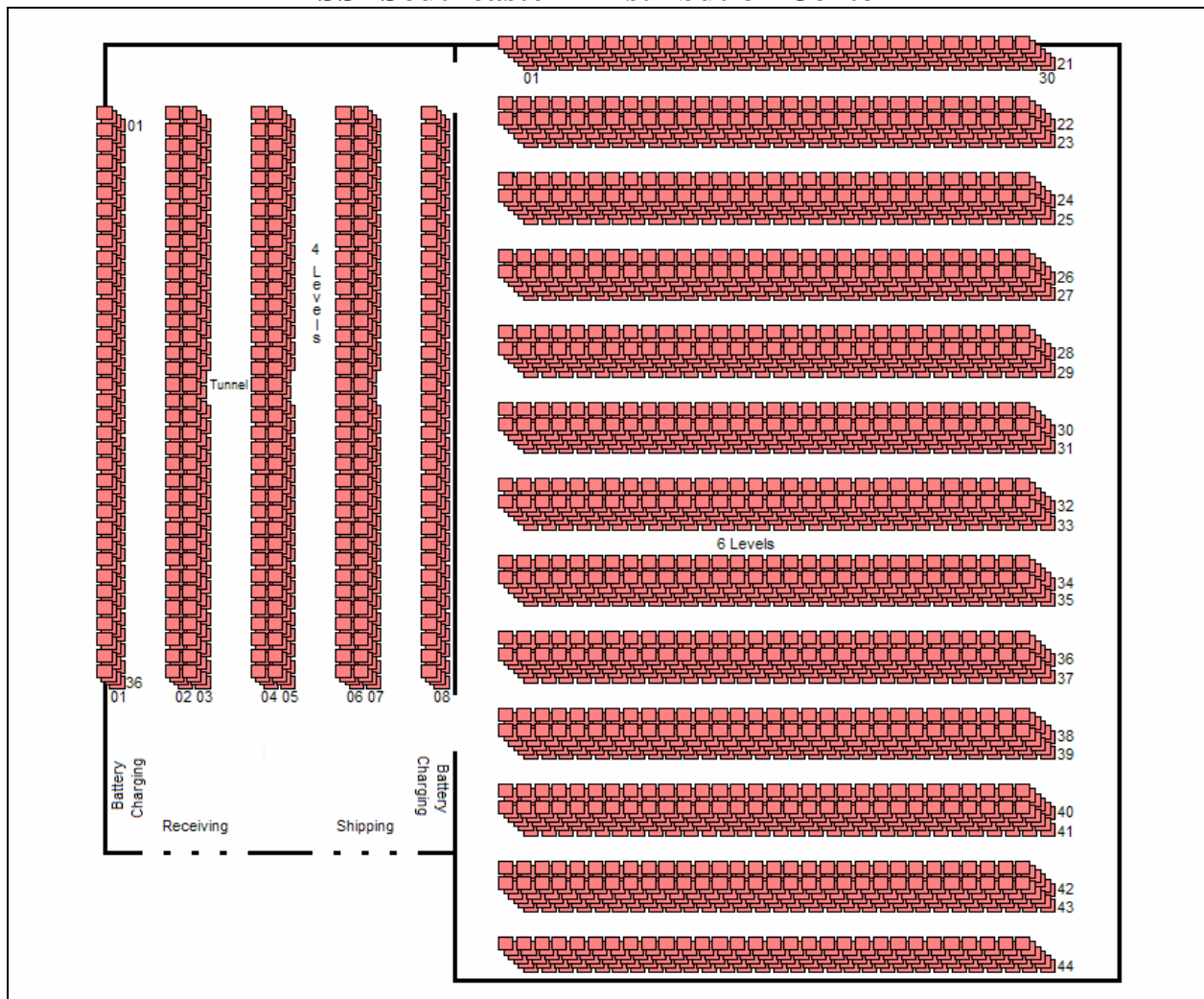


ProRep® XYZ Travel Time Calculation Module

The XYZ Travel Time Calculation Module determines accurate standard travel times based on the optimum travel path and actual equipment used. The result is more accurate measurement of associate performance in operations where travel is a significant portion of the work day.

The XYZ module calculates the standard times of each horizontal and vertical movement by using a map of the facility and tables that specify vehicle speeds and characteristics. To perform the actual daily calculations, ProRep imports the individual transactions from a file(s) provided by your existing WMS, pick-to-light, voice picking and other systems. ProRep's extensive data mining capabilities place a minimal burden on your IT staff. ProRep works with your data in your format.

SSI Southeastern Distribution Center

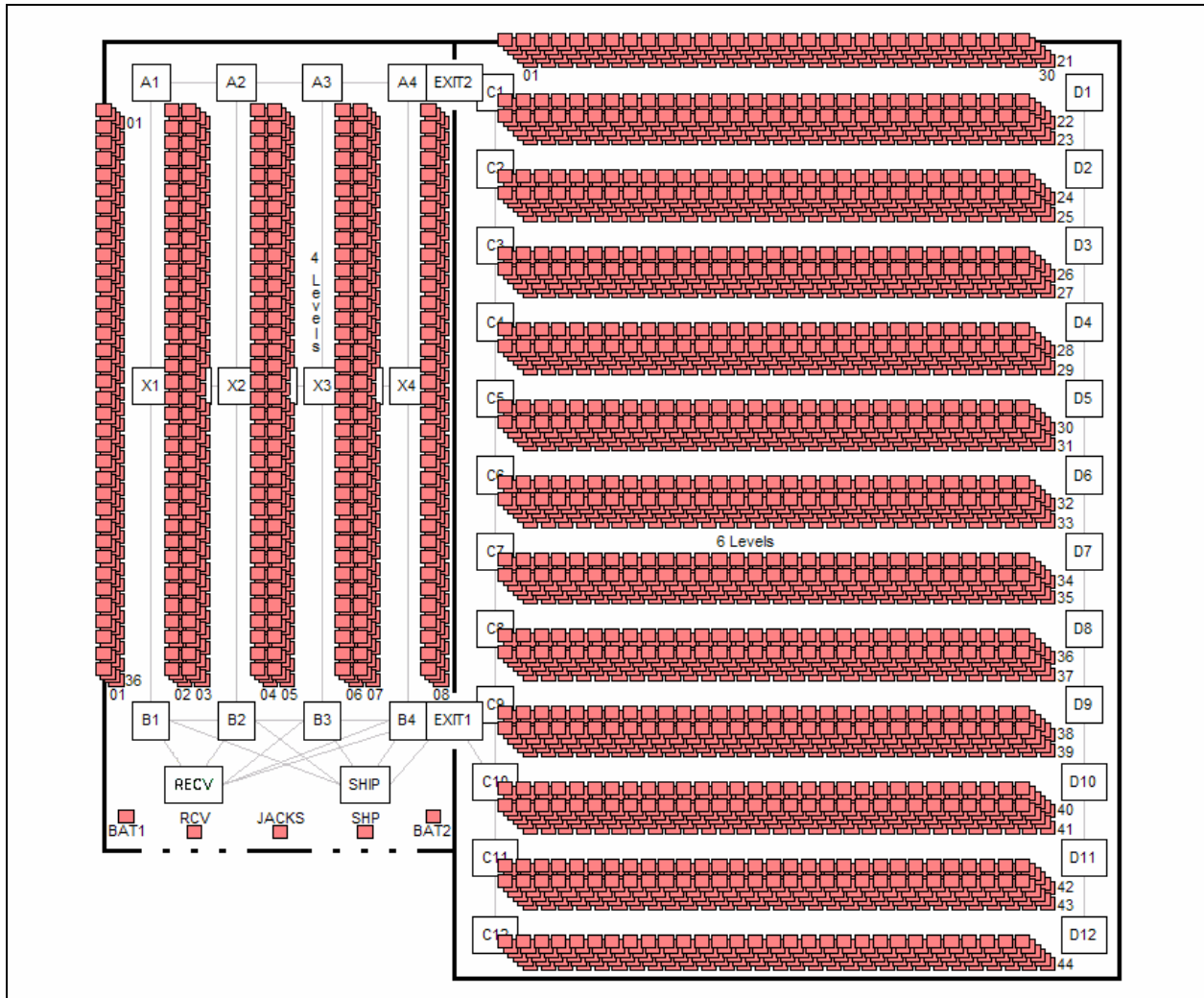


Facility Layout

Above is the layout of a distribution center that will be used as an example. The DC consists of two adjacent buildings that share two entry/exits. The shaded areas are storage locations. The

building on the left has a cross tunnel at the midpoint of the storage rack. Some material handling equipment cannot pass through the tunnel because of height restrictions.

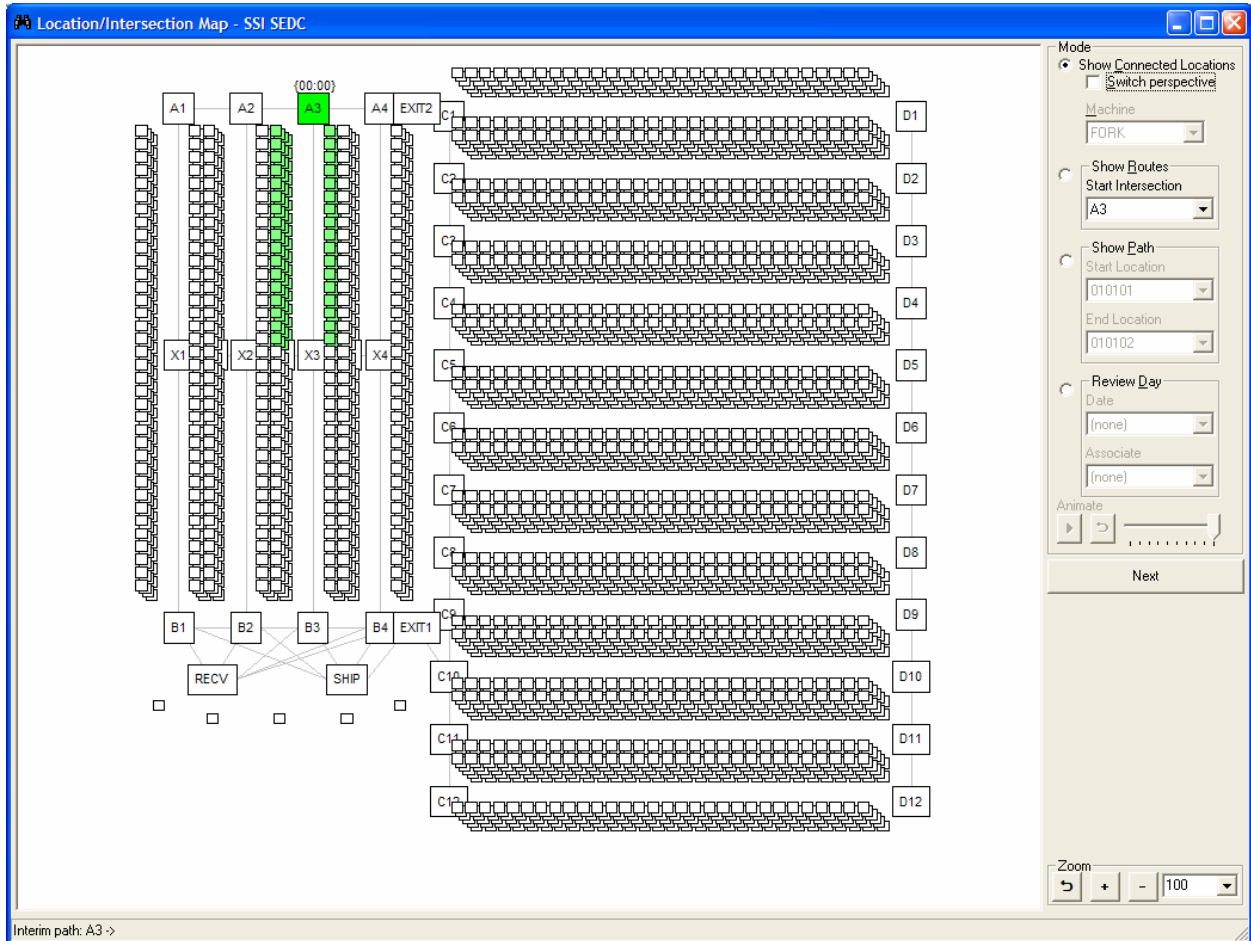
The facility mapping data consists of XYZ grid coordinates for Locations and XY grid coordinates for Intersections. Locations are origins and destination of moves. Intersections are nodes on a travel network that define the possible paths through the facility.



Locations and Intersections

- Locations
 - Storage locations like pallet rack, shelving and block stacks
 - Pick-up and deposit stations or areas like receiving and shipping
 - Vehicle parking or staging areas like battery charging
- Intersections
 - Ends of aisles
 - Tunnels
 - Entries
 - Exits
 - Corners and other changes in direction

Every Location is connected to either one or two Intersections.

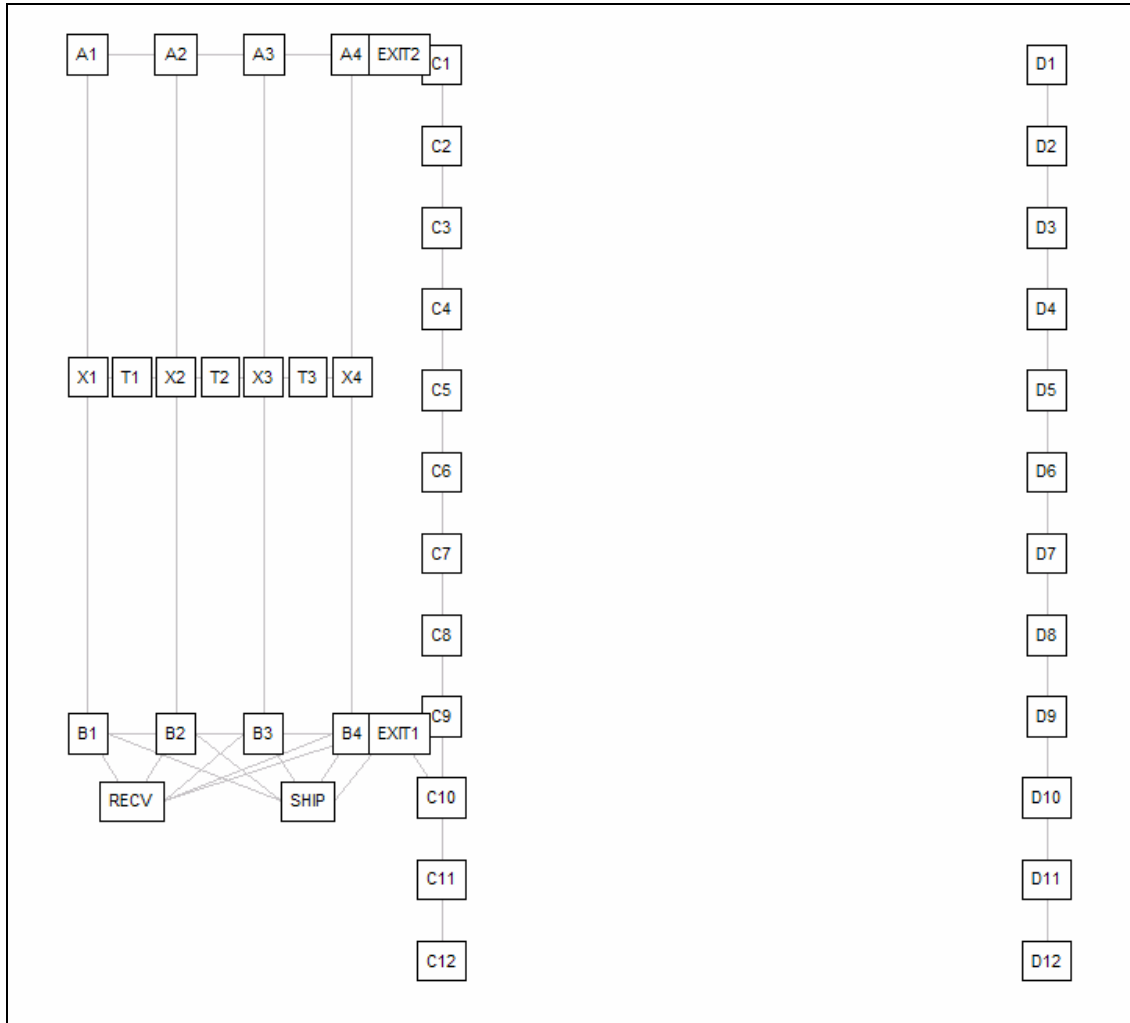


Locations Connected to Intersection A3

The shaded Locations are all connected to Intersection A3.

If a move is made between two locations that are connected to the same intersection, the move, by default is assumed to be an in-aisle move. The horizontal travel distance is the straight line distance between the starting and ending locations' XY coordinates.

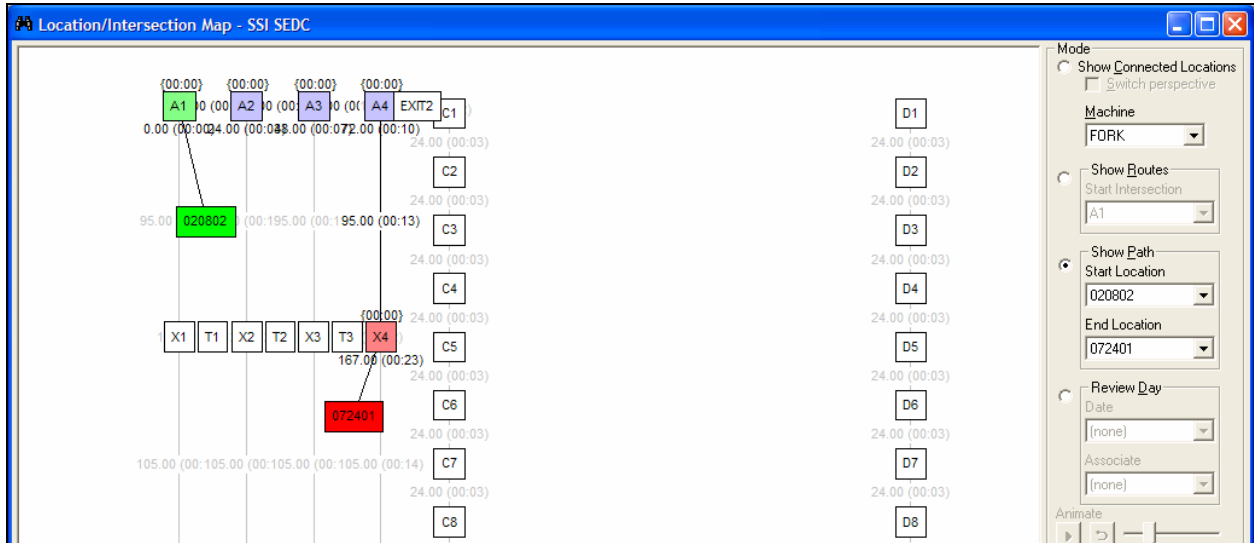
In order to calculate travel distance throughout the facility, the map specifies how the intersections are connected to each other. This defines the possible travel paths.



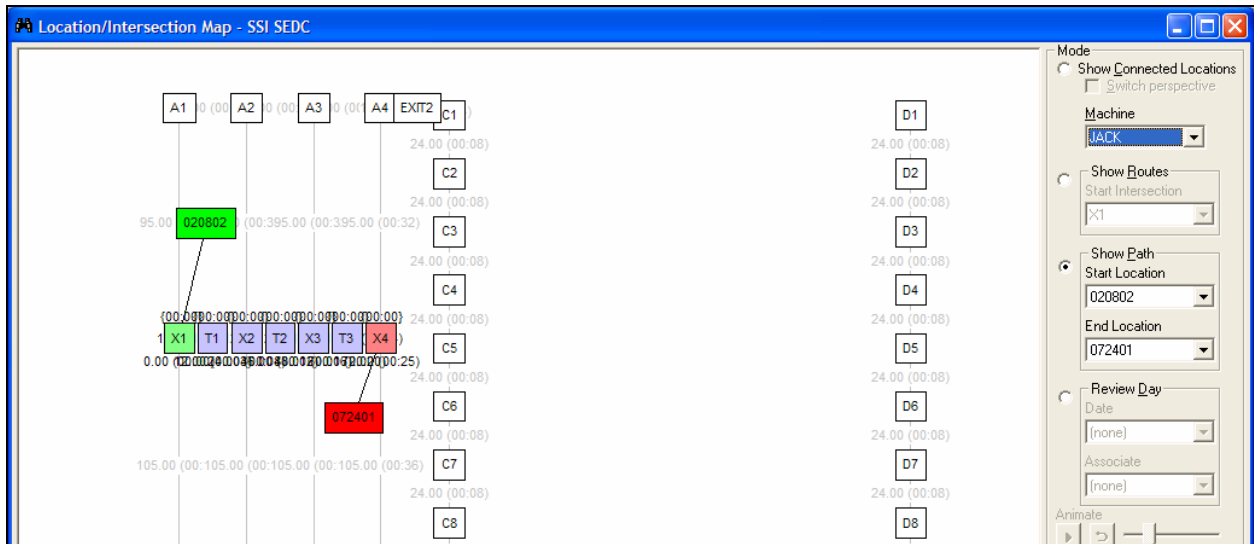
Intersections and Travel Paths

Note that there is an in-rack tunnel between locations X1 and X4. The tunnel has a head clearance of about 7 feet. The only vehicles that can travel through the tunnel are pallet jacks. The fork trucks and reach trucks that are used are too tall to pass through the tunnel. To remove the tunnel from being used in determining the optimum travel path for the taller vehicles, a set of additional locations labeled T1, T2 and T3 were established and a Penalty or pass through restriction assigned to these locations for the taller vehicles.

The examples below show the optimum travel paths that ProRep calculates for a movement between the same starting and ending locations using a fork truck versus a pallet jack.



Fork Truck Movement from Location 020802 to 072401 - Tunnel Not Used

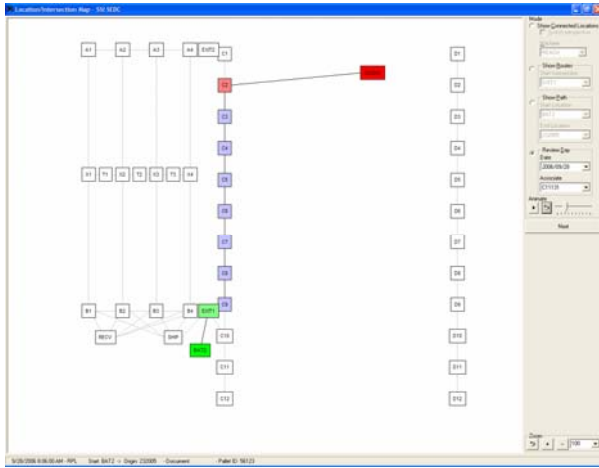


Pallet Jack Movement from Location 020802 to 072401 - Tunnel Is Used

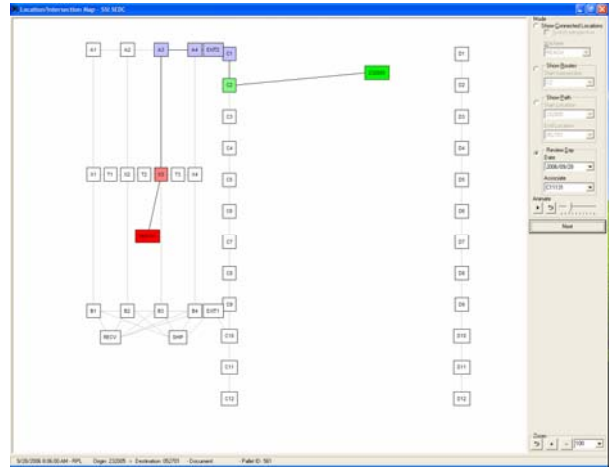
On a daily basis, transaction records are imported from a file created by the WMS or other systems. These records contain data about what was done, who did it, when it was done and where it was done or moved. ProRep mines the data from these files and determines the optimum travel path for each movement. Based on path and machine used, the standard or earned travel time is calculated. This is in addition to the earned time for the pallets, cartons, SKUs, locations and other elements associated with the activity.

After the data is imported and the XYZ routing is performed, the travel paths calculated by ProRep can be visually displayed. The examples below are from an animation in ProRep that

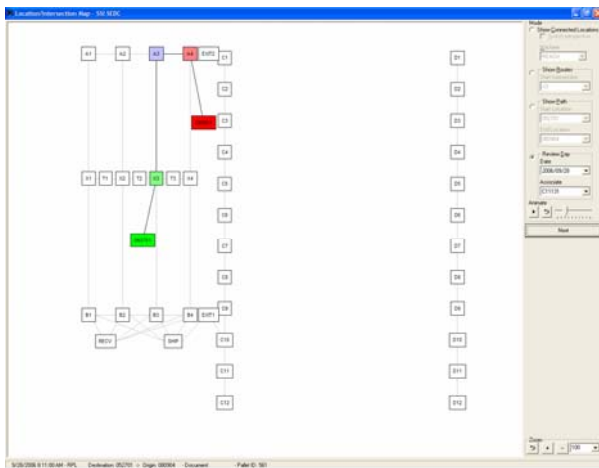
shows every movement performed by an associate over the course of the work day. These screen shots depict a series of three pallet replenishment transactions.



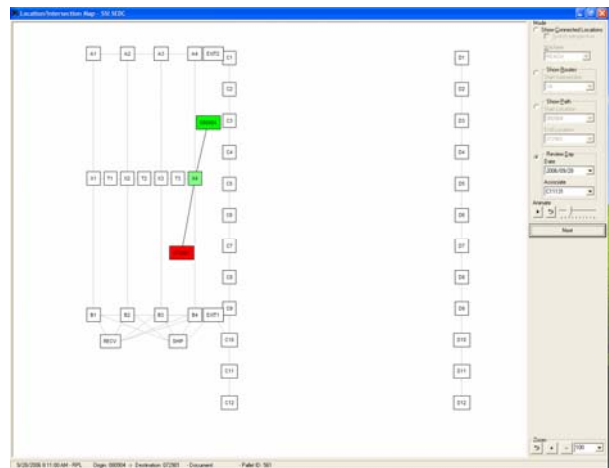
Obtains reach truck at battery charging, drives to storage rack location and pulls pallet from level 5.



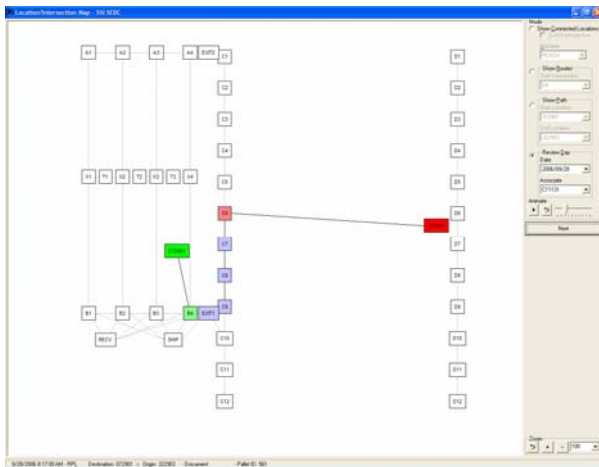
Moves pallet to forward pick location and stores pallet to level 1.



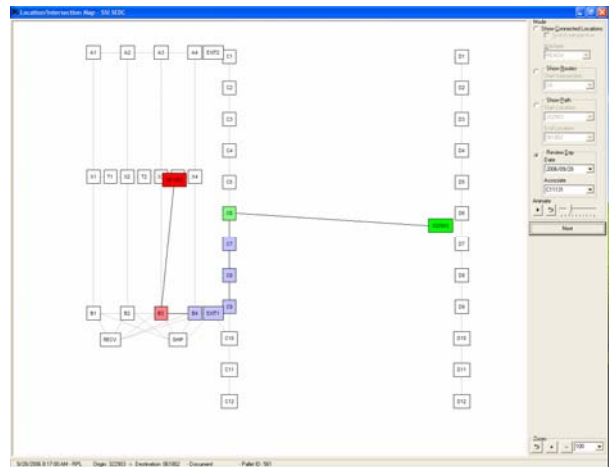
Drives to storage rack location and pulls pallet from level 4.



Moves pallet to forward pick location and stores pallet to level 1.



Drives to storage rack location and pulls pallet from level 3.



Moves pallet to forward pick location and stores pallet to level 2.

The ProRep XYZ Travel Time Calculation Module contains the features and flexibility necessary to accurately calculate standard travel times:

- Flexible location identification to match that used by the WMS. Locations can consist of any combination of company, building, zone, aisle, side, column, level, position, etc. Locations can be a single field, multiple fields or non-contiguous fields in the WMS daily transaction file.
- Default origins and destinations based on location
- Default origins and destinations based on type of activity
- Default start-use and end-use locations for vehicles based on type
- One way travel restrictions between specific intersections or points on the travel network
- Multiple horizontal and vertical travel speed tables based on machine type and type of travel such as in aisle travel, out of aisle travel, congested area travel, narrow aisle travel, wide aisle travel, etc.
- Different travel types and speeds between different points on the travel path and locations
- Time penalties for entering or exiting aisles based on machine type
- Time penalties for passing through points on the travel path such as doors, curves, mandatory stops, etc. based on machine type

The primary result of using the ProRep XYZ Travel Time Calculation Module is more accurate work measurement in travel intensive operations. One benefit is more accurate associate performance evaluation.

Another important benefit is isolating the portion of an activity's time that is spent on travel. By continually tracking travel time, ProRep can provide feedback that might suggest it is time to review the facility layout, product slotting, forward pick assignments, reserve storage locations, pick sequencing, slot assignment rules or alternative vehicle capabilities. And, after the changes are made, to quantify the results.