Project Description & Brief

SATS Catering (SATSCAT) cordially invites Vendors to participate in this tender for the supply, delivery, installation and commissioning of Pallet Automated Guided Vehicles (AGVs) at SATS Inflight Catering Centre 1.

With the government's emphasis to increase work productivity and the strict restrictions on the reliance of foreign of foreign labour, it is imperative that that SATSCAT introduces automation and IT systems to improve work efficiency and productivity.

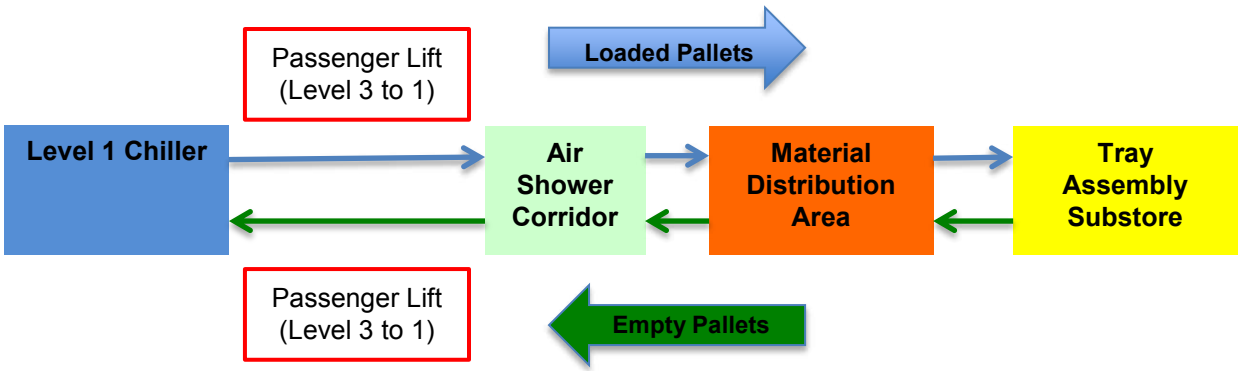
This project involves the automation of transfers and deliveries of pallets using mechanical pallet walkers and replace with Pallet Automated Guided Vehicles (AGVs) that will serve to pick up and deliver pallets from Level 1 Stores to the various locations at Level 3 Production Area. This will also include the implementation of Pick-up and Drop-off Stations that will form part of the receiving and delivery processes.

The scope of the tender is to provide a solution for but not limited to:

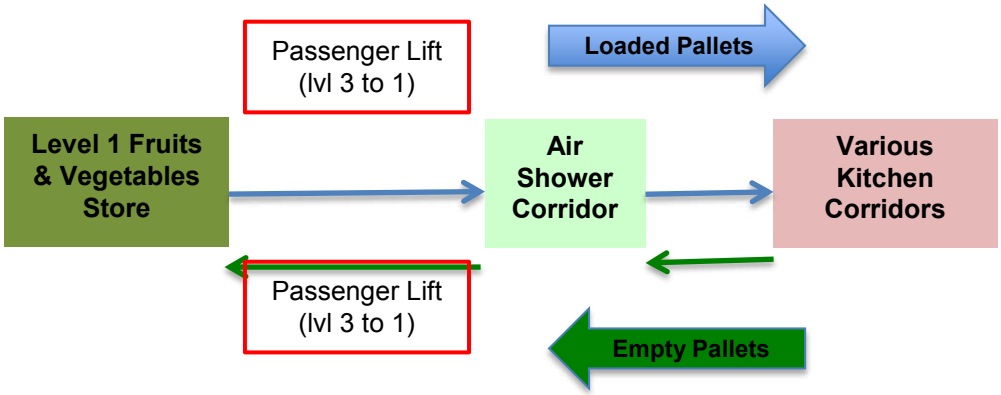
a) Automated Guided Vehicles or AGV(s)
b) Pick-up & Drop-off Stations
c) IT Systems to interface and monitor all autonomous systems (Control and Monitoring System, SCADA, fleet management etc.)

Process Flows

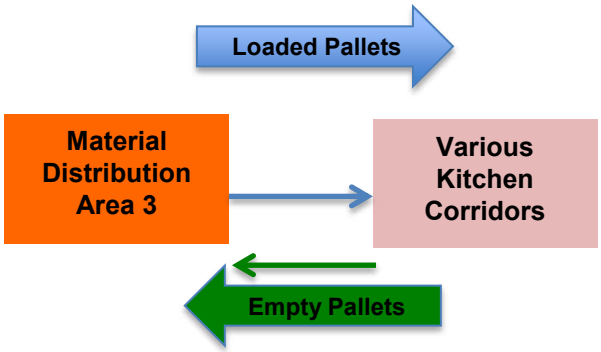
1. From Chillers to Tray Assembly Substore



2. From Fruits & Vegetable Store to Various Kitchen Corridors



3. From Material Distribution Area 3 to Various Kitchen Corridors



Vendors are required to submit proposals for the following areas of the project:

1. Scope of work and responsibilities

2. Functional and technical specifications of new equipment to be supplied and installed

3. Vendor is to ensure that proposed new equipment should interface and work accordingly with the existing M&E requirements, or otherwise make recommendations in the proposal

4. Depending on the proposed system by the Vendor, it will include the main electrical control panels and necessary interfaces for performance management monitor and audit trails

5. Project Management, which include the submission of engineering drawings, approval from authorities (where necessary), submission for Safety requirements (Method Statement etc.) detail timeline, testing and commissioning as well as user and technical training

6. To provide one year warranty upon the commissioned system

7. To provide one year of Maintenance Services commencing from the end of warranty period with an option to extend it each year for at least the next two years

Evaluation Criteria

The proposals will be evaluated based on the following factors (including but not limited):

- Overall value; i.e. cost versus benefit to SATSCAT
- Point-by-point responses to the Scope of Work
- Proof of concept
- Completeness of solution
- Completeness of tender submission
- Ease of integration with existing system eg. M&E systems
- Technical Expertise
- Prior & Proven Experience
- Value added services (Energy Conservation, Process Re-Engineering, reduced running cost etc.)
- Completion of project within given project schedule

The evaluation process may include telephone calls to the declared referees (clients) to verify claims stated in the tender documents.

Only short listed candidates will be requested to present their Tender Submission on-site at SATS premises. SATS will provide the necessary facilities in Singapore for the presentation but all other expenses incurred by the Vendors in making the presentations will be borne by Vendors.

Vendor Matrix

Please complete the Matrix briefly (URLs are not acceptable). Additional information can be given as an attachment and / or in the relevant parts of your tender proposal.

Category/Section	Description
Corporate Information	
Company's Name and Address	
Year of Incorporation	
Parent Company Name and Address (if any)	
Mission and Vision	
Core Competencies / Business	
Profit & Loss statements for the 3 last current year-end periods	
Profit & Loss statements for the 3 most current year-end periods	
Technology / Business Partner (if any)	
Contact Person's Name, Job Title, email address, mobile & DID contact no., fax no.	
Experience	
Project Experience with Automated Guided Vehicles/Material Handling Systems. (It will be an advantage with Inflight Catering experience) - number of years - state the projects title & customer reference (a brief description should be provided as an attachment)	
Product Features	
Estimated Market Share (Singapore)	
Resources	
Number of Full Time Employees in Singapore - Total - Technical (Consultant, Engineer, etc.) - Maintenance Support	
Project Management	
Development Methodology Adopted	
Development Model (on-site/off-shore/ hybrid)	
CMM, ISO or equivalent Certification	

Project Schedule

The following schedule gives the overview guideline on the project tasks and the milestones. Vendor is to submit project schedule based on these guidelines. These dates shall be detailed by major installation stages, sub-packages and areas in the building. Additional information can be given as an attachment and / or in the relevant parts of the tender proposal.

Task	Timeline
Preliminary Design Submission (Scale 1:100) including Building and Utilities Requirements	*5 Weeks*
Preliminary Equipment Details and Design Specifications Submission	
Review Meeting	
Approval of Final Equipment Design Specifications Submission	*2 Weeks*
Commence Fabrication/Construction	*12 Weeks*
Final Acceptance Test	*1 Week*
Delivery and Installation of Equipment	*6 Weeks*
Permanent Power turn on	*4 Weeks*
Testing and Commissioning	
Site Acceptance Test/Handover*	
Staff Training	*1 Week*
Start of Full Operation	
Start - up support / Warranty Servicing	
Warranty Period (1 year plus time from Start of Full Operation to Final Acceptance)	
Total	*31 Weeks*

PRICING

PRICING SUMMARY

Supply, installation & commissioning of the following items including all the necessary accessories for the equipment to operate properly (otherwise stated as described in “Technical Specifications”). For software items, the required run-time licences and development licences must be clearly stated separately.

The Vendor must submit a fixed fee proposal. Items illustrated in the itemised pricing table are not exhaustive. The Vendor shall provide a detailed price breakdown including those that have already been listed in the pricing table, with unit prices.

Other options proposed by the Vendor shall be quoted separately.

All prices should be quoted in Singapore Dollars (SGD)

The total contract sum is _____
(No Exceptions To Specifications) excl. GST

Options as proposed by Vendor, purchase price is _____
(No Exceptions To Specifications) excl. GST

ITEMISED PRICING TABLE

Item	Description	Qty	Unit Price (S$)	Total Price (S$)	Remarks
1	**Supply:**				
i	Autonomous Vehicle/AGV	1			
ii	Infrastructure required for AGV				
iii	Pick-up & Drop-off Stations				
iv	Control & Monitoring system				
v					
vi					
2	**Freight Charges/ Insurance/ Local Transport/ Handling/ Site Materials, Accessories & Preliminaries**				
3	**Installation/Testing/Commissioning:**				
i	Final Connection				
ii	Start-up Support				
iii					
4	**Other Proposed Equipment and accessories (Please specify):**				
i					
ii					
iii					
5	**Design & Engineering:**				
i	Engineering Drawings & Documentation				
ii	Project Management				
iii	Testing and Commissioning				
iv					
6	**Training**				
7	**Warranty (1 Year)**				
8	**Maintenance Services (Monthly PM):**				
i	Year 1				
ii	Year 2				
iii	Year 3				
iv					
9	**Monitoring Systems to be integrated with IT systems located in Technical Office 1 (cabling to be provided by SATS)**				

ITEMISED PRICING TABLE

Please complete the Matrix briefly (URLs are not acceptable). Additional information can be given as an attachment and / or in the relevant parts of your tender proposal.

Optional items:

Item	Description	Qty	Unit Price (S$)	Total Price (S$)	Remarks
1	Autonomous Vehicle/AGV	3			
2					
3					

All prices as quoted to be in Singapore Dollars

SPARE PART ITEMISED PRICE LIST

Please complete the Matrix briefly (URLs are not acceptable). Additional information can be given as an attachment and / or in the relevant parts of your tender proposal.

Item	Description	Unit Price (S$)	Country of Origin	Proposed Qty to Stock
1				
2				
3				

All prices as quoted to be in Singapore Dollars

Technical Specifications

General requirements

- High degree of standard components and uniform brands/makes, reduced number of sub-Vendors/suppliers; lower maintenance and repair cost; reduced number of spare parts
- Standard spare parts such as indication lamps, transmission belts, electrical motors etc. must be locally available.
- Heavy duty design and execution
- All machines to be fit for purpose.
- All surfaces that require frequent cleaning to be in stainless steel.

Design

- Topside of cabinets, splash backs, utility distribution ducts, etc. to be manufactured in slanted position.
- Flexible installation and erection of all equipment and machines for easy exchange of equipment location.
- Heat- and sound insulation materials to be asbestos-free and CFC/HCFC-free.
- All switches, e-stops, knobs, sockets, door/drawer handles etc. to be recessed and protected against damages by moving trolleys/carts.
- Half open lid of electric socket with plugged connections must not protrude the equipment front.
- All knobs to be mechanically secured by screws or similar devices.
- PCB boards/control boards, keypads etc. to be robust or heavy-duty type.

Equipment installation

The tender price must include all materials, installation, functions, operational and hygiene tests etc. as well as required qualified personnel for installation, installation supervision, etc. No subsequent charges will be accepted.

All necessary installations beyond the connection point and all installations for equipment and machine performance, maintenance and easy fault finding must be supplied and installed by the Vendor or his local licensed installation workers.

Installation and location of final connection points to meet structural requirements such as beams, intermediate beams etc. The Vendor at no extra cost shall execute necessary amendment of the equipment due to installation constraints.

All installations shall be co-ordinated with all building Engineers (architects, M + E Engineers, structural Engineers, systems and equipment Engineer)

The Vendor must also provide all:

- Necessary lifting devices, mobile cranes, scaffolding, tools etc.
- Unloading of all material and system components from delivery truck/container and transport to points of installation.
- Removal of all packing materials from work place and site.

Mechanical installation and utilities

Mechanical utilities (electricity, compressed air) will be supplied to each piece of equipment according to Vendor's requirements. The final connection to the equipment will be executed by the equipment Vendor.

For utility distribution ducts the utilities will be supplied from below except gas and electricity, which will be from above.

All necessary utility installations beyond the connection point must be supplied and installed by the Equipment Vendor or his locally licensed installation workers. Such installation items will comprise:-

1. Power Supply

The electrical power will be supplied to each piece of equipment and machine according to Vendor's requirements. One cable / one connection point per machine. The final connection to the equipment's control cabinets and boxes will be executed and supervised by the equipment Vendor and/or his local licensed sub-contractor. All power distribution beyond the connection point as well as all control cable distribution is the responsibility of the Equipment Vendor.

Electrical isolators to the equipment will be supplied and installed by others. The Equipment Vendor will terminate the equipment cables at the electrical isolator.

For equipment located at walls the sockets/isolators are wall mounted.

2. Control cabinets

Where applicable, power connection and motor circuits are to be accommodated in control cabinets. They contain all fuses, main switches, contactors, motor protection switches, relays, panel indication lamps, terminal strips, auto timer, operating hour meters, fans, cooling unit required for the function of the system.

Each control cabinet must have an isolator, cable locks and an emergency push button. Entry of cable to be from the top or from below. Access for final connection, which will be by others, is to be provided by the Vendor.

Control cabinets must have interior lighting and socket outlet as well as internal testing device for indication lamps, etc.

The location of the control cabinets is to be shown in the proposal tender drawings together with the proposal. Each control cabinet shall have 20% spare space for later extensions.

Each control cabinet is equipped with a suitable means for keeping the electrical drawings and layouts located at the first opening door. Control cabinets are to be at least splash proof and easy to operate.

3. Installation and wiring

The tender price must include all materials, installation, wiring, function tests etc.; No subsequent charges will be accepted.

The installation comprises:

- Manufacturing and installation of control cabinets, control desks, control panels, control boxes etc.
- Installation and wiring of and to all control/monitoring peripherals as well as of and to all peripheral equipment like central monitoring panel

- Installation and wiring of motors, cable ducts, cable ladders/racks and steel conduits, control and signal cables between the system elements, the control cabinets and the control centre.
- Cables and wires are to be installed in galvanised cable ducts/ladders/racks with covers or in steel conduits to provide protection against mechanical damage
- Cable duct/ladders/racks are to be provided with 20 % spare space for later installation of additional cables.
- Cables passing through firewalls and ceilings must be in accordance with regulations of fire protection, with cable sleeves and making good and closing of openings
- Marking of cables and cable ducts/ladders/racks every 10 m and next to walls and floor openings (letters in height size at least 10 mm). Labels to be affixed with 2 screws or 2 rivets.

4. Electric cables

- All cables and plugs to be of food-,oil-, heat-, cold- and detergent-resistant as well as non-ageing materials
- All electric cables to be cut to appropriate length. No cables on floor surface.
- Mobile equipment to be equipped with spiral cable and cable/plug holder or hook.
- Cables, plugs, and installation at least splash-proof
- Plug execution according to local code

5. Electric sockets, junction boxes etc.

- All sockets, junction boxes etc. to be of food-, oil-, heat-, cold- and detergent-resistant as well as non-ageing materials
- Socket, junction box, execution etc. to be at least splash-proof
- Open lids of socket with connected plug must not protrude front surface, socket to be located in recessed areas
- Socket, junction box execution etc. design according to local authority codes

Current Processes

- 3 manual pallet truck operators
  - 2 operators handle the transfer of pallets (dry goods) from the Level 3 Material Distribution Area 3 to the various kitchen locations, Tray Assembly Area and Tray Assembly Substore
  - 1 operator handles the transfer of pallets (chilled/perishable goods) from the Level 1 Chiller/Fruits & Vegetables Area to the various kitchens at Level 3
- Approximately 200 pallets transferred daily (refer to Annex A for daily pallet distribution)
  - Approx. 126 pallets (dry goods) are conveyed daily from Level 1 Store to Level 3 Material Distribution Area 3 via a material handling system, and then distributed to the various Level 3 areas by 2 manual pallet truck operators
  - Approx. 70 pallets (chilled/perishable goods) are directly transferred from Level 1 to the various Level 3 kitchens by 1 pallet truck operator
- Pallet transport between Level 1 & Level 3 of the facility
  - Manual pallet truck will be driven into the passenger lift and powers down for passengers' safety
  - No dedicated lift for material transport, staff are able to take the same passenger lift as the manual pallet truck. Lifts can stop at all Levels
  - Operator will ensure all passengers have disembarked from the lift before powering up the pallet truck and moving off
  - Operator has to scan his staff pass to activate the roller shuttle at the Level 3 link bridge before the pallet truck can be driven through the Link Bridge
  - Once exiting the link bridge, the operator will send the pallets to their respective drop-off points
- Pallet delivery to the various kitchen corridors requires the operators to manoeuver the pallet trucks carefully through congested and narrow corridors
- After delivering the pallet of chilled items, the operator will disembark and enter the kitchen to inform the kitchen staff that the items have been delivered, so that the staff will immediately collect the chilled items
- First-in, First-out (FIFO) pallet delivery method
  - Items on the innermost pallets at the corridors are cleared by the kitchen staff first, operator will disembark from the manual pallet truck to temporarily remove the empty pallet from the pallet designated area (yellow box) to one side, before using the new pallet to push the remaining pallets inwards (ie. Second pallet that came in will move in and become the first pallet that the kitchen staff should clear the food items from, so on and so for)
  - Operator will then put the empty pallet on the manual pallet truck and drive off
- Pallet Pick-up Points:
  - Level 1 Chiller
  - Level 1 Fruits & Vegetables Store
  - Level 3 Material Distribution Area 3
- Pallet Drop-off Points:
  - Level 3 Material Distribution Area 3
  - Tray Assembly Substore/Chiller
  - Tray Assembly Pre-cup Area
  - Pre-prep Corridor
  - Hot Kitchen Corridor
  - Cold Kitchen Corridor
  - Pastry Corridor
  - Indian Kitchen Corridor
- For Pastry Kitchen, the operator will sometimes send the pallets into the Kitchen itself and place the pallets near the cold room for the staff to transfer the items into the cold room
- Operators will remove any empty pallets found along the corridors and drop the pallets off at the Material Distribution Area or Level 1 Store

Current Operating Environment

- Kitchen corridors are filled and cluttered with dolleys/trolleys
    - Operator has to disembark from the manual pallet truck to shift the items to one side before they can manoeuvre the pallet truck through the corridor
- Dolleys which are used to transfer orange bins from the pallets into the kitchens are left at the designated areas (yellow boxes)
    - Operator has to disembark from the manual pallet truck to shift the dolleys away in order to drop off the pallet
- As there is not enough space at the potwash area to accommodate the soiled and washed trolleys, many trolleys that are meant for washing at the potwash area are left along the Cold Kitchen/Indian Kitchen corridors and also spill out into the main corridors
- During the daily area cleaning at night, many trolleys/items are brought out of the kitchens and left outside the corridors

General Layout

The illustrated layouts of the proposed movement of the pallet trucks are appended below; exact dimensions to be confirmed during site show round:

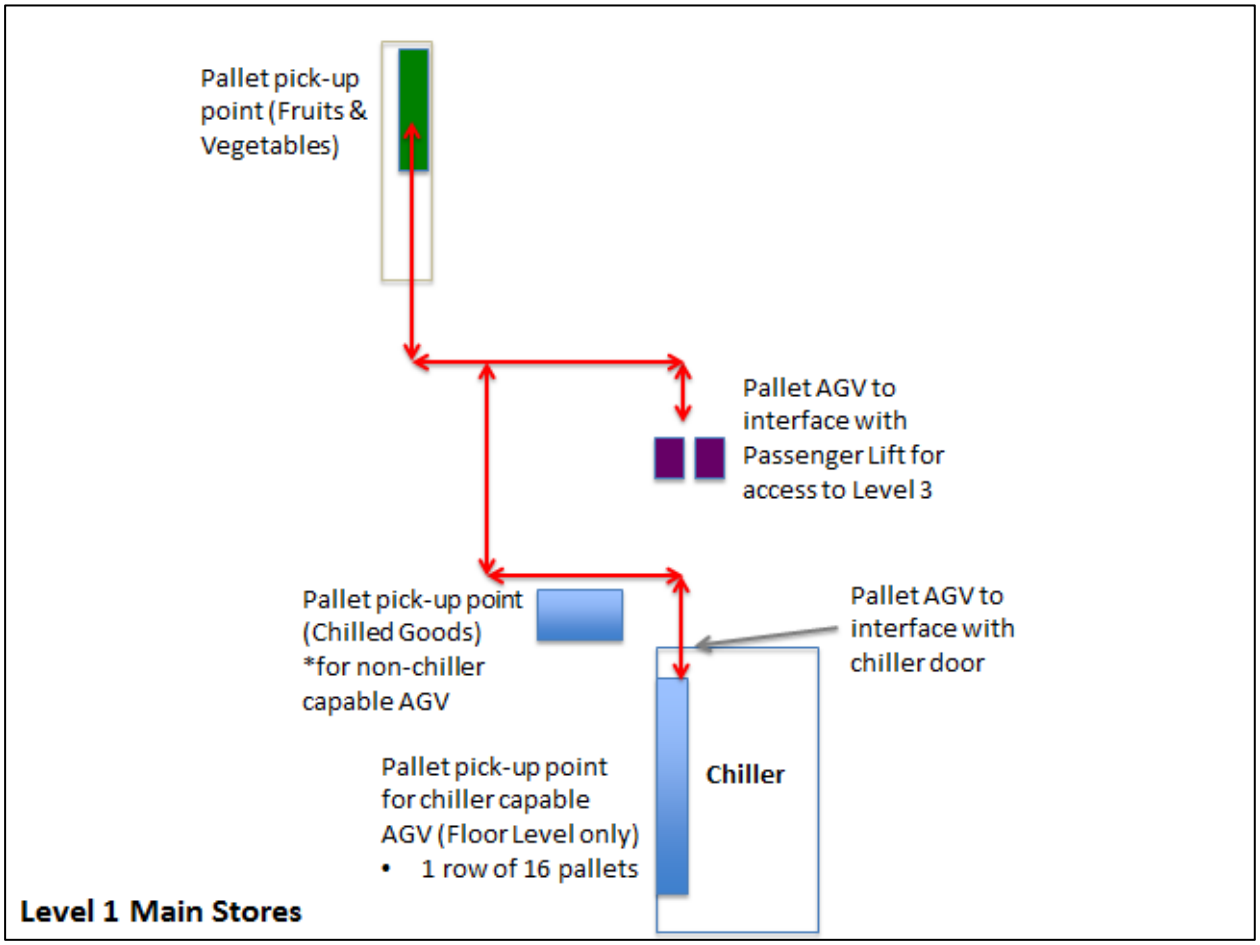


Diagram 1: **Level 1 Main Store to Passenger Lift** (Chilled/Perishable Goods Pick-Up Points)

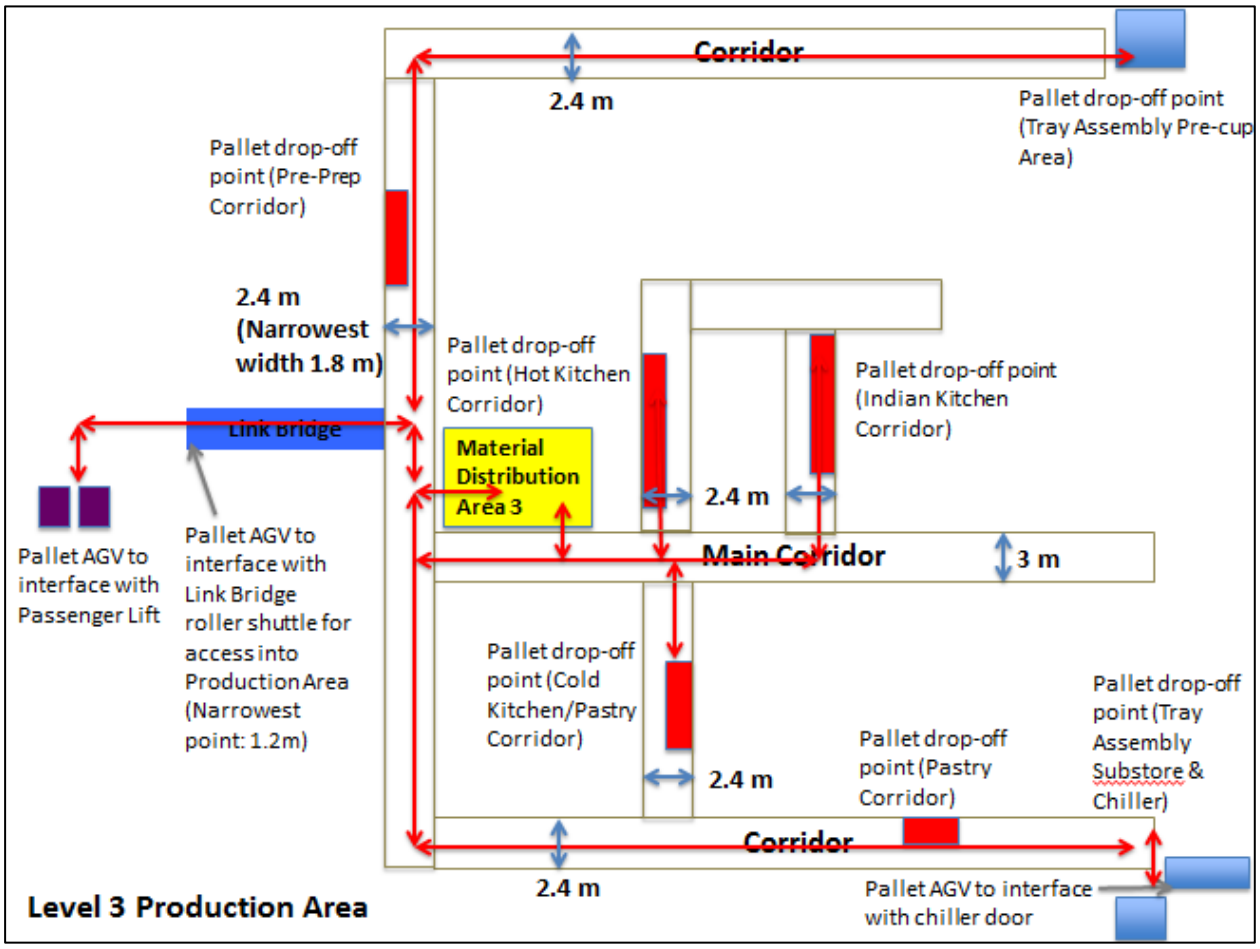


Diagram 2: **Level 3 Kitchen Layout (AGV Routes)**

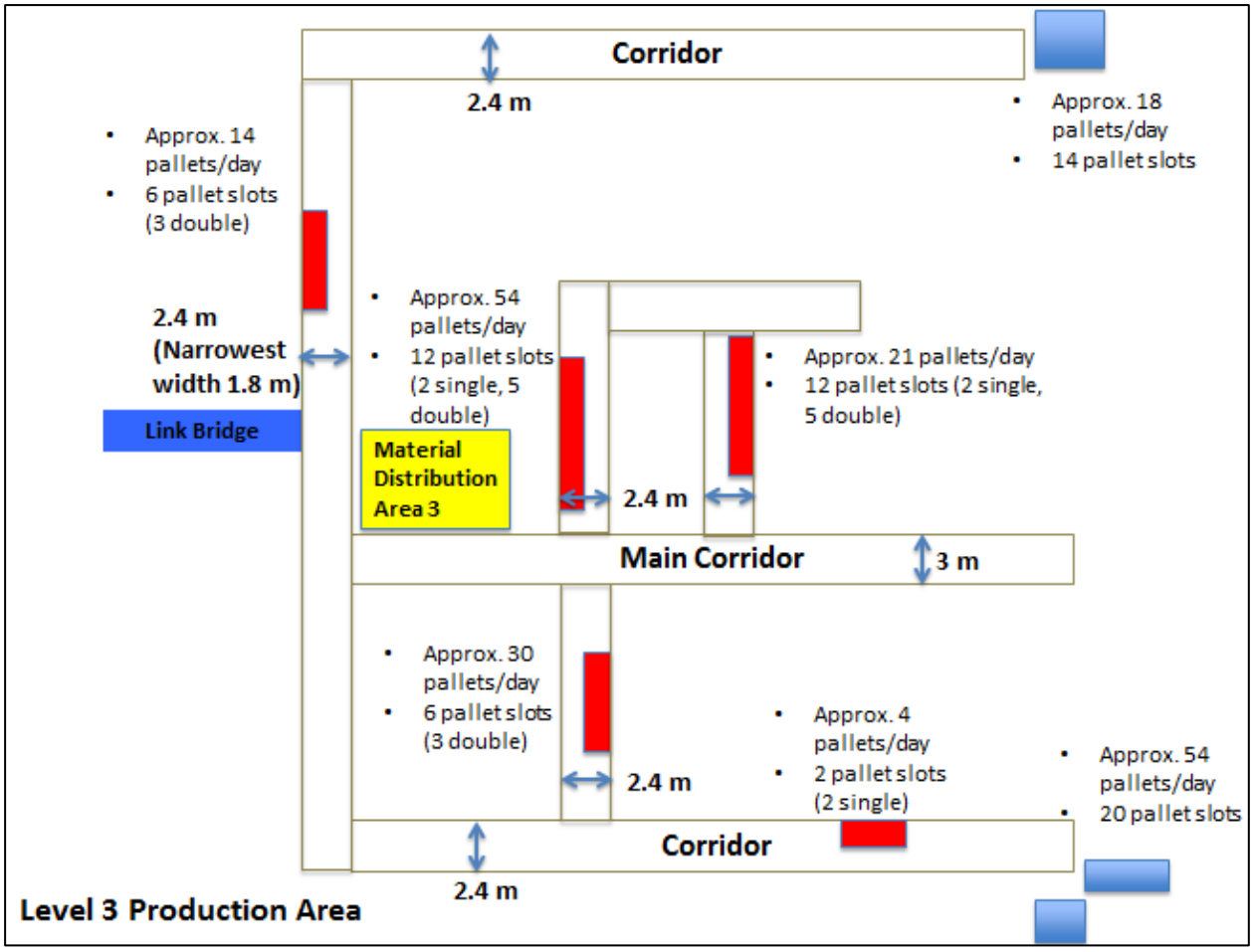


Diagram 3: **Level 3 Kitchen Layout (Pallet Slots)**

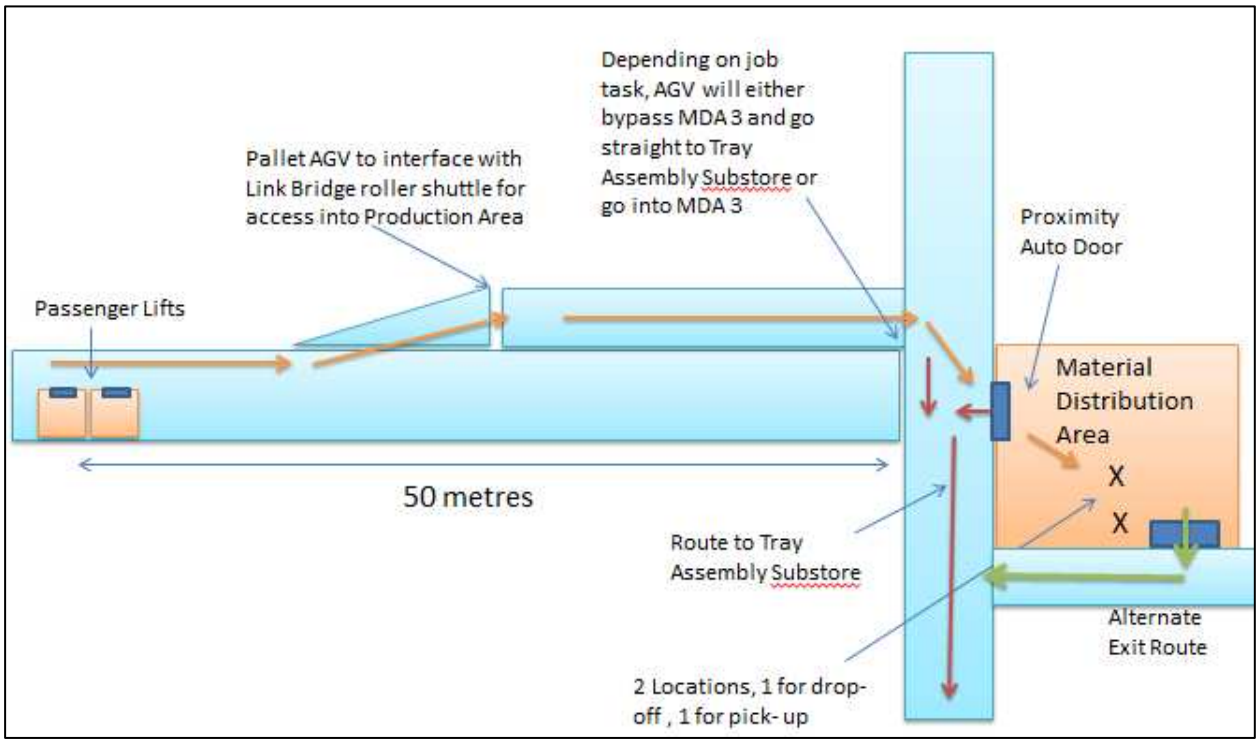


Diagram 4: **Level 3 Passenger Lift to Material Distribution Area 3 Layout**

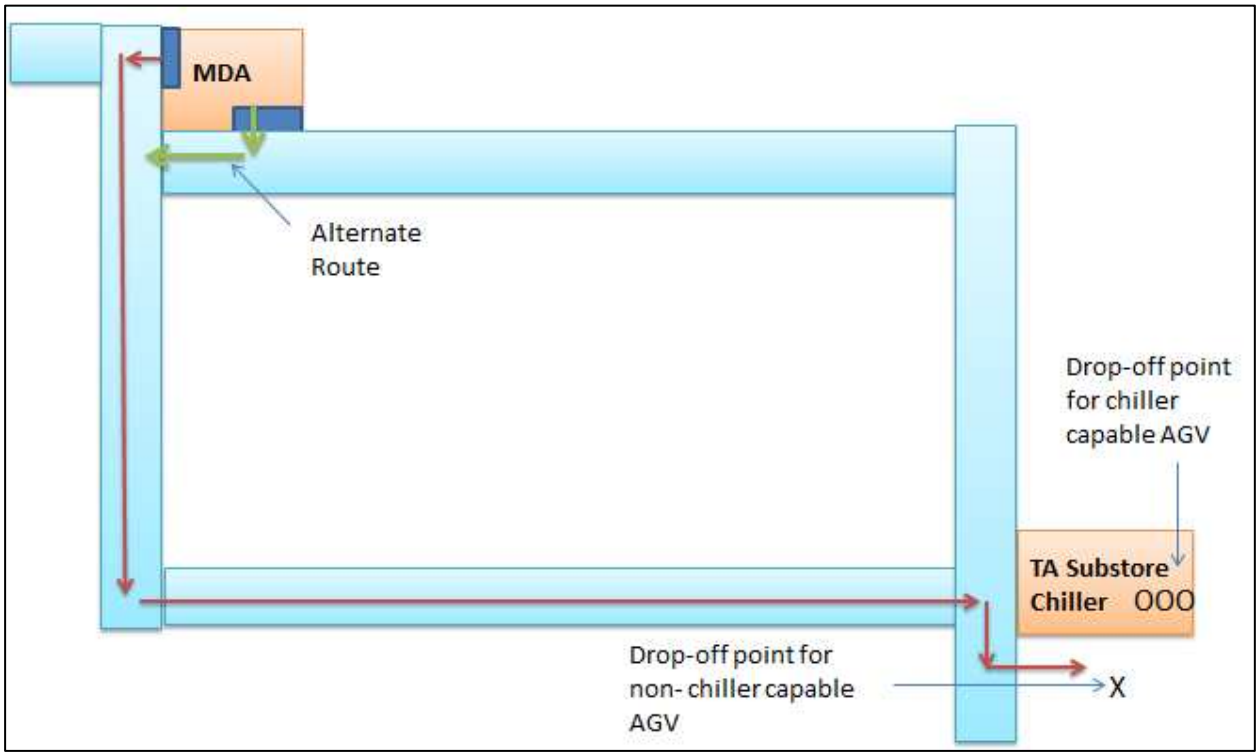
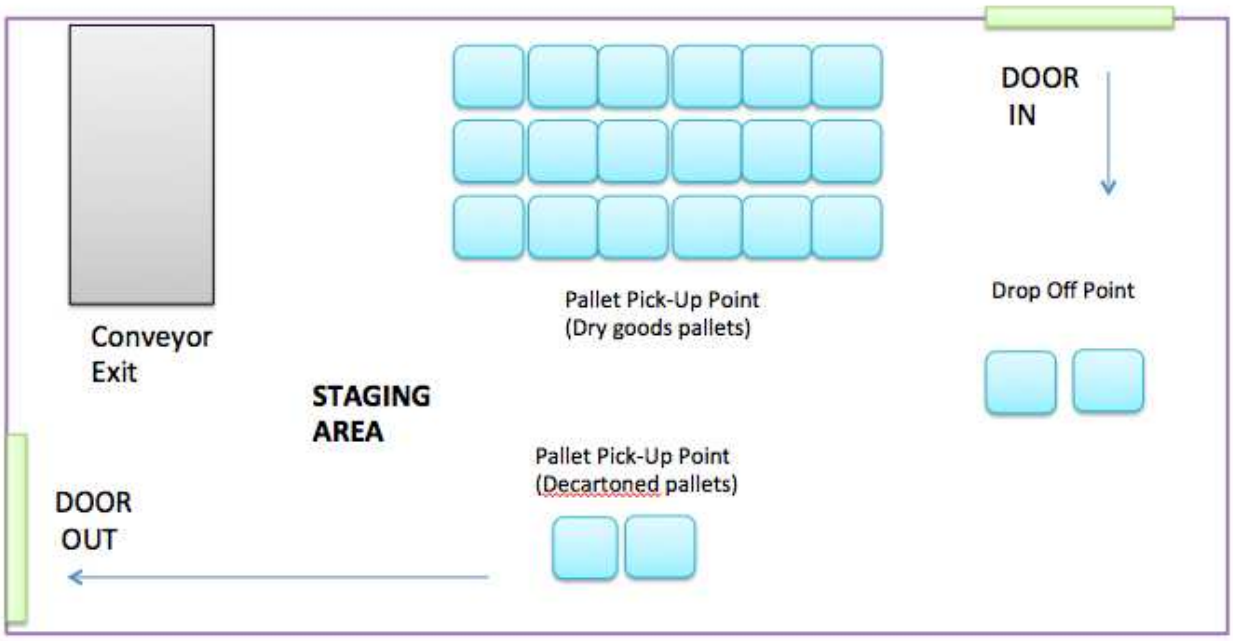
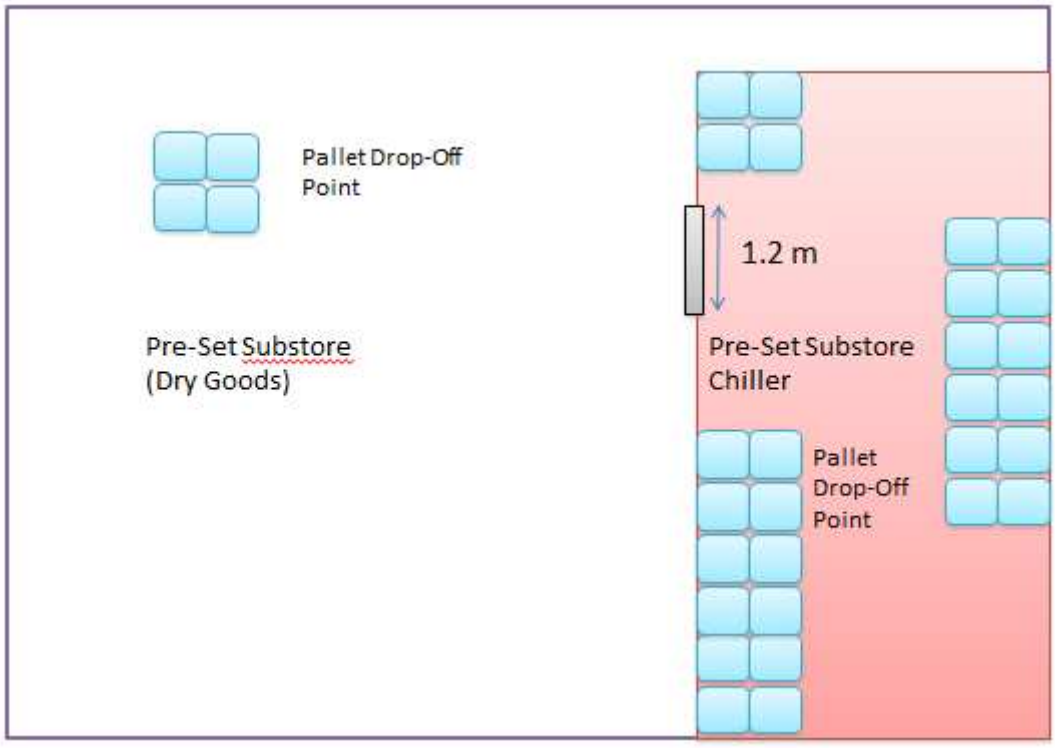


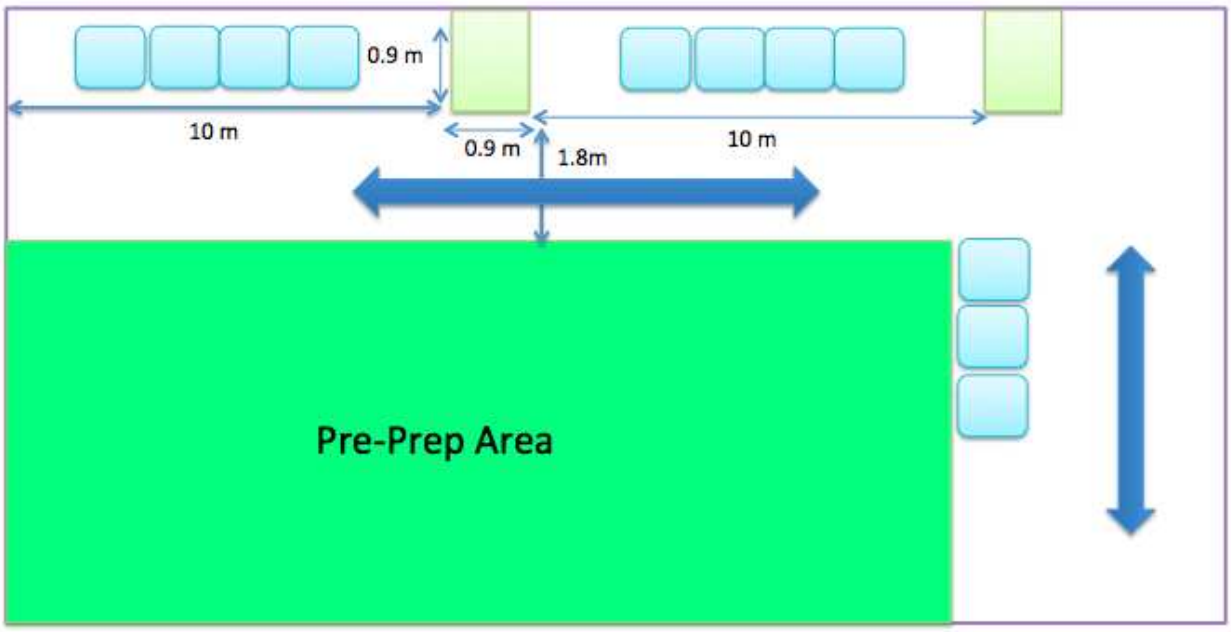
Diagram 5: **Level 3 Material Distribution Area 3 to Tray Assembly Substore Layout**



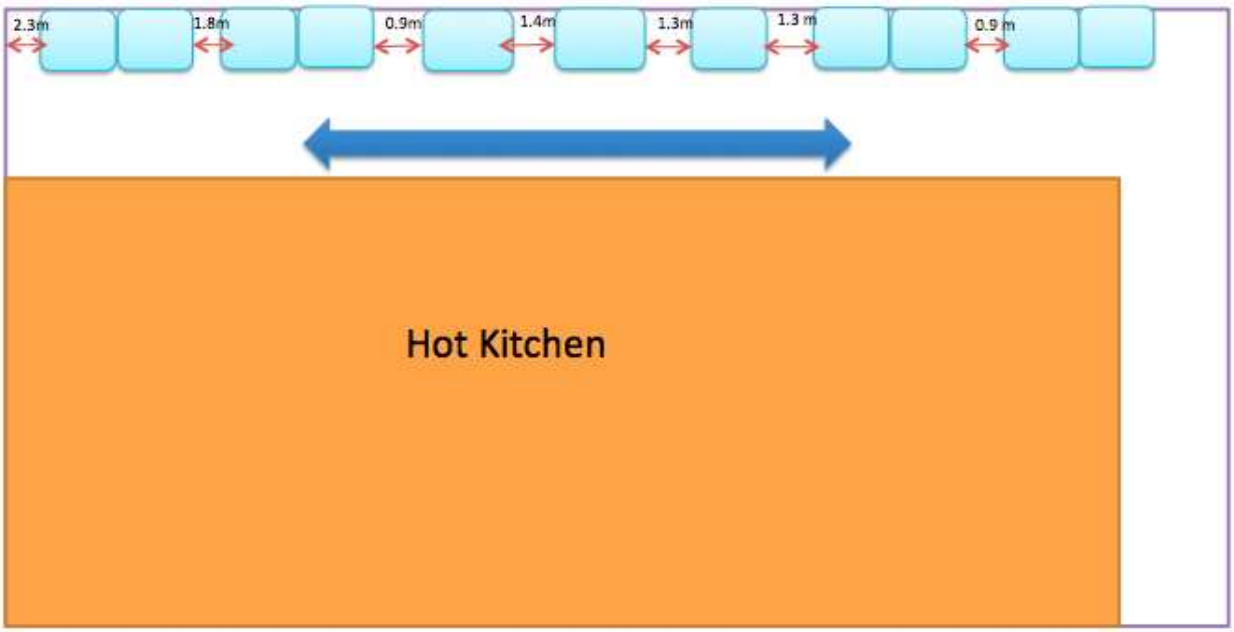
Layout 1: **Level 3 Material Distribution Area 3**



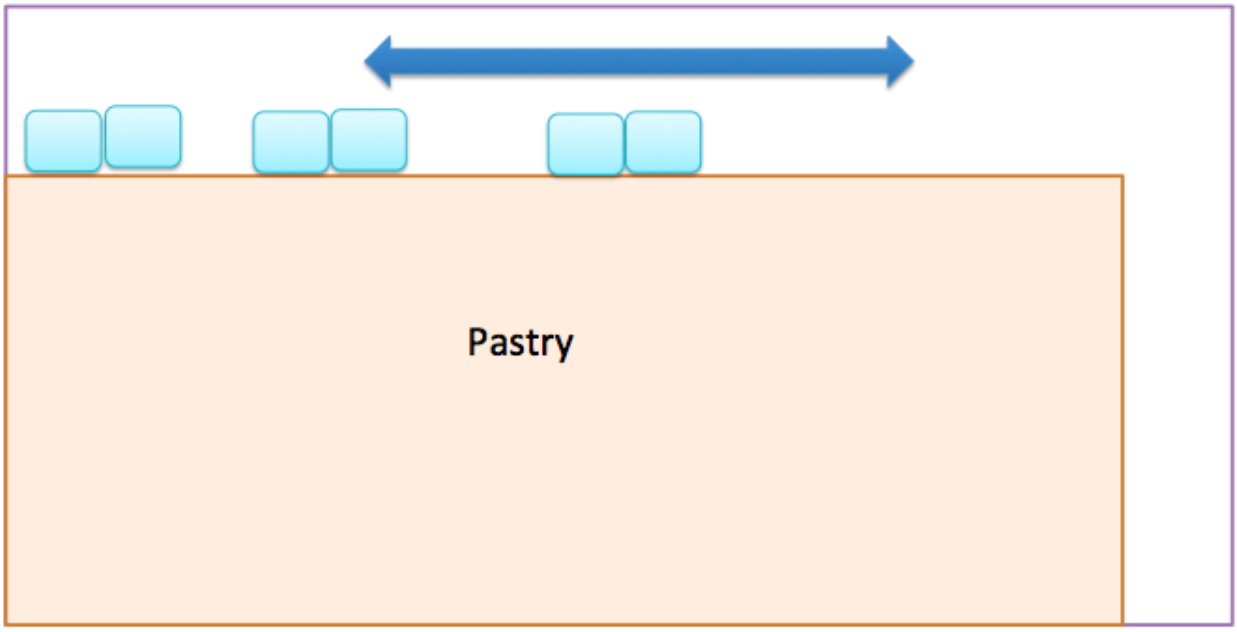
Layout 2: **Level 3 Tray Assembly Substore Area**



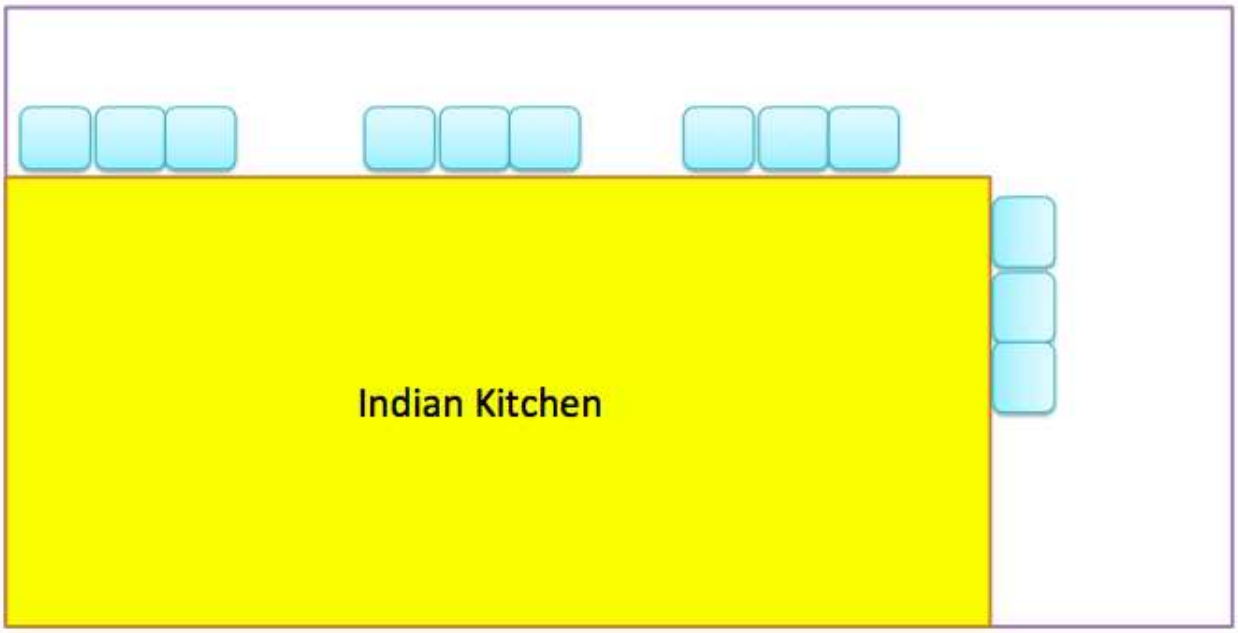
Layout 3: **Level 3 Pre-Prep Corridor**



Layout 4: **Level 3 Hot Kitchen Corridor**



Layout 5: **Level 3 Pastry Kitchen Corridor**



Layout 6: **Level 3 Indian Kitchen Corridor**

Proposed Processes

Vendors to propose a solution (not limited to the following suggestions) to automate the current manual material movement process:

1. Pallet AGVs able to transverse between the service Levels of the facility by using the passenger lifts to transport the pallets from Level 1 Store to Level 3 Production Areas; or

2. Pallet AGV on Level 1 loads the pallets into the passenger lift, while another AGV on Level 3 will offload the pallets in the lift and distribute the pallets to the respective drop-off locations

3. Propose a new material handling system that transfers pallets of chilled item from Level 1 Main Stores to Material Distribution Area 3. Pallet AGV on Level 1 loads the pallets onto the material handling system, while another AGV on Level 3 will offload the pallets at Material Distribution Area 3 and distribute the pallets to the respective drop-off locations

Equipment Specifications

1. Autonomous Vehicle(s) or AGV(s)

- Able to pick up, transport and drop off Euro size pallets (1.2 m x 0.8m) with loads of up to 800Kg and about 1.5m in height (excluding pallet)
- Material transport between the service Levels of the Production Areas
- Must be able to work 24/7 regardless of operating environment's conditions
- Interface with passenger lift, link bridge corridor and pallet pick-up and drop-off points for upstream and downstream processes
- An internationally recognised standard with regard to safe operations around people
- Must be able to mix with human traffic
- No dedicated lift for the AGV, staff are able to share the same lift with the AGV
- Demarcated zones in the lift for AGV and for human traffic
- Interfaces and communicates with the passenger lift Fujitec control system, able to call for and select the required floor Level, and disengage "door hold" function of the lift
- AGV only enters or exits the lift after staff have exited the lift
- Powers down during movement on the lift
- Heavy duty design
- Narrow pallet truck design to transport loads in narrow and confined areas, and to make tighter turns
- Multi-directional movement with electronically controlled all-wheel steering
- Side loading of pallets to allow pick up and drop off of pallets along narrow corridors
- Must be able to handle and transport pallets with uneven weight distribution without toppling
- Bi-directional movement of AGV, able to move forward or reverse without doing a 360° turn
- Programmable height limiter (set at recommended safe height limit so that the AGV does not operate when overloaded)
- Speed of at least 1.55 m/s when loaded with pallet
- Pallet Pick-up and Drop-off Stations consist of pallet positions for the AGV to pick-up from (Level 1 Store/Level 3 Material Distribution Area) and deliver to (Level 3 Material Distribution Area 3/Level 3 Tray Assembly Substore/Tray Assembly Area/Kitchen Corridors). The Pick-up Stations require a set of guides or detents mounted to the floor to assist with proper user positioning of the pallet for pick-up
- Pallet Pick-up and Drop-off Stations comprise a sensor mounted in the ceiling to detect presence of a pallet underneath. Once a pallet is detected, the AGV automatically transfers the pallet to the next designated location
- Response and transportation time of AGV upon detection of pallet at Level 1 Main Stores Pick-up Stations/Level 3 Material Distribution Area 3, or upon call timing from any Drop-off Stations located at Level 3 (Material Distribution Area 3/Tray Assembly Substore/Tray Assembly Area/Various Kitchen Corridors) must be the same or less than current operation (Refer to Annex D for the current manual pallet truck transport timings for the various routes)
- Vendor to propose a solution whereby the pallet AGV is able to notify the kitchen staff to collect the items/to clear any possible obstructions at the drop-off points for the pallet to be delivered
- Vendor to propose a solution whereby the kitchen staff has to acknowledge that the pallet has been delivered to the respective kitchen drop-off point
- AGV must be able to pick up stack of empty pallets/pallets with empty orange bins and send back to Level 1 Store or Level 3 Material Distribution Area 3 upon detection of empty pallets at the Drop-off Stations
- Vendor must propose how the First-in and First-out method (as stated in the current processes) will work with the implementation of the pallet AGV
- Vendor to propose a solution for the collecting and consolidating the empty dolleys (eg. Multiple collection points around the kitchens)
- All-round beam sensors to detect obstacles without contact, multi-layer sensor fields
- Safety features and sensors at fork tips
- Safety bumper contact sensors which stops the AGV upon contact

- 100 % accuracy in arriving at its intended destination along an unobstructed path and capable of manoeuvring around a partially obstructed path
- Possess inbuilt systems to navigate itself through the area of work (inertial guidance or laser target navigation)
- Capable of obstruction avoidance without any permanent fixtures, strips, tracks or RFID set up onsite. Possess collision avoidance systems (lidar or IR)
- AGV must be able to transverse through the narrow Link Bridge corridor (1200 mm width)
- Built-in webcam or Internet protocol cam-recorders to allow the operator to monitor the AGV whereabouts and movement, as well as to record the movement of the AGV. Vendor to work with SATSCAT to get webcam on the network.
- AGV will send a signal to inform the operator if it stops for more than 2 mins due to an obstruction that it cannot maneuverer its way past or blocks it from having access to the Pick-up or Drop-off Stations
- Built-in audio features to allow verbal communication between operator and other staff, as well as for AGV to sound warning if a person is blocking its part and does not move away
- User friendly interface; easily configurable and programmable
- If the AGV is laser-guided, ensure that sun light will not affect the reflective capability or effectiveness of the reflective strips that are used for the AGV to identify its location
- Sound insulation for processes with noise Level of above 85 dB(A)
- Readily accessible and easy for general cleaning and maintenance
- Wheels/tyres must give good traction on possibly wet tiled floor surface, be made of a non-marking material, and be inert to chemicals used for cleaning/washing
- Automatically seek and search for electrical charging points at the end of the work shift, and hook itself up for charging
- Long life lithium-ion battery modules (does not need to be replaced for at least 8 years)
- Battery modules must have manual hot swap capabilities
- Each battery charge cycle must provide sufficient energy storage capacity for the AGV to work an entire shift (8 hours) without any interruption for charging. Battery charging time must not exceed 20% of the expected work shift duration
- Power Charging point should be floor mounted so that the electrical connections are made by simply driving over it. Contact brushes must be self-cleaning
- Power Charging point must have provision to charge backup battery units
- Battery unit of the AGV can be replaced by one person in under 10 minutes
- As more than one AGV might be functioning at one time, all AGVs must be able to communicate wirelessly with each other through the FMS to optimize work flow
- Must be able to handle at least a 2% gradient
- All electrical, mechanical, servo-mechanical, pneumatic and hydraulic systems must comply with Singapore Safety Standards.
- Safety features such as warning lights, bumpers, beepers and speakers integral to the AGV
- On-board control panel/display to show AGV destination, status, mode, battery conditions, error messages, etc. Can be used for AGV dispatching and diagnostics
- Constant communication with the Control and Monitoring centre
- Can be remotely directed/controlled
- AGV can change its destination or route anytime once it receives the command from the Control and Monitoring centre; AGV does not need to go back home in order to receive and act on new commands
- Can be adopted or programmed to serve other areas in the future without extensive add-ons to the infrastructure
- Any delay to the Start of Full Operation Date, the Vendor will bear the Liquidated Damage of S$800.00 a day if the delay is solely attributed to the Vendor

OPTIONS:

- Chiller-going AGV for operating in chiller environment (approx. 2 - 5°C). AGV to pick up pallets from assigned Pick-up Stations in the Level 1 cold rooms, and transfer to Level 3 Material Distribution Area 3
- Sensors and webcam of chiller AGV do not fog up during movement in and out of the chiller
- Able to interface with the chiller doors

1 Autonomous Vehicle(s) or AGV(s)

Technical Data		Projected by SATS	Designed by Vendor
Travel speed (with load)	m/s	> 1.55	
Travel speed (without load)	m/s		
Throughput	pallet/hr	7 - 8	
Straight track clearance	mm		
Turning radius	mm		
Turning clearance	mm		
Maximum gradeability (with & without load)	%	>2	
Time at which AGV can operate in chiller (2 - 5°C) (Option)	min		
Operation time/full charge	min	480	
Battery charging time	min		
Electrical			
Supplied Voltage from Mains	V	400 (3 phase)	
Protection enclosure	IP	65	
Noise Level at 1 m distance	dB(A)	<85	
Load Capacity	kg	1000	
Link Bridge Corridor Entrance Width	mm	1200	
Kitchen Corridor Width	mm	2400	
Main Corridor Width	mm	3000	
Dimensions of Pallet			
Length	mm	1200	
Width	mm	800	
Height	mm		

Dimensions of AGV			
Length	mm		
Width	mm		
Height	mm	< 1500	

Manufacturer .....

Type .....

Comments .....

.....

2. Control and Monitoring, SCADA and Fleet Management System

- Transport schedule management and allocation control
- Controls the interlock and synchronisation with the passenger lift, Link Bridge corridor and the Pick-up and Drop-off Stations
- Minimises empty AGV travel
- Data collection and processing system
- Gathers data on material movement and then coordinates and supervises AGV task assignments in response to the system demand
- Server talks to the AGV frequently over the WLAN, sending small packets of data
- Vendors to propose separate WLAN infrastructure
- Fault tolerant and/or high availability server (99.999%) complete with monitors and IT peripherals
- Duplicate lockstep hardware and failsafe software
- Power supply with necessary UPS (minimum 30 minutes backup) for High Availability
- Built-in monitoring and remote serviceability features for online support
- Easily configurable and programmable
- System Security Features with Role and User Management Capabilities
- Anti-virus and monitoring updates (where applicable if not standalone)
- System backup and recovery capabilities
- Application monitoring and troubleshooting
- Real-time Operational Data and Visual and Control Management through Human Machine Interface (HMI)
- Able to manage the AGVs for both upstream and downstream processes as an integrated system
- Able to log statistical data for the integrated system as well as individual sub-system
- Data logging and Management Report
- Data Archiving and Retrieval Functions
- Communication between AGVs and FMS must be done wirelessly

Note: Vendor to provide and submit the System Specifications, including the Architectural Design, IT Infrastructure and Technical Details and Functional Specifications Brief. Vendor to state the different software/interfaces (eg. WMS etc.) that the control system needs to link up with.

In addition to the above, the tender price shall include:

- Delivery and installation of AGV infrastructures in SATS premises
- Work closely with the various SATS Vendors (passenger lift, air shower corridor, cold room door) to ensure seamless integration and handshaking of the AGV
- Integrated control cabinets and integrated electrical installation of equipment/ machines. This applies to the electrical installation and wiring between equipment/machines and remote control cabinets
- Layout and design of pallet AGV, Pick-up & Drop-off Stations including necessary layout amendments caused by the final architectural layout, updating of drawings and final design
- Preparation of functional design specification documents incl. draft copies, presentations, meetings etc.
- Fire rated pipes/pipe sleeves for remote equipment and machine components and cables at fire compartment walls and floors
- Approval of all appliances, equipment, machines etc of this tender package by local authorities inclusive fees
- For the Factory Acceptance Test, Vendor must conduct trials to prove that the AGVs can smoothly pick up and drop off pallets at the stations, as well as to collect empty pallets
- Final connections and associated pipe-works / electrical cables etc. between equipment and connection points
- Any necessary subsequent work, readjustments etc., necessary because of shortcomings and defects evident from the various acceptance runs
- Timely and comprehensive training and instruction of the management, operational and maintenance personnel in advance of the integration phase
- Co-ordination at all interfaces and at every point of contact to other works to achieve the construction of a complete unified plant. In particular, interfaces will arise between site works and the above-described scope of work.
- Visits to SICC1 catering facility for contractor's key personnel to understand operation and terminology prior to commencing design and construction
- Participation in meetings and regular site meetings
- Factory inspections
- Start-up attendance
- Participation and attendance in feedback meetings and appraisals
- Basic training for general users and technical training for maintenance personnel in operating and programming the AGV etc.
- Any necessary subsequent work, readjustments etc., as a result of any shortcomings and defects evident during acceptance runs that indicate that the equipment/AGVs do not satisfy core requirements.
- Regular maintenance during the 12 months defects liability period. Proposal for recommended maintenance schedule
- Operations manual and testing report
- Critical spare parts list

The Vendor is further required:

- to submit a proposed layout in drawings at a scale of 1:50 or 1:100
- to submit a detailed drawing at a scale of 1:20 showing the construction and installation method
- to fill in the attached technical data forms completely for all quoted equipment and machines including alternatives and options
- to submit 2 sets of original coloured equipment brochures, photographs etc. of each piece of equipment including attachment and accessories, each brochure to be identified by the specification item number

SPECIAL NOTES

The functions, procedures, information and requirements provided in this document serve as a guide for the bidding of this package. It is by no means complete.

All functions, procedures, information and requirements necessary for achieving full operational performance for the equipment and machines but not listed in this tender document must be included in the proposal.

To avoid any misunderstanding and dispute, the Vendor must seek acceptance (i.e. acceptance signature) for each stage/phase of the design and development process, and also during the various stages/phases of the implementation process.

Any changes made to accepted design must be re-accepted before start of its implementation.

Service Levels for Warranty Period and Preventive Maintenance Services

1. WARRANTY / MAINTENANCE SUPPORT

1.1 Help Desk Telephone Service

For the duration of warranty period and application maintenance services (post warranty period), Vendor will operate from service centre located in Singapore and a helpline will be provided to SATS Catering staff. The helpline will be active for 24 hours x 7 days.

1.2 Process & Procedures

SATS Catering will provide first line support to Catering users and will carry out preliminary investigations to ascertain the nature of the problem, and having identified the problem, make a decision to call the Vendor helpline to activate the Vendor support with Severity Level made known to the Vendor as well.

Vendors will need to comply with SATSCAT incident management flow (Refer to section 4).

2. PROBLEM RESOLUTION CRITERIA

2.1 Problem Response Time

The time taken by the maintenance team to validate, confirm and acknowledge that it is an application problem.

2.2 Problem Resolution Time

The time taken by the application maintenance team to fix the problem, produce a workaround or resolution plan.

3. SERVICE LEVEL

3.1. Severity & Service Levels Table

Severity Level	Definition of Severity Level	Response time		Resolution time
		Office hours	After office hours	
1	Affects 50% or more of the entire System. No acceptable workaround is available leading to significant business impact.	2 hour	2 hour	Within 2 hours
2	Affects up to 50% of the entire System. No acceptable workaround is available leading to substantial business impact.	2 hour	2 hour	Within 1 working day
3	Error in the system functionality, which does not interrupt the operational flow due to availability of an acceptable workaround.	4 hours	Next working day	Within 3 working days
4	Non-critical error or a cosmetic change, which disrupts neither the functional nor operational flow.	1 working day	Next working day	Within 10 working days

3.2 Service Credits for Non-compliance of Service Levels

In the event of a Service Level default (where the Vendor is unable to meet the Service Level stipulated in Section 3.1 above), the Vendor will provide Service Credits (SCUs) per incident per day or part of a day that the work manufactured and/or supplied are not available as a consequence of the non-compliance. SCUs are payable in the following month in which the Service Level default has occurred i.e. if Service Level default occurred in Jan 2015, the SCUs are to be paid in Feb 2015. Should the Vendor's non-compliance persist, SATSCAT reserves the right to exercise other remedies under Contract and/or General Law.

Severity Levels	**Service Credits for Non-Compliance of Service Levels**
Severity Level 1	4
Severity Level 2	3
Severity Level 3	2
Severity Level 4	1

The value of the SCUs will be calculated using the following formula:

Value per SCU = $\frac{\text{At Risk Amount x Allocation factor x Number of Day}}{\text{Maximum SCU}}$

At Risk Amount = 3% of Contract Price/100

Allocation Factor = Service Credits for Non-Compliance of Service Levels (Depending on severity Levels)

Maximum SCU = 4

The Vendor acknowledges and agrees that the Service Level Credits and the Vendor's obligations relating thereto shall not in any way limit SATSCAT's rights and remedies at law or under this Annex or the Agreement nor shall the Service Level Credits be deemed or construed to be liquidated damages or a sole and exclusive remedy or in derogation of any other rights and remedies SATSCAT has hereunder or under the Agreement.

4. INCIDENT MANAGEMENT

Resolver Acceptance

Roles and Responsibilities

1. Allocate initial resource to assess the Incident
2. Assess the assigned Incident Severity and feedback to SATSCAT if there is any discrepancy.

Incident Resolution

Roles and Responsibilities

1. Ascertain whether there is a workaround
2. If so, apply the workaround and update status and Severity if necessary
3. If no workaround available:-
    a. Ascertain whether more resources are required.
    If required, then assign additional resources
    b. Commence work to resolve problem

Incident Closure

Roles & responsibilities

1. Contacts SATSCAT appointed personnel(s) to discuss any outstanding issues regarding the Incident.

2. Resolves incident and updates with details of incident resolution with stated date/time of completion. (Field Service Report)

3. SATSCAT is the only entity that can close an Incident. A closure request can be from:
    - an intermittent problem where the problem has "gone away"
    - Resolver who has resolved the Incident to the satisfactory of SATSCAT

Annex A – Example of a Daily Pallet Distribution

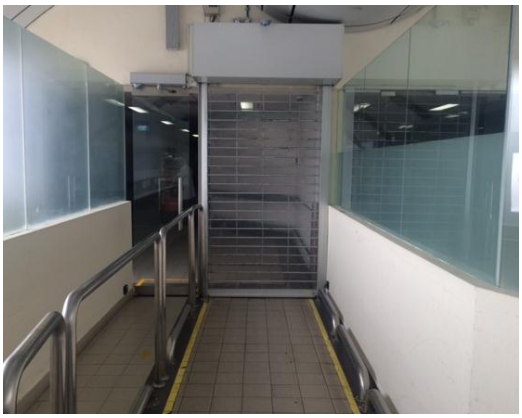
To	From Level 1	From Level 3 MDA
Cold Kitchen	5	7
Pantry	8	6
Pastry	4	14
Western Kitchen	9	12
Premium Kitchen	2	2
Indian Kitchen	6	15
Hot Kitchen	12	21
Tray Assembly Substore	12	33
Tray Assembly Pre-Cup	0	14
Pre-Prep Area	12	2
TOTAL	**70**	**126**

Annex B – Pallets

Annex C – Pick-Up & Drop-Off Locations

Level 1 Chiller:

Level 3 Link Bridge:



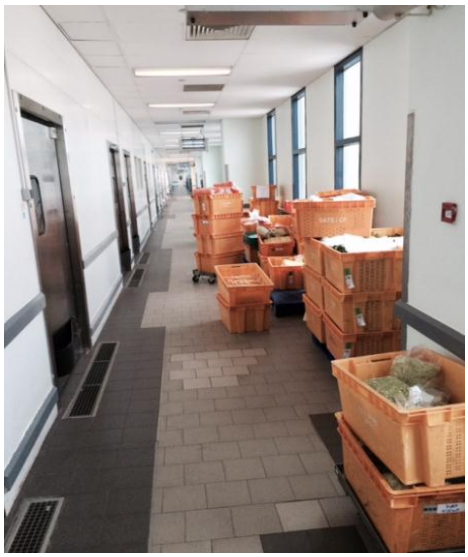
Level 3 Material Distribution Area 3:

Tray Assembly Substore Area (Dry Goods):

Tray Assembly Chiller:

Tray Assembly Pre-Cup Area:

Pre-Prep Area Corridor:



Hot Kitchen/Cold Kitchen Corridor:

Pastry Kitchen Corridor:

Indian Kitchen Corridor:

Annex D – Current Manual Pallet Truck Transport Timings

Routes		Time Taken
From	**To**	
Different Floor Levels		
Level 1 Fruits & Vegetables Pick-up point	Level 3 Pre-Prep	*3 – 4 mins
Level 1 Chiller	Level 3 Tray Assembly Substore Chiller	*4 – 5 mins
Level 1 Main Stores	Level 3 Hot Kitchen Corridor	*3 – 4 mins
Level 1 Main Stores	Level 3 Cold Kitchen Corridor	*3 – 4 mins
Level 1 Main Stores	Level 3 Indian/Muslim Kitchen Corridor	*3 – 4 mins
Level 1 Main Stores	Level 3 Pastry Corridor	*3 – 4 mins
Same Floor Levels		
Level 3 Material Distribution Area 3	Level 3 Tray Assembly Substore/Chiller	1 – 2 mins
Level 3 Material Distribution Area 3	Level 3 Hot Kitchen Corridor	30 sec
Level 3 Material Distribution Area 3	Level 3 Cold Kitchen Corridor	20 sec
Level 3 Material Distribution Area 3	Level 3 Indian/Muslim Kitchen Corridor	20 sec
Level 3 Material Distribution Area 3	Level 3 Pastry Corridor	30 sec
Level 3 Material Distribution Area 3	Level 3 Tray Assembly Pre-Cup Water Area	1 – 2 mins

*includes passenger lift waiting time