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1. Introduction

This document contains the functional proposal of the HA- ETC lane in the Toll Collection System (TCS) project.

Each HA- ETC lane is equipped with the devices needed for its specific functionalities for automatic reading and processing of TAG vehicle without manual intervention without overweight functionalities using MSWIM and SWB.

2. ABREVIATURES

TMS: Toll Management System

WIM: Weigh in Motion

SWB: Static Weigh Bridge

AVC: Automatic Vehicle Classification

LPIC: License Plate Image Capture

TC: Toll Collector

CCH: Central Clearing House

MOP: Method of Payment

HA- ETC: Hybrid Automatic- Electronic Toll Collection

3. HA-ETC Lane Overview

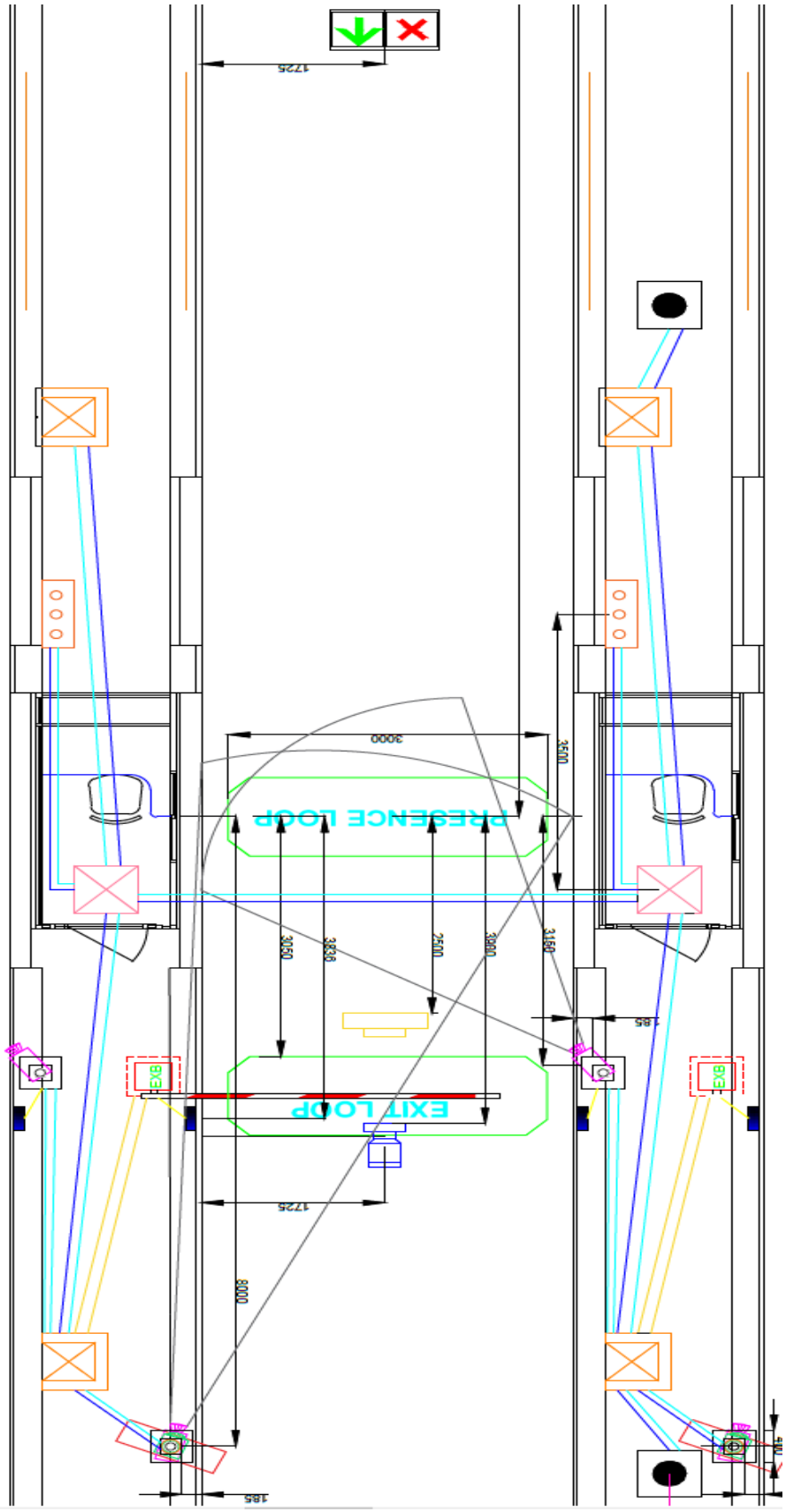
The main aim of the HA- ETC lane is to automatically process the transactions of the tag users without manual intervention as well as the manual transactions with other MOPs. These hybrid lanes are connected to the plaza and data can be sent to CCH from the plaza server.

The Hybrid lane is designed to accept the following means of payment:

- CCH Tag: Tag works at only in ETC lanes.
- Smart Cards: - Following are the types of Smart Cards
- Local Pass: - Smart Card issued to local commuters (Optional)
- Monthly Pass: - Transits limit in a month of 30days.
- Cash payment.
- E-Payments: Concessionary tags, Credit/Debit card, Wallet & CCH tag

Note: All HA- ETC lanes are not designed to work with MSWIM and SWB for overweight functionality.

3.1 Hybrid Lane Architecture

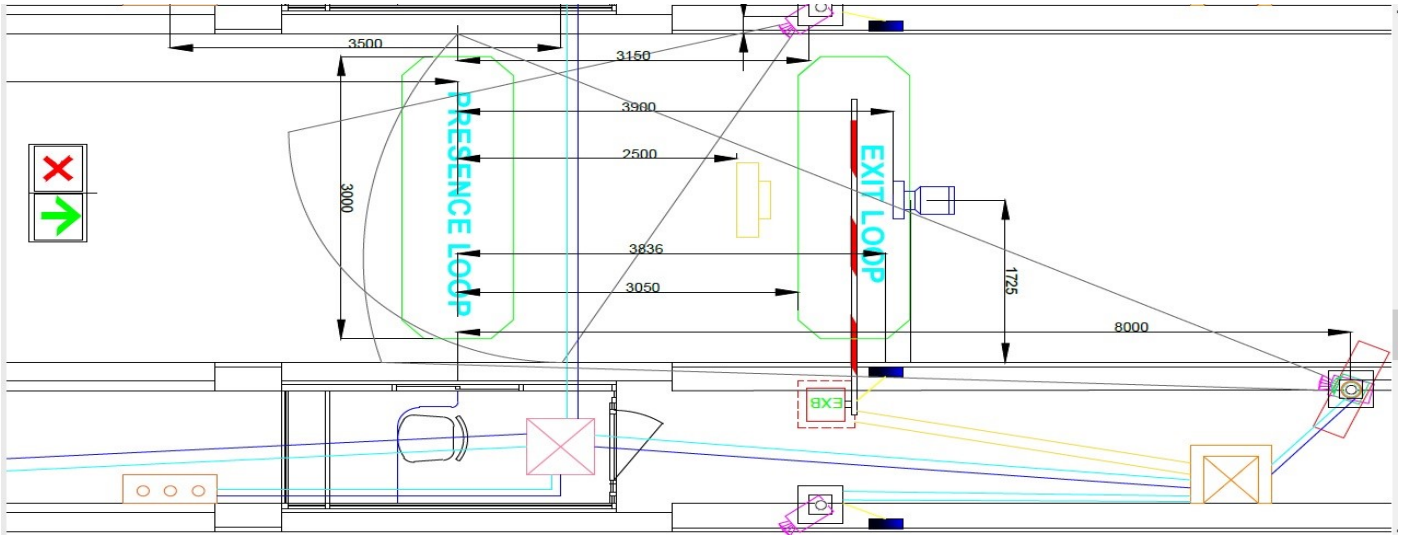


EQUIPMENTS	
EXIT BARRIER	
ENTRY BARRIER	
UFD	
CAMERA	
TRAFFIC LIGHT	
OHLS	
RFID READER	
CANOPY PILLAR	
MANHOLE OUT SIDE BOOTH	
MANHOLE INSIDE BOOTH	
LASER SCANNER	
VIOLATION ALARM	
AXLE SENSOR	
TLC WITH UPS	

There are zones in this lane.

- Presence zone
- Exit zone

Here, presence zone plays the important role in the HA-ETC lane to create and activate the Canopy RFID reader for automatic processing of the TAG vehicle.



3.2 Hybrid lane-HW

For automation and control purposes, the Hybrid lane is equipped with following Hardware devices.

Booth equipment	Lane equipment
• Toll Collector (TC) • Monitor Keyboard with 108 keys • Barcode reader • Smart Card Reader • Receipt Printer • Intercom Unit • CCTV booth camera • Panic Alarm with foot pedal	• Lane & AVC Controller • Exit Automatic Barrier • **Presence Loop** • Exit Loop Detector • AVC Sensors (photocells for axle and overhead laser separator) • Traffic Light (TL) • User Fare Display (UFD) • Lane Incident Camera • RFID Reader LPIC Camera • Overhead Lane Sign (OHLS)

3.3 Hybrid lane Functionality

The following use case will explain about the HA- ETC lane functionality. All the other MOPs will also work in the HA- ETC lane. But vehicle will be created as soon as vehicle is hit the presence loop and simultaneously activates the RFID reader to reads the tag and sends the tags information to the lane.

Following is the operating Process for HA- ETC lane

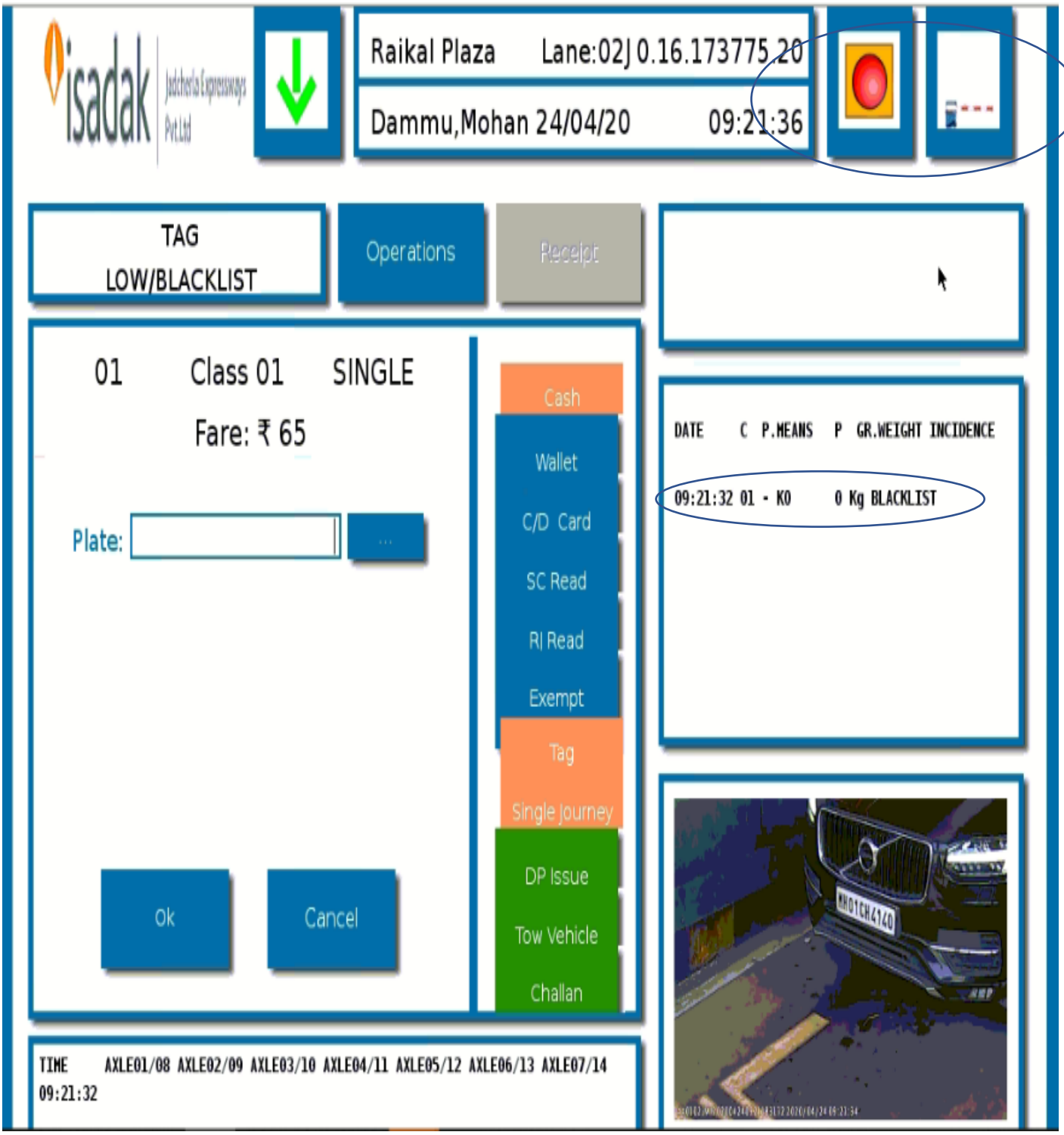
- TC login: Toll Collector has to login in the lane, but if lane is supposed to process only the TAG vehicle then, Toll Collector need not to be present in the booth subject to processing the other MOPs vehicle entered in the lane somehow or any other system related problem.
- MOPs: - All other MOPs will work like Cash, Wallet, E-payments, Exemption, Multi journey in case operational team want to use the lane for other MOPs along with Automatic read and processing of TAG vehicles in the lanes.
- TC logout: - TC Shall log out automatically in the end of each shift, so operation team shall ensure the Login of TC after each Logout.
- Back- Office Functionality: - As in normal lanes the HA-ETC lane TC must be logout after each shift end and shall done the cash up to close the shift. Rest all other processes like validation, Cash up, and all other processes which requires to close the day shall remain same and shall be followed.

Note: - Tag read accuracy will be subject to the Vehicle speed, Tag quality and TAG placement.

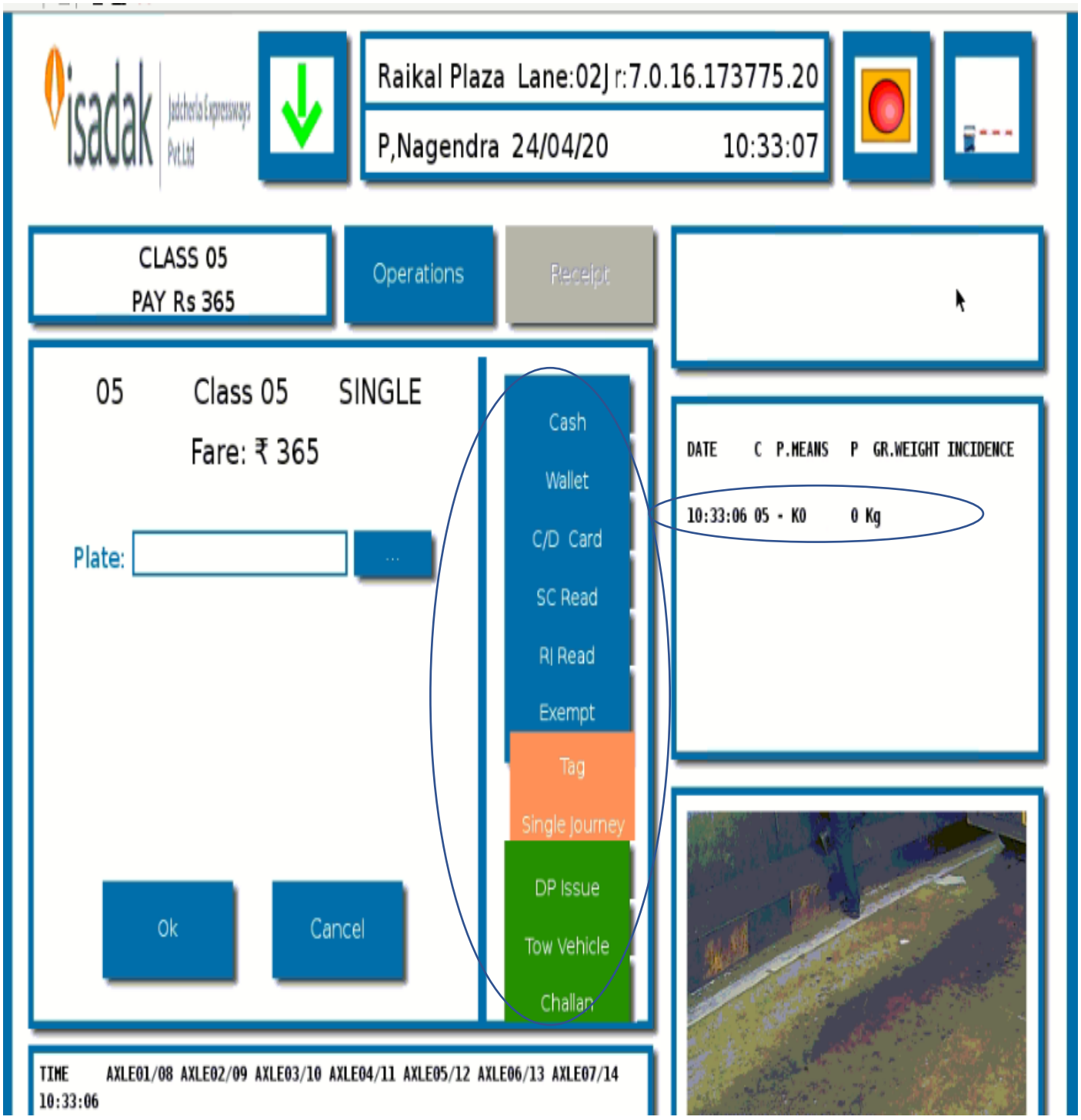
3.4 Transaction Process - Use Case

- **Vehicle with Valid Tag:-** Once the user enters in the lane and hits the presence loop at the Payment axis, the vehicle will be automatic created and RFID Antenna gets activated and TAG information will be read by the RFID Antenna to pass to the lane controller. Upon checking the TAG information as Valid the lane will process the TAG vehicle and "TAG OK" message will be displayed at the TC screen along with barrier in open position, Traffic Light in Green Status and UFD showing the appropriate message. After vehicle passage from the lane system will be ready for next transaction in the queue with barrier in down position, Traffic light in RED status and UFD with appropriate message for approaching vehicle.

- **Vehicle with Blacklist TAG:-** Once the user enters in the lane and hits the presence loop at the Payment axis, the vehicle will be automatic created and RFID Antenna gets activated and TAG information will be read by the RFID Antenna to pass to the lane controller. Upon checking the TAG information as Blacklist, the lane will not process the TAG vehicle and "BLACKLIST" message will be displayed at the TC screen along with barrier down position, Traffic Light in RED status and UFD showing the appropriate message. In this case TC must process the vehicle using other MOPs.



- **Vehicle without TAG:-** Once the user enters in the lane and hits the presence loop at the Payment axis, the vehicle will be automatic created and RFID Antenna gets activated and absence of TAG information RFID Antenna will unable to send any information to Lane controller. TC screen will display the message for created vehicle only. In this case TC must process the vehicle using other available MOPs.



teamwork begins with safety

Thank You