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# BTS HHPSD Retrofit Project
# Operation Training-1

# BTS HHPSD Project

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# Contents

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# Contents

- Locking Block
- DOI
- Operator lock/key
- Controls system

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# Course Objectives

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- Overview of HHPSD
- Understanding of Mechanical system/sub system
- Understanding of Control system/sub system
- Operation interfaces such as SCR/SLI/LCP & DOI
- Overview of Signalling interfaces
- Overview of LCD & Interfaces

# Glossary

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| Abbreviation | Description |
|---|---|
| ASD | Automatic sliding door |
| BTS | Bangkok Mass Transit System |
| CANBus | Control Area Network Bus |
| DAD | Driver Access Door |
| DCU | Door Control Unit |
| DOI | Door Open Indicator |
| EMI | Electromagnetic Interference |
| ERD | End Return Door |
| ERM | Emergency Release Mechanism |
| FDP | Fixed Driving Panel |
| FP | Fixed Panel |
| HHPSD | Half Height Platform Screen Doors |
| HMI | Human Machine Interface |
| HW | Head Wall |
| LCB | Local Control Board |
| LCD | Liquid Crystal Display |
| LCP | Local Control Panel |
| LED | Light Emitting Diode |
| LMB | Lower Mounting bracket |
| MBD | Motorised Bi-parting Door |
| PDP | Power Distribution Panel |
| PLC | Programmable Logic Controller |
| PSCC | Platform Screen Control Cabinet |
| PTE | Portable Test Equipment |
| SCR | Station Control Room |
| SER | Signalling Equipment Room |
| SIG | Signalling System |
| STE | Singapore Technologies Electronics Ltd |
| SLI | Summary Lamp Indicator |
| TW | Tail Wall |
| VGI | VGI Global Media Public Company Limited |
| XLPE | Cross-linked Polyethylene |

# Introduction to BTS HHPSD

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- HHPSD is primarily for the safety of passengers at the platform from accidentally falling on to the track
- HHPSD also provides proper traffic flow of the passengers in and out of the train
- Improves throughput for the operator
- HHPSD also prevents track dust and shield potential objects from the track back to the platform
- The HHPSD system must only be used in good working condition

# Introduction to BTS HHPSD
# Typical dimensions

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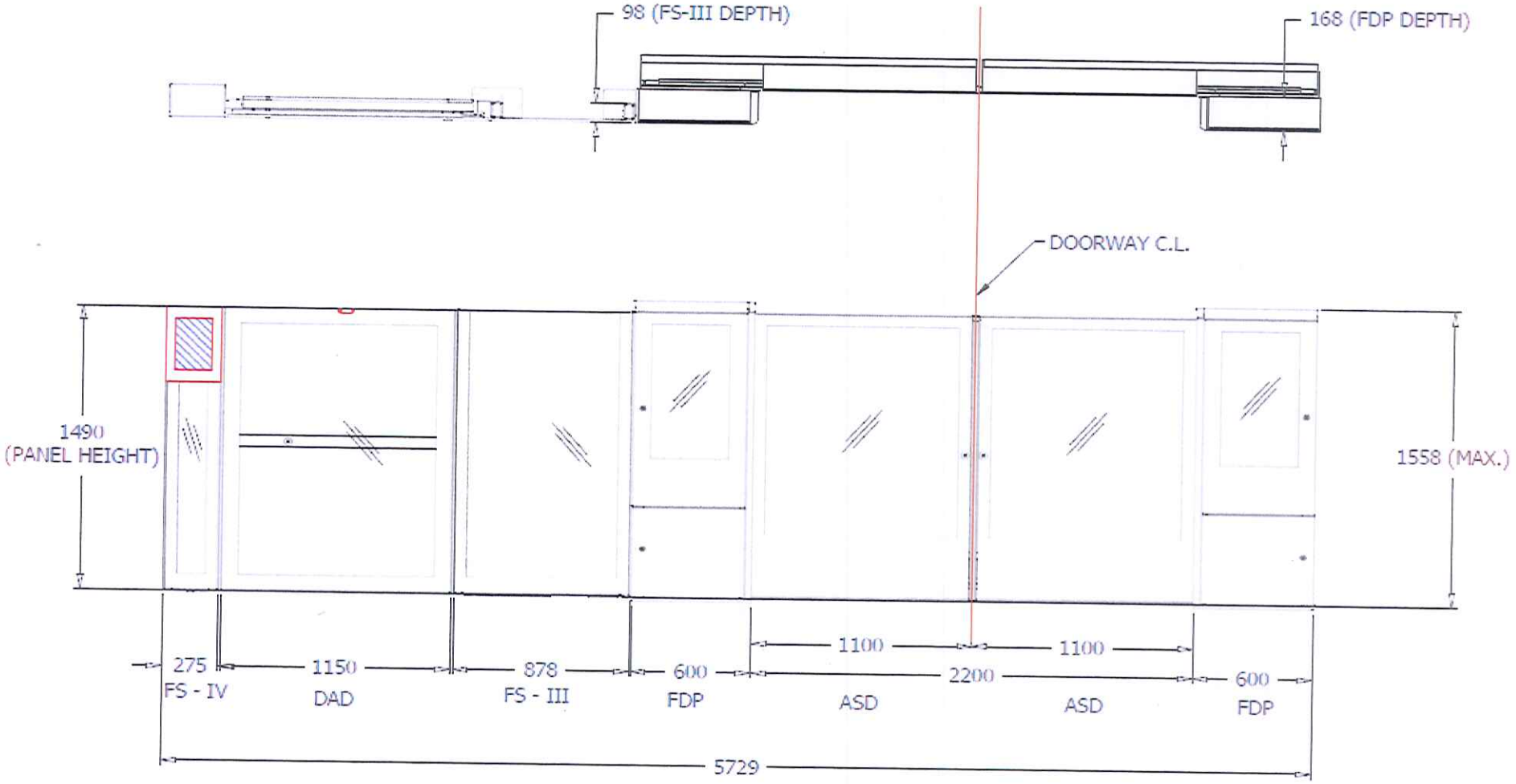


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# Introduction to BTS HHPSD Typical Layout

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- Refer to drawing attached

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# Introduction to BTS HHPSD Typical Layout

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- Doorways 7 to 22 are motorised. The remaining doorways have all mechanical features except motor and DCU

- The non-motorised doors are part of safety loop and their open status will be monitored

# Mechanical System

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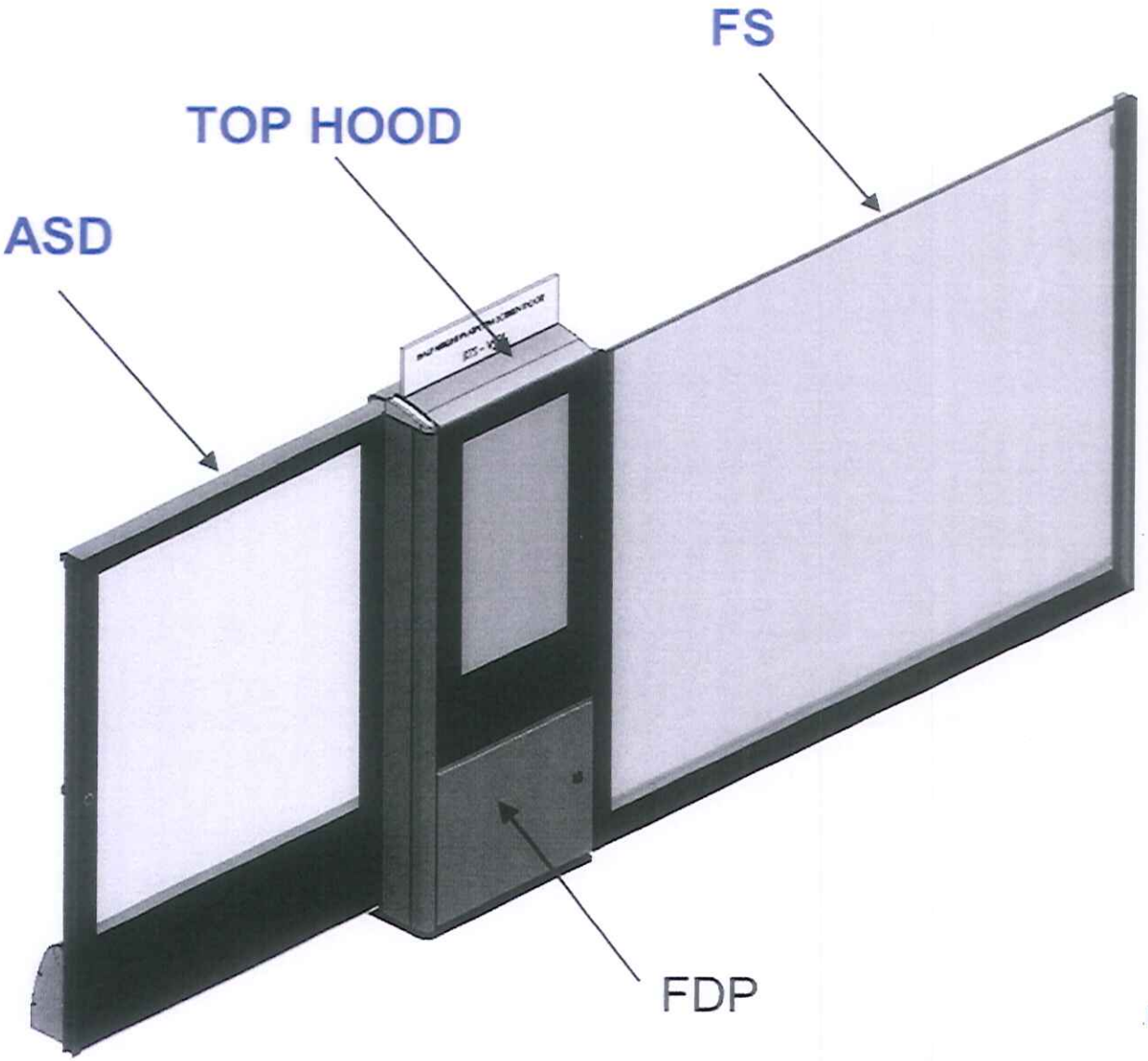

# Mechanical System

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- Mechanical Systems comprises of the physical hardware elements of the door system. Main components are

  - ✓ Structure
  - ✓ FDP
  - ✓ ASD Door
  - ✓ EED Door
  - ✓ DAD Door
  - ✓ Fixed Screens
  - ✓ ERM
  - ✓ Operator lock
  - ✓ DCU Enclosure box (included under control module)

# Mechanical System
# Structure- LMB

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- The structure forms the mounting structure of the BTS HHPSD to the platform

- It is termed as Lower Mounting Bracket (LMB)

- It translate all the forces in X,Y,Z & Moments to the platform below

# Mechanical System Structure- LMB

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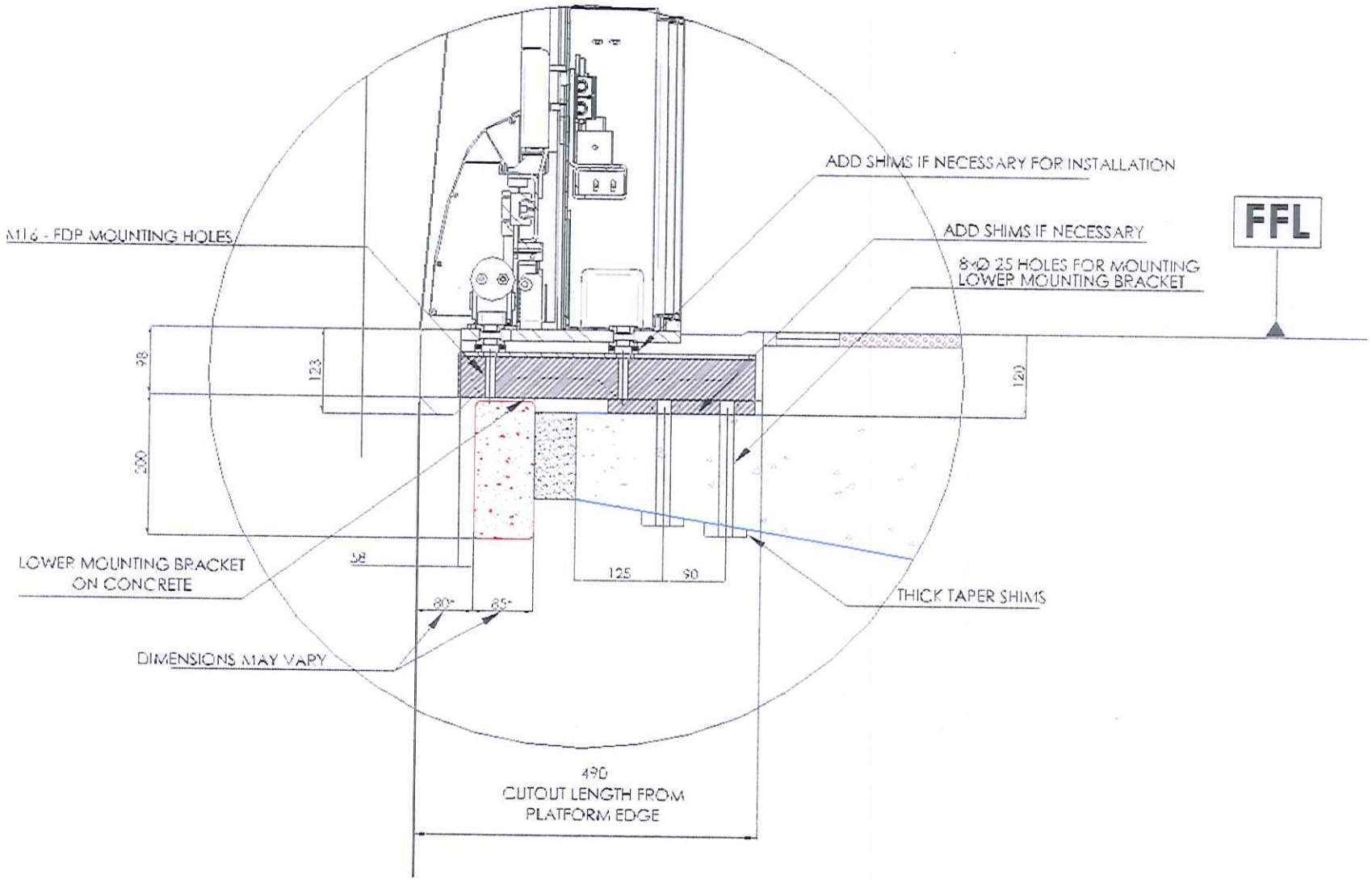


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# Mechanical System Structure- LMB

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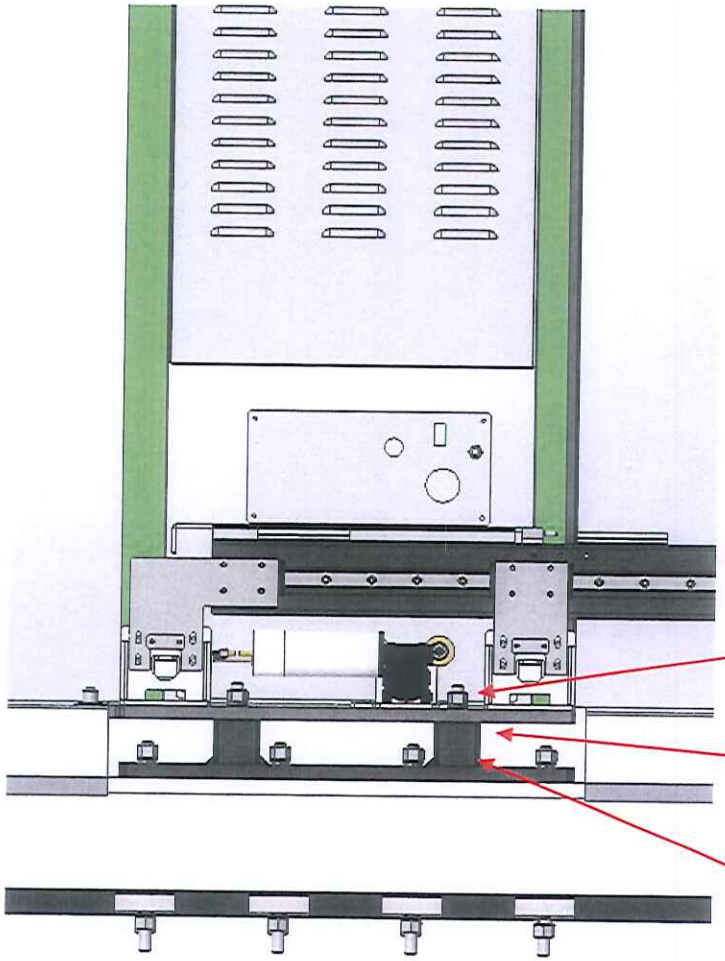


- **Insulation bushes isolate the HHPSD from station earth to which LMB is connected**

# Mechanical System
# FDP

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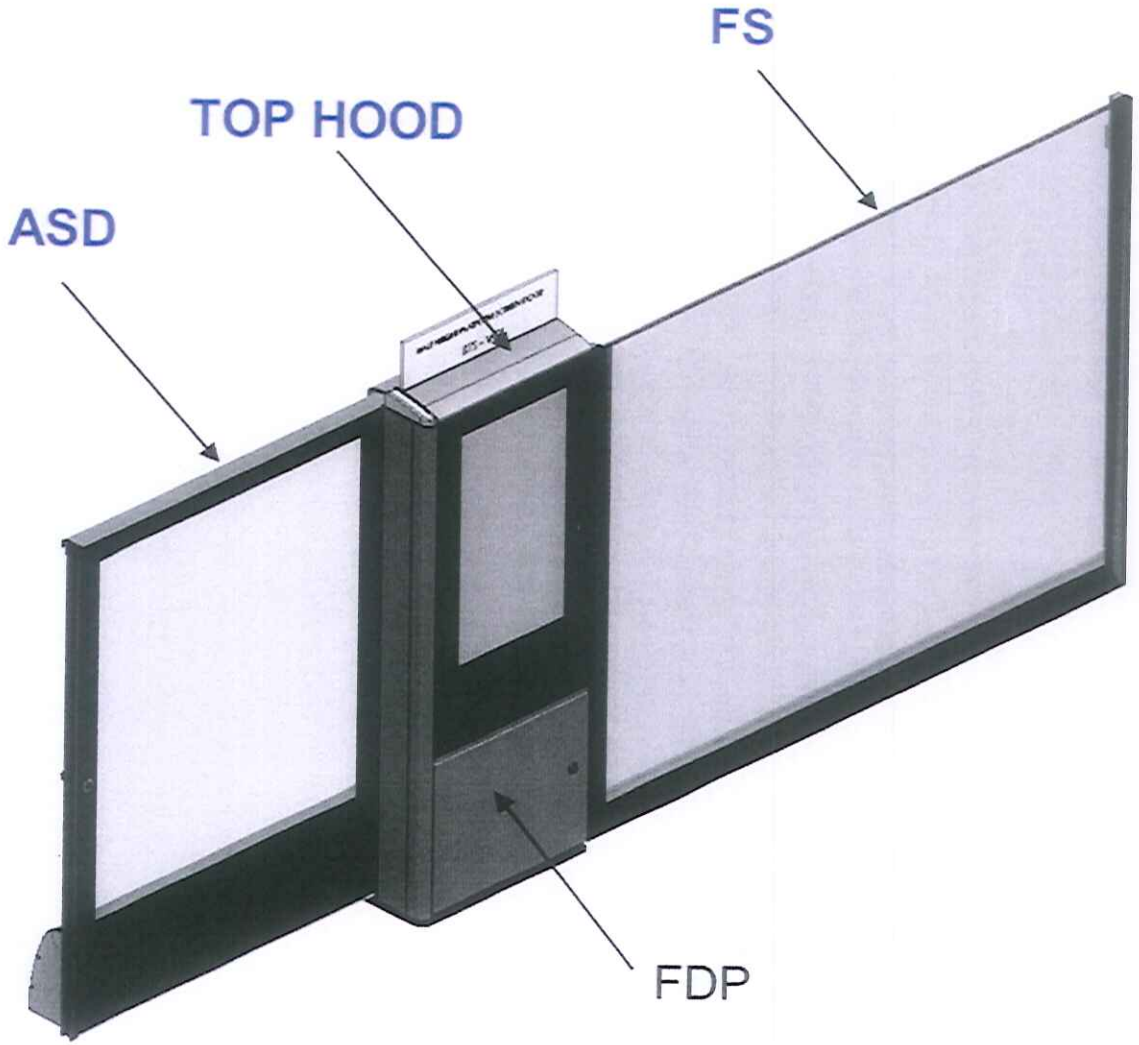


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# Mechanical System
# FDP

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- Fixed driving panel is commonly referred to FDP
- This provides the structural integrity to the sliding doors
- This is made up of steel structure and hot dip galvanized
- The structural strength of the HHPSD system is based on the use of strong, rigid, structural frames within each Fixed Driving Unit.
- The loads applied to the Sliding Doors and Fixed Panels are transmitted to these frames via the mounting points at the top and bottom of each element.
- The FDP frames then transmit these loads to the civil structure of the platform on which the HHPSD system is mounted.

# Introduction to BTS HHPSD

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## HHPSD Operation

- When the train stops within the correct stopping range, the signalling system provides the door enable and open commands to open the HHPSD system.

- When the signalling system issues the door close command, the HHPSD closes all doors and feedback that all doors are closed and locked to Signalling system

- Once the closed and locked signal is received, the train safely leaves the platform

# Mechanical System
# ASD

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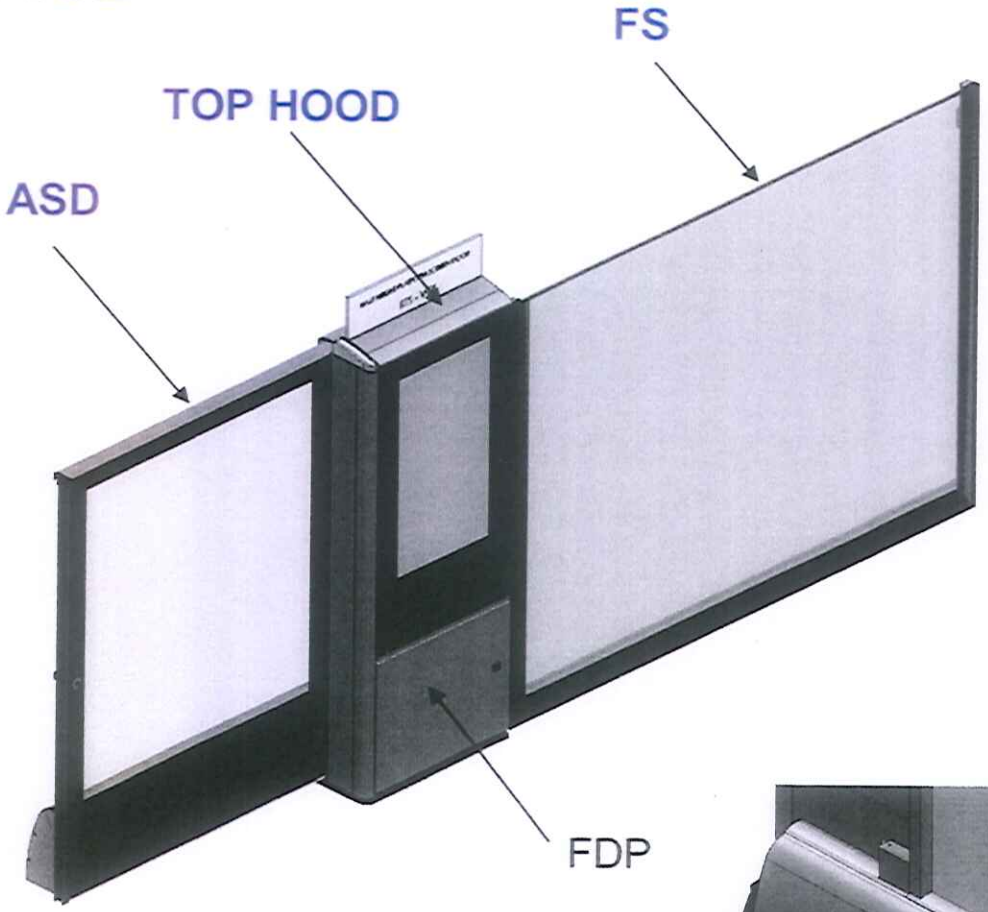


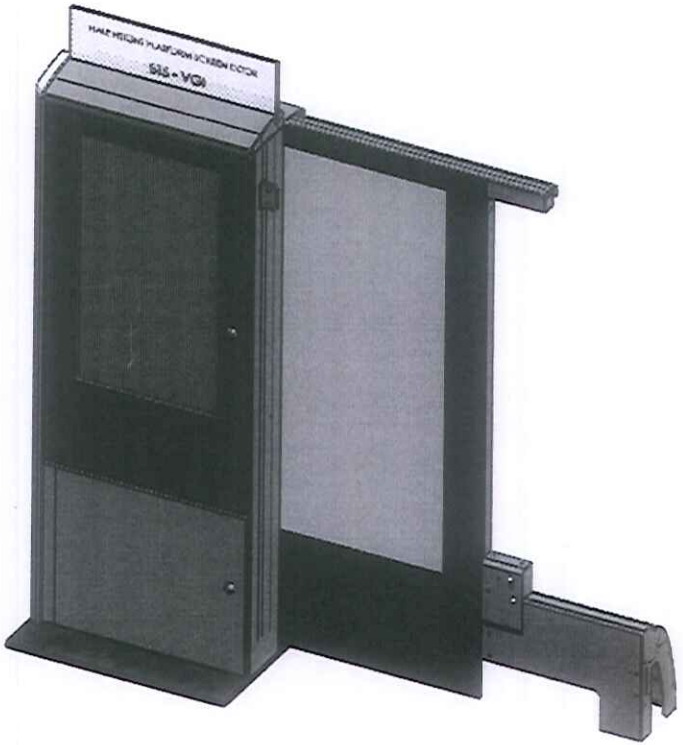

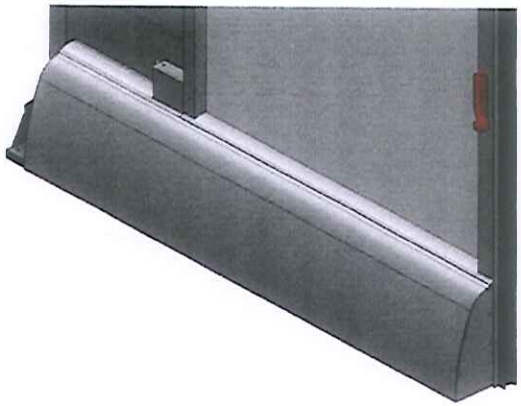

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# Mechanical System
# ASD

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- Automatic sliding doors provide the opening & closing function for the HHPSD system
- They are made up of aluminium hollow section & PVDF coated
- ASD façade is made up of laminated safety glass
- The frames of the sliding door are constructed from aluminium sections, securely joined in the corners with horizontal upper and lower spars engaged within the sliding door guide mechanism of the supporting Fixed Driving Unit.
- A linear guide rail is fitted to the lower door section and is designed to withstand loads imposed on the sliding door and normal door operation for the design life of the HHPSD.

# Mechanical System
# EED

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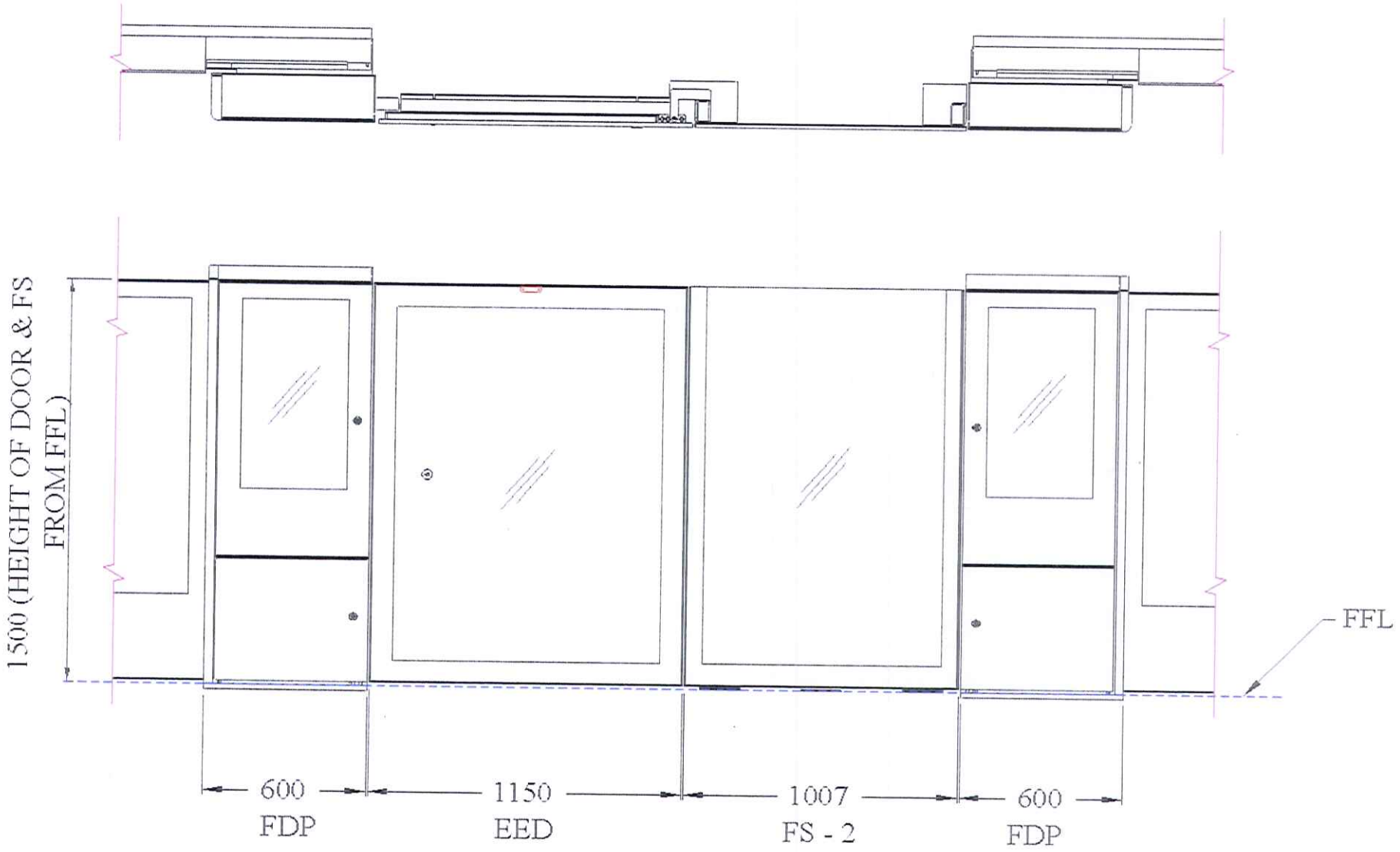


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# Mechanical System
# EED

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- Emergency exit door provide evacuation form the train to the platform during an emergency
- They conform to NFPA 130
- The EED is also equipped with a panic exit device on the trackside.
- Passengers are able to unlock the door by pushing the bar to release the lock.
- On the platform side, station staff will be able to unlock the EED using a service key.

# Mechanical System
# DAD

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- Driver access door provide egress from driver cabin to platform for platform duties
- They conform to NFPA 130
- The DAD is also equipped with a panic exit device on the trackside.
- Train drivers are able to unlock the door by pushing the bar to release the lock.
- On the platform side, station staff will be able to unlock the DAD using a service key.

# Mechanical System
# DAD

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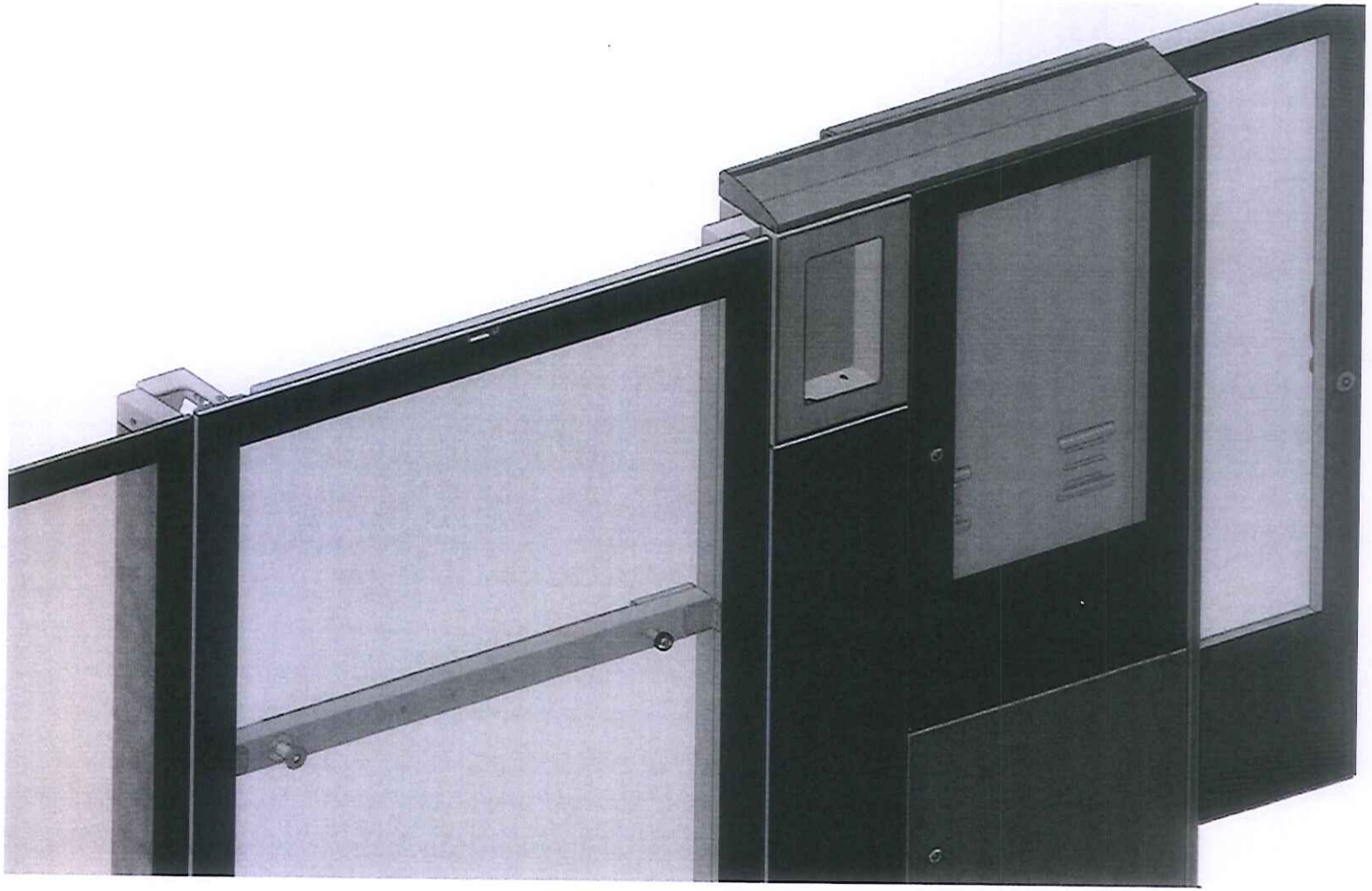

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# Mechanical System
# Fixed Screen

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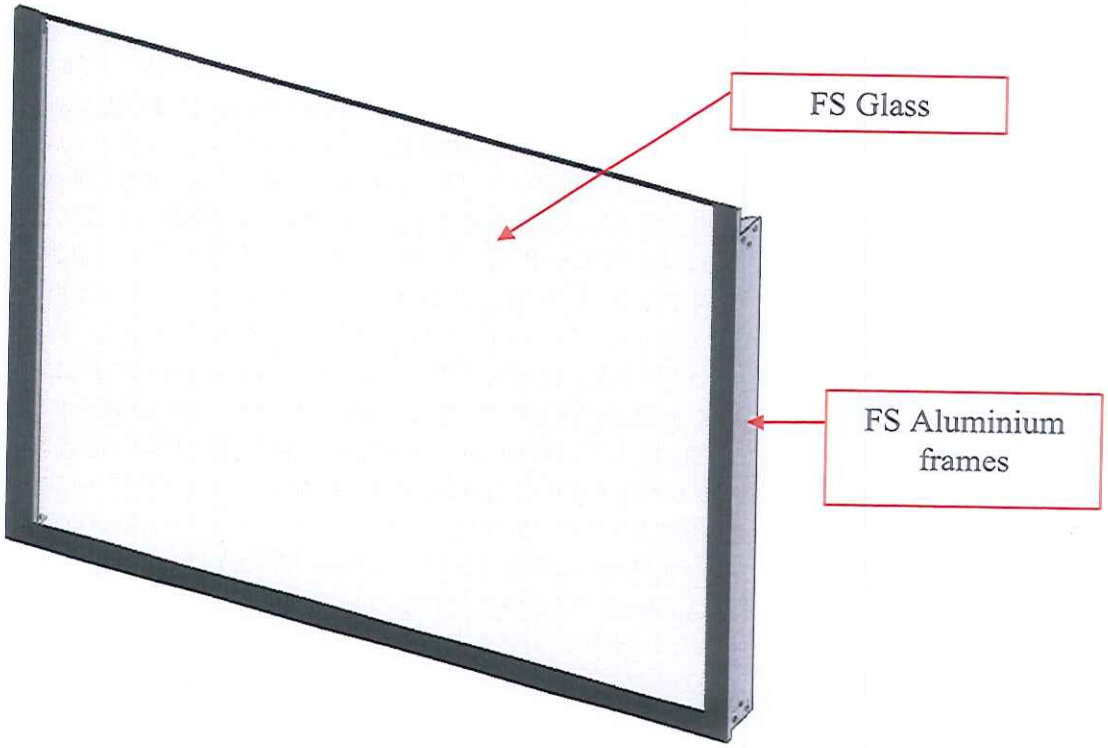

# Mechanical System
# DAD

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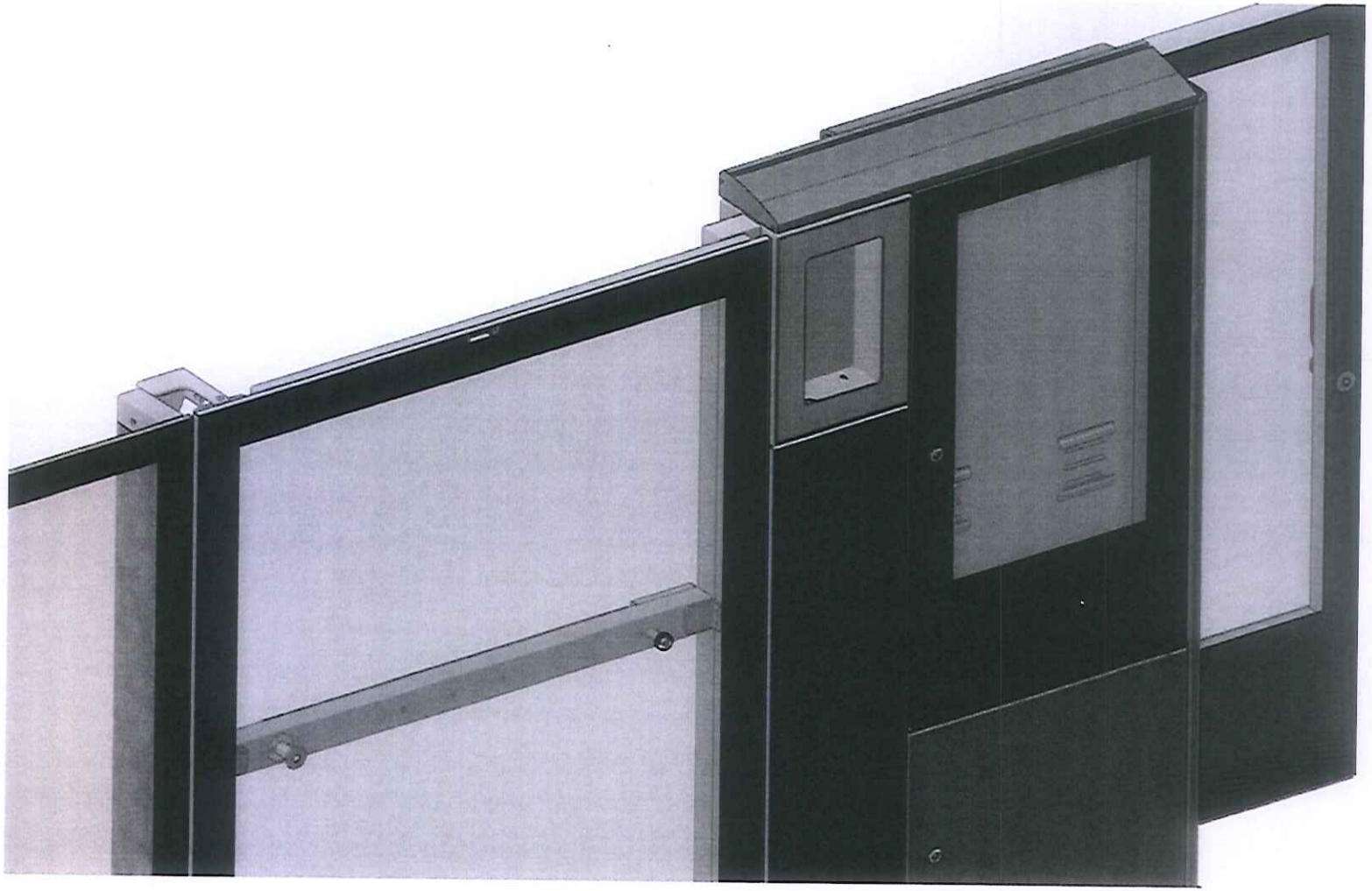

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# Mechanical System
# Fixed Screen

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- Fixed screen fills up the space between the sliding doors
- The glass used is laminated & safety glass
- It is a single panel door screen
- It provides maximum vantage to the train body for advertisement purposes

# Mechanical System
# ERM

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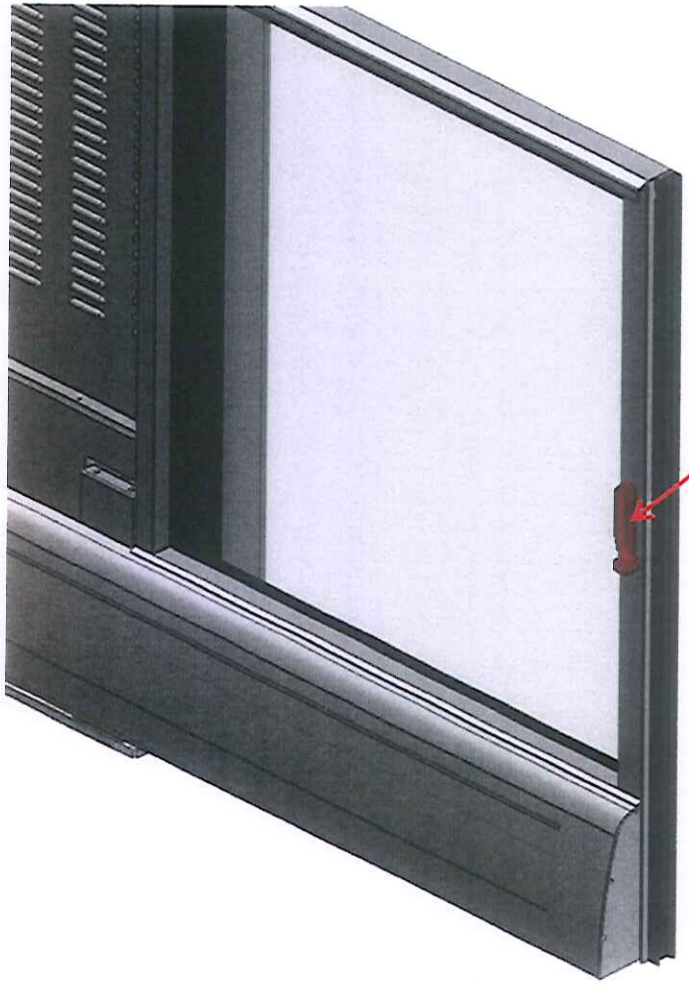

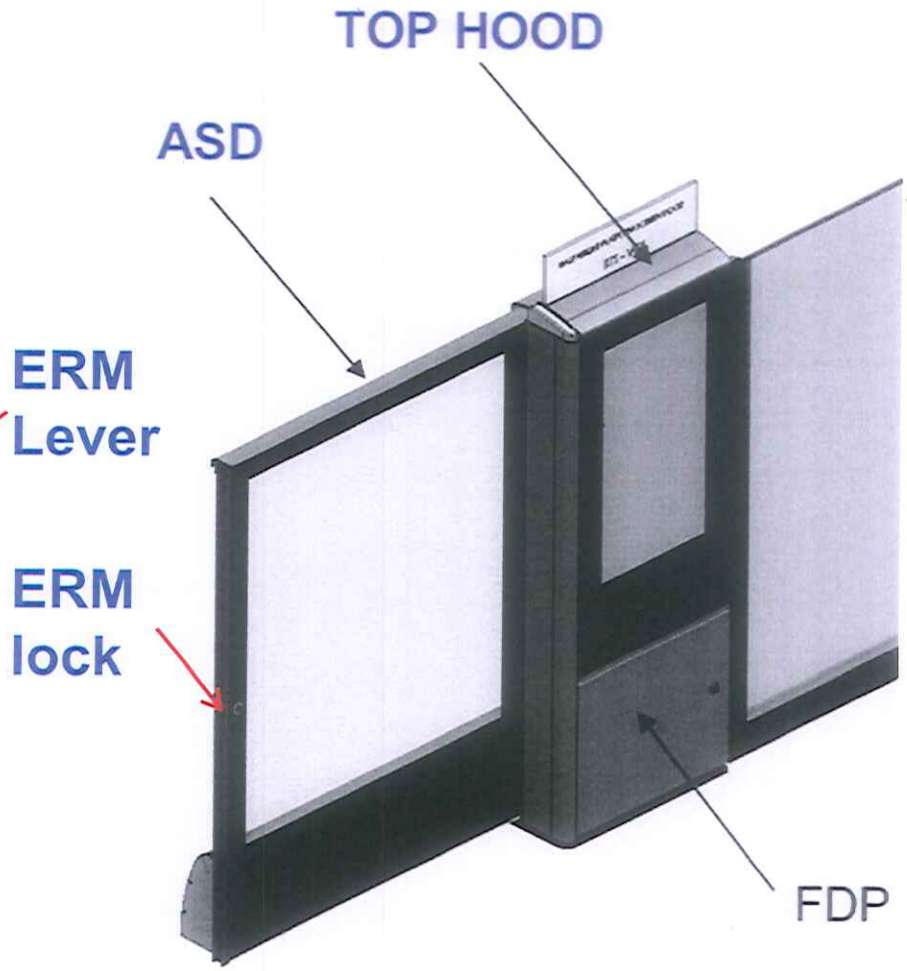

# Mechanical System
# ERM

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- Emergency Release Mechanism (ERM) is used to unlock the sliding doors during a power failure mode or DCU failure mode for evacuation. Misaligned stoppage by trains are considered as well

- Each sliding door leaf is fitted with an Emergency Release Mechanism to allow them to be manually opened from the trackside.

- The release mechanism can also be operated from the platform side by authorised staff using a staff key. The keyhole is located on the vertical stile of the doorframe

# Mechanical System
# ERM

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- The unlatching of a sliding door via the ERM will break the hardwired '*closed and locked*' status circuit.

- For safety reasons, the door opened using ERM is closed automatically after 60 sec(adjustable) and upon receiving a door 'closed and locked' signal, the DCU reverts to normal modes of operation.

# Mechanical System

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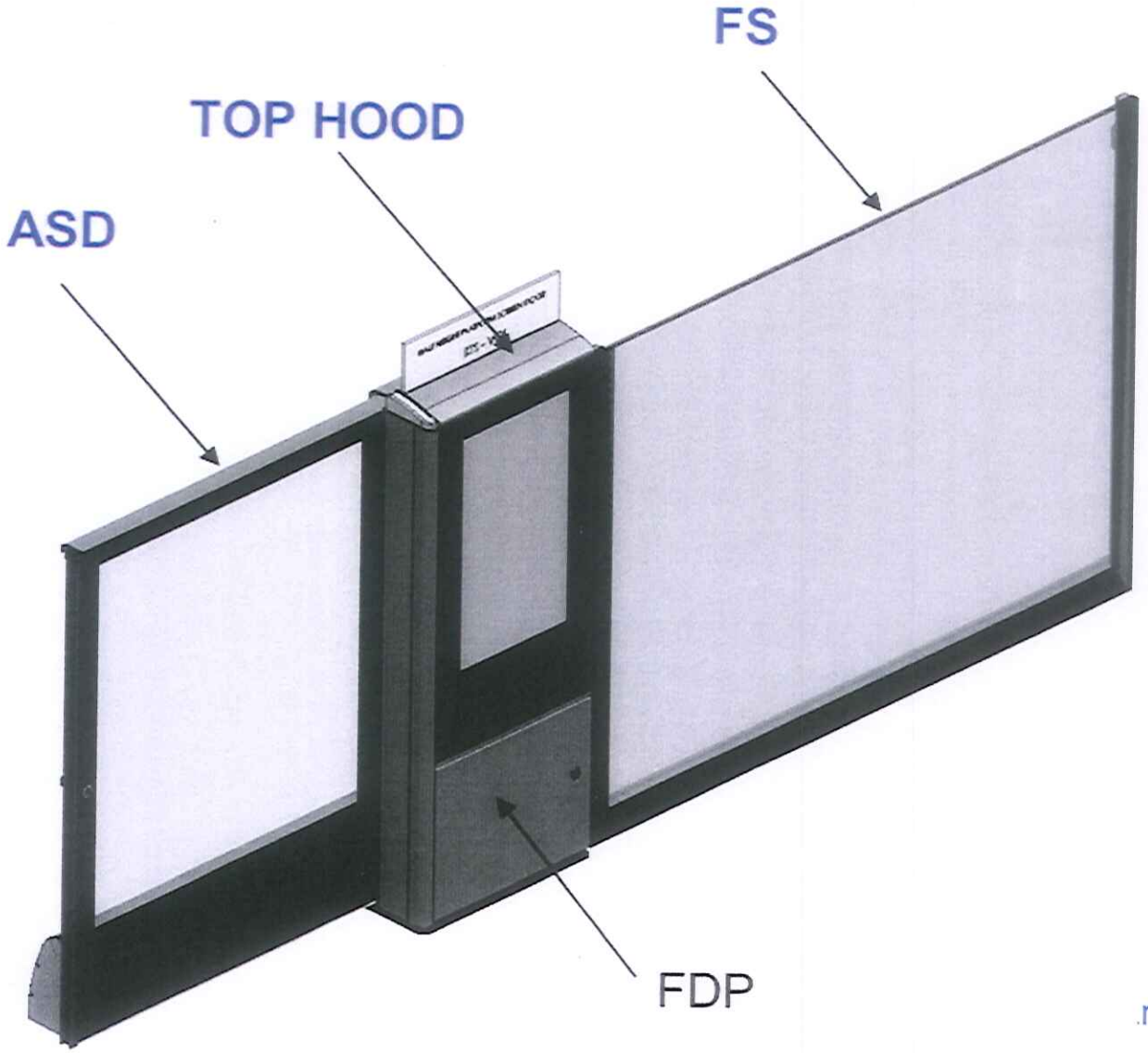

# Mechanical System
# Locking block

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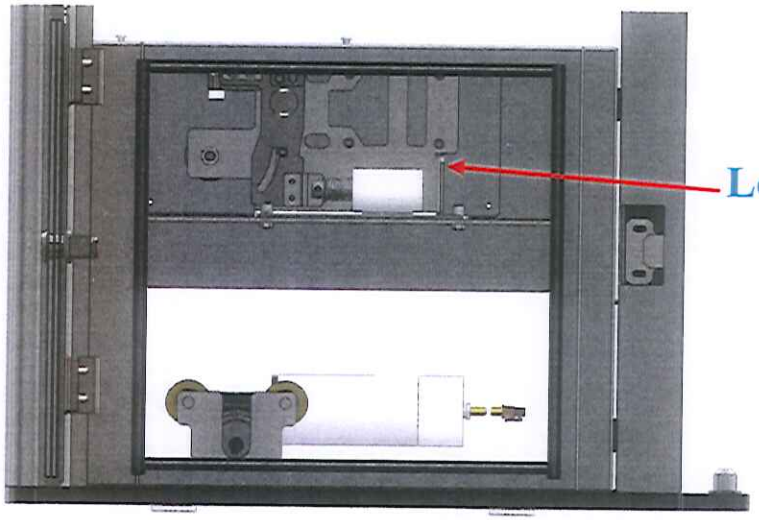


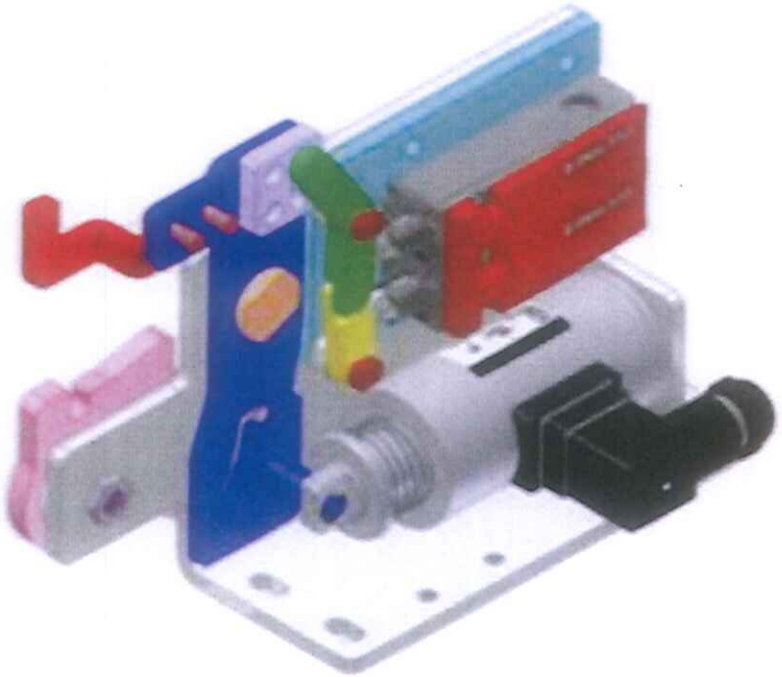

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# Mechanical System
# Locking Block

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- The door locking mechanism is mounted in the fixed drive panel on the left and right side of the doorway.

- When both door leaves are powered or manually driven to the close position, the locking lever engages with door pins mounted on the door frame.

- This locks them mechanically against opening. Hence, the doors cannot be opened manually without operating the ERM

# Mechanical System
# DOI

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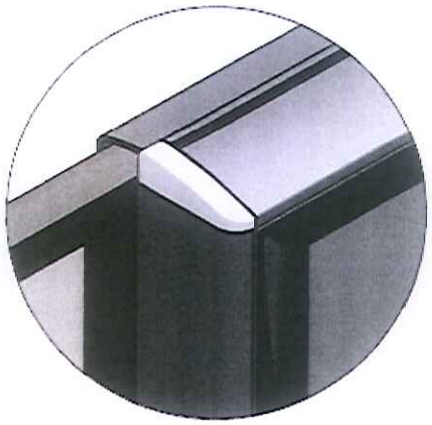
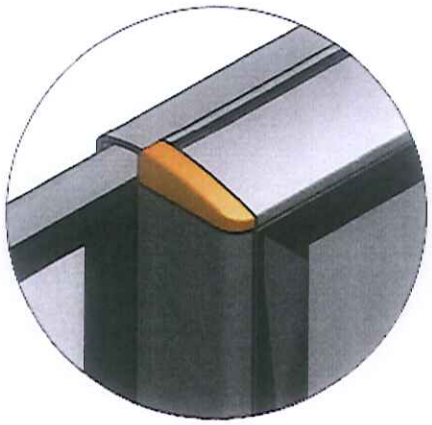
BTSHHPSD
ASD DOI STATUS CHART

"Door Open Indicator"

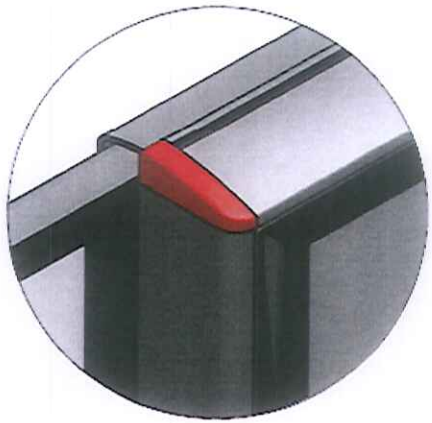


UNLIT
DOORS CLOSED & LOCKED
- OR -
POWER OFF



AMBER, FLASHING
DOORS OPENING
- OR -
DOORS CLOSING

AMBER, SOLID LIT
DOORS FULLY OPEN



RED, FLASHING
DCU ERROR
- OR -
ERM ERROR

- **Door open indicator indicates the status of the operating door**

# Mechanical System
# Motor Assembly

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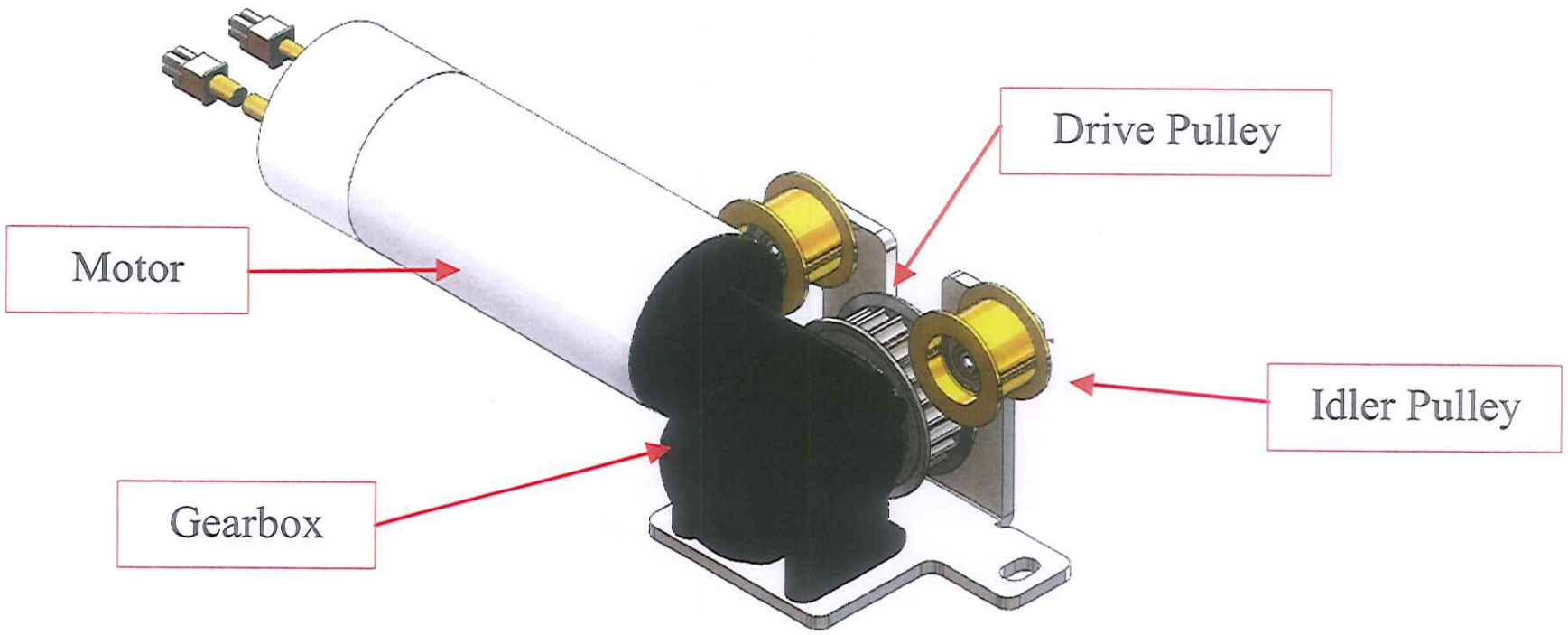

# Mechanical System
# Motor Assembly

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- The motor assembly comprises of an electric brush DC motor, gearbox, encoder and positioning devices to form a single line replaceable unit.

- To provide the synchronous motion of the bi-parting doors, an open loop of high torque drive belt is driven by a toothed pulley mounted on the gearbox, and mounted on the driving slide at both the ends.

- Two idler pulleys are positioned such that belt contact with the pulley is maintained at all times