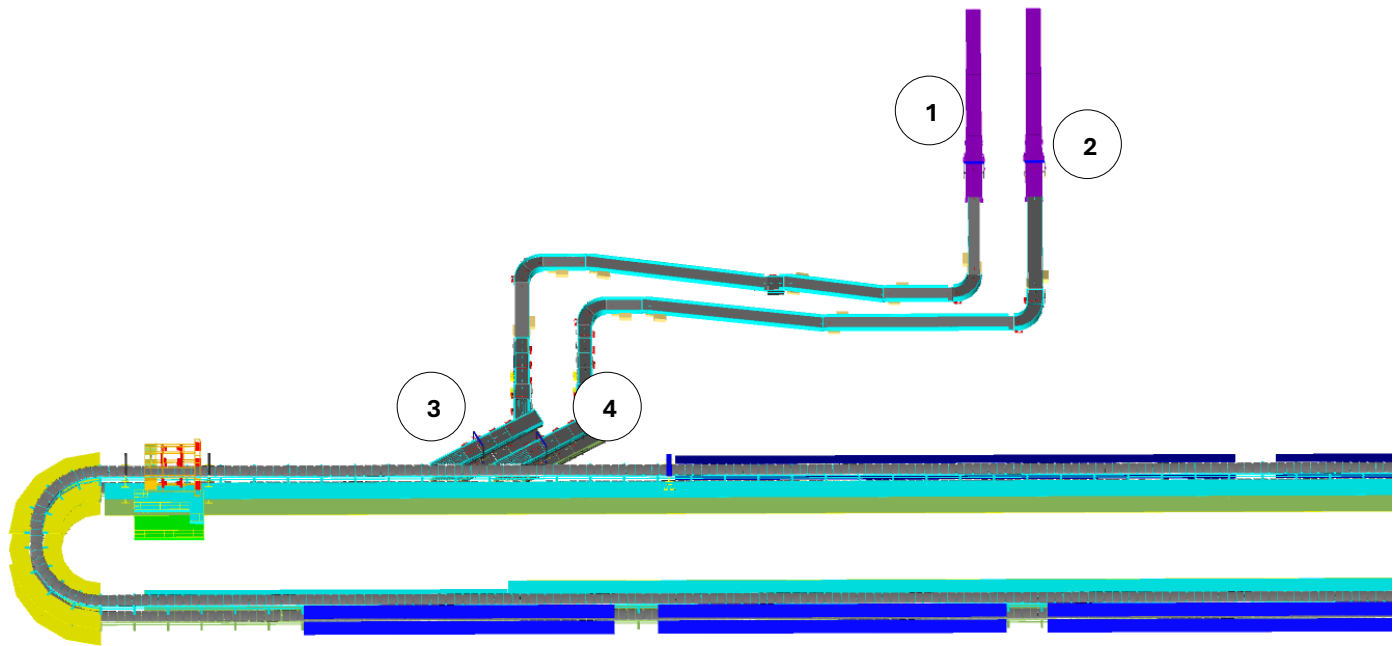
7.2 Material Flow Diagram

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
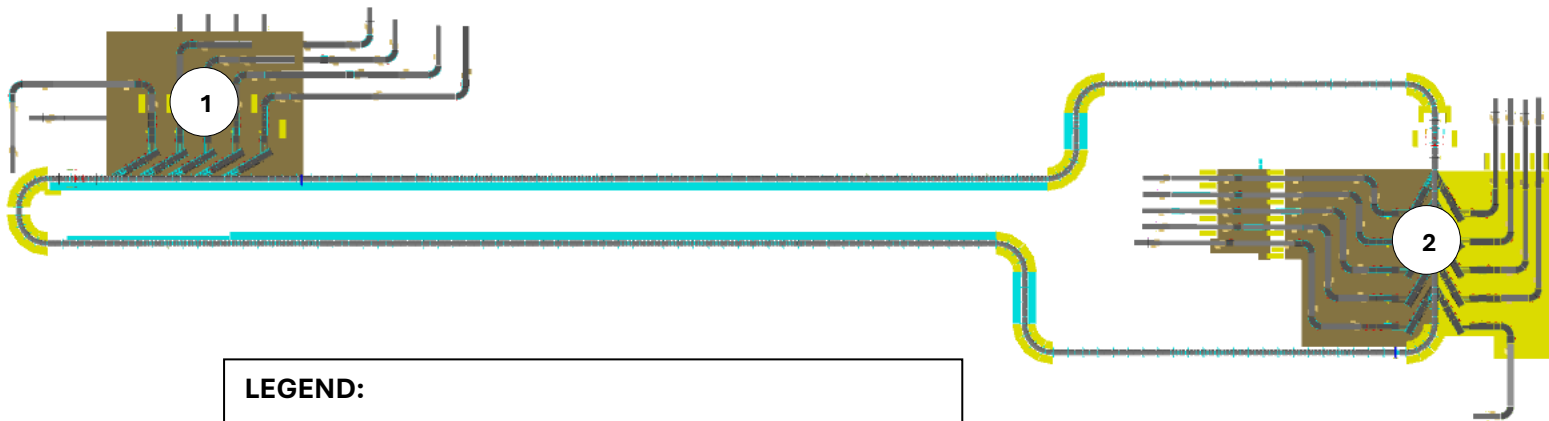
8.1 Inbound from Telescopic Belt Conveyor:


```
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
```
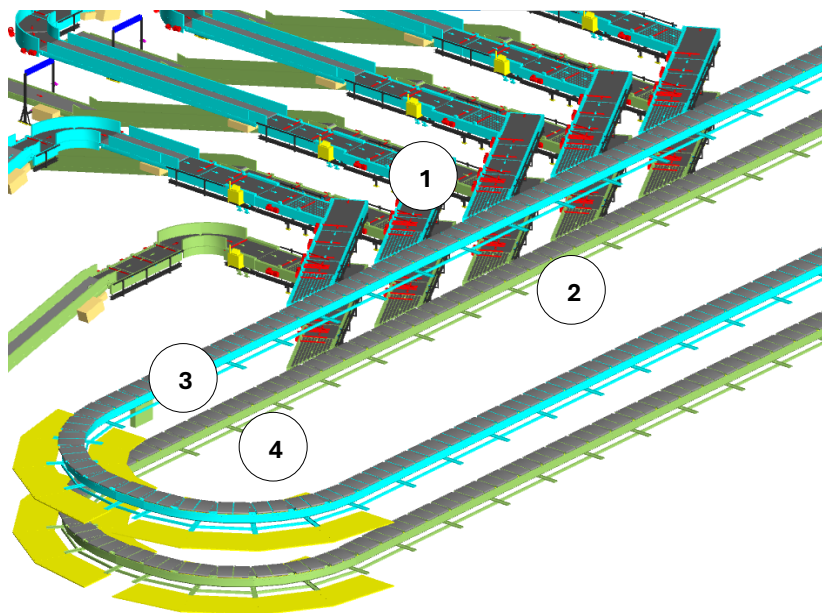
- *The Vehicles arrive at the unloading dock. Parcels are unloaded directly on the telescopic belt conveyors positioned inside the vehicles.*
- *Shipments are unloaded directly on the Telescopic Belt Conveyors.*
- *These telescopic belt conveyors are directly connected to the auto induction lines in 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

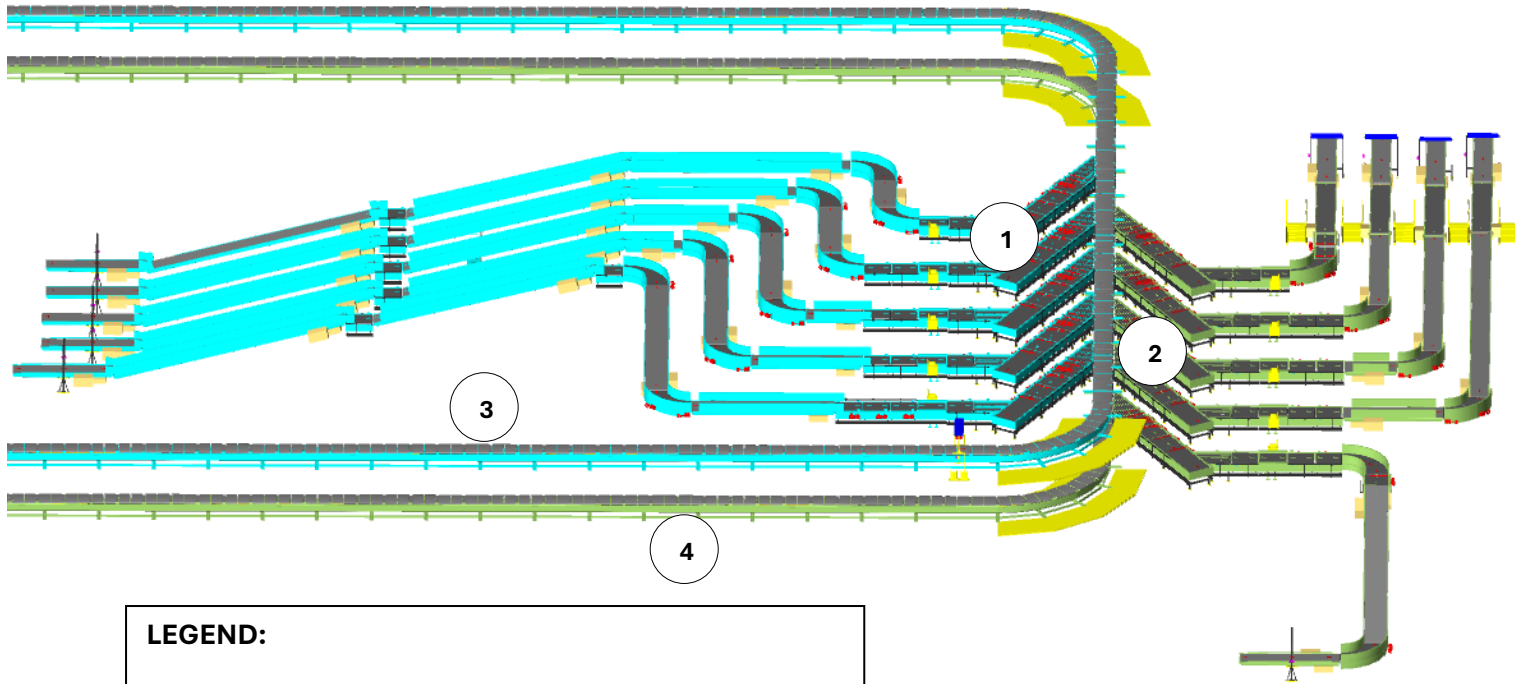**LEGEND:**

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

Infeed Zone - 1

LEGEND:

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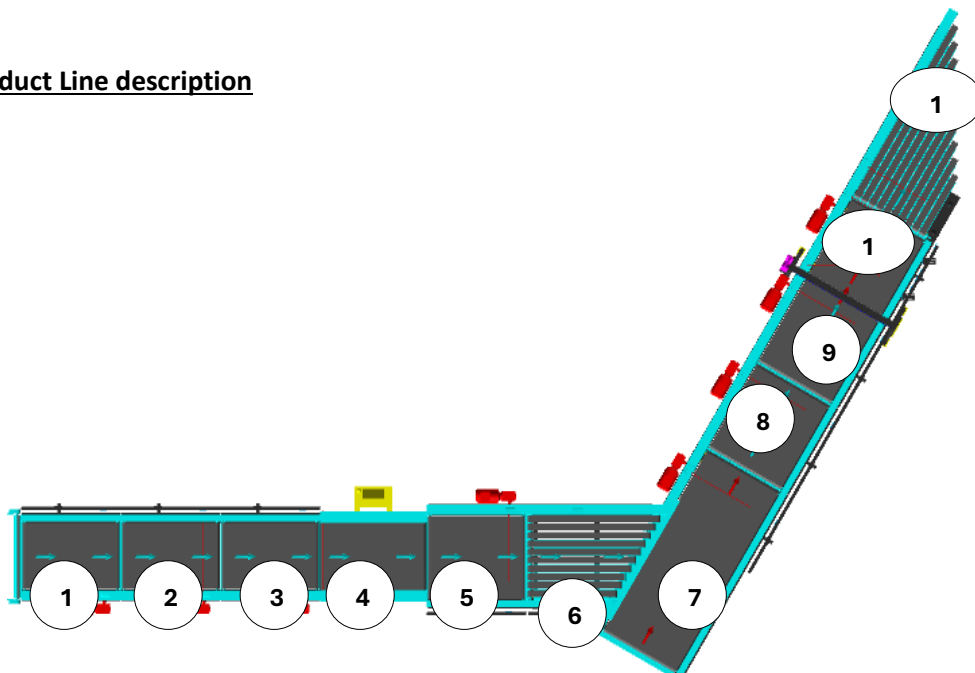4. Lower Deck of the Loop CBS

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.
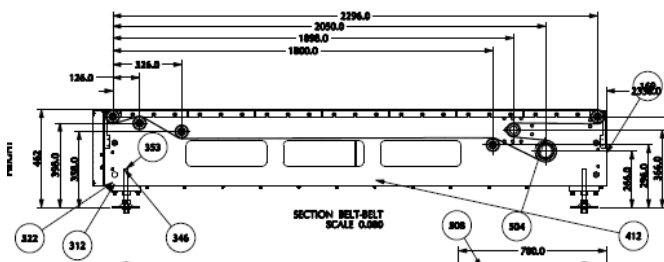
Make- Bizerba/ Mettler Toledo

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.
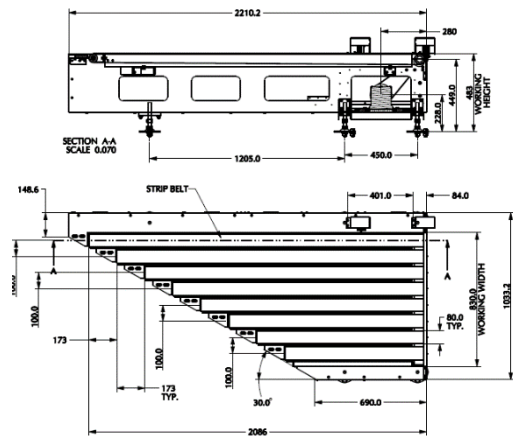
This Conveyors required to maintain the Throughput of Line.

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.
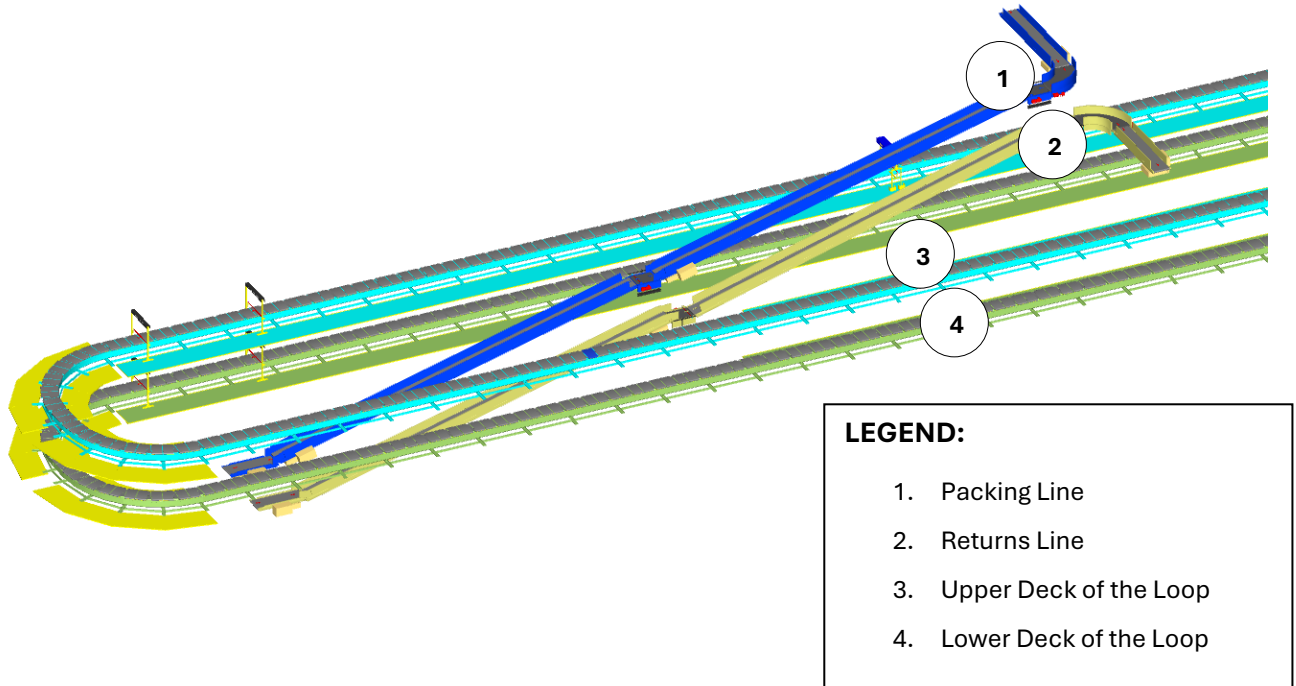

8.2.6 Orientation/ Loading Conveyor/Receiving Conveyor –

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.
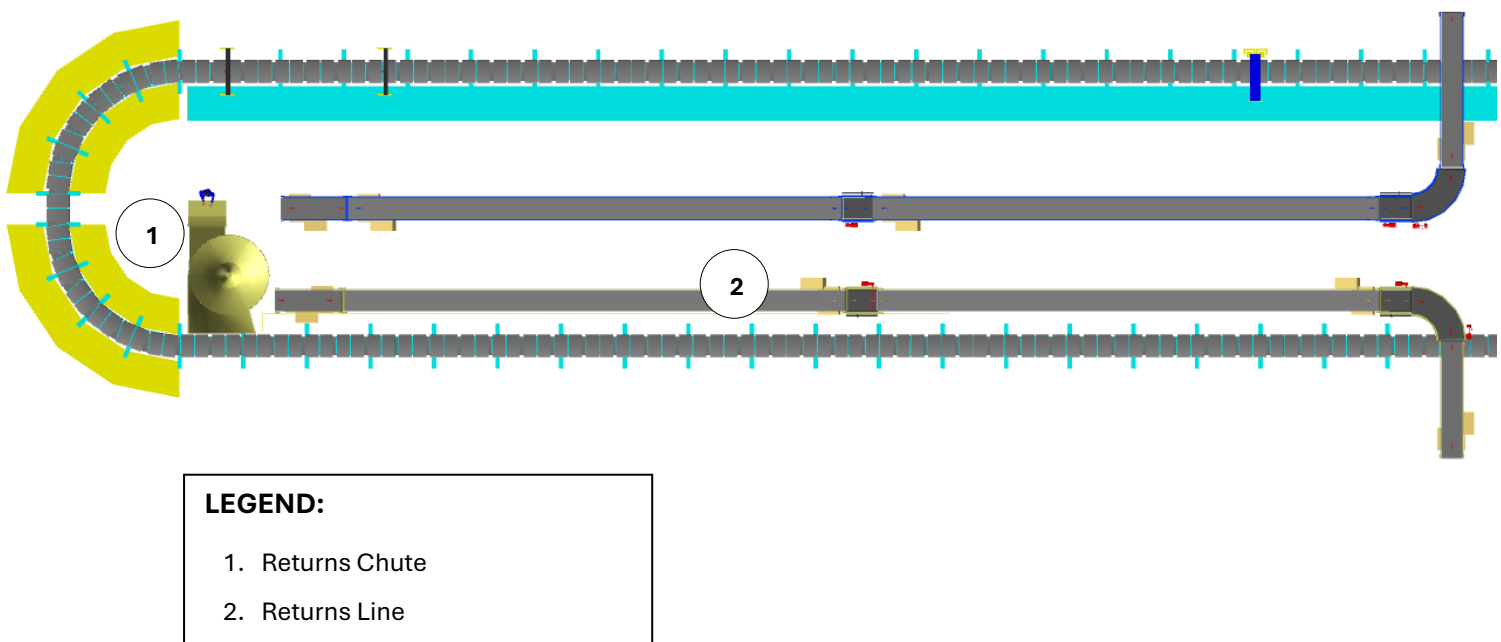
8.3 Packing Line and Returns Line at G+1

LEGEND:

1. Packing Line
2. Returns Line
3. Upper Deck of the Loop
4. Lower Deck of the Loop
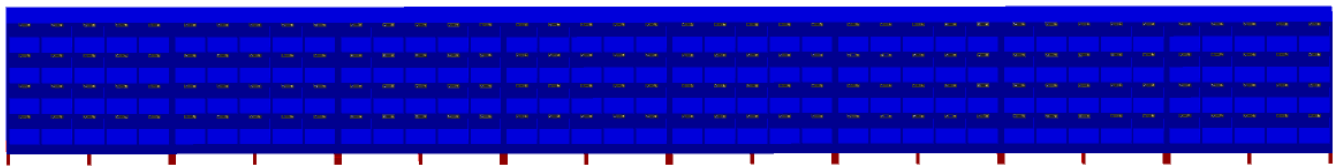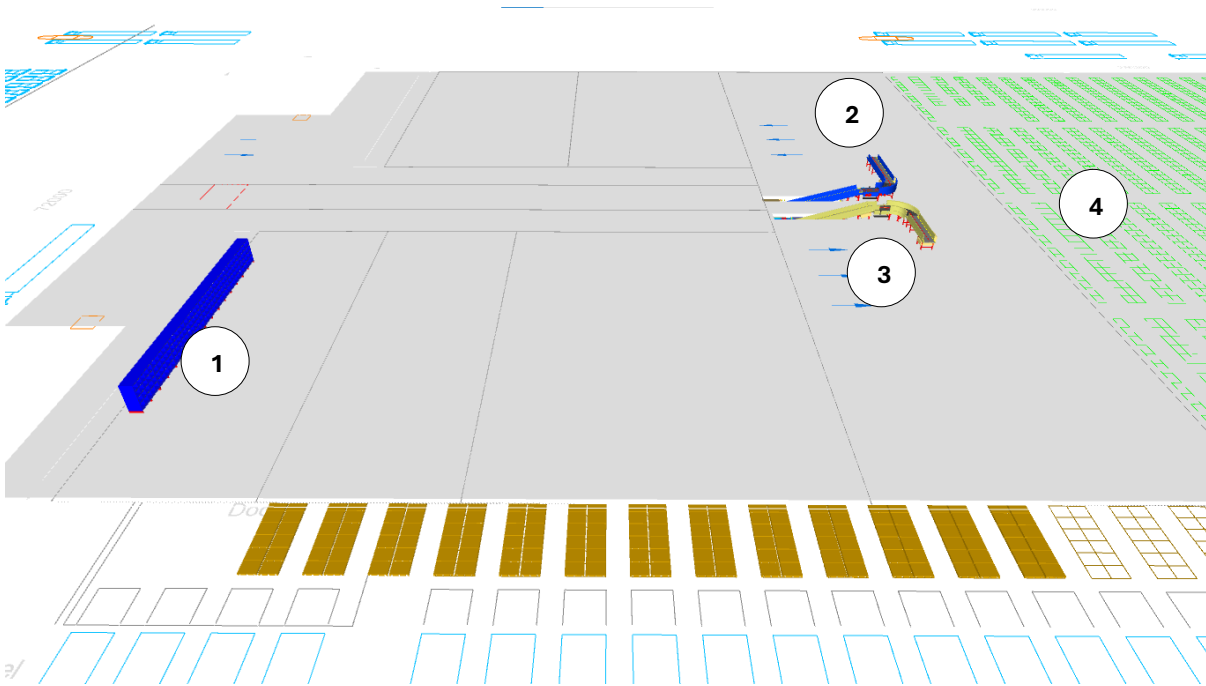
Packing Line Process

- *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.*

LEGEND:

1. Returns Chute
2. Returns Line

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.*
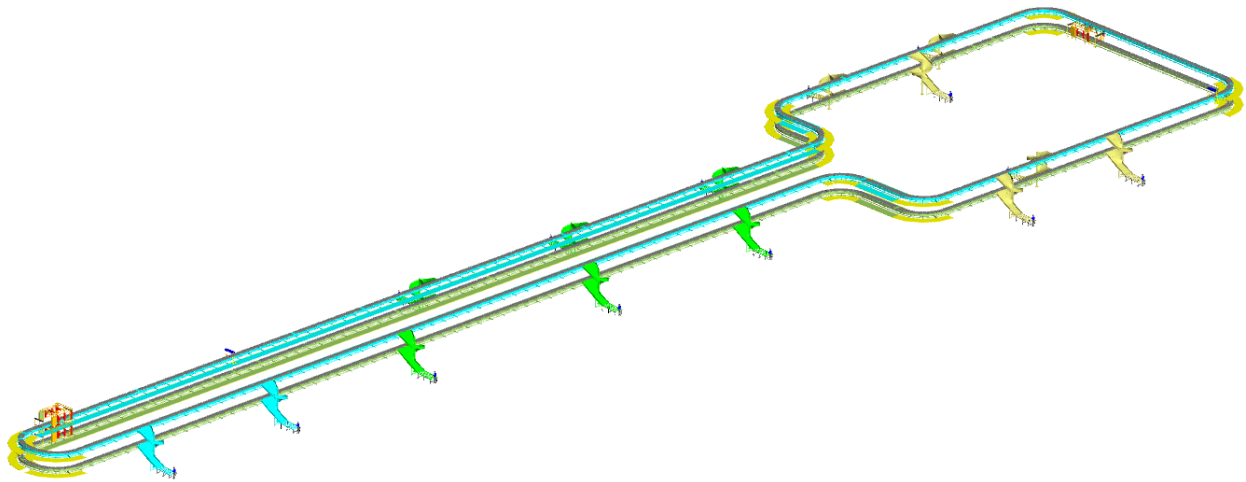
8.4 Put to Wall at G+1 Level

LEGEND:

1. Put to Light wall for Mail Sorter (G+1 Level)

2. Packing Line (G+1 Level)

3. Returns Line (G+1 Level)
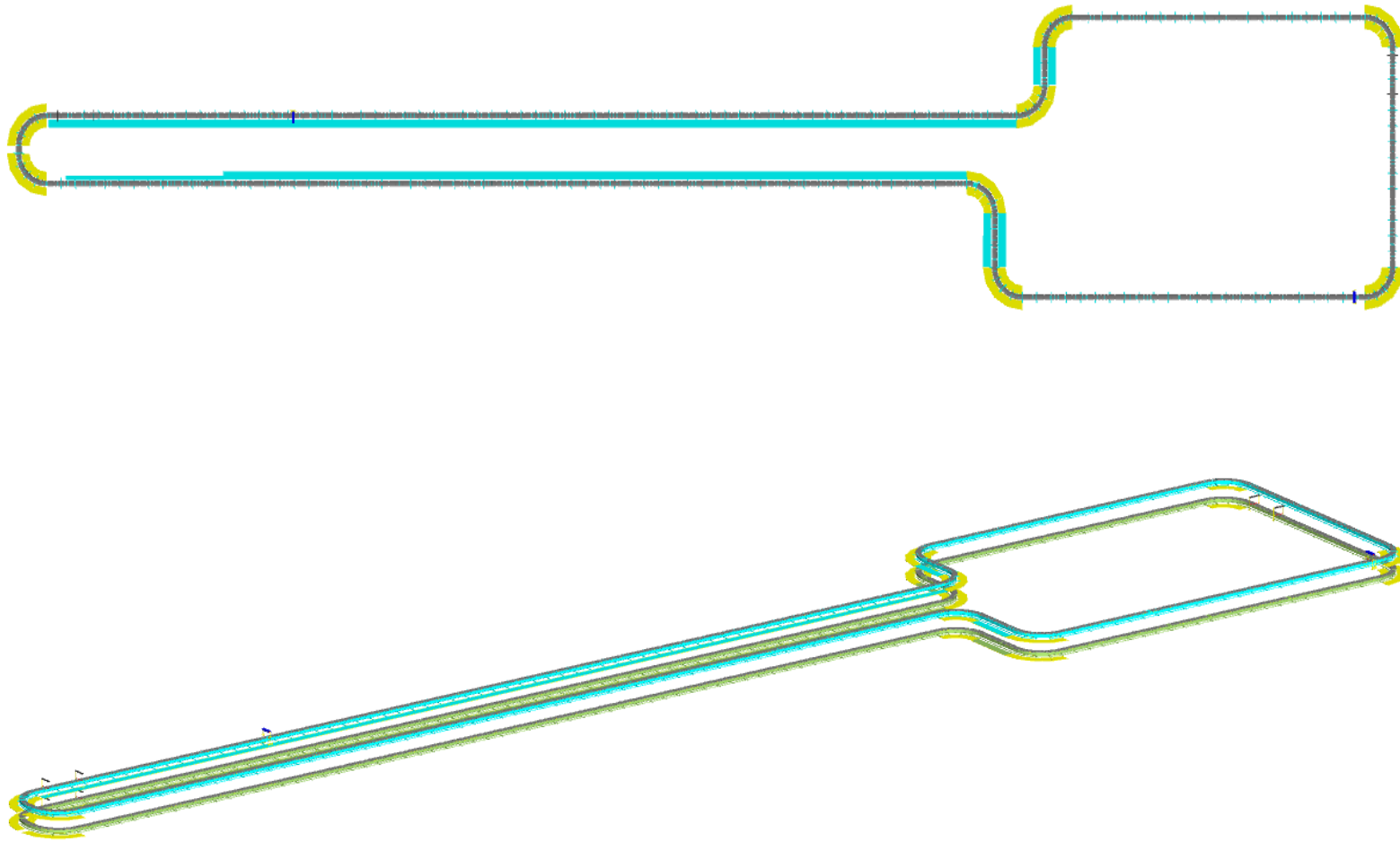
4. Shelving at G+1 Level

- *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.*
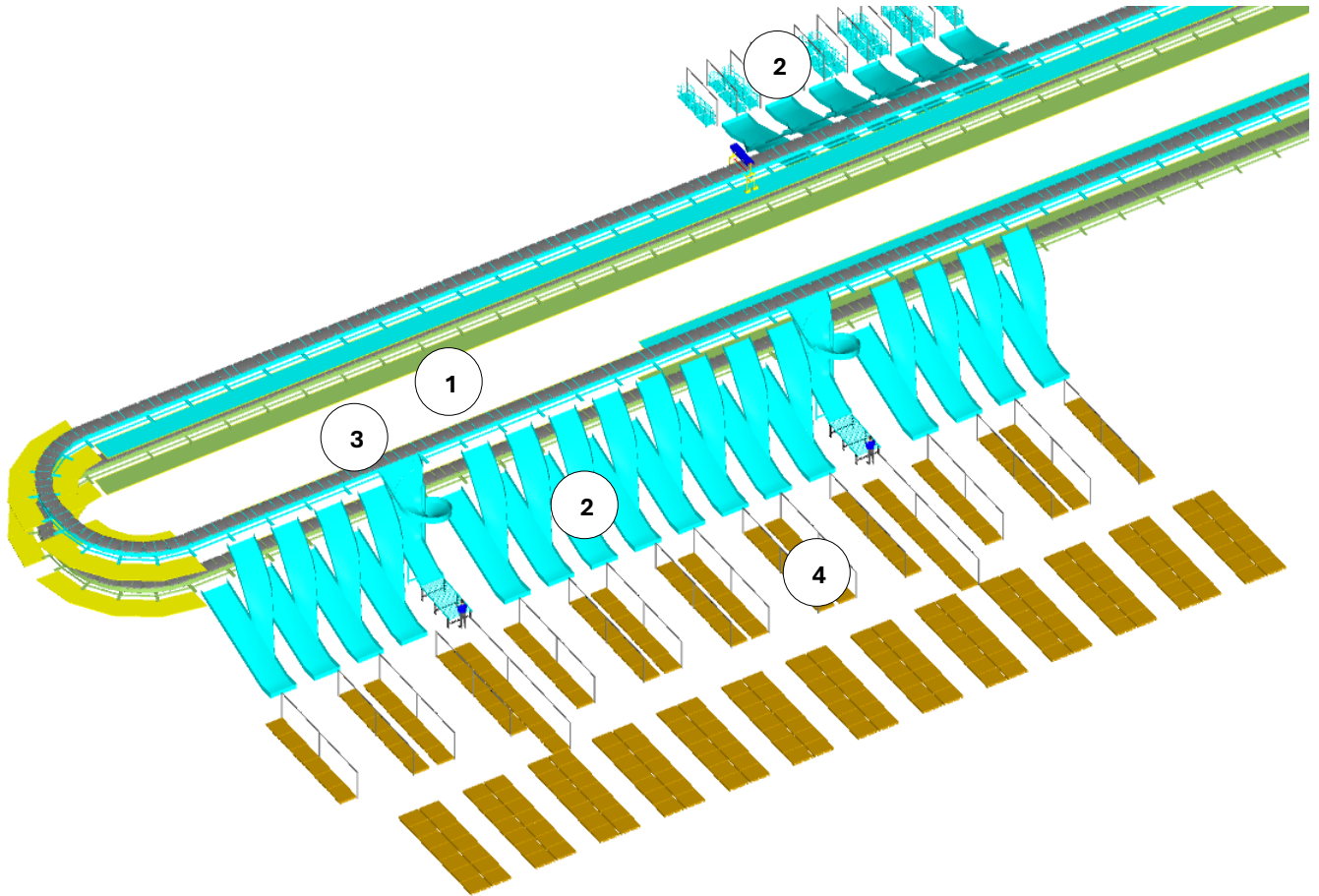
8.5 Documents Sorting

- *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.
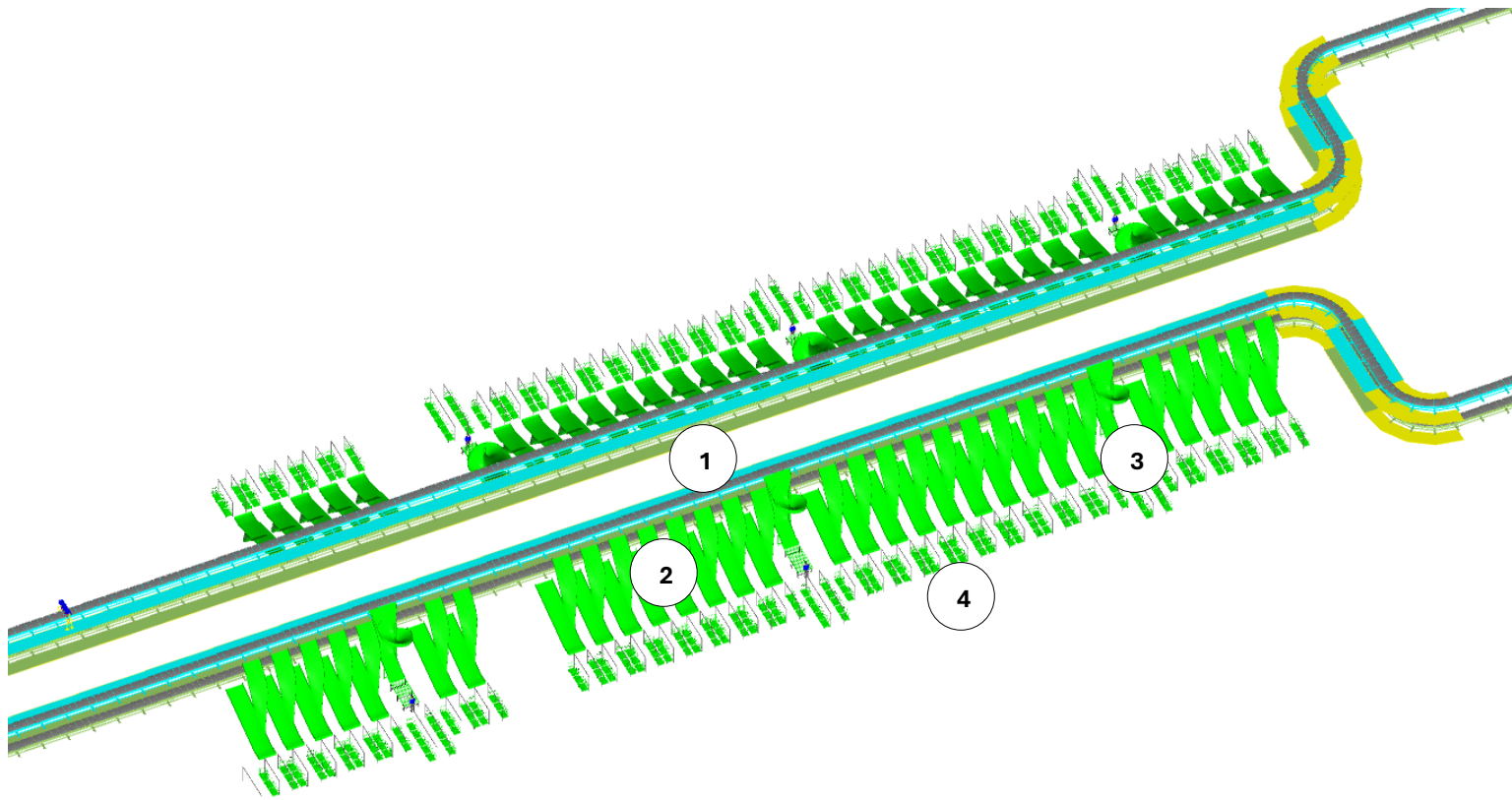
8.7 Line Haul Chutes and Staging

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.*
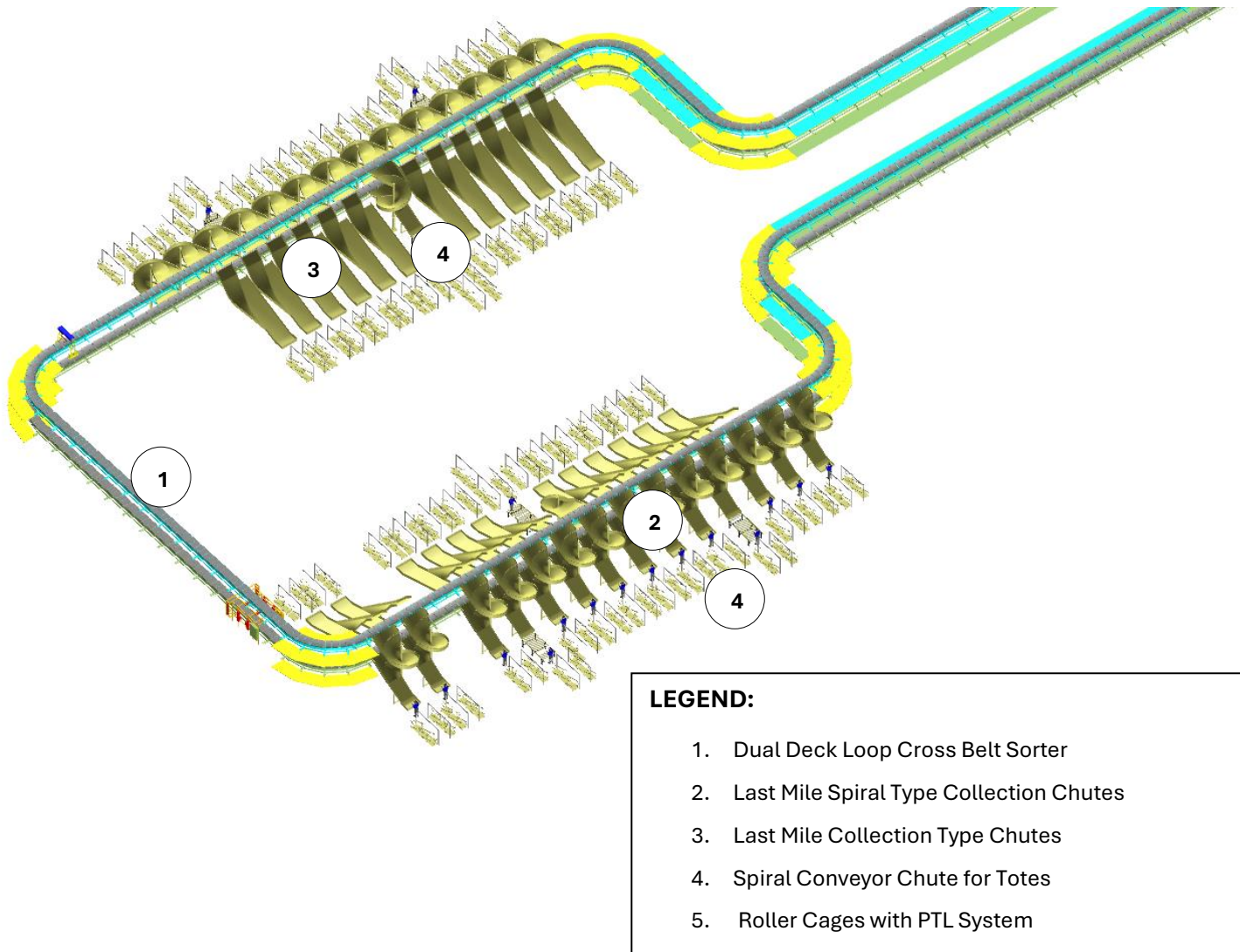
8.8 Post Office Chutes and Staging

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** designated 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

LEGEND:

1. Dual Deck Loop Cross Belt Sorter
2. Last Mile Spiral Type Collection Chutes
3. Last Mile Collection Type Chutes
4. Spiral Conveyor Chute for Totes
5. Roller Cages with PTL System

- *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.