Getting started with

ELEVATE

DYNAMIC ELEVATOR SIMULATION

Version 6.01

Peters Research

The **Elevate** installation program requires you to agree to a Licence Agreement before **Elevate** is installed. A copy of this Licence Agreement can also be viewed by following the hyperlink on our support web pages. Please select **Elevate on the web** from the **Help** menu, while connected to the internet.

Peters Research Ltd gratefully acknowledges:

Dr Gina Barney for assistance in the implementation of Group Collective Down Peak, ETA and Destination Dispatch (ACA) algorithms. And for defining requirements for the Barney traffic templates.

Dr Bruce Powell for defining the requirements of the Powell traffic templates.

Dr Marja-Liisa Siikonen for defining the requirements of the Siikonen traffic templates.

Document last updated: 08 April 2004

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1. Introducing Elevate

An Overview

Elevate is software used by designers worldwide to select the number, size and speed of elevators for all types of buildings both new or old. Elevate can also be used to demonstrate that modernizing an existing elevator installation can improve service for passengers.

Elevate's main features.

- Analysis of elevator performance in

offices	hotels	hospitals
shopping centres	residential buildings	car parks
mixed use buildings	airports	public buildings
sports and leisure complexes	schools and colleges	

  This is achieved by techniques ranging from up peak round trip time calculations through to full dynamic simulation.
- Dynamic simulation incorporating a graphical display of elevators responding to passenger calls. For your clients, this provides a convincing visual demonstration of your proposals.
- An easy to use Windows interface. Enter basic information for a quick analysis or comprehensive data for a detailed model.
- Kinematics calculations are applied to generate accurate elevator speed profiles.
- Fully comprehensive help system and online user support.
- A facility to demonstrate your own dispatcher control system using Elevate Developer Interface. This facility is useful to test and develop dispatcher algorithms.

A more comprehensive list of features of the features included in Elevate are shown overleaf.

Warning! Elevate is an extremely powerful traffic analysis tool. However, it will not make the user an elevator traffic analysis expert. For details of training courses and recommended books, please select **Elevate on the web** from the **Help** menu, while connected to the internet.

Examples

A wide range of examples and case studies are available. Please select **Elevate on the web** from the Elevate **Help** menu.

Versions

Depending on the Version of Elevate purchased, different features and functions will be available.

This manual describes the **full** version of Elevate. For a summary of the features of other versions, please refer to the following table.

Features	Elevate	Elevate Express
Analysis Data		
Up peak analysis - assumes all people arrive at the ground floor, calculates handling capacity and interval	✓	✓
Enhanced up peak analysis - like up peak, but you specify the target handling capacity	✓	✓
General analysis - people can arrive at any floor - calculate up peak, two way, basement service and more!	✓	
General analysis for double deck elevators – all traffic flows, but with double deck elevators	✓	
Simulation - models the whole process of people being transported by the elevators	✓	✓ *
Selection of control systems including conventional and destination dispatch	✓	✓ *
Use Elevate to implement, test and demonstrate your own dispatcher algorithms with simulation	✓	
Select Metric or U.S. (imperial) units	✓	✓
Building Data		
Enter floor name and floor level, up to 100 floors served per group	✓	✓
Express zones	✓	✓
Elevator Data		
Enter number of elevators, maximum 12 per group	✓	✓
Enter any capacity or select from standard sizes	✓	✓
Enter door times, or allow Elevate to choose automatically based on capacity	✓	✓
Enter any speed or select from standard speeds	✓	✓
Enter any acceleration and jerk rate or allow Elevate to choose based on speed	✓	✓
SELECT and SPECIFY features to help you analyse many different configurations in single run	✓	✓
Report options to automatically reject results that do not meet your criteria	✓	✓
Option for elevators in a group not to serve the same floors, e.g. basement service by only part of the group	✓	
Option for elevators to be specified individually, e.g. different sizes and speeds in the same group	✓	
Passenger Data		
Enter passenger loading and unloading times	✓	✓
Enter passenger mass	✓	✓
Enter capacity factor	✓	✓
Enter length of simulation run	✓	✓
Enter stair factor	✓	✓
Enter floor population	✓	✓
Passengers may arrive at any floor	✓	
Passengers may arrive at ground (lowest) floor only		✓
Option to mix traffic types, for example passengers, goods, porter with trolley	✓	
Option to change intensity of traffic by time of day	✓	
Tools to assist fast entry of common traffic flows	✓	
Option to provide Elevate with a list of passengers, and define each passenger individually	✓	
Printed Output		
Summary of data entered and results calculated - includes your job titles, company name and logo	✓	✓
Select toolbar button to transfer the data and results to Excel (if installed on your computer)	✓	
Maintenance and support		
Support - telephone, fax and email support included from date of purchase for:	1 year	90 days
Maintenance - upgrades issued to the software provided at no additional charge, from date of purchase for:	1 year	90 days
Option to renew maintenance and support with Peters Research Ltd at end of free period	✓	✓
Option to purchase future upgrades from Elevator World	✓	✓
Available Formats		
Software and manual available for download from internet	✓	✓
Software provided on CD with printed manual	✓	
Activating Elevate		
When you purchase, we provide a key to unlock the software on your computer (plugs into USB port)	✓	
When you have purchased, we provide an unlocking code which unlocks the software on your computer		✓

*** Indicates for up peak only**

Updates

If you have a current maintenance and support agreement with Peters Research Ltd, you will be informed when updates are available.

On the Tools menu, the **Update Version** option provides a simple way to install intermediate Elevate updates. You are required to enter a Version Number and Password. The latest version of Elevate is downloaded from the internet and installed automatically.

For this feature to work correctly, you must be connected to the internet, logged in with administrative rights, and have turned off any firewall preventing applications accessing and downloading files from the internet. If due to company IT policy you cannot use this feature, Technical Support will provide alternative ways to update Elevate.

Developer Interface

The **Elevate Developer Interface** provides a way of building your own dispatcher control systems into Elevate. Rather than spending years developing a new simulation package to test and develop your control systems, why not use ours?

The **Developer Interface** requires you to code your control system into a Dynamic Link Library (DLL) using Microsoft Visual C++. A sample project including a basic group control system is provided to get you started (you must own a copy of Microsoft Visual C++).

When you compile the new DLL, it is placed in the directory where Elevate is installed. Then within Elevate, select the dispatcher from the **Custom** options in **Analysis Data**. All of Elevate's simulation and analysis options are then available to use with your dispatcher.

If you have purchased Elevate and require the sample Developer Interface project, please contact Technical Support.

Please note that assistance with the Developer Interface is not included in the Elevate Maintenance and Support package. Support for the Developer Interface is provided on a consultancy basis. For details of the services on offer, please contact Technical Support.

2. Start Here

System Requirements

Elevate requires Windows 95 or later. It is recommend that a minimum hardware specification of a Pentium 120 MHz with 24 MB RAM is used. Machines with more memory and faster processors significantly enhance the speed of analysis.

Installing Elevate

Place the Elevate CD in the CD-ROM drive. Depending on how your computer is configured, the CD may launch automatically. If it does not, press **Start**, select **Run**, enter **X:\start.exe** (where X is the letter of your CD ROM drive) and press **OK**. Follow the on-screen instructions to complete the installation.

If you are upgrading from Elevate Express to the full version of Elevate, please select the **About Elevate** dialog box from the **Help** menu. Use the button provided to release your unlocking code. Then restart the program and follow the instructions to unlock the full version.

Assuming you accept the default installation path, Elevate will be installed in the folder:
C:\Program Files\Elevate.

Using Elevate

You can start Elevate in several ways:

- press **Start**, then select **Programs**, **Elevate**
- double click on the **Elevate** icon on the desktop
- double click on any **Elevate** document.

Optionally, you can create a new Elevate document without starting Elevate. Right click in a blank part of your desktop and select **New**, **Elevate Document**.

Elevate documents have an **.elv** extension.

You can view this manual as a PDF file using Adobe Acrobat Reader at any time by selecting **Elevate Manual** from the **Help** menu.

We recommend that you read this manual and try out the features discussed before using Elevate on actual projects. **Advanced** mode sections can be skipped if you are only using the basic functions of Elevate.

This guide assumes that you are familiar with the version of Windows you are using. If you are not, please refer to Windows documentation and help systems before using Elevate.

3. Technical Support

Getting Help

First please read the documentation provided.

Answers to common questions can be found on our web site. Please select **Elevate on the web** from the **Help** menu, while connected to the internet.

If you still have questions about using Elevate, please contact us stating:

1. Your name, company and contact details.
2. The version of Elevate you are using (to check these details, select **About Elevate** on the **Help** menu).
3. A brief description of the problem.

Our contact details are as follows. Email is our preferred means of communication as it allows us to give a fast, but considered response to your question. It is helpful if you attach a copy of the .elv Elevate document to your email.

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Your Feedback Counts!

We want to hear your comments on Elevate, so that we can make it even better. What additional features would you like to see? Does anything annoy or frustrate you?

Although we cannot promise to incorporate every request, all suggestions will be seriously considered. Please contact Technical Support at any time.

4. The Elevate Screen

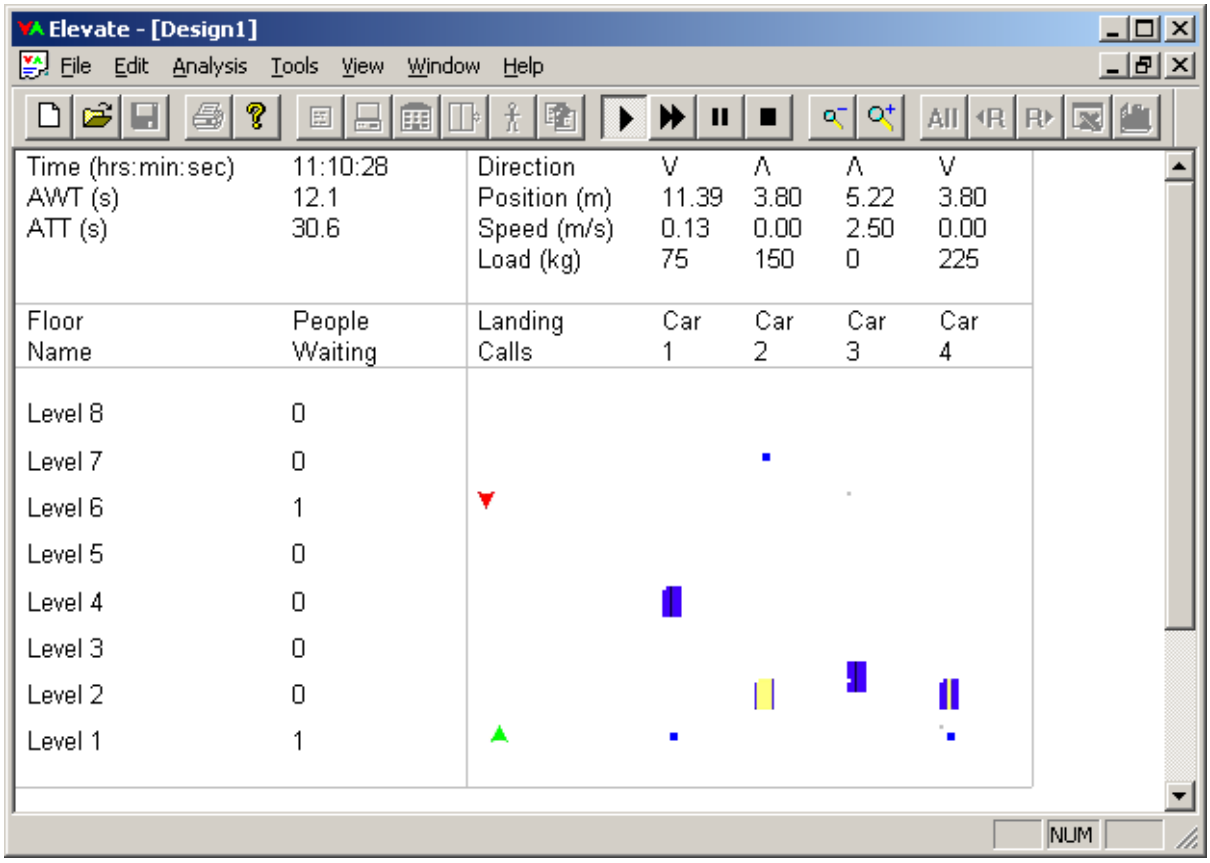


Figure 1 Elevate screen

Main Display Area

The main display area provides a graphical representation of the building. When a simulation is running, the elevators and calls placed on the system are displayed. When a Round Trip Time calculation is being performed, a progress report is displayed. This is discussed in more detail in Chapter 11, **Running the Analysis**. Once the analysis is complete, the main display area provides a preview of the data and results that can be printed. This is discussed in Chapter 12, **Viewing the Results**.

Accessing Elevate Commands

Commands can be accessed from the menu system in the conventional manner using the mouse. Alternatively, shortcut keyboard commands can be used, e.g. press **Alt** plus **F** to select file menu, then **P** to select print (the underlined letter denotes the shortcut key). Some frequently used commands can also be accessed from the Toolbar. A description of each button's function is displayed when the mouse pointer is placed on the button (without clicking). The Toolbar can be dragged to a new position if required (point to a blank portion of the Toolbar, click and drag).

File Menu

The **File** menu offers the following commands:

New	Creates a new document.
Open	Opens an existing document.
Close	Closes an opened document.
Save	Saves an opened document using the same document name.
Save As	Saves an opened document to a specified document name.
Page Setup	Edit the number of lines per page for the result print out. This increases/decreases the font sizes used.
Print	Prints a document.
Print Preview	Displays the document on the screen as it would appear printed.
Print Setup	Selects a printer and printer connection.
Exit	Exits Elevate.

The **File** menu also provides a numbered list of the four most recently used documents. Select from this list for quick access to these documents.

Edit Menu

The **Edit** menu offers the following commands:

Job data	Information about the job.
Analysis Data	Information about the analysis.
Building Data	Information about the building.
Elevator Data	Information about the elevators.
Passenger Data	Information about the passengers.
Report Options	Options which select which results are presented.

The contents of these dialog boxes are discussed in the following chapters. Once you have opened one of these dialog boxes, you can switch between them quickly by using the **Next** and **Back** buttons.

Analysis Menu

The **Analysis** menu offers the following commands:

Run	Run the analysis.
Run Fast	Run the analysis as quickly as possible.
Stop	Stops the analysis.
Pause	Pauses the analysis.
Run Batch	Select a folder and batch run all the Elevate files in that folder.
Deletes Result	Deletes the analysis results. As results are saved with the Elevate file, the action of deleting the results will reduce the file size.

Tools Menu

The Tools menu offers the following commands:

Kinematics	Provides analysis of a trip according to the specified speed, acceleration and jerk.
Update Version	Updates the version of Elevate you are using over the Internet.

View Menu

The **View** menu offers the following commands:

Zoom In	Magnifies the view of the display.
Zoom Out	Reduces the view of the display.
Summary Results	Displays a summary of all results if a range of configurations has been analysed.

Next Results	Displays the next set of results if a range of configurations have been analysed.
Previous Results	Displays the previous set of results.
Results Spreadsheet	Transfers the current set of results to an Excel spreadsheet.
Results Graphs	Presents a dialog in which you can view results graphs individually.
Toolbar	Shows or hides the Toolbar.
Status Bar	Shows or hides the Status bar.

Window Menu

The **Window** menu offers the following commands:

Cascade	Arranges windows so that they overlap.
Tile	Arranges windows as non-overlapping tiles.
Arrange Icons	Arranges icons at the bottom of the window.

The **Window** menu also provides a numbered list of the documents that are currently open. Select a document from this list to make it the current, active document.

Help Menu

The Help menu offers the following commands:

Elevate Manual	Opens this manual. If you have a high resolution screen, you can keep the manual open and to one side while working with Elevate**.**
Elevate on the web	Opens Peters Research Ltd web pages for Elevate**.**
About Elevate	Displays Elevate's **About** box.

Saving your own default data

Each time you start a new Elevate document, a standard set of default data is loaded.

To create your own default data:

- Start a new Elevate document
- Make any changes you want (e.g. U.S. units instead of metric, lists of standard elevator capacities, number of lines per page for the print out)
- Save the file as **default.elv** in the directory in which Elevate is installed (normally C:\Program Files\Elevate).

This data will now be loaded each time you start a new document.

5. Job Data

Entering Job Data

You can access **Job Data** by selecting **Edit**, **Job Data**, or by pressing the button on the Toolbar.

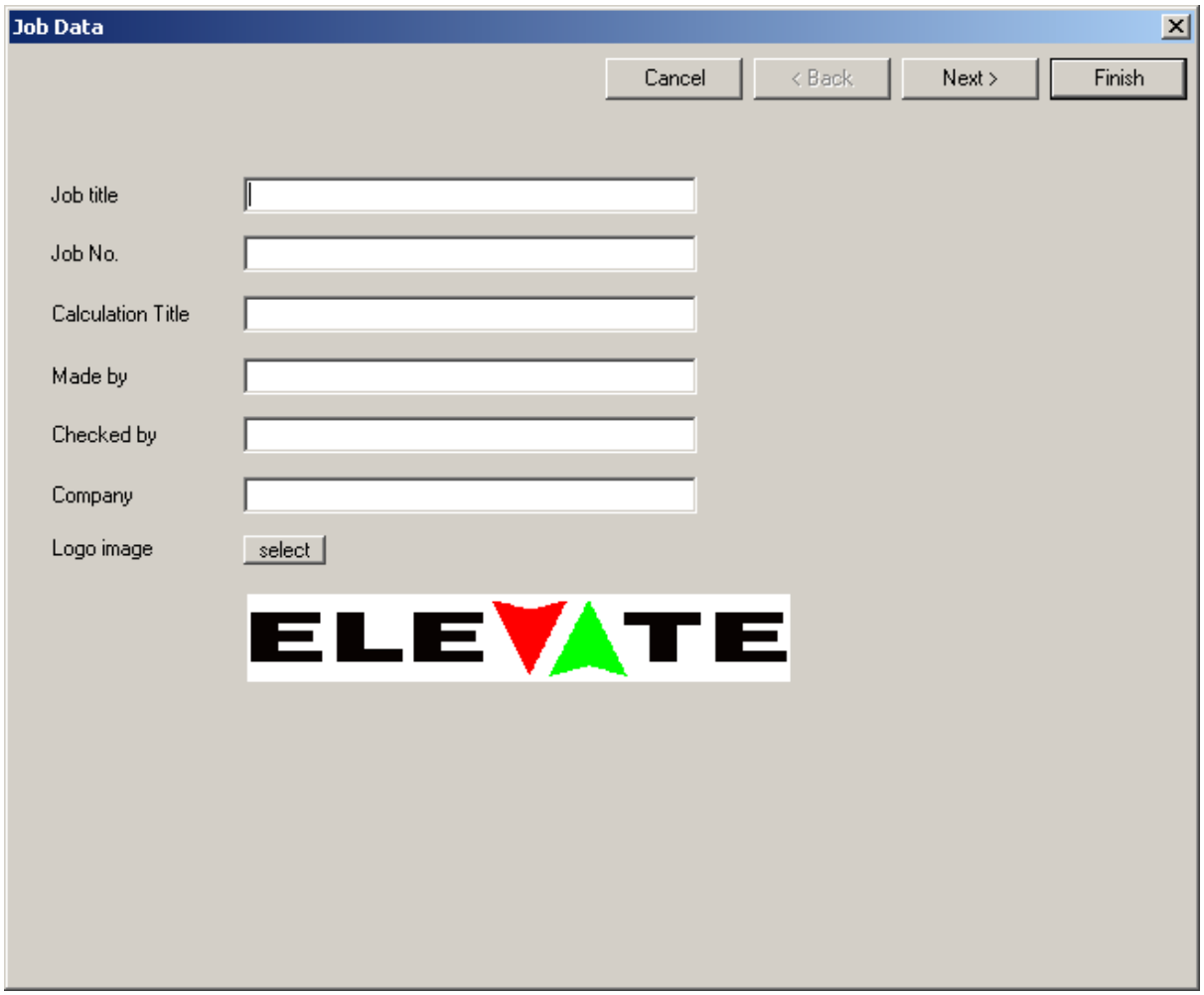


Figure 2 Job Data dialog

Job data allows you to record details of the project, and who has performed the calculations. This information, the date, and document name is included in the header of all Elevate print outs.

By default the Elevate logo will be displayed on the top right of print outs. If you prefer to use your own **Logo image** file, click on the **select** button to choose any bitmap, jpeg or gif available from your computer. For best results use a logo with a similar aspect ratio to the Elevate logo. If your logo looks very small on the print outs, this is because the image file is larger than the logo itself. To solve this, resize the image file to have a minimal border using a program such as Windows Paint. If you want your logo to be loaded every time you start a new Elevate document, refer to **Saving your own default data** in Chapter 4, **The Elevate Screen**.

6. Analysis Data

Introduction

You can access **Analysis Data** by selecting **Edit**, **Analysis Data**, or by pressing the button on the Toolbar.

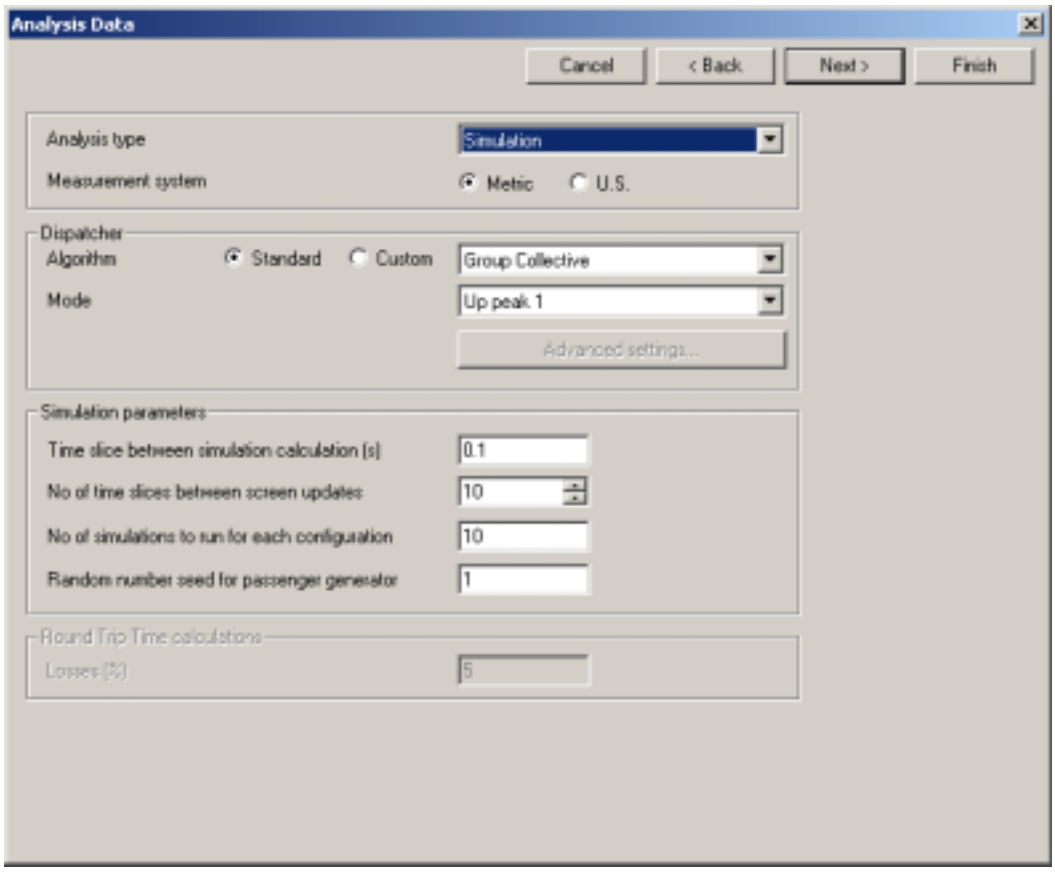


Figure 3 Analysis Data dialog

This dialog contains general information about the analysis you want to perform. The **Analysis type** selected here reflects what data is entered in **Building Data**, **Elevator Data** and **Passenger Data**.

Analysis Type

The **Analysis type** determines what type of calculation will be performed by Elevate. Select between:

Simulation

In a simulation Elevate models the whole process of passengers arriving, pressing the hall call buttons, getting into the elevators when they arrive, and then getting out at their destinations. By monitoring every passenger, Elevate provides an analysis which includes **Passenger Waiting Times** and **Passenger Transit Times**.

Up peak

In an up peak calculation you assume that all passengers get into the elevators at the lowest, "main terminal" floor. The destinations of passengers are determined by the population of upper floors, as entered in **Passenger Data**. Elevate uses formulae to calculate the **Interval** and **Handling Capacity** of the system. This analysis method will provide similar results to most other elevator planning software and hand calculations providing that consistent input data is used.

Enhanced up peak

This performs the same calculation as the **Up peak** analysis type, but allows you to enter the required **Handling Capacity** (**Capacity Factor** is adjusted automatically during the analysis so that the required **Handling Capacity** is achieved). This is a much quicker way to find solutions when you are designing to a specified **Handling Capacity** and **Interval**.

General analysis

This analysis method gives similar results to the **Enhanced up peak**, but you are no longer restricted to passengers getting into the elevators at the lowest floor in the building. Passengers can get into the elevators at any or all floors. This is particularly useful for buildings with multiple entrance floors, car parks and basements. **Elevate** uses formulae to calculate **Interval** and **Capacity Factor** for the system.

Double Deck General analysis

This analysis method is the equivalent of the General analysis, but for double deck elevators. Passengers can get in at any or all floors. Passengers may only travel from odd to odd or even to even number floors.

For more information about the analysis techniques used by Elevate, please select **Elevate on the web** from the **Help** menu.

Measurement System

Choose whether you want to use **Metric** or **U.S.** (Imperial) units for this analysis. Your selection here will determine whether Elevate uses "metres and kilograms" or "feet and pounds" in the other dialog boxes, and for output of results.

Dispatcher

These inputs are only applicable and active when the **Analysis type** is **Simulation**. The dispatcher algorithm determines how the elevators will serve the calls placed on the system by the passengers.

Select either **Standard** or **Custom** Algorithms. **Custom** algorithms are only available if you have chosen to implement your own algorithms using the **Developer** interface.

Select the chosen **Algorithm**, **Mode** and **Advanced Options**. For **Standard** algorithms, the available options are discussed below.

Group Collective

A control system which allocates hall calls by (i) estimating the expected travel distance between hall calls and each elevator; (ii) allocating the call to the "nearest" elevator. Allocations are regularly reviewed in case a delay to one elevator means that another could answer the call sooner. A load bypass feature is included to avoid the elevator stopping to pick up passengers when it is already full.

In **Up peak 1** mode, "idle" cars are returned to the **Home Floor** with a parking call which does not open the elevator doors on arrival. This strategy normally improves up peak traffic handling. Using this algorithm elevators are loaded one at a time. This encourages people to fill one elevator rather than part fill two or more elevators.

In **Up peak 2** mode "idle" cars are returned to the **Home Floor** with a parking call which opens the elevator doors on arrival. This strategy improves on **Up peak 1** for particularly heavy traffic situations when it is advantageous to load more than one elevator at a time. If this is not the case, the algorithm is normally less efficient than **Up peak 1**.

In **Down peak** mode, the served floors above the **Home Floor** are divided into sectors, where the number of sectors is equal to the number of elevators. Elevators are dispatched to the sectors in turn. When the elevator has served the down calls in its allocated sector, it is allowed to stop for additional hall calls in its path on the

trip back to the **Home Floor**. This strategy normally improves performance when the predominant traffic flow is in the down direction towards the home floor.

For details of the Auto mode, please refer to **Elevate on the Web.**

Estimated Time of Arrival (ETA)

A control system that allocates halls calls to the elevator with the lowest Estimate Time of Arrival.

In **Up peak** mode, "idle" cars are returned to the **Home Floor** with a parking call which does not open the elevator doors on arrival. This strategy normally improves up peak traffic handling. Using this algorithm elevators are loaded one at a time. This encourages people to fill one elevator rather than part fill two or more elevators.

Early car announcement can be turned on or off. When turned on, it is assumed that as soon as a passenger places a hall call, the allocated car is "announced" with a gong and or/light. This can assist in passenger loading, which can be modelled in Elevate by reducing **Passenger Loading Time**. However, when a call is announced it can no longer be re-allocated. This generally impairs the performance of the dispatcher.

Load bypass can be turned on or off. Turned on, this feature will prevent hall calls from being allocated to full cars. The **Load bypass threshold** determines how full a car is before load bypass comes into operation.

Coincident call bonus reduces the calculated ETA for a hall call if the elevator is already stopping at the same floor for a car call. This normally reduces the overall number of stops made by the elevator, and consequently improves performance.

Number of cars loading simultaneously during up peak allows you to specify the maximum number of elevators you want to be able to load at the same time, during an up peak, from the **Home Floor**. Normally a system would only load one car at a time. But in heavy traffic situations it can be advantageous to load more. The **based on people counter at home floor** option assumes that there is a people counting device at the home floor. This device decides how many people are waiting, and uses this information to decide how many elevators to load simultaneously.

Destination Dispatch (ACA)

Destination Dispatch or Adaptive Hall Call Allocation (ACA) requires every passenger to enter their destination on the landing. When a call is entered the systems makes an allocation, and immediately displays the selected elevator to the passenger.

When a new call is introduced, the system calculates every passenger's remaining waiting and transit times for each possible allocation. The allocation is made according the selected **Cost Function**, which is either **Minimum Waiting Time** or **Minimum Journey Time**.

Minimum Journey Time is generally applied during the morning up peak. Either function may be applied at other times of the day.

Minimum journey time with waiting time constraint is a Minimum Journey Time function. However, a penalty is applied if the dispatcher anticipates the waiting time will exceed the specified threshold level.

Reduction in number of stops can be applied to increase the chance of people travelling to/from the same floors being allocated to the same elevator.

For a detailed discussion of this algorithm, please refer to the **Elevator Traffic Handbook** by Dr Gina Barney.

Destination Dispatch can dramatically improve performance during up peak traffic.

Caution! This improvement is not consistent across all traffic conditions. If you select less, slower, or smaller elevators because of the performance improvements realized by destination dispatch, it is very important to analyse other peak traffic conditions (e.g. down peak and lunchtime traffic).

Time Slice Between Simulation Calculations

This input is only applicable and active when the **Analysis type** is **Simulation**.

Elevate runs a time slice simulation. It calculates the status (position, speed, etc.) of the elevators, increments the time, re-calculates status, increments time, and so on.
The **time slice between simulation calculations** is the time increment in this loop.

No of Time Slices Between Screen Updates

This input is only applicable and active when the **Analysis type** is **Simulation**.

Elevate does not have to update the screen after each time slice. Increasing the **No of time slices between screen updates** will speed up the simulation, but the display will be less smooth during the run. This variable has no effect on the final results calculated by Elevate.

If you want to turn off the simulation display completely, set this variable to 999.

Random number seed for passenger generator

This input is only applicable and active when the **Analysis type** is **Simulation**.

When Elevate runs a simulation, it takes the information entered in Passenger Data and makes a list of people. For example, if you have a total arrival rate of 10 persons per five minutes, and a simulation running for 5 minutes, then a list of 10 people will be generated.

A random number generator is used to determine what time these people arrive. For example, one person may arrive after 10 seconds, another after 23 seconds, another after 1 minute 23 seconds, and so on.

By changing the random number seed, the simulation will have the same number of people generated, but they will arrive at different times**.**

Number of simulations to run for each configuration

This input is only applicable and active when the **Analysis type** is **Simulation**.

There is a chance element in simulation which means that changing a parameter, such as speed or handling capacity, can sometimes lead to performance results getting worse when you expect them to get better (or vice versa). For example, consider two simulations with exactly the same data, except one had 2.5 m/s elevators and the other 1.6 m/s. In a single simulation with 2.5 m/s elevators, a group of passengers may miss an elevator by less than a second, where as in the simulation with 1.6 m/s elevators they catch it. So, sometimes the faster elevators perform worse. Of course, in the long run, the faster elevators will perform better. By running multiple simulations for the same data, Elevate is mimicking real life. It is as if we are simulating Monday, Tuesday, Wednesday, etc. The results are then averaged for all the simulations, so overall we can see the benefit of the improved performance.

Losses

This input is only applicable and active when the **Analysis type** is **Up peak**, **Enhanced Up peak** or **General analysis**.

Some designers add a % to the calculated value of Round Trip Time (RTT) to allow for controller inefficiencies and people holding doors, etc. To increase RTT in this way, enter a value here. Alternatively, enter zero.

7. Building Data

Introduction

You can access **Building Data** by selecting **Edit**, **Building Data**, or by pressing the button on the Toolbar.

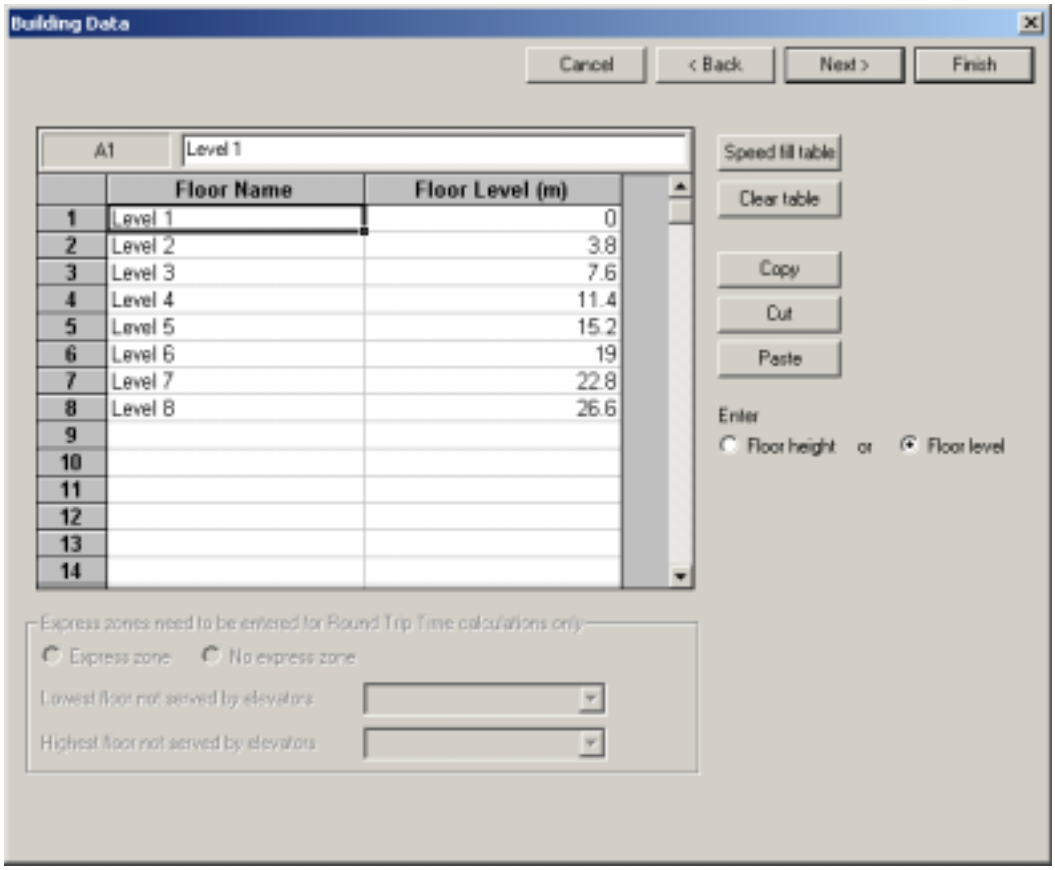


Figure 4 Building Data dialog

The **Building Data** dialog contains information about the building.

To speed up your data entry, all Elevate tables are designed to operate like Microsoft Excel spreadsheets.

Your selection of **Measurement System** in **Analysis Data** will determine whether Elevate asks for data in **Metric** or **U.S.** units. **Metric** units will be assumed for discussion in this chapter.

Floor Name

You must give every floor in the building a unique floor name, entering the floors in sequence, lowest first.

You can enter the floor names in the table individually. However, we recommend that you use one of the speed-fill functions. Either use the **Speed fill table** button or

- Click on the cell in row 1 under the **Floor Name** column.
- Type in **Basement**, **Ground**, or **Level 1** depending on how you want to identify the lowest floor in the building.
- Keep pressing **Enter** on the keyboard until the number of floors matches the building being modelled.

- With the mouse, click any cell other than the current one to stop the auto-fill.

You could start the auto-fill at another cell, for instance by typing **Ground** in row 4, having entered the names of four basement floors.

You can insert additional floors at the beginning or middle of the table by highlighting and dragging cells as you would in a spreadsheet.

Floor Level and Floor Height

First use the radio buttons below the table to specify whether you want to enter the height of each floor (e.g. 5 m, 3.6 m, 3.6 m.) or the level of each floor (e.g. 0 m, 5 m, 8.6 m, 12.2 m).

You can enter floor levels or heights individually. However, we recommend that you use one of the speed-fill functions. Either use the **Speed fill table** button or, if entering floor heights:

- Enter 3.6 in row 1 of the **Floor Height** column and press **Return.**
- Click again on the cell in row 1 of the **Floor Height** column to select it.
- Point to the bottom right hand corner of the cell (the pointer will turn into a small cross).
- Click and drag the black cross down the table.

Speed fill table

This is normally the fastest way to fill the **Building Data** table.

The **Speed fill table** button allows you to select from a number of pre-defined floor name series, then specify the number of floors and floor height (or total travel). The **Edit series** option allows you to define your own series.

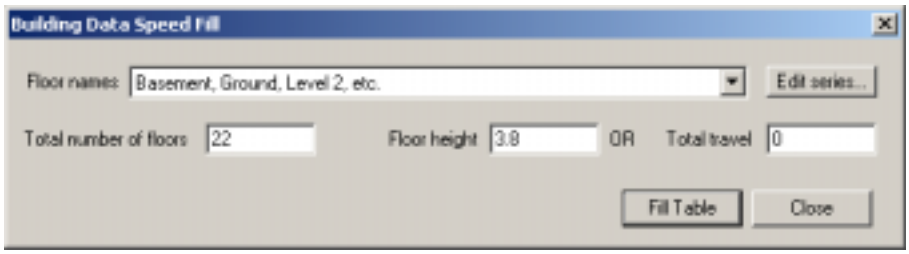


Figure 5 Building Data Speed fill dialog

If you define your own series, and want these series to be available in future documents, please refer to **Saving your own default data**.

Express zone

This input is only applicable and active when the **Analysis type** is **Up peak**, **Enhanced Up peak** or **General analysis**. **Simulation** allows you to have express zones, but you do not need to define an express zone specifically, see **Example 4b**.

Select the **lowest floor not served by the elevators**, and the **highest floor not served by the elevators** to define an express zone.

8. Elevator Data

Introduction

You can access **Elevator Data** by selecting **Edit**, **Elevator Data**, or by pressing the button on the Toolbar. The **Elevator Data** dialog contains information about the elevators. There are two modes:

Standard This provides a quick and easy way to enter data, which is sufficiently detailed for most cases. If you use any **Select** options, Elevate will run in sequence a separate analysis for each possible configuration. If you use only **Specified** options, Elevate will run a single analysis.

Advanced This mode can only be used when the **Analysis type** is **Simulation**. Parameters are specified individually for each elevator, so in the same group, elevators can have different speeds, capacities, etc. Elevate runs a single simulation in **Advanced** mode.

You can change between the modes by clicking on the radio buttons labelled **Standard** and **Advanced**. All the variables are discussed in the following sections. Your selection of **Measurement System** in **Analysis Data** will determine whether Elevate asks for data in **Metric** or **U.S.** units. **Metric** units will be assumed for discussion in this chapter.

STANDARD MODE

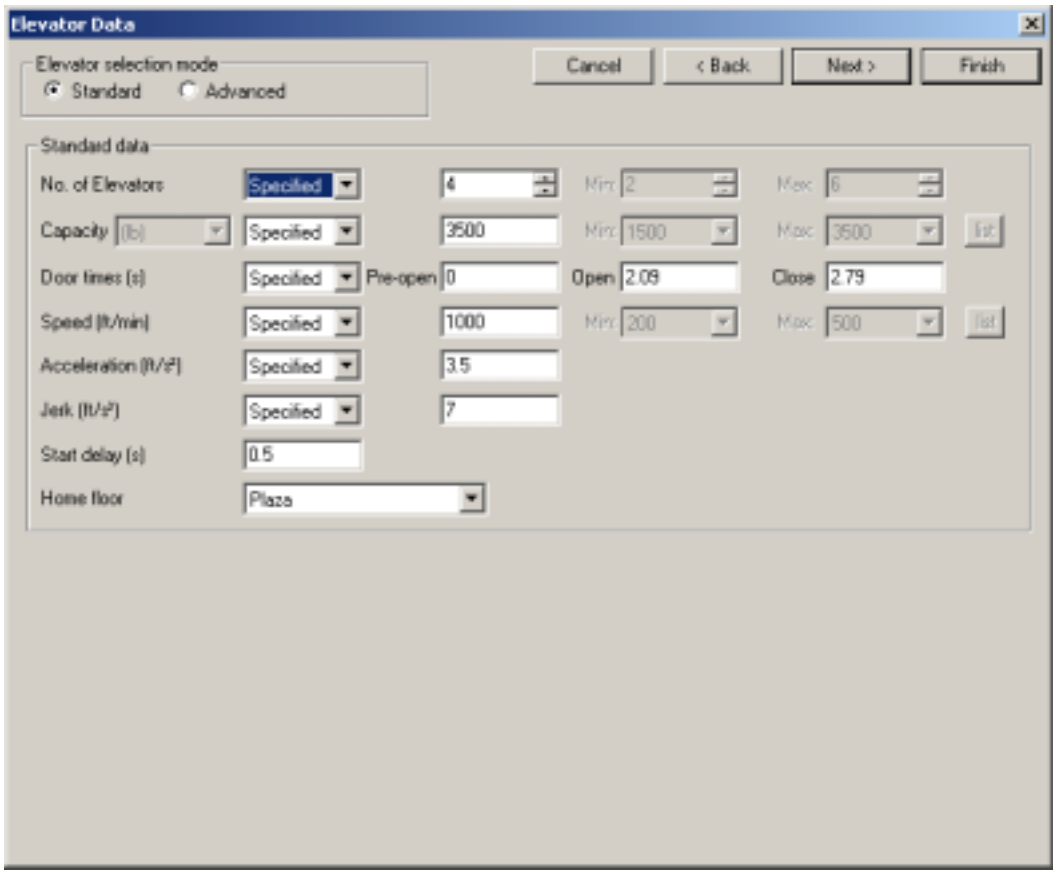


Figure 6 Elevator Data dialog, Standard Mode

Number of Elevators

The number of elevators in the group. This can be **Select**ed over a range, or **Specified** to be an exact number. Elevate will allow you to analyse a group of up to 12 elevators (it is unusual to have more than 8 elevators in a single group). Please contact Technical Support if you need to analyse a group of more than 12 elevators.

Capacity

The rated (contract) load, in kilograms, of each elevator car. This can be **Specified** to be an exact number, or **Select**ed over a range. A list of standard capacities is used for the **Select** option. To modify this list, click on the button marked **list**.

For double deck elevators, the capacity entered here is the capacity of each deck. For example, 1000 kg would indicate that each of the two cars has a 1000 kg capacity.

Door Times

The door pre-opening, opening and closing times. These can be selected **Auto**matically, or **Specified** to be exact numbers.

Door **pre-open** is the improvement in door opening time achieved by overlapping the levelling operation with the first part of the opening of the doors, in seconds.

Door **open** is the time, in seconds, from the instant of the elevator car being level at a floor to when the doors are fully open. Elevate assumes passenger transfer begins at the end of the door open time. If, like some designers, you want to assume that passenger transfer begins before the doors are fully open, you can take the door open time to be from the instant of the elevator car being level at a floor to when the doors are (say) 800 mm open.

Door **close** is the time, in seconds, from the instant the car doors start to close, to the time when they are locked closed.

If the **Auto** option is used, Elevate uses the **Capacity** to decide door width, from which door times are selected as follows. The open and close times chosen are typical of high speed centre-opening doors.

Table 8.1 Automatic door selection for Metric units analysis

Capacity (kg)	Door Width (mm)	Door Pre-Open Time (s)	Door Open Time (s)	Door Close Time (s)
630	800	0.0	1.5	2.0
800	800	0.0	1.5	2.0
1000	1100	0.0	1.8	2.9
1250	1100	0.0	1.8	2.9
1600	1100	0.0	1.8	2.9
1800	1100	0.0	1.8	2.9
2000	1100	0.0	1.8	2.9
2500	1100	0.0	1.8	2.9
2700	1100	0.0	1.8	2.9
3000	1100	0.0	1.8	2.9

Table 8.2 Automatic door selection for U.S. units analysis

Capacity (lb)	Door Width (in)	Door Pre-Open Time (s)	Door Open Time (s)	Door Close Time (s)
1500	36	0.0	1.5	2.1
2000	36	0.0	1.5	2.1
2500	48	0.0	1.9	2.9
3000	48	0.0	1.9	2.9
3500	48	0.0	1.9	2.9
4000	48	0.0	1.9	2.9
4500	48	0.0	1.9	2.9
5000	48	0.0	1.9	2.9
5500	48	0.0	1.9	2.9
6000	48	0.0	1.9	2.9

If the **Analysis type** is **Simulation**, **Elevate** also needs door **dwell** times. Elevate uses two dwell times:

Door Dwell 1 is the time, in seconds, that the doors will wait until closing if the passenger detection beam across the door entrance is not broken.

Door Dwell 2 is the time, in seconds, that the doors will wait until closing after the broken passenger detection beams are cleared.

Door Dwell 1 is automatically set to 3 seconds, and **Door Dwell 2** to 2 seconds when you are using **Standard** mode. To use alternative values, you must use **Advanced** mode.

Speed, Acceleration and Jerk

Elevate uses a speed reference generator to calculate flight times between floors, and to track the exact position of elevators during a simulation.

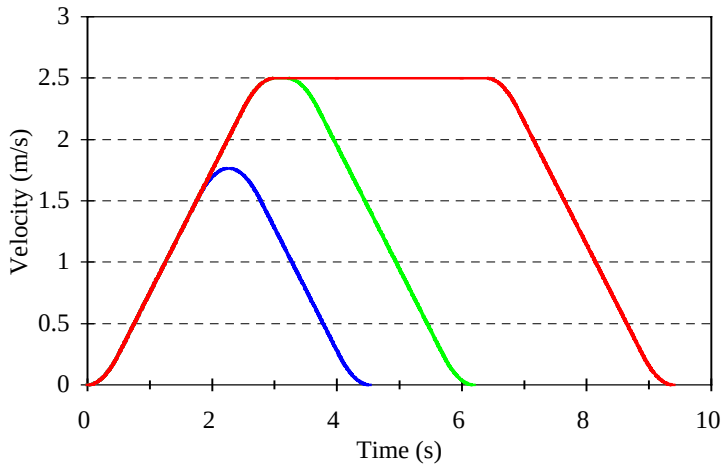


Figure 7 Example speed profiles

You can control this speed profile completely by entering your values for:

Rated (contract) **speed**, in m/s. This can be **Specified** to be an exact number, or **Select**ed over a range. A list of standard speeds is used for the **Select** option. To modify this list, click on the button marked **list**.

Acceleration in m/s². This can be selected **Auto**matically or **Specified** as an exact value. If the **Auto** option is used, Elevate uses the table below to select an **acceleration** appropriate to the elevator **speed**.

Jerk in m/s^3. This can be selected **Auto**matically or **Specified** as an exact value. If the **Auto** option is used, Elevate uses the table below to select a **jerk** appropriate to the elevator **speed**.

Table 8.3 Automatic acceleration and jerk selection for Metric units analysis

Speed (m/s)	Acceleration (m/s²)	Jerk (m/s^3)
0.30	0.4	0.8
0.63	0.4	0.8
1.00	0.4	0.8
1.60	0.7	1.4
2.50	0.8	1.6
3.15	1.0	1.6
5.00	1.2	1.6
6.00	1.5	1.6
7.00	1.5	1.6
8.00	1.5	1.6

Table 8.4 Automatic acceleration and jerk selection for U.S. units analysis

Speed (ft/min)	Acceleration (ft/s^2)	Jerk (ft/s^3)
150	1.31	2.62
200	1.31	2.62
300	1.31	2.62
400	2.30	4.59
500	2.62	5.25
700	3.28	5.25
1000	3.94	5.25
1200	4.92	5.25
1400	4.92	5.25
1600	4.92	5.25

Start Delay

The **Start Delay** is measured from the when the elevator doors are fully closed until the elevator actually starts moving. Start up delay may include time to pre-torque the motor, close the door locks, lift the break, etc.

Home Floor

The default floor to which the elevator returns when allocated a parking call (e.g. in up peak mode), and its starting point at the beginning of a simulation or a round trip time calculation. For example, if you had an office building with a basement and 2 car parking floors below ground, you could set the **Home Floor** to be ground.

If the **Analysis type** is **Up peak or Enhanced up peak**, the **Home Floor** is fixed at the lowest floor in the building as this is an assumption required by the calculation.

ADVANCED MODE

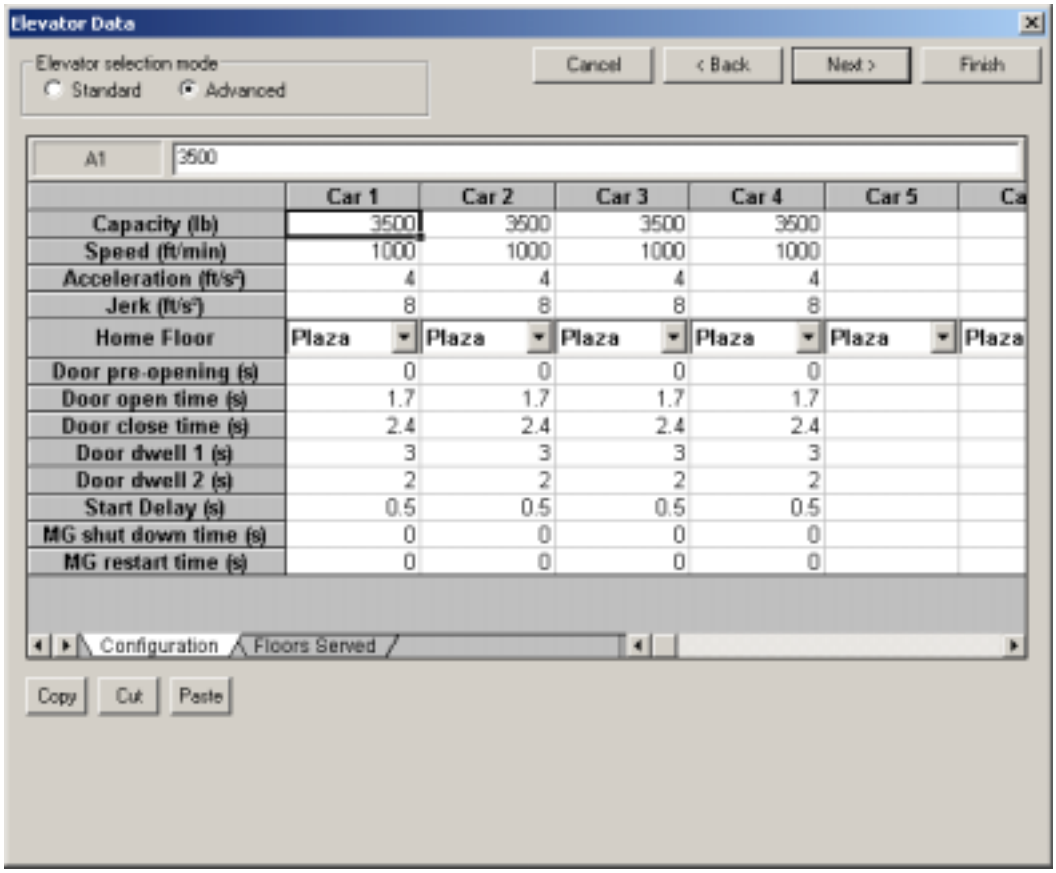


Figure 8 Elevator Data dialog, Advanced Mode

Advanced mode can only be used when the **Analysis type** is **Simulation**. In **Advanced** mode, data is entered in a table. As in **Building Data** this table operates like a Microsoft Excel spreadsheet; you can use formulae, speed fills, drag and drop, etc. to help with data entry.

When you change from **Standard** to **Advanced** mode the data you have entered is not transferred to the **Advanced mode**. However Elevate does convert the data when you start an analysis, so having run a simulation you can switch to and continue in **Advanced** mode.

Caution! In **Advanced** mode, Elevate allows you to have elevators in the same group with different sizes, speeds, etc. (which is unusual, but an occasional requirement). Some manufacturers' control systems cannot cope with this level of complexity, so check with your suppliers before specifying this type of system.

Floors Served

Advanced mode also allows you to define a group of elevators where not all elevators serve all floors. For example, in a building with a group of four elevators where only one serves the basement. Select the **Floors Served** tab if this option is required.

Caution! If not all the elevators serve all the floors, then a person may press a hall call button, and have their call answered by an elevator which does not serve their destination. As a default, Elevate assumes that the person will get into the car, travel to the nearest floor to their destination, then walk the rest of the way. Other options are possible, please contact Technical Support.

MG shut down and restart time

These options assist in modelling existing installations which have motor generators installed. To disable the feature, set both **MG shutdown time** and **MG restart time** to 0.

MG shutdown time is the time after which an idle elevator will shut down its motor generator set. **MG restart time** is the time it takes to restart the motor generator set. Restart is initiated when the elevator is allocated a hall call.

9. Passenger Data

Introduction

You can access **Passenger Data** by selecting **Edit**, **Passenger Data**, or by pressing the button on the Toolbar.

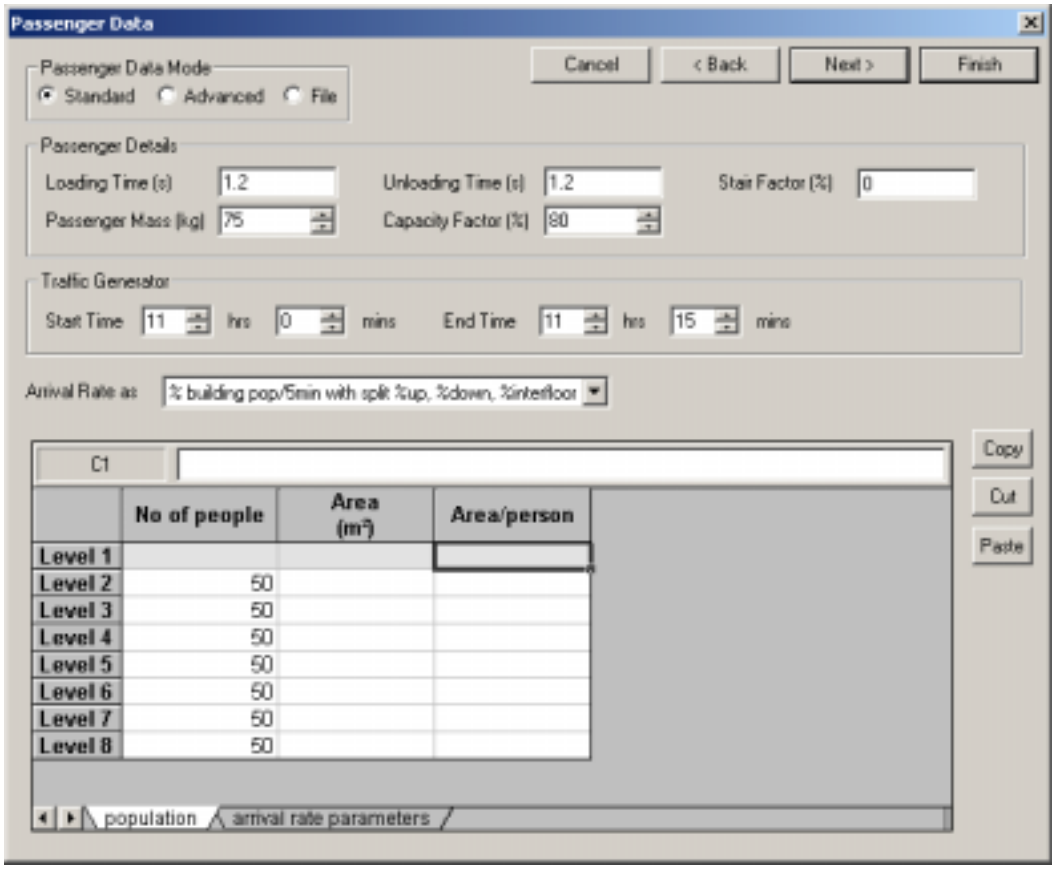


Figure 9 Passenger Data dialog, Standard Mode

The **Passenger Data** dialog contains information about the passengers using the elevators. There are three modes in which you can enter your data:

Standard This provides a quick and easy way to enter data which is sufficiently detailed for most cases.

Advanced Advanced Data can only be used when the **Analysis type** is **Simulation** or **General analysis**. Use this for detailed modelling, when you need to define passenger destinations more precisely, consider changing traffic levels, or introduce different types of loads.

File This option is only available when the **Analysis type** is **Simulation**. It allows you to specify a list of passengers entered in a text file rather than use Elevate's passenger generator.

You can change between the modes by clicking on the radio buttons labelled **Standard, Advanced** and **File**.

Your selection of **Measurement System** in **Analysis Data** will determine whether Elevate asks for data in **Metric** or **U.S.** units. **Metric** units will be assumed for discussion in this chapter.

STANDARD MODE

Loading Time

The time taken, in seconds, for a single passenger to load the car.

Unloading Time

The time taken, in seconds, for a single passenger to unload from the car.

Passenger Mass

The nominal mass of a passenger in kilograms.

Capacity Factor

Capacity Factor (%) allows for passengers not loading the elevators to their rated capacity.

When the Analysis type is **Enhanced up peak** or **General analysis** you do not need to enter a value. As you are entering details of how many passengers are using the elevators, Elevate will calculate the resulting **Capacity Factor**. When the **Analysis type** is **Simulation,** if the **Capacity Factor** is x%, a passenger will not enter the car if, by doing so, the car will be greater than x% full by weight. In these instances, Elevate assumes that passengers will wait for the elevator doors to close, and for the elevator to depart before re-registering their hall call.

Traffic Generator

These inputs are only applicable and active when the **Analysis type** is **Simulation**. It may also be disabled for a Simulation if the time of the simulation run is determined by the **Arrival Rate As** drop down.

Enter the **Start Time** and **End Time** for the traffic generator using the 24 hour clock.

For example, assume the traffic generator is set to start at 9:00 and end at 9:10. If the total arrival rate is 20 persons per five minutes, then the traffic generator will "create" 40 people arriving at randomly distributed times between 9:00 and 9:10.

Stair Factor

Stair Factor provides a quick and easy way to make an allowance for stair (or escalator) usage in your calculations.

If you enter a **Stair Factor** of x, Elevate assumes that x% of the passengers will walk when travelling one floor, (x% of x%) will walk when travelling two floors, and (x% of x% of x%) will walk when travelling three floors. For example if you enter a **Stair Factor** of 40%, Elevate will assume the following split of passengers between the stairs and the elevators:

No of floors to be travelled	% passengers using stairs	% passengers using elevators
1	40	60
2	16	84
3	6	94
4	3	97
5	1	99
6	0	100

If the assumptions of the **Stair Factor** are not appropriate, use a value of 0% and modify the floor populations or arrival rates and destination probabilities instead. You should always use a **Stair Factor** of 0% if the building includes an express zone.

Arrival Rate as

This input is only applicable and active when the **Analysis type** is **General analysis** or **Simulation**.

This drop down refers to how the arrival rate is entered in the table immediately below this drop down in the dialog box. Select from the following options:

% building population in 5 minute

The arrival rate is taken as a percentage of the population arriving at the corresponding floor in a 5 minute period.

% floor population in 5 minute

The arrival rate is taken as a percentage of the floor population.

persons per 5 minutes

The arrival rate is taken as the number of persons arriving in five minutes.

Other options

The following options are only available when the **Analysis Type** is **Simulation**. These options are explained in detail in **Appendix A**.

% building population per 5 minutes with split %up, %down, %interfloor
Barney one hour up peak template
Barney one hour down peak template
Barney one hour lunch template
Barney one hour interfloor template
Powell 2 hour lunch template
Powell 40 minute lunch template
Siikonen full day template
Siikonen full day (24 hour) template
Strakosch full day template
Strakosch full day (24 hour) template
CIBSE full day template
CIBSE full day (24 hour) template
Step profile

5 min handling capacity (%)

This input is only applicable and visible when the **Analysis type** is **Enhanced up peak**.

This is the % of the building population arriving at the lowest floor in a 5 minute period.

Floor Population, Area and Area/person

Enter the population of each floor in the table. Or enter the area and area per person allowed. For example, entering 800 m² area and 10 m²/person would be the same as entering a population of 80 people.

The population is used to determine passenger destinations, e.g. if the population of floor x is 50 people, and the population of floor y is 100 people, a passenger travelling from floor z is twice as likely to want to travel to floor y as he/she is to floor x.

Arrival Rate

This input is only applicable and visible when the **Analysis type** is **Simulation** or **General analysis.** Enter the arrival rate for each floor. The units are as specified in the **Arrival Rate as** drop down.

ADVANCED MODE

Advanced Data can only be used when the **Analysis type** is **Simulation** or **General analysis**.

Entering **Passenger Data** in **Advanced** mode allows you to enter separate destination probabilities for passengers travelling from each floor.

If the analysis type is **Simulation**, you can also define a number of periods each with their own set of arrival rates and destination probabilities. Each period has a start time, end time, loading times, passenger mass, etc. Periods may overlap in time. This allows Elevate to model changing levels of traffic, and to introduce refreshment trolleys, goods loads, etc. into the passenger traffic flow.

When you change from **Standard** to **Advanced** mode the data you have entered is not transferred to the **Advanced mode**. However Elevate does convert the data when you start an analysis, so having run a simulation you can switch to and continue in **Advanced** mode.

In **Advanced** mode, data is entered in a table. As in **Building Data** this table operates like a Microsoft Excel spreadsheet; you can use formulae, speed fills, drag and drop, etc. to help with data entry.

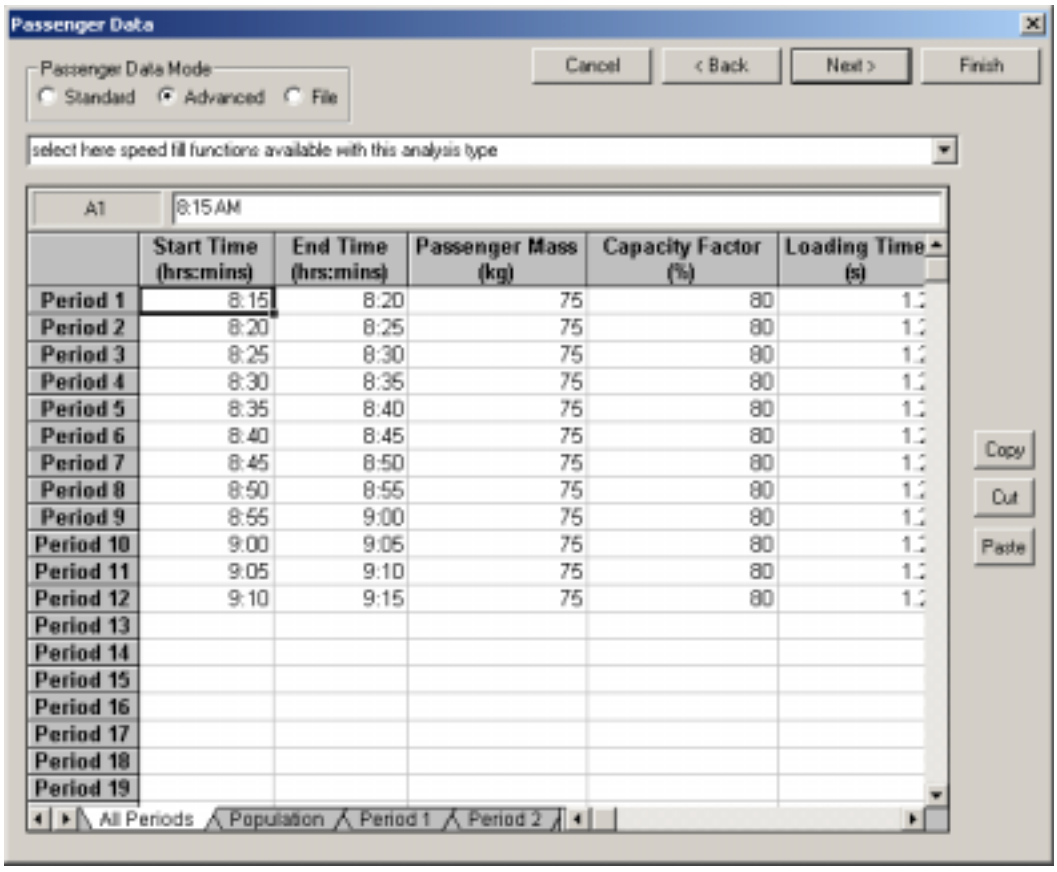


Figure 10 Passenger Data dialog, Advanced Modem, All Periods tab

Click on the **All periods** tab to select this page. Enter the **Start Time**, **End Time**, etc. (see preceding **Standard** mode section for definitions). The notes column is for your reference only.

Complete the information for as many periods as you require.

Period 1, 2, ….

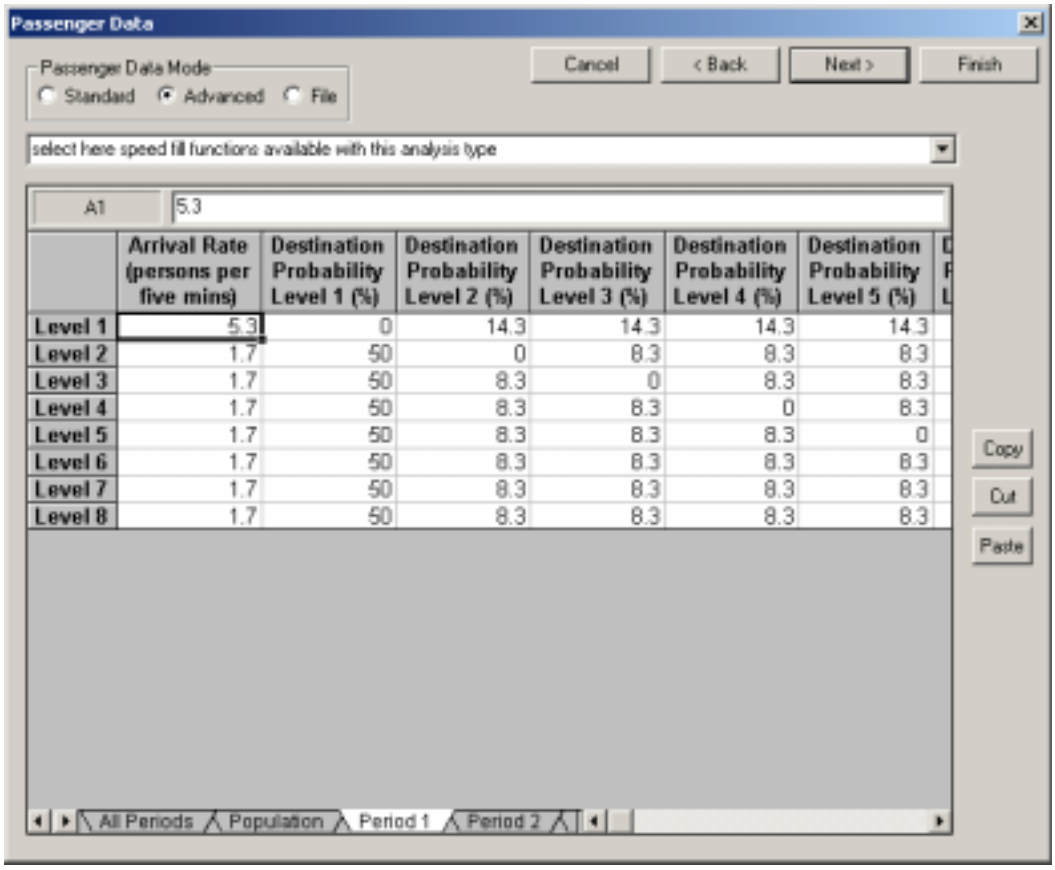


Figure 11 Passenger Data dialog, Advanced Mode, Periods 1 tab

For all rows completed in **All Periods**, you must complete the corresponding arrival rate and destination probability table, which can be selected by clicking on the **Period 1**, **Period 2**, etc. tabs.

Arrival rates are entered in persons per five minutes.

Destination probabilities are entered as percentages, e.g. if the arrival rate is x persons per five minutes and the destination probability to the n^{th} floor is y%, then y% of the x persons per five minutes are travelling to the n^{th} floor. Note that destination probabilities from any level to the same level must be zero as passengers do not take an elevator from one floor to the same floor.

Passengers are created for the simulation using a random number generator, and applying **Arrival Rate** and **Destination Probability** data.

Speed Fill Functions

Depending on the **Analysis type** selected, the following speed fill functions are available. To use these speed fill functions, you must provide details of the building population, which is entered in one of the table pages. The population entered is only used to generate the arrival rate and destination probability data. If you change the population, you must use the speed fill function again to generate new arrival rate and destination probability data.

% building population per 5 minutes with split %up, %down, %interfloor
one hour up peak template
Step profile
CIBSE full day template
Strakosch full day template
Siikonen full day template

Powell lunch template

"apply one hour up peak template" is included for compatibility with previous version of Elevate. Please use the "Barney one hour up peak template" in **Standard** mode.

Other templates are as described for **Standard** mode.

FILE MODE

File mode can only be used when the **Analysis type** is **Simulation**. In this mode Elevate will load a list of passengers from a comma separated text file when a simulation is run. This mode is normally used for testing control systems, rather than for traffic analysis. For each passenger you are required to specify:

Arrival time	The time the passenger starts his or her journey, in seconds past midnight.
Arrival floor	Where the passenger starts his or her journey, where 1 corresponds to the lowest floor as defined in building data.
Destination floor	Where the passenger is travelling to, where 1 corresponds to the lowest floor as defined in building data.
Mass	The mass of the passenger (kg).
Capacity factor	The capacity factor this passenger will base his/her decision on when deciding whether or not to get into the car or wait for another elevator.
Loading time	The passenger loading time (s).
Unloading time	The passenger unloading time (s).
Car not service destination decision	This option is to address scenarios when not all elevators serve all floors. If the passenger's call is answered by a car which does not serve the destination floor, he/she may choose to either 1. Not get it. Wait for this car to depart, then re-register the hall call. 2. Get in anyway and travel in the car as far as possible towards the destination floor. Then get out of the car and walk the remaining floors. Set this parameter to 1 or 2 according to how you want the passenger to behave. Note: in destination dispatch systems, the user enters their destination, so a car serving the passenger's destination will be sent anyway.

A typical file with 4 passengers may look like this:

801,8,7,75,80,1.2,1.2,2
810,6,3,75,80,1.2,1.2,2
840,1,12,75,80,1.2,1.2,2
890,4,5,75,80,1.2,1.2,2

Note - there needs to be a blank line at the end of your text file, to ensure that the last passenger is picked up by the simulation run.

10. Report Options

Discussion

You can access **Report Options** by selecting **Edit**, **Report Options**, or by pressing the button on the Toolbar.

Report Options allow you to change the results and graphs that are displayed on the Elevate standard reports.

You can change all of the Report Options and immediately regenerate the report without re-running the analysis.

When you are satisfied with the **Report Options**, print in the usual way.

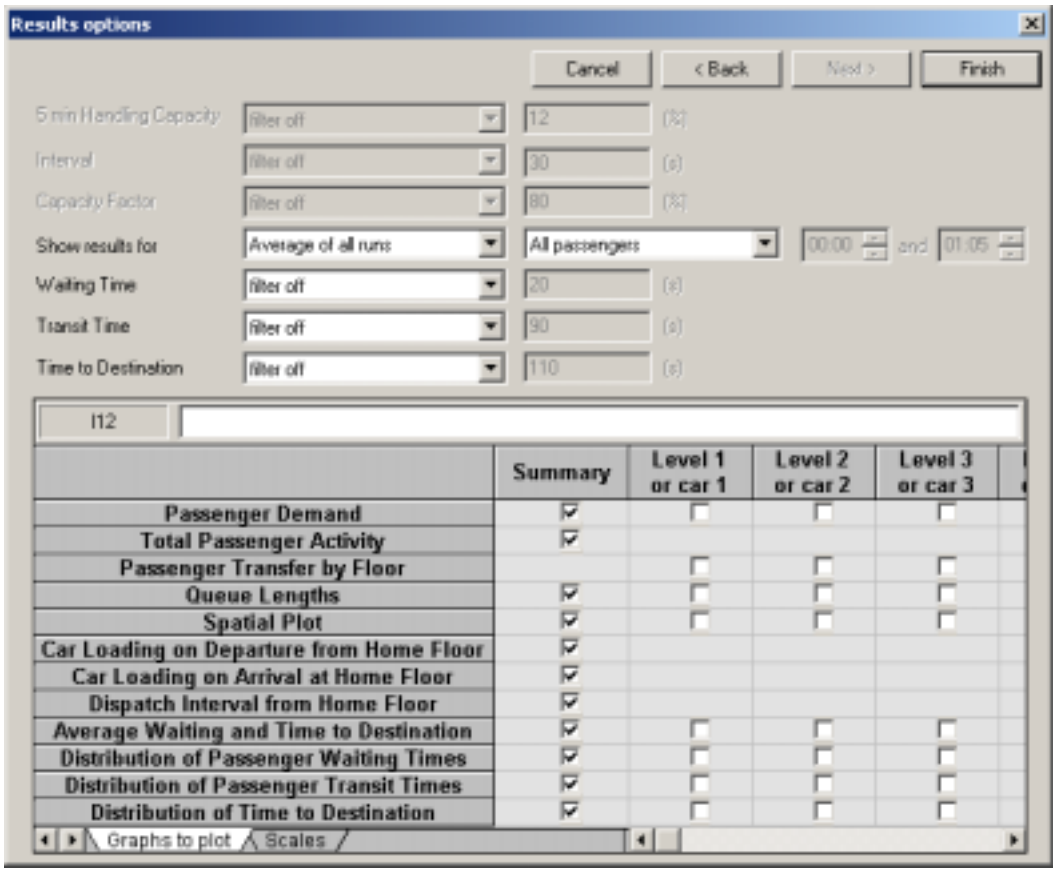


Figure 12 Report Options dialog

Choosing the results to display

If you have selected a range of configurations (different numbers, sizes and speeds of cars) to analyse in **Elevator Data**, you can choose to display only the results that meet criteria you specify. The options available depend on the analysis type.

If the Analysis type is **Up peak**, results can be rejected on the basis that the configuration achieves less than a specified 5 minute handling capacity.

If the Analysis type is **Enhanced Up Peak**, **General Analysis** or **Double Deck General Analysis**, results can be rejected on the basis that the interval or capacity factor is higher than specified.

If the Analysis type **Simulation**, you can choose to see the results for any individual run, or for an average of all runs. You can also choose to look at the results for passengers who arrive in a specified time frame. Based on this selection, you may also choose to reject results on the basis that the Average Waiting Time, Average Transit Time, or Average Time to Destination is greater than specified.

Selecting Graphs to plot

Elevate will plot a wide range of graphs, according to the boxes ticked in the Report Options table.

For a discussion of the simulation results graphs, please refer to the Chapter 12, **Viewing the Results**. By default the graphs are set to scale automatically. Select the **scale** tab if you want to set the scale yourself.

11. Running the Analysis

Introduction

When you have finished entering data, you can start the analysis by selecting **Analysis**, **Run**, or by pressing the ▶ or ▶▶ button on the Toolbar. You can stop the analysis before it is finished by selecting **Analysis**, **Stop** or by pressing ■ on the Toolbar. However, if you **Stop** the analysis before it is finished, Elevate will not display any results. A pause button ⏸ is also available.

You can zoom in and out of the Analysis display screen by selecting **View**, **Zoom In** or **View**, **Zoom Out**. Alternatively, press the 🔍+ and 🔍− buttons on the Toolbar.

Your selection of **Measurement System** in **Analysis Data** will determine whether Elevate displays values in **Metric** or **U.S.** units. **Metric** units will be assumed for discussion in this chapter.

SIMULATION DISPLAY

When a simulation is running, you are given a full visual display of the elevators' operation.

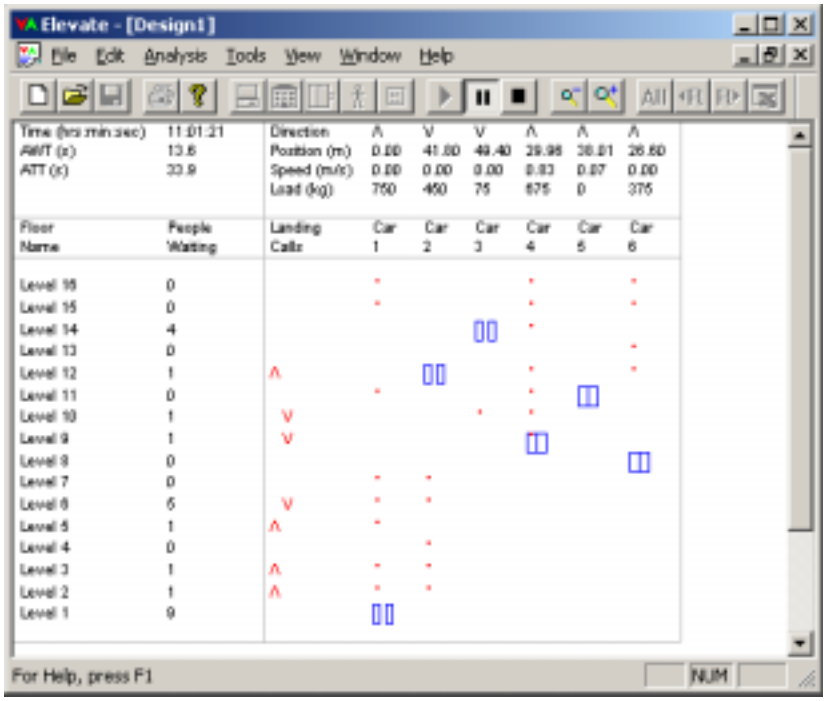


Figure 13 Simulation Display

Floor Names

The **Floor Names** are displayed, as entered in Chapter 7**, Building Data**. The floor to floor heights are drawn to scale according to the **Floor Levels**, also entered in **Building Data**.

People Waiting

Indicates the number of people waiting at each landing at the current time.

Elevators

Elevators are displayed according to their current position and door status:

Indicates that the elevator's doors are fully closed.

Indicates that the elevator's doors are opening or closing.

Indicates that the elevator's doors are fully open.

Hall and Car Calls

Hall and car calls are displayed according to their status:

Indicates up and down hall calls have been registered by waiting passengers.

Indicates one or more destination calls have been registered. Calls are aligned with the floors on which they are registered.

Indicates car calls registered by the passengers travelling in each elevator. Car calls are aligned with the floors for which they are registered.

p Indicates a parking call which is used to re-locate an "idle" car. This parking call does not open the elevator doors on arrival (see **Dispatcher** in Chapter 6, **Analysis Data**).

po Indicates a parking call which is used to re-locate an "idle" car. This parking call opens the elevator doors on arrival (see **Dispatcher** in **Analysis Data**).

Time

Indicates the current time of the simulation in the format, hours : minutes : seconds.

AWT

Indicates the **Average Waiting Time** of passengers whose calls have already been answered, in seconds. **Average Waiting Time** is discussed in more detail in Chapter 13, **Simulation Results**.

ATT

Indicates the **Average Transit Time** of passengers who have already completed their journey, in seconds. **Average Transit Time** is discussed in more detail in Chapter 13, **Simulation Results**.

Direction

Indicates the current direction of the elevator, as is normally indicated at landings using directional arrows above elevator doors.

Position

Indicates the absolute vertical position of the elevator, in metres, at the current simulation time. This is calculated from the floor levels, taking into account the distance travelled on any particular journey.

Speed

Indicates the absolute speed of the elevator, in metres per second, at the current simulation time.

Load

Indicates the total load of passengers in the elevator, in kilograms, at the current simulation time.

RTT CALCULATION DISPLAY

When an **Up peak**, **Enhanced up peak**, or **General analysis** is running, details of the configuration being analysed (number of elevators, capacity and speed) is displayed.

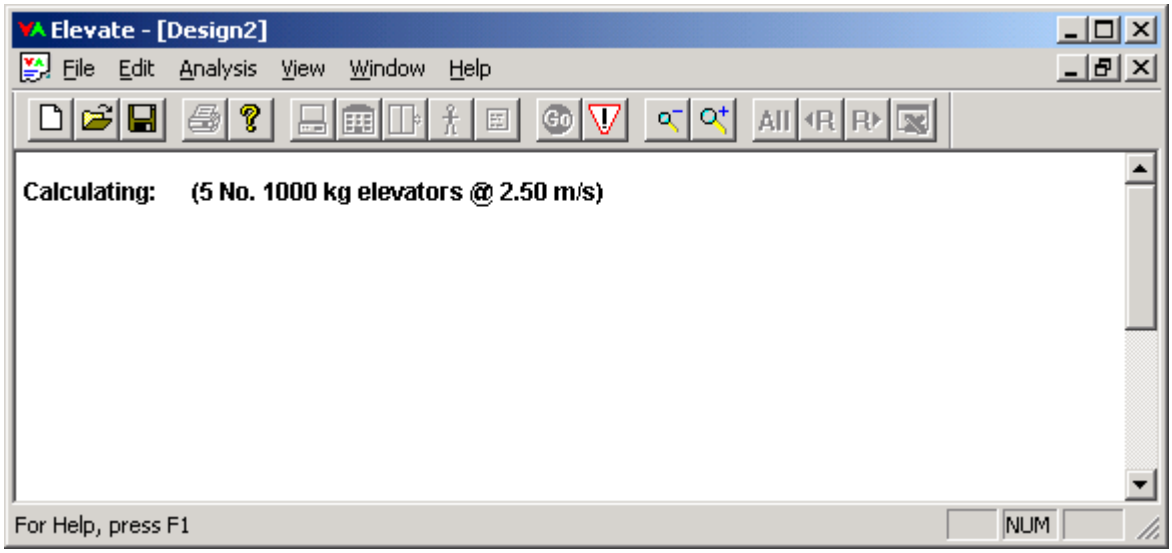


Figure 14 RTT Calculation Display

12. Viewing the Results

Introduction

Data and results are displayed in a print preview format on the main display area once the simulation is complete. The results are presented below the data, so you may need to scroll down the report to see the results.

You can zoom in and out of these results by selecting **View**, **Zoom In** or **View**, **Zoom Out**. Alternatively, press the and buttons on the Toolbar. If the fonts used are too small or too big when you print, select **File, Page Setup** to adjust the number of lines per page. If you have analysed a range of configurations using the **Standard** mode **Elevator Data** options, you can scan through these results by selecting **View**, **Next Results** or **View**, **Previous Results**. Alternatively use the and buttons on the Toolbar. To view a summary of data and results for all the configurations analysed, select **View**, **Summary Results**. Alternatively, press the button on the Toolbar.

If you change any data (apart from **Job Data** or **Report Options**), the analysis results cease to be valid, and the results screen is no longer displayed. You must run the analysis again for new results. More technical information about the calculations performed by Elevate is available. Please select **Elevate on the web** from the **Help** menu. Your selection of **Measurement System** in **Analysis Data** will determine whether Elevate displays results in **Metric** or **U.S.** units. **Metric** units will be assumed for the discussion of results.

Results are automatically saved with the **Elevate** file. If you **Save** the file, and then **Open** it later you do not need to run the analysis again. When you re-open the **Elevate** file,

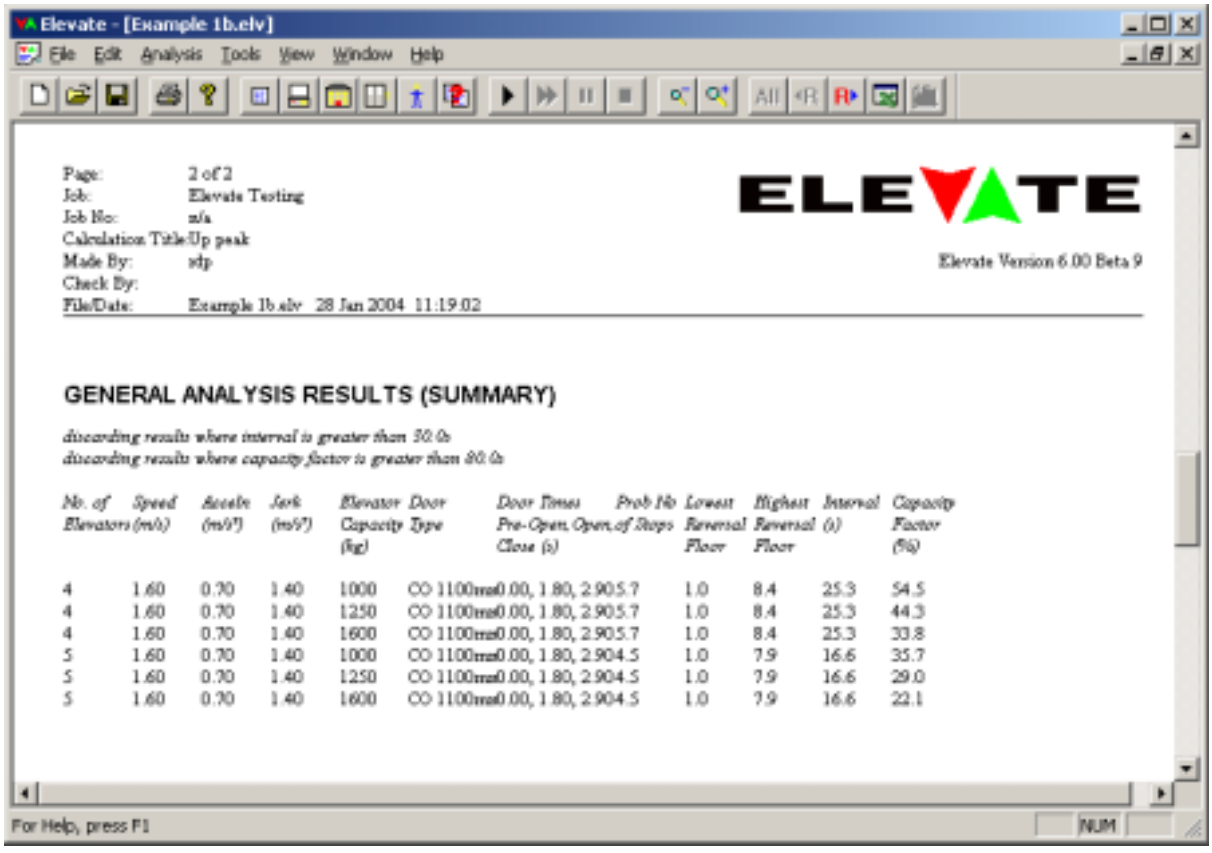


Figure 15 Example RTT calculation results display

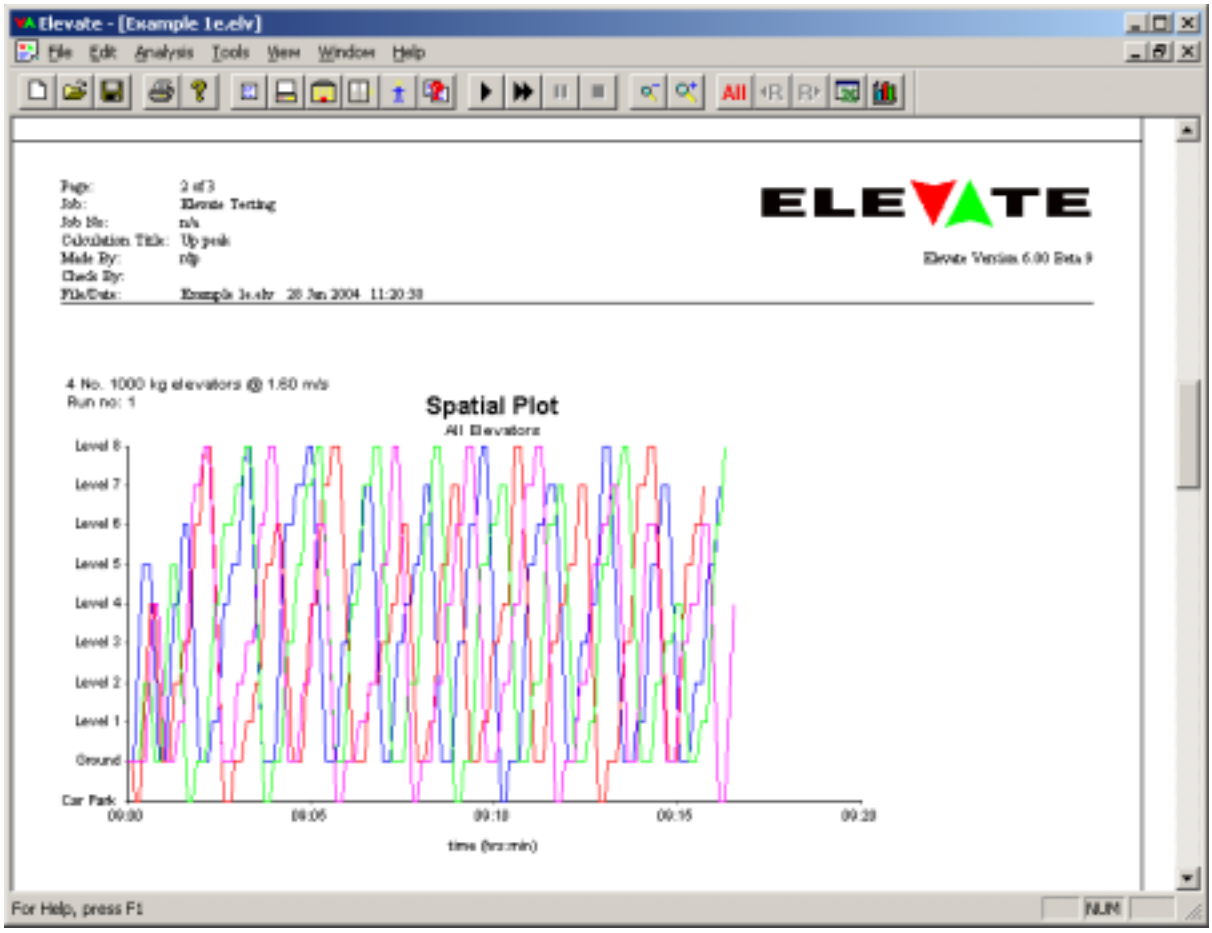


Figure 16 Example simulations results display

13. Simulation Results

Introduction

Most simulation results are presented as graphs. You can select which graphs to plot in **Report Options**.

If you want to copy the graphs to another program, use the  button on the toolbar. Select the graph you want, and press the **copy** button.

A discussion and sample of the available graphs follows.

Passenger Demand

Passenger Demand plots the traffic that has been generated as a result of your inputs in **Passenger Data**. The traffic is divided into traffic up and down the building.

You can view this graph for any one run, or based on an average of all runs.

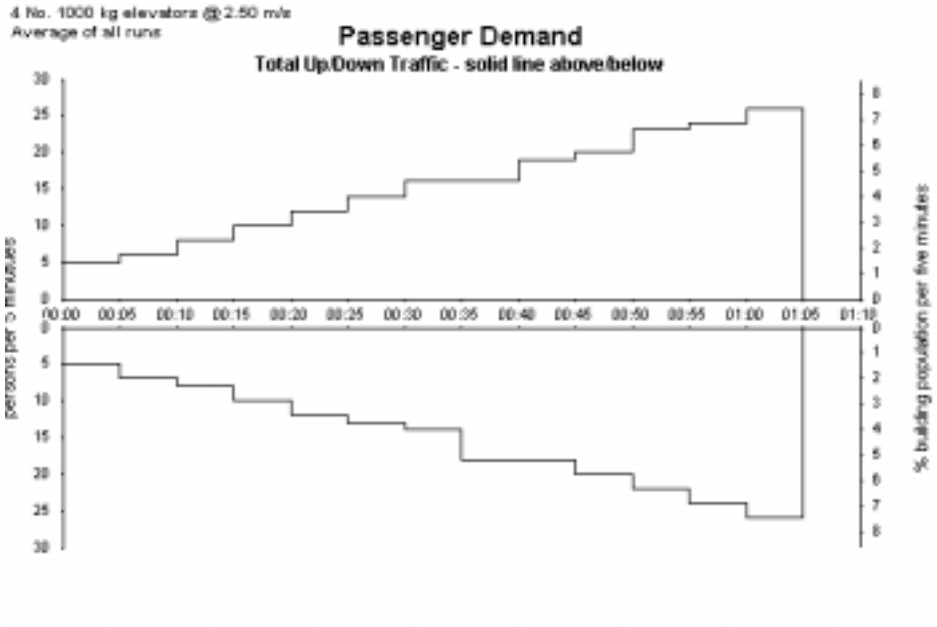


Figure 17 Example Passenger Demand graph, from all levels

You can also view this graph for any floor. The example below represents the total traffic originating from level 4 which is travelling up (upper axis), and travelling down (lower axis).

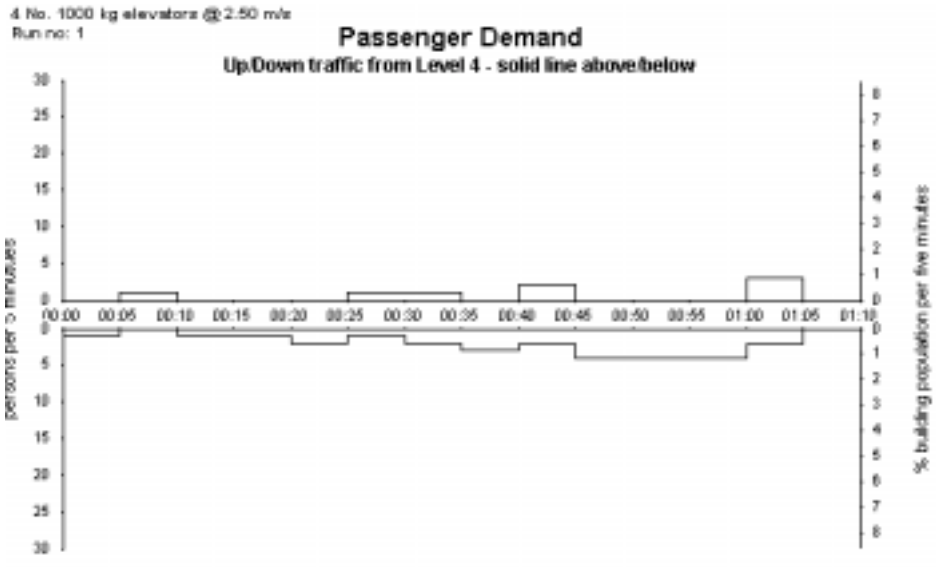


Figure 18 Example Passenger Demand graph, from single level

Total Passenger Activity

Total Passenger Activity plots the traffic that has been generated as a result of your inputs in **Passenger Data**. This is a "stacked" graph. The lower line is the incoming traffic originating from the Home floor. The second line adds on top the interfloor traffic. And the top line adds on top the outgoing traffic, travelling towards the Home floor.

You can view this graph for any one run, or based on an average of all runs.

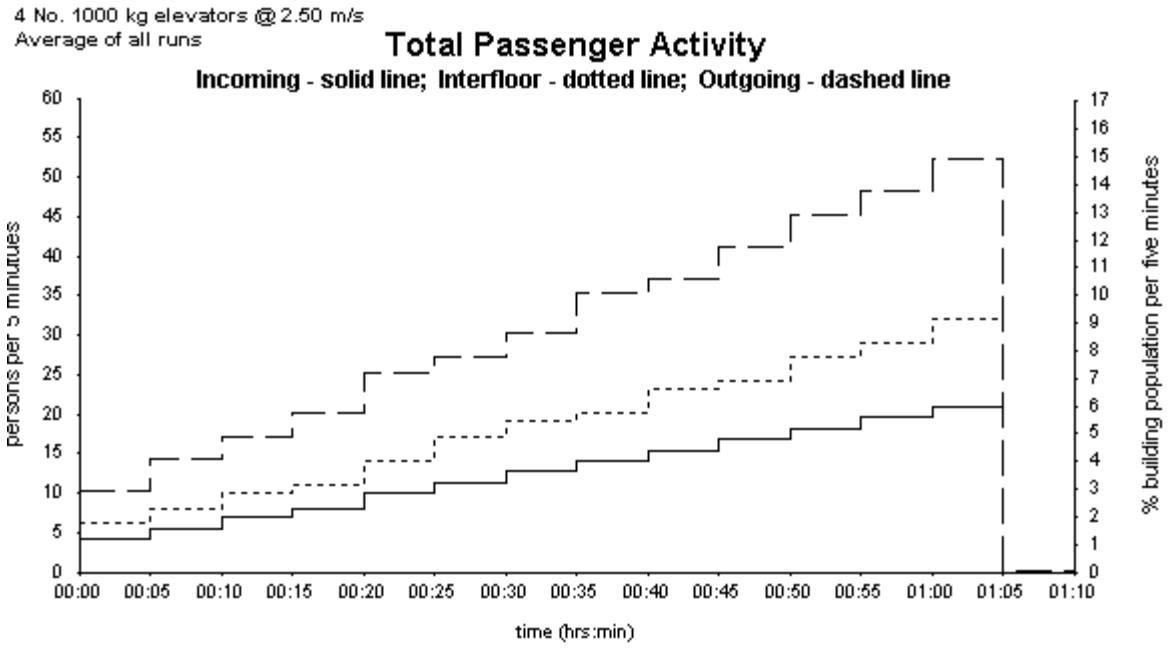


Figure 19 Example Total Passenger Activity Graph

Passenger Transfer by Floor

Passenger Transfer by Floor plots arrivals and departures from the selected floor. This corresponds to what you would observe if you were standing on the landing, counting people as they unload and load the car.

You can view this graph for any one run, or based on an average of all runs.

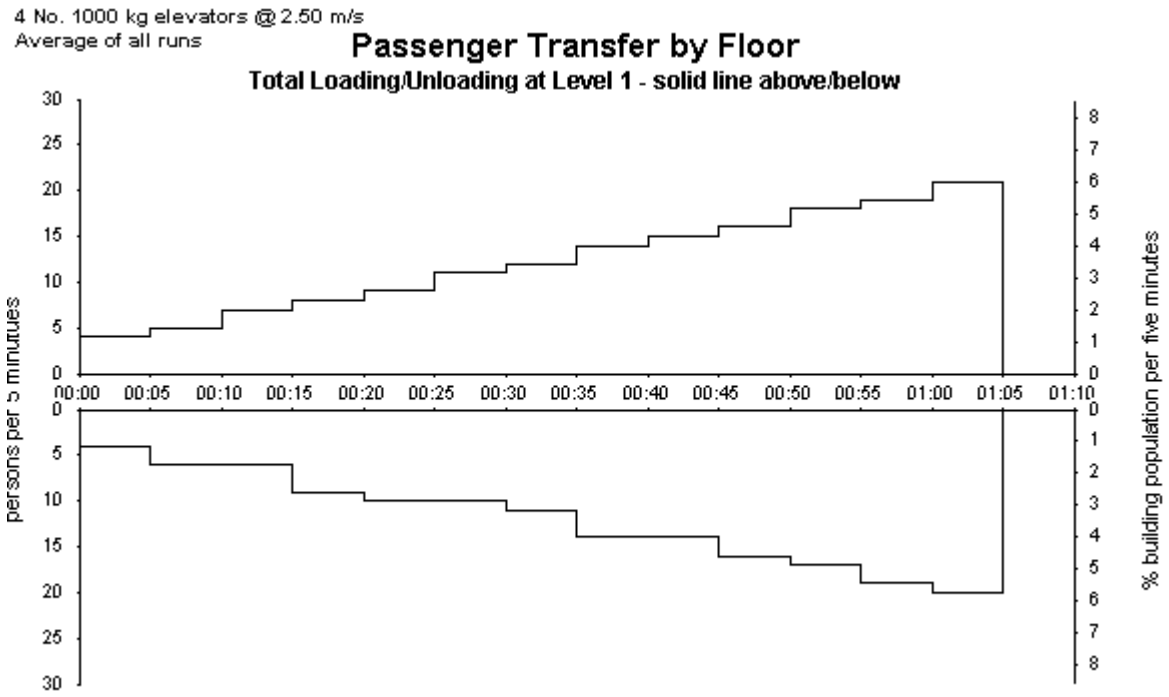


Figure 20 Example Passenger Transfer Floor graph

Queue Lengths

Queue Lengths shows how many people are waiting at elevator landings. This graph is plotted as a scatter diagram. Each time the queue length changes, another dot is plotted.

This graph can be plotted for a selected floor, of for all floors. If you are plotting “all floors”, the graph corresponds to the total number of people queuing on all the elevator landings.

If you plot the “Average of all runs”, the queue lengths for every run are plotted on top of each other in different colours.

You can view this graph for any one run, or based on an average of all runs.

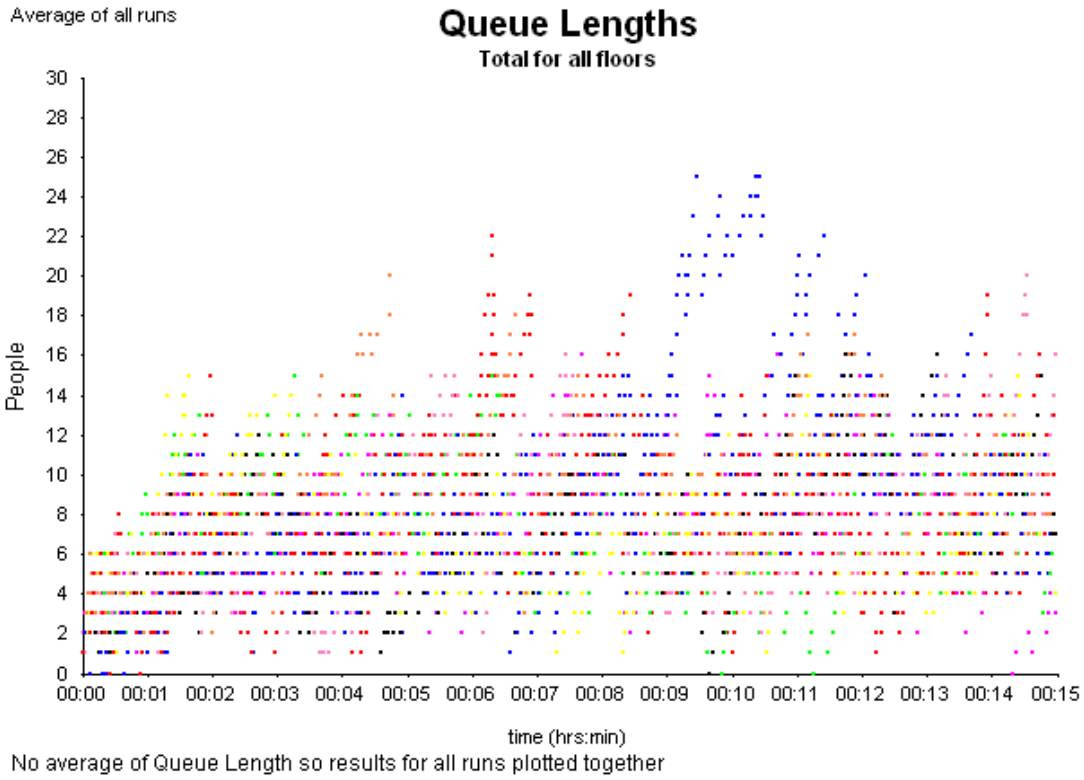


Figure 21 Example Queue Lengths graph

Spatial Plot

Spatial Plots draw a trace of each car's movement. Spatial plots can be selected for all cars, or for each car individually.

You can select the spatial plot for any single run.

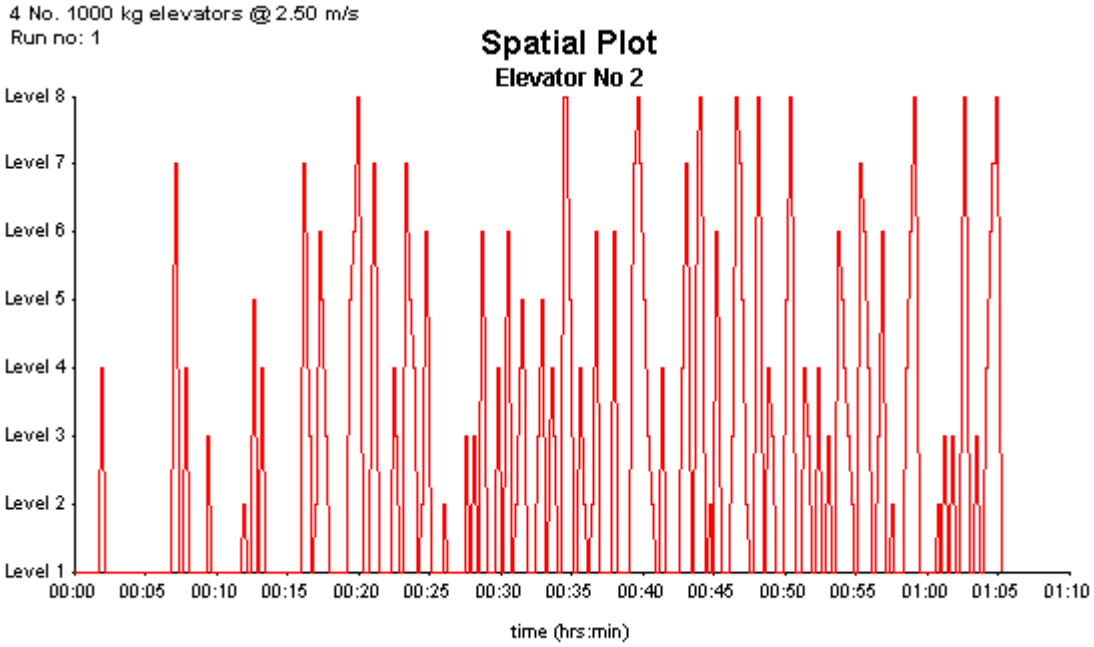


Figure 22 Example Spatial Plot graph

Car Loading on Departure from Home Floor

Car Loading on Departure from Home Floor shows you how full the cars are at the beginning of a round trip. This is of particular interest during up peak traffic. The lower line show the average loading in each five minutes. The upper line shows the highest loading in each five minutes.

You can view this graph for any one run, or based on an average of all runs.

The right hand side y axis (persons) is only displayed when Elevate determines that you have defined all cars to have the same capacity and all passengers to have the same mass.

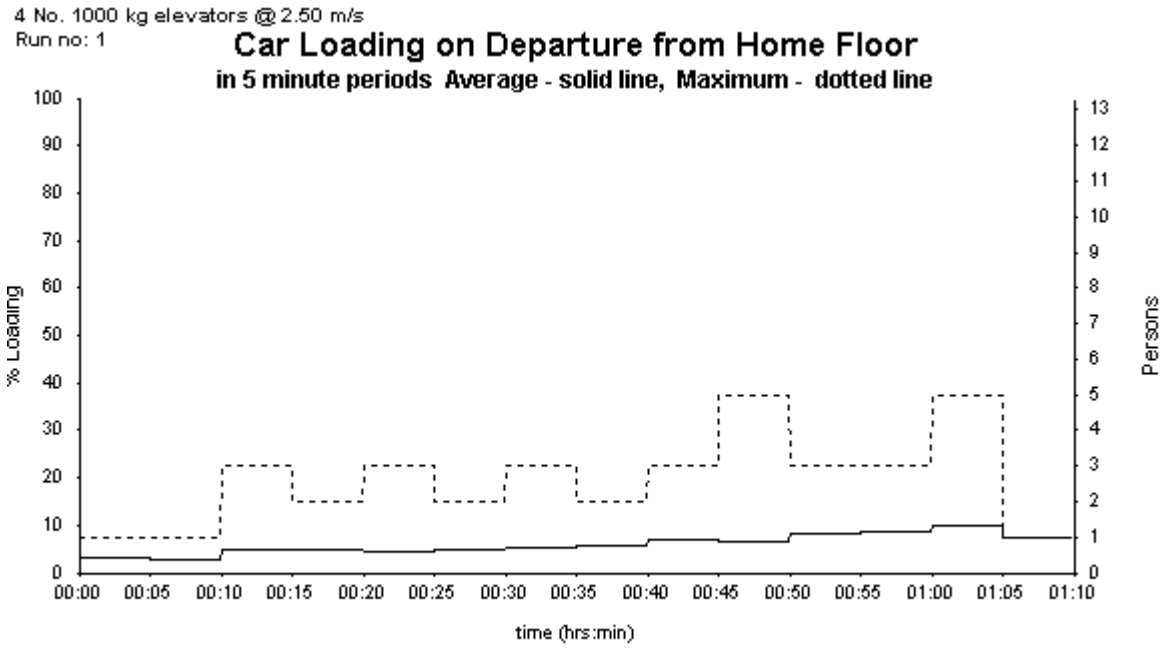


Figure 23 Example Car Loading on Departure graph

Car Loading on Arrival at Home Floor

Car Loading on Arrival at Home Floor shows you how full the cars are at the end of a round trip. This is of particular interest during down peak traffic. The lower line show the average loading in each five minutes. The upper line shows the highest loading in each five minutes**.**

You can view this graph for any one run, or based on an average of all runs.

The right hand side y axis (persons) is only displayed when Elevate determines that you have defined all cars to have the same capacity and all passengers to have the same mass.

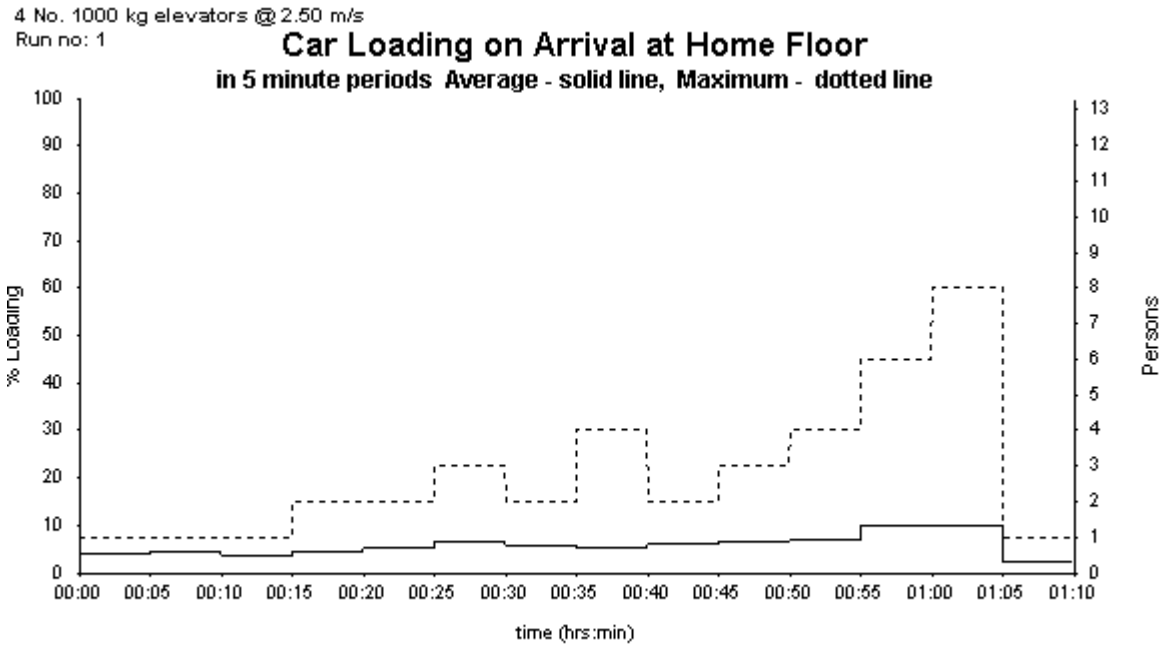


Figure 24 Example Car Loading on Arrival graph

Dispatch Interval from Home Floor

Dispatch Interval from Home Floor plots the interval in each five minutes.

The dispatch interval is the average time between cars departing from the main home floor. This is calculated by counting the number of times a car is dispatched from the home floor in each five minute period. Then dividing this number into 300 seconds (5 minutes).

You can view this graph for any one run, or based on an average of all runs.

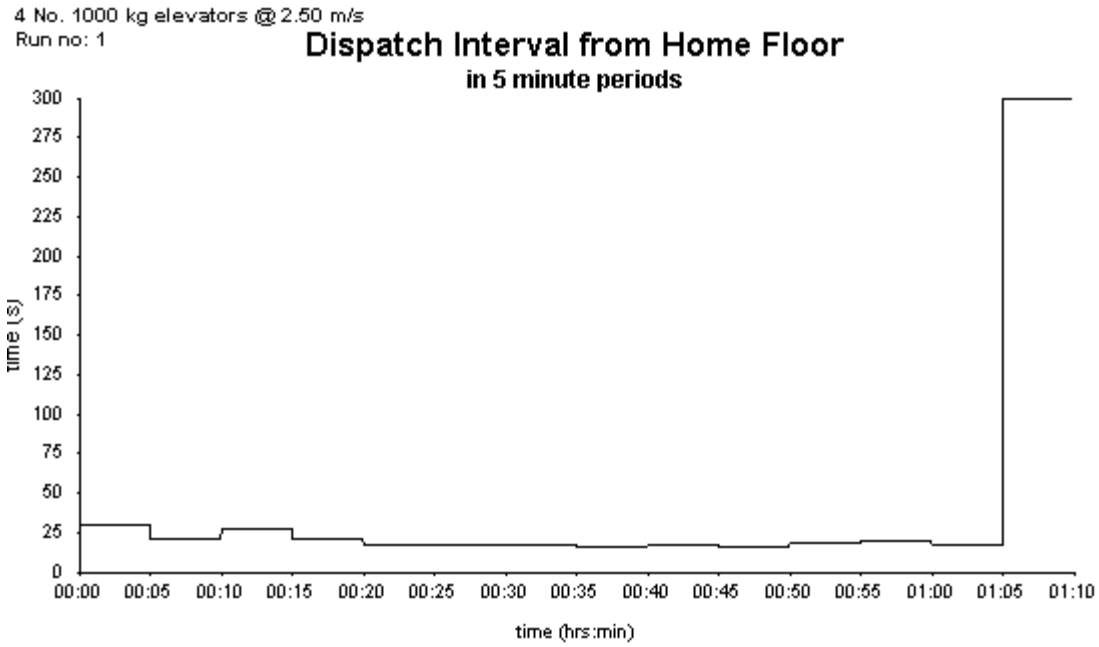


Figure 25 Example Dispatch Interval graph

Note that during interfloor or light traffic the car may not stop at the home floor regularly. This results in large values for the interval. Thus, at times when there is little traffic to or from the home floor, interval is not a good measure of performance.

BEWARE! In simulation a good interval does not necessarily correspond to good performance. For example, the interval may be 20 seconds, but if there are queues on the landing passengers may have to wait two or more intervals before there is enough space for them to get into an elevator.

Average Waiting Time and Time to Destination

Passenger Waiting Time is defined as the actual time a prospective passenger waits after registering a hall call (or entering the waiting queue if a call has already been registered) until the responding elevator doors begin to open. If the responding elevator doors are already open when a passenger arrives, the waiting time for this passenger is taken as zero.

Passenger Transit Time is the time the responding elevator doors begin to open to the time the doors begin to open again at the passenger's destination. If the responding elevator doors are already open when a passenger arrives, the transit time for this passenger commences at the time the passenger arrived.

Time to Destination is the **Passenger Waiting Time** plus the **Passenger Transit Time**.

The **Average Waiting Time** and **Time to Destination** graph is plot for each 5 minutes. The lower line is the Average Waiting Time. The upper line is the Time to Destination. The difference between the two lines is the Passenger Transit Time.

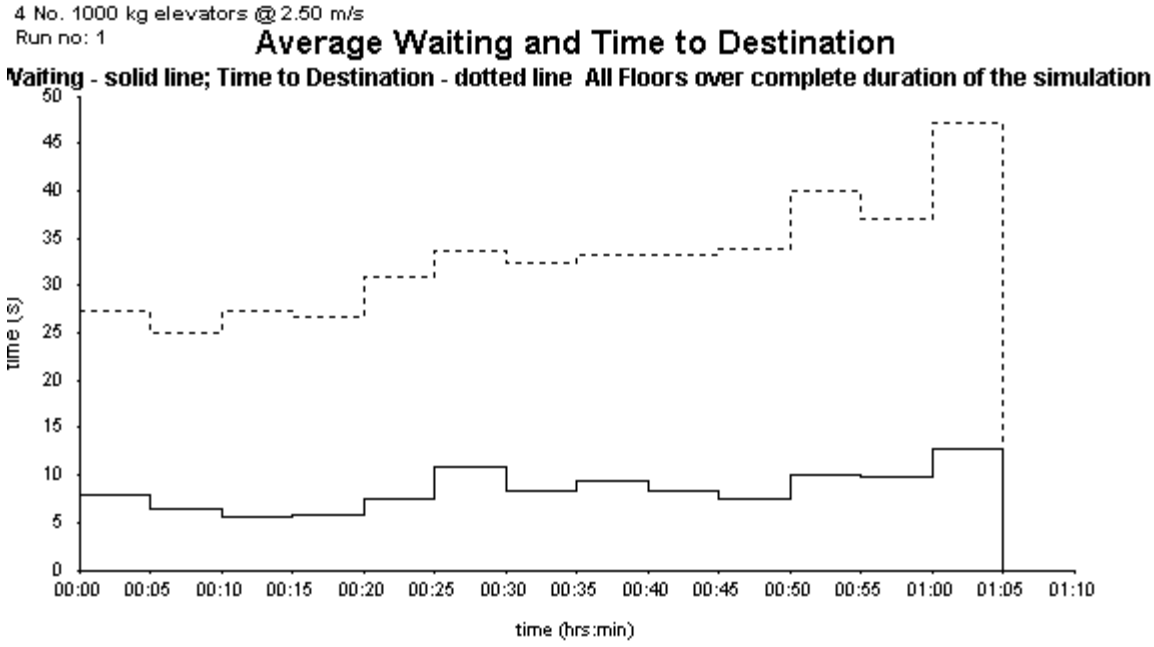


Figure 26 Example Average Waiting Time and Time to Destination graph

Passenger Waiting Time Results

Passenger Waiting Time is defined as the actual time a prospective passenger waits after registering a hall call (or entering the waiting queue if a call has already been registered) until the responding elevator doors begin to open. If the responding elevator doors are already open when a passenger arrives, the waiting time for this passenger is taken as zero.

Elevate plots against the right hand side y axis, a graph showing what percentage of passengers have waiting times less than or equal to the value on the x axis. A dotted line identifies the 90 percentile.

Plotted against the y1 axis, Elevate identifies the number of passengers who have waited in each of the specified time ranges.

Elevate also calculates the **Average Waiting Time**, and identifies the **Longest Waiting Time**. If the **Number of simulations to run for each configuration** greater than 1, Elevate presents the average result, and a range, e.g. 30.0 (+5.1/-1.5).

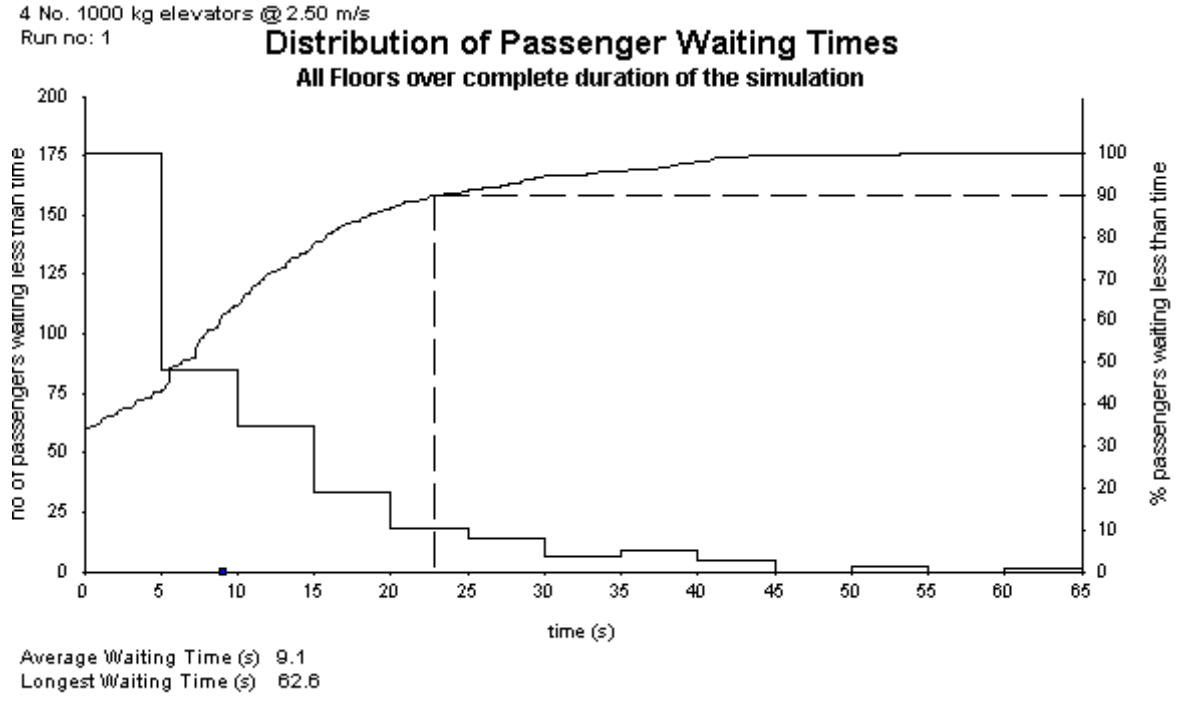


Figure 27 Example Distribution of Passenger Waiting Times graph

Passenger Transit Time Results

Passenger Transit Time is the time the responding elevator doors begin to open to the time the doors begin to open again at the passenger's destination. If the responding elevator doors are already open when a passenger arrives, the transit time for this passenger commences at the time the passenger arrived.

Elevate plots against the right hand side y axis, a graph showing what percentage of passengers have had transit times less than or equal to the value on the x axis. A dotted line identifies the 90 percentile.

Plotted against the y1 axis, Elevate identifies the number of passengers who have had a transit time in each of the specified time ranges.

Elevate also calculates the **Average Transit Time**, and identifies the **Longest Transit Time**. If the **Number of simulations to run for each configuration** greater than 1, Elevate presents the average result, and a range.

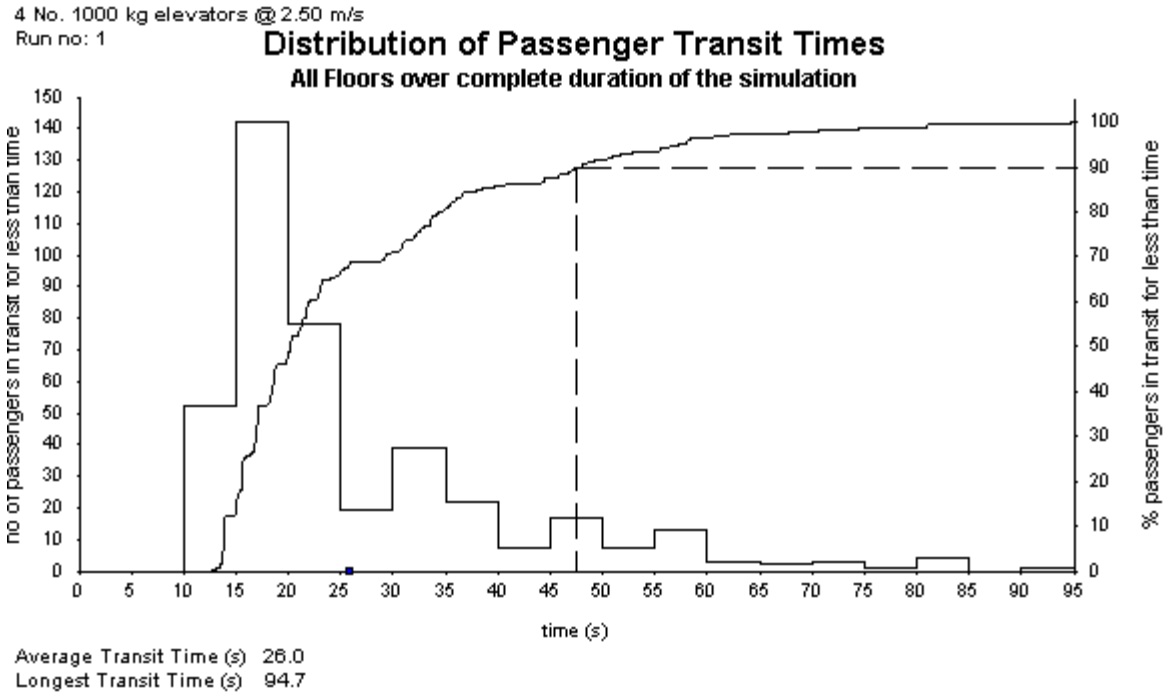


Figure 28 Example Distribution of Passenger Transit Times graph

Time to Destination

Time to Destination is the **Passenger Waiting Time** plus the **Passenger Transit Time**. Elevate calculates **Average Journey Time** and **Longest Journey Time**.

Elevate displays a graph showing what percentage of passengers have a time to destination less than or equal to the value on the x axis.

Elevate plots against the right hand side y axis, a graph showing what percentage of passengers have had a time to destination less than or equal to the value on the x axis. A dotted line identifies the 90 percentile.

Plotted against the y1 axis, Elevate identifies the number of passengers who have had a time to destination in each of the specified time ranges.

Elevate also calculates the **Average Time to Destination and**, and identifies the **Longest Time to Destination** experienced. If the **Number of simulations to run for each configuration** greater than 1, Elevate presents the average result, and a range.

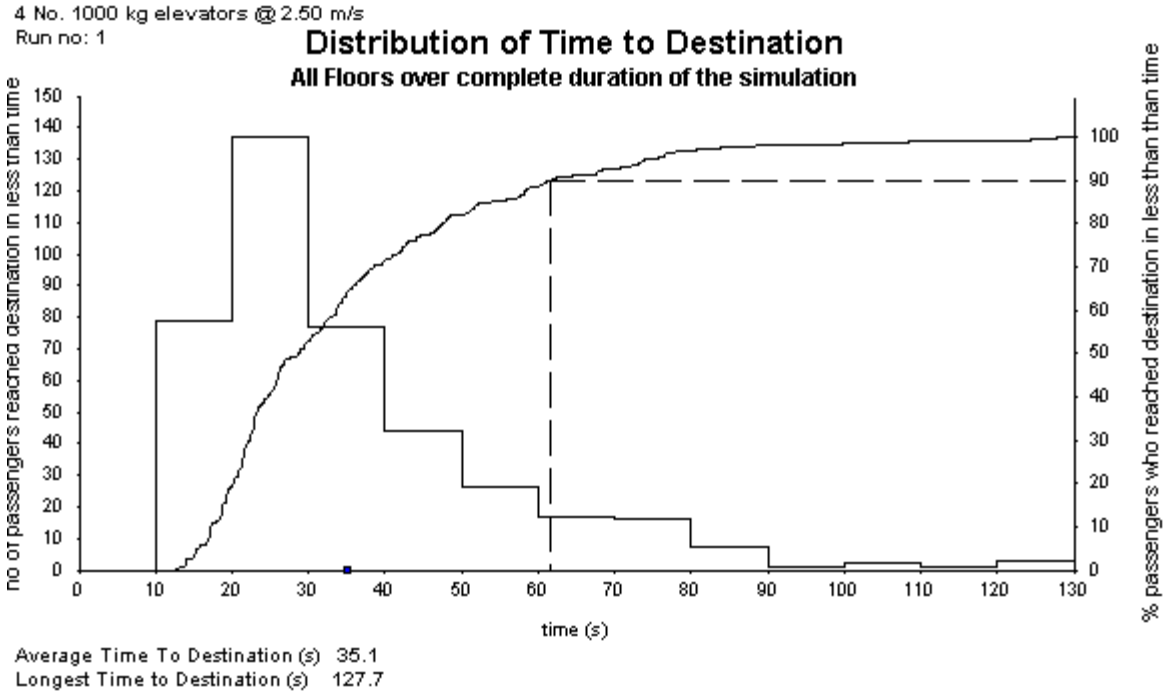


Figure 29 Example Distribution of Time to Destination graph

Spreadsheet Results

In addition to the standard Elevate report, you can transfer the data and results, as currently displayed, to **Excel** by selecting **View, Results Spreadsheet.** Alternatively, press the button on the Toolbar. If you use a spreadsheet other than **Excel**, and want to use this spreadsheet facility, please contact Technical Support.

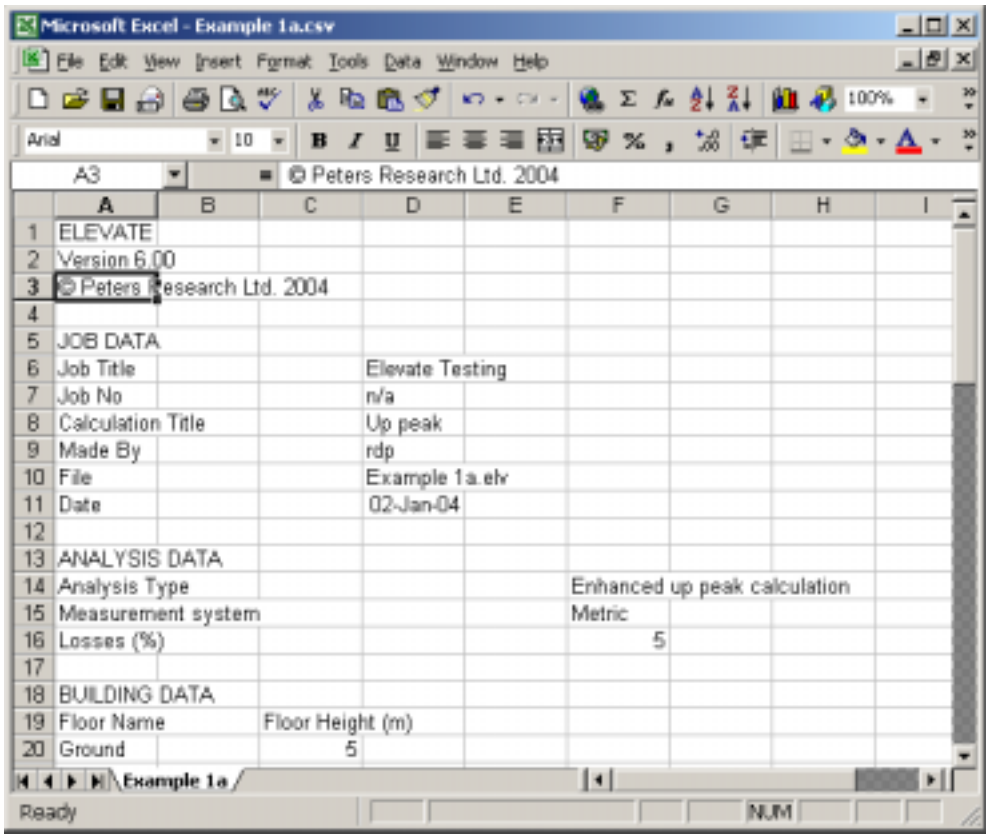


Figure 30 Spreadsheet output of results

Additional results are provided in the spreadsheet:

- Up, down and total motor starts for each elevator.
- Total up and down running time for each elevator.
- Number of times dispatched from home for each elevator.
- Number of hall calls up, down and total. Average response time.
- Hall call analysis by time of day.
- Hall call analysis by floor number.
- Hall call response time distribution.
- Car call analysis by time of day.
- Car call analysis by floor number.
- Car call response time distribution.
- Passenger list – includes details of every passenger included in the simulation, what time and floor they arrived, which elevator they used, their waiting time and journey time, etc.

For more information about these results, please contact Technical Support.

14. RTT Calculation Results

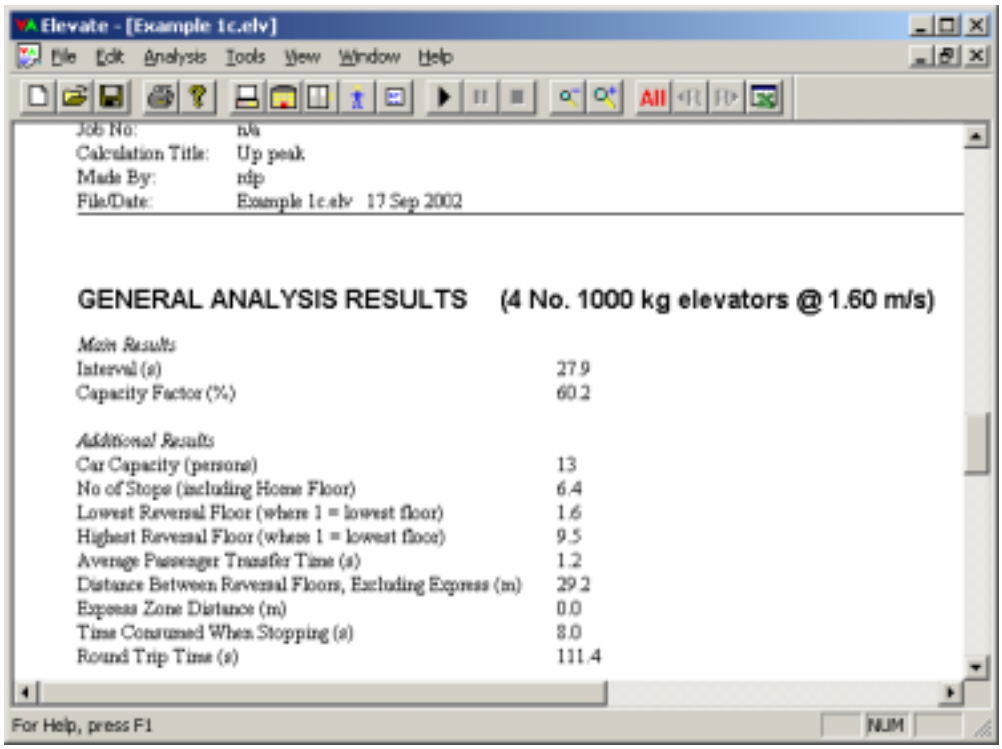


Figure 31 RTT results

Interval

This represents the average time in seconds between successive elevator cars arriving at the main entrance floor(s).

Capacity Factor and 5 minute handling capacity (%)

Capacity Factor (%) refers to the most full the elevator will be for an average round trip.

5 minute handling capacity (%) is the percentage of the building population transported by the elevators in five minutes during a morning up peak.

If the **Analysis type** is **Enhanced up peak** or **General analysis** you specify how much traffic there is going to be and Elevate calculates a **Capacity Factor**. In an **Up peak** analysis you assume the elevator will be, say 80% full, then calculate the **5 minute handling capacity**. Thus only one of these two results is given according to which analysis you are using.

Intermediate Results

Elevate also displays intermediate results calculated during the analysis. For more information about these results, please contact Technical Support.

No Results

Elevate will abort calculations where the **Capacity Factor** is >100% as the configuration is clearly unacceptable. On the results print out for this configuration the message with be displayed: "This configuration has been rejected because the required handling capacity cannot be achieved without increasing the size or number of the cars".

If you are using the **Report Options**, Elevate will also discard configurations which do not meet any criteria specified. On the results print out for this configuration, the message "This configuration has been rejected due to the Report Options parameters" with be displayed.

If you have no results, adjust the **Report Options**, reduce amount of traffic defined in **Passenger Data**, or increase the specification of the elevators in **Elevator Data**.

If all results are either invalid, or have been rejected due to the **Report Options** settings, the summary results page will display the message "All results are either invalid, or have been rejected due to the Report Options settings".

Low and Zero Results

Round Trip Time calculations are intended for analysis of **peak** traffic, when the elevators are busy. If this is not the case, some results may be low, or even zero. This is a limitation of the calculation. With Elevate, you can overcome this by changing the **Analysis type** to **Simulation**.

Spreadsheet Results

In addition to the standard Elevate report, you can transfer the data and results, as currently displayed, to **Excel** by selecting **View, Results Spreadsheet.** Alternatively, press the  button on the Toolbar. If you use a spreadsheet other than **Excel**, and want to use this spreadsheet facility, please contact Technical Support.

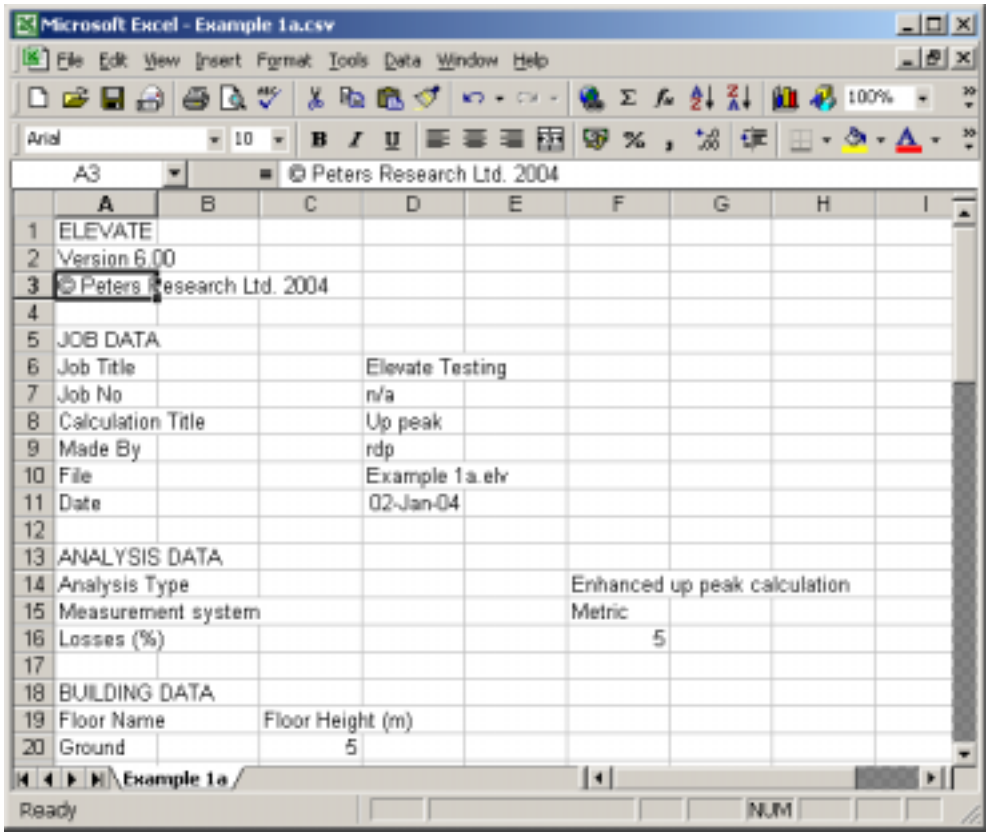


Figure 32 Example Spreadsheet output of RTT results

15. Tools

Introduction

The **Tools** menu is provided for additional analysis features not directly related to the main calculations. The following tools are available.

Kinematics

The kinematics tool allows you to select any trip, and the speed, acceleration and jerk.

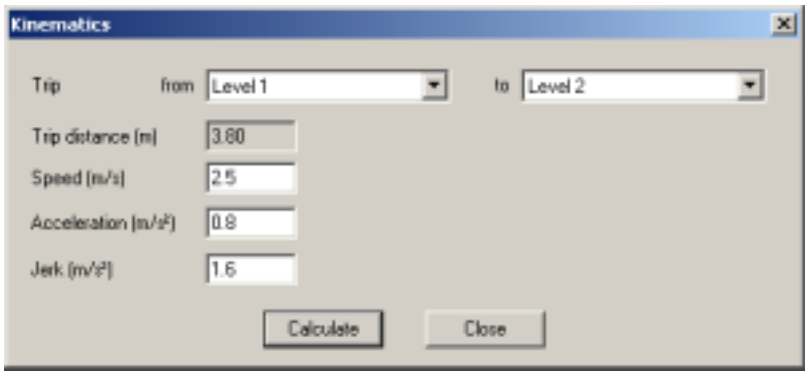
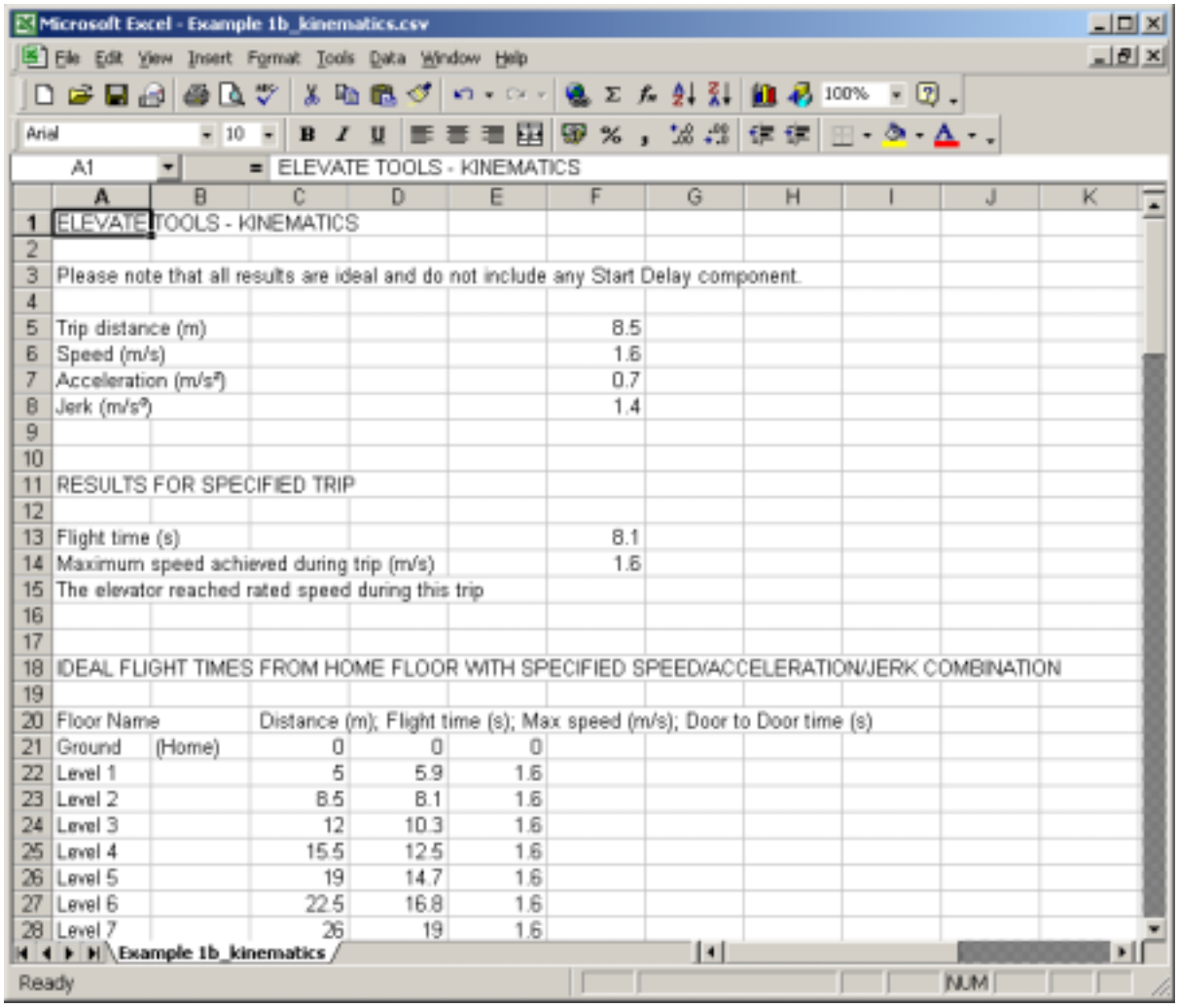


Figure 33 Kinematics dialog

When you click on the **Calculate** button, an Excel spreadsheet is generated providing a detailed kinematics analysis of the trip including:

- Flight time.
- Maximum speed achieved during trip.
- Details as to whether or not the elevator reached rated acceleration and speed during the specified trip.
- Flight times and door to door times from the **Home floor** to all other floors entered in **Building Data** using the specified speed/acceleration/jerk combination.
- Distance travelled to reach rated acceleration.
- Time elapsed to reach rated acceleration.
- Speed at rated acceleration.
- Distance travelled to reach rated speed.
- Time elapsed to reach rated speed.
- Numerical values allowing you to plot the distanced travelled, velocity, acceleration and jerk profiles for the specified trip.



Microsoft Excel - Example 1b_kinematics.csv

File Edit View Insert Format Tools Data Window Help

A1 = ELEVATE TOOLS - KINEMATICS

	A	B	C	D	E	F
1	ELEVATE TOOLS - KINEMATICS					
2						
3	Please note that all results are ideal and do not include any Start Delay component.					
4						
5	Trip distance (m)					8.5
6	Speed (m/s)					1.6
7	Acceleration (m/s²)					0.7
8	Jerk (m/s³)					1.4
9						
10						
11	RESULTS FOR SPECIFIED TRIP					
12						
13	Flight time (s)					8.1
14	Maximum speed achieved during trip (m/s)					1.6
15	The elevator reached rated speed during this trip					
16						
17						
18	IDEAL FLIGHT TIMES FROM HOME FLOOR WITH SPECIFIED SPEED/ACCELERATION/JERK COMBINATION					
19						
20	Floor Name		Distance (m);	Flight time (s);	Max speed (m/s);	Door to Door time (s)
21	Ground	(Home)	0	0	0	
22	Level 1		5	5.9	1.6	
23	Level 2		8.5	8.1	1.6	
24	Level 3		12	10.3	1.6	
25	Level 4		15.5	12.5	1.6	
26	Level 5		19	14.7	1.6	
27	Level 6		22.5	16.8	1.6	
28	Level 7		26	19	1.6	

Example 1b_kinematics

Ready NUM

Figure 34 Kinematics results

Appendix A

This appendix details additional options available from the **Passenger Data** dialog **Arrival Rate As** drop down.

% building population per 5 minutes with split %up, %down, %interfloor

In this mode the table has two tabs. Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Select the **arrival rate parameters** tab to define the traffic. The **Total Arrival Rate** is entered as a percentage of the building population per 5 minutes. This is divided into three parts as follows:

% up	the part of the total arrival rate that corresponds to passengers arriving at the home floor, and travelling up the building (or down to any floors below the home floor).
% down	the part of the total arrival rate that corresponds to passengers arriving at floors above (or below) the home floor, and travelling to the home floor.
% interfloor	the part of the total arrival rate that corresponds to passengers travelling between floors other than the home floor.

The population of individual floors is used to determine the distribution of arrival rates across the floors, and the attraction of each floor as a destination.

Barney one hour up peak template

In this mode the table has two tabs. Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Select the **arrival rate parameters** tab to define the peak arrival rate as a percentage of the population. Elevate generates a one hour traffic profile which rises to the peak arrival rate for 5 minutes, then drops again. Over the hour, 80% of the population are transported.

An example of the resulting **Passenger Demand** graph is given below. For more information about **Passenger Demand** graphs, please refer to Chapter 13, **Simulation Results**.

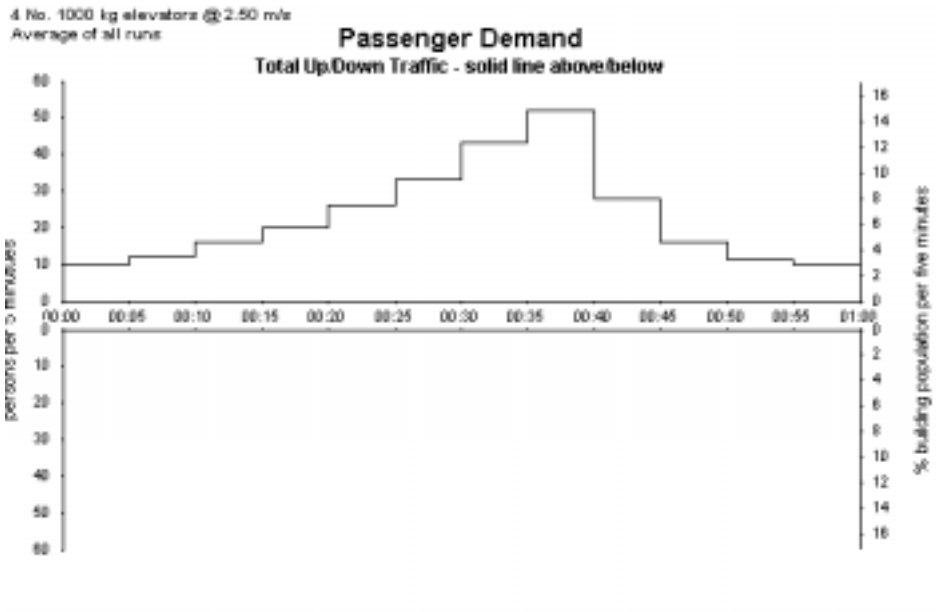


Figure A1 Example Passenger Demand profile for Barney one hour up peak template

For Dr Barney's discussion of this template, please refer to **Elevate on the web**.

Barney one hour down peak template

In this mode the table has two tabs. Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Select the **arrival rate parameters** tab to define the peak departure rate as a percentage of the population. Elevate generates a one hour traffic profile which rises to the peak departure rate for 5 minutes, then drops again. Over the hour, 80% of the population are transported.

An example of the resulting **Passenger Demand** graph is given below. For more information about **Passenger Demand** graphs, please refer to Chapter 13, **Simulation Results**.

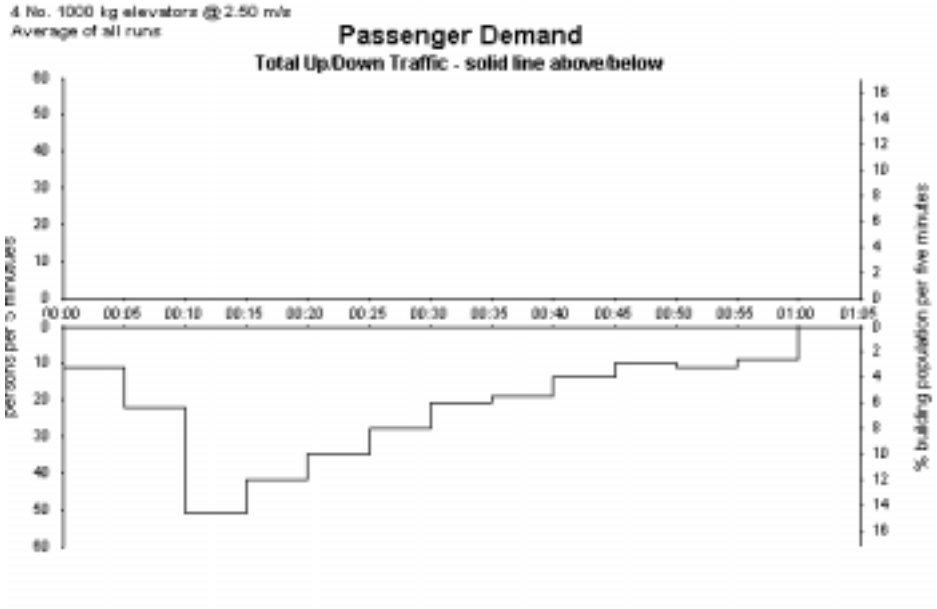


Figure A2 Example Passenger Demand profile for Barney one hour down peak template
For Dr Barney's discussion of this template, please refer to **Elevate on the web**.

Barney one hour lunch template

In this mode the table has two tabs. Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Select the **arrival rate parameters** tab to define the **peak** as a percentage of the population. Elevate generates a one hour traffic profile. The profile consists of four 5 minutes bursts of traffic at 1 times, 1⅓ times, 1⅔ times and 2 times the **peak**. Between these four bursts of traffic, the traffic is maintained at on tenth of the **peak**.

The traffic which is generated is split 40% up, 40% down, 20% interfloor. Split is defined as follows:

% up	the part of the total arrival rate that corresponds to passengers arriving at the home floor, and travelling up the building (or down to any floors below the home floor).
% down	the part of the total arrival rate that corresponds to passengers arriving at floors above (or below) the home floor, and travelling to the home floor.
% interfloor	the part of the total arrival rate that corresponds to passengers travelling between floors other than the home floor.

An example of the resulting **Total Passenger Activity** graph is given below. For more information about **Total Passenger Activity** graphs, please refer to Chapter 13, **Simulation Results**.

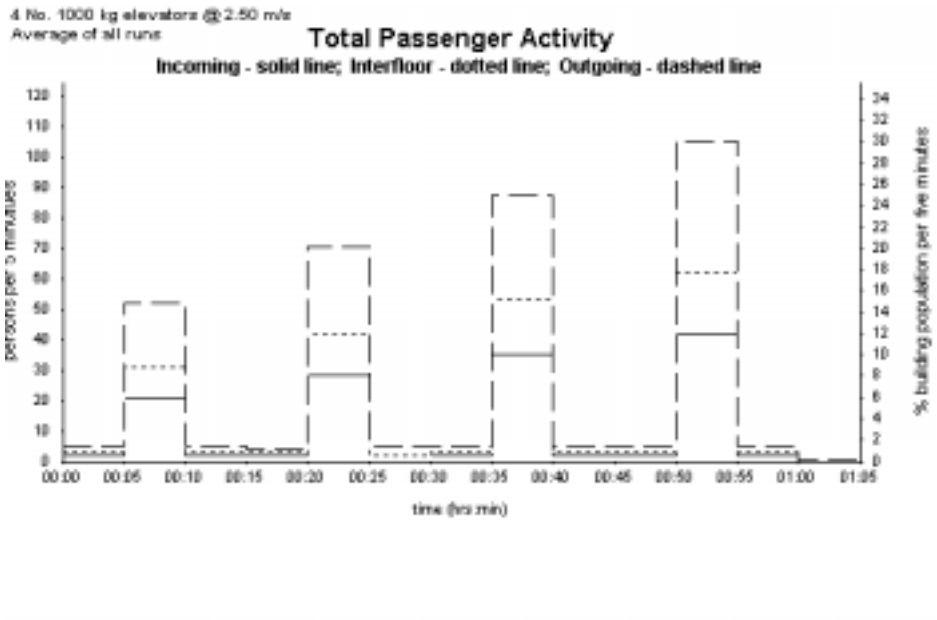


Figure A3 Example Passenger Demand profile for Barney one hour lunch template

For Dr Barney's discussion of this template, please refer to **Elevate on the web**.

Barney one hour interfloor template

Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Select the **arrival rate parameters** tab to define the **peak** as a percentage of the population. Elevate generates a one hour traffic profile with interfloor traffic. The total traffic, as a percentage of the building popultion, is 2% for 20 minutes, then 3% for 20 minutes, then 4% for 20 minutes.

The traffic which is generated is split 10% up, 10% down, 80% interfloor. Split is defined as follows:

% up	the part of the total arrival rate that corresponds to passengers arriving at the home floor, and travelling up the building (or down to any floors below the home floor).
% down	the part of the total arrival rate that corresponds to passengers arriving at floors above (or below) the home floor, and travelling to the home floor.
% interfloor	the part of the total arrival rate that corresponds to passengers travelling between floors other than the home floor.

An example of the resulting **Total Passenger Activity** graph is given below. For more information about **Total Passenger Activity** graphs, please refer Chapter 13, **Simulation Results**.

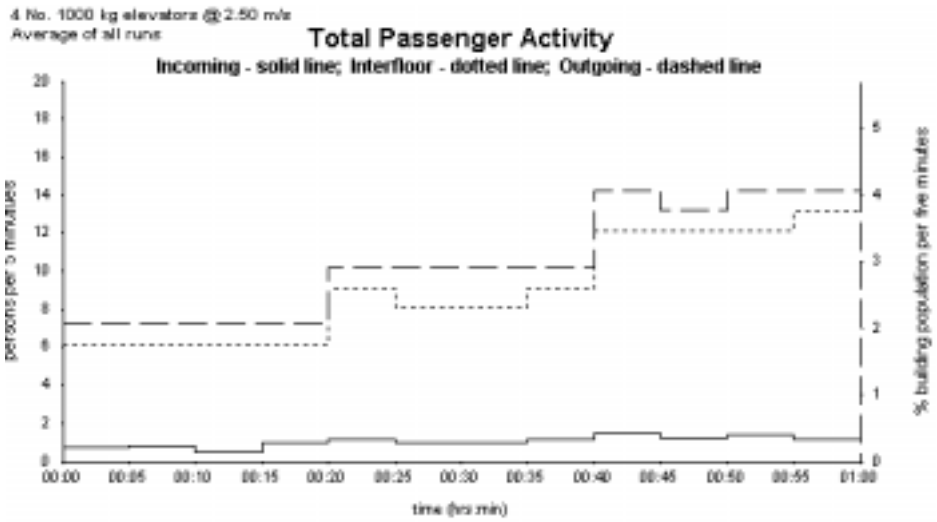


Figure A4 Example Passenger Demand profile for Barney one hour interfloor template

For Dr Barney's discussion of this template, please refer to **Elevate on the web**.

Powell 2 hour lunch template

Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Elevate generates a 2 hour lunchtime traffic profile appropriate to the building population.

An example of the resulting **Total Passenger Activity** graph is given below. For more information about **Total Passenger Activity** graphs, please refer to Chapter 13, **Simulation Results**.

The population of individual floors is used to determine the distribution of arrival rates across the floors, and the attraction of each floor as a destination.

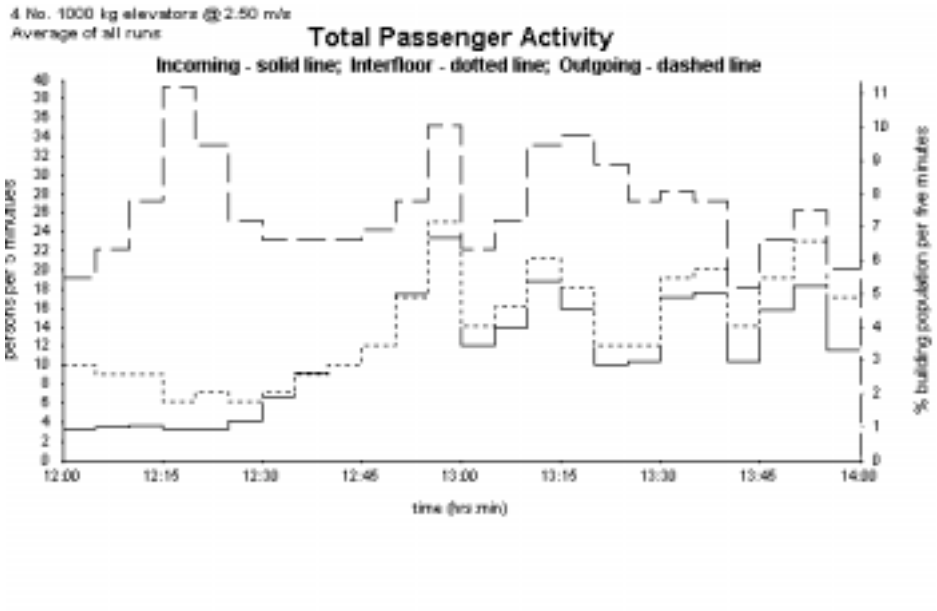


Figure A5 Example Passenger Demand profile for Powell two hour lunch template

Powell 40 minute lunch template

Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Elevate generates a 40 minute lunchtime traffic profile appropriate to the building population.

An example of the resulting **Total Passenger Activity** graph is given below. For more information about **Total Passenger Activity** graphs, please refer to Chapter 13, **Simulation Results**.

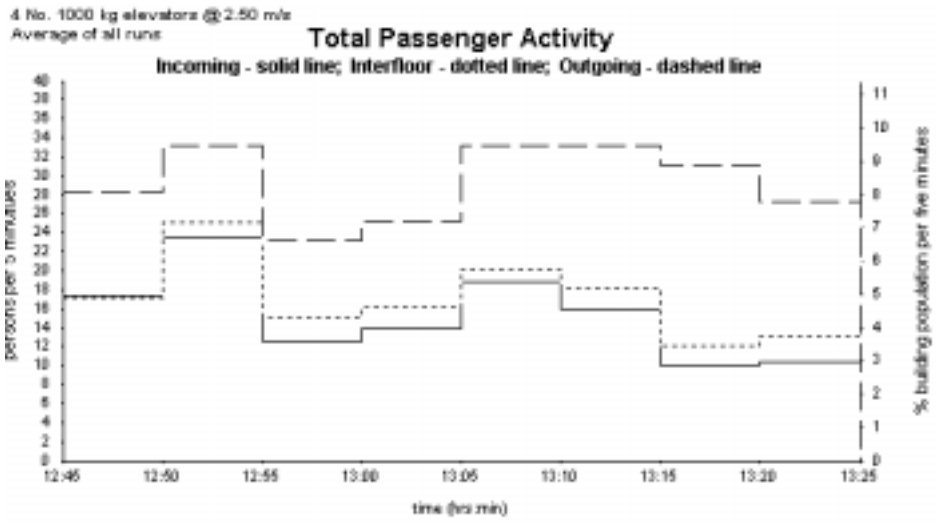


Figure A6 Example Passenger Demand profile for Powell 40 min lunch template

Siikonen full day template

Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Elevate generates an example all day traffic profile based on a sample multi-tenant office building in Paris. The traffic intensity data for this template was published by Dr Marja-Liisa Siikonen in *Elevator Technology 10, Proceedings of Elevcon 2000.*

An example of the resulting **Total Passenger Activity** graph is given below. For more information about **Total Passenger Activity** graphs, please refer to Chapter 13, **Simulation Results**.

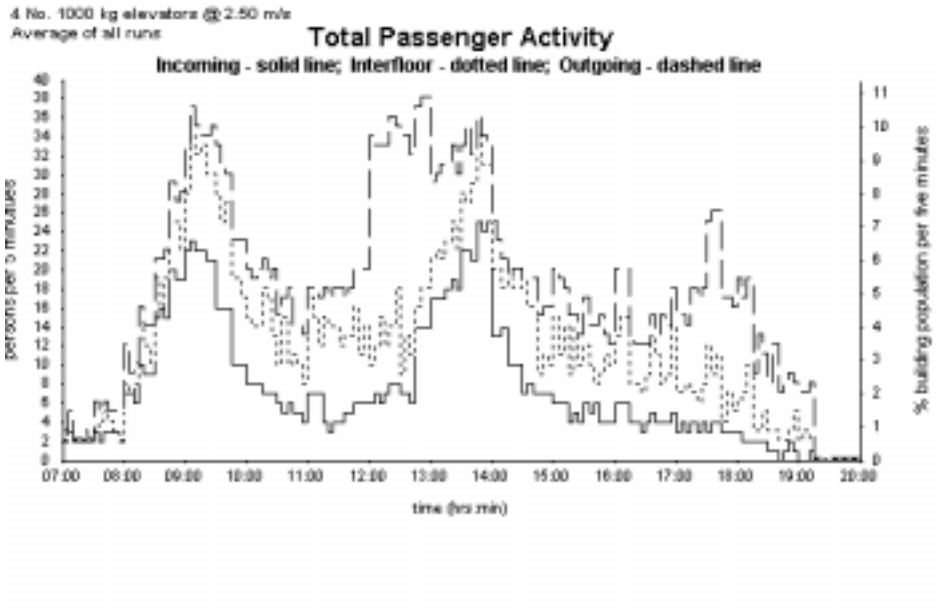


Figure A7 Example Passenger Demand profile for Siikonen full day template

Siikonen full day (24 hour) template

This is the same as **Siikonen full day template** except that the simulation runs for the full 24 hours rather than between 07:00 hrs. and 20:00 hrs.

Strakosch full day template

Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Elevate generates an example all day traffic profile based on the traffic profile presented by Mr George Strakosch in The Vertical Transportation Handbook. The profile is based on the requirements of a commercial office building.

An example of the resulting **Passenger Demand** graph is given below. For more information about **Passenger Demand** graphs, please refer to Chapter 13, **Simulation Results**.

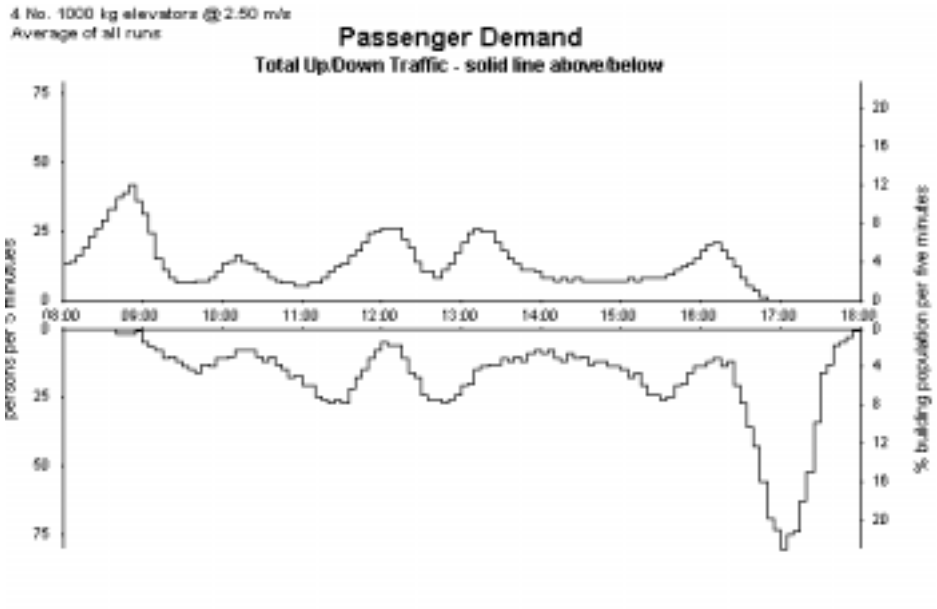


Figure A8 Example Passenger Demand profile for Strakosch full day template

Strakosch full day (24 hour) template

This is the same as Strakosch full day template except that the simulation runs for the full 24 hours rather than between 08:00 hrs. and 18:00 hrs.

CIBSE full day template

Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Elevate generates an example all day traffic profile based on the traffic profile presented by Dr Gina Barney in *CIBSE Guide D, Transportation Systems in buildings*. The profile is based on the requirements of an office building.

An example of the resulting **Passenger Demand** graph is given below. For more information about **Passenger Demand** graphs, please refer to Chapter 13, **Simulation Results**.

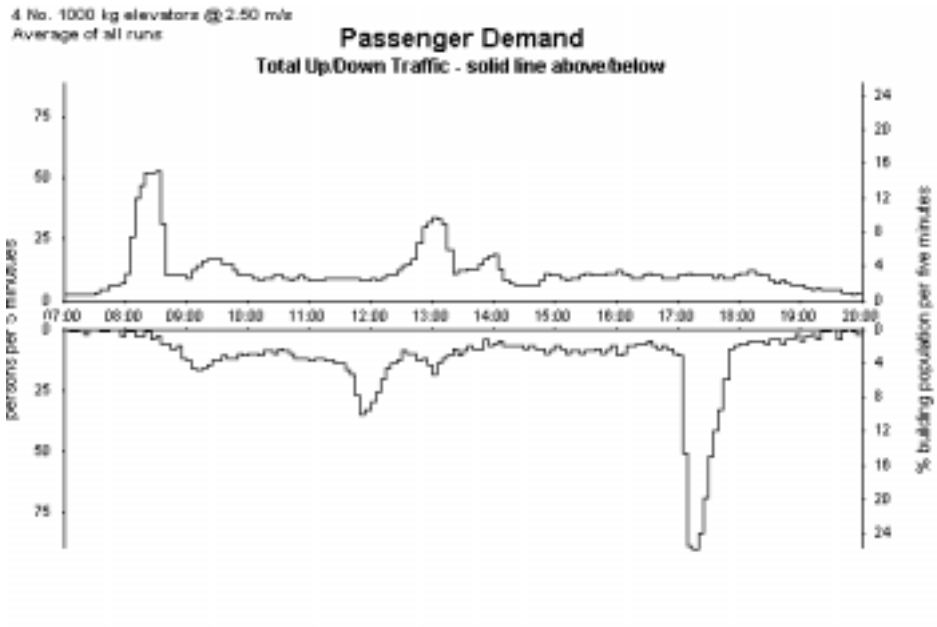


Figure A9 Example Passenger Demand profile for CIBSE full day templatee

CIBSE full day (24 hour) template

This is the same as CIBSE full day template except that the simulation runs for the full 24 hours rather than between 07:00 hrs. and 20:00 hrs.

Step profile

In this mode the table has two tabs. Select the **population** tab to enter details of the building population. The population of the home floor is required to be zero, and is greyed out.

Select the **arrival rate parameters** tab to define the parameters of the step profile. The traffic starts the simulation with the total 5 minutes handling capacity (as a percentage of the building population) at the **Minimum** level. The traffic increases in steps until it reaches the **Maximum** level. The **Time between steps** can be set, as well as the **Step** height.

The traffic can be split in three parts as follows.

% up the part of the arrival rate that corresponds to passengers arriving at the home floor, and travelling up the building (or down to any floors below the home floor).

% down the part of the arrival rate that corresponds to passengers arriving at floors above (or below) the home floor, and travelling to the home floor.

% interfloor the part of the arrival rate that corresponds to passengers travelling between floors other than the home floor.

An example of the resulting **Total Passenger Activity** graph is given below. For more information about **Total Passenger Activity** graphs, please refer to Chapter 13, **Simulation Results**.

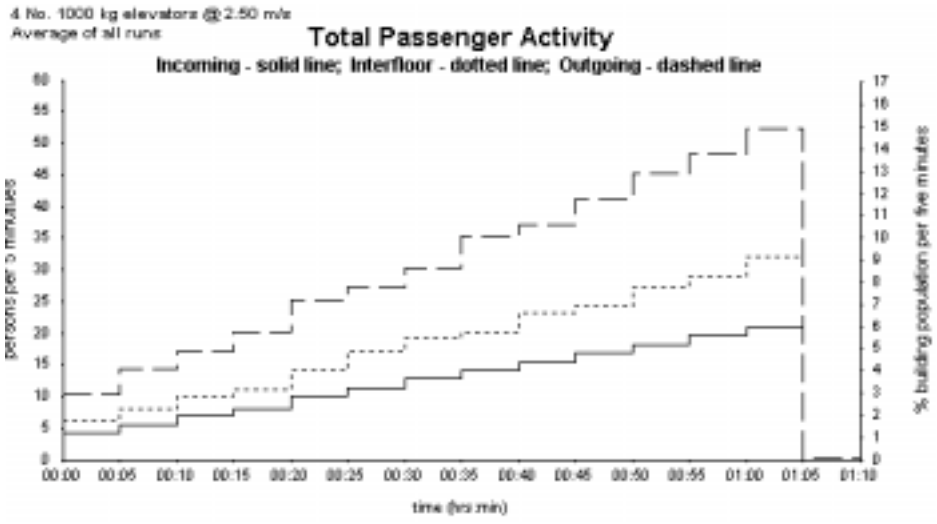


Figure A10 Example Passenger Demand profile for step profile

Examples

For additional examples, Please select **Elevate on the web** from the **Help** menu, while connected to the Internet.

EXAMPLE 1

Office Building Up Peak

Discussion

This example demonstrates the use of **Elevate** to analyse the morning incoming up peak in an office building. To load the Elevate document select **File, Open** and then **Example 1a.elv.** (If the file is not there, change the **Look in** drop down to point to the folder in which **Elevate** has been installed.) Repeat to open **Example 1b.elv, Example 1c.elv, and Example 1d.elv.**

The building under consideration has a ground floor plus 8 upper floors. The interfloor distance is 3.5m except for the ground floor, which is 5m high. The population is 80 persons per floor. A **Stair Factor** of 50% has been used to make an allowance for people using the stairs.

The client has specified a 5 minute handling capacity of 15%, and a maximum interval of 30 seconds.

Example 1a.elv shows the **Enhanced up peak Analysis type** being used to search a range of possible configurations to find a solution. The lowest specification to meet the design criteria is 4 No 1000 kg elevators @ 1.6 m/s.

Example 1b.elv shows that the **General analysis** gives very similar results for the same input.

If the **Analysis type** is **General analysis** or **Simulation**, you can analyse more complex scenarios:

Example 1c.elv shows the same building, but this time with a basement car park floor. The total handling capacity is still 15%, but some of the passengers are now arriving at the parking floor.

Example 1d is a **Simulation** of the previous example. The client can now be given an indication of passenger waiting and transit times. In this instance, the Group Collective dispatcher in Up peak 2 mode performs best.

Example 1e is a **Simulation** using Destination Dispatch. Note that in this example the average waiting time is longer than in 1d, but that the overall journey time is faster.

Example 1f is a **Simulation** based on the original example without a basement floor. An up peak profile is being applied such that the traffic starts quiet, rises to the peak for just five minutes, and then falls again. Note that the nominal peak is 15%, but that because of the stair factor, the “measured” passenger demand peaks below 15%.

ANALYSIS DATA

Analysis Type	Enhanced up peak calculation
Measurement system	Metric
Losses (%)	5.00

BUILDING DATA

Floor Name	*Floor Height (m)*
Ground	5.00
Level 1	3.50
Level 2	3.50
Level 3	3.50
Level 4	3.50
Level 5	3.50
Level 6	3.50
Level 7	3.50
Level 8	

ELEVATOR DATA

No of Elevators	SELECT	Min: 2	Max: 6
Capacity (kg)	SELECT	Min: 1000	Max: 1600
Door Pre-opening Time (s)	AUTO		
Door Open Time (s)	AUTO		
Door Close Time (s)	AUTO		
Speed (m/s)	SPECIFIED	1.60	
Acceleration (m/s²)	AUTO		
Jerk (m/s³)	AUTO		
Start Delay (s)	0.50		

PASSENGER DATA

Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Stair Factor (%)	50.00
Arrival Rate as	% building population in 5 mins

Floor Name	*No of people*	*Area (m²)*	*Area/person*	*Arrival Rate*
Ground				15.00
Level 1	80			
Level 2	80			
Level 3	80			
Level 4	80			
Level 5	80			
Level 6	80			
Level 7	80			
Level 8	80			

ENHANCED UP PEAK CALCULATION RESULTS (SUMMARY)

discarding results where interval is greater than 30.0s
discarding results where capacity factor is greater than 80.0s

No. of Elevators	*Speed (m/s)*	*Acceln (m/s²)*	*Jerk (m/s³)*	*Elevator Capacity (kg)*	*Door Type*	*Door Times Pre-Open,Open, Close (s)*	*Prob No of Stops*	*Highest Reversal Floor*	*Interval (s)*	*Capacity Factor (%)*
4	1.60	0.70	1.40	1000	CO 1100mm	0.00, 1.80, 2.90	5.0	7.6	26.3	56.7
4	1.60	0.70	1.40	1250	CO 1100mm	0.00, 1.80, 2.90	5.0	7.6	26.3	46.1
4	1.60	0.70	1.40	1600	CO 1100mm	0.00, 1.80, 2.90	5.0	7.6	26.3	35.2
5	1.60	0.70	1.40	1000	CO 1100mm	0.00, 1.80, 2.90	3.8	7.3	17.7	38.1
5	1.60	0.70	1.40	1250	CO 1100mm	0.00, 1.80, 2.90	3.8	7.3	17.7	31.0
5	1.60	0.70	1.40	1600	CO 1100mm	0.00, 1.80, 2.90	3.8	7.3	17.7	23.6
6	1.60	0.70	1.40	1000	CO 1100mm	0.00, 1.80, 2.90	3.0	6.9	12.7	27.4
6	1.60	0.70	1.40	1250	CO 1100mm	0.00, 1.80, 2.90	3.0	6.9	12.7	22.3
6	1.60	0.70	1.40	1600	CO 1100mm	0.00, 1.80, 2.90	3.0	6.9	12.7	17.0

ANALYSIS DATA

Analysis Type	General analysis
Measurement system	Metric
Losses (%)	5.00

BUILDING DATA

Floor Name	*Floor Height (m)*
Ground	5.00
Level 1	3.50
Level 2	3.50
Level 3	3.50
Level 4	3.50
Level 5	3.50
Level 6	3.50
Level 7	3.50
Level 8	

ELEVATOR DATA

No of Elevators	SPECIFIED	4
Capacity (kg)	SPECIFIED	1000
Door Pre-opening Time (s)	AUTO	
Door Open Time (s)	AUTO	
Door Close Time (s)	AUTO	
Speed (m/s)	SPECIFIED	1.60
Acceleration (m/s²)	AUTO	
Jerk (m/s³)	AUTO	
Start Delay (s)	0.50	
Home Floor	Ground	

PASSENGER DATA

Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Stair Factor (%)	50.00
Arrival Rate as	% building population in 5 mins

Floor Name	*No of people*	*Area (m²)*	*Area/person*	*Arrival Rate*
Ground	0			15.00
Level 1	80			0.00
Level 2	80			0.00
Level 3	80			0.00
Level 4	80			0.00
Level 5	80			0.00
Level 6	80			0.00
Level 7	80			0.00
Level 8	80			0.00

GENERAL ANALYSIS RESULTS (SUMMARY)

discarding results where interval is greater than 30.0s
discarding results where capacity factor is greater than 80.0s

No. of Elevators	*Speed (m/s)*	*Acceln (m/s²)*	*Jerk (m/s³)*	*Elevator Capacity (kg)*	*Door Type*	*Door Times Pre-Open,Open, Close (s)*	*Prob No of Stops*	*Lowest Reversal Floor*	*Highest Reversal Floor*	*Interval (s)*	*Capacity Factor (%)*
4	1.60	0.70	1.40	1000	CO 1100mm	0.00, 1.80, 2.90	5.7	1.0	8.4	25.3	54.5

ANALYSIS DATA

Analysis Type	General analysis
Measurement system	Metric
Losses (%)	5.00

BUILDING DATA

Floor Name	*Floor Height (m)*
Car Park	3.30
Ground	5.00
Level 1	3.50
Level 2	3.50
Level 3	3.50
Level 4	3.50
Level 5	3.50
Level 6	3.50
Level 7	3.50
Level 8	

ELEVATOR DATA

No of Elevators	SPECIFIED	4
Capacity (kg)	SPECIFIED	1000
Door Pre-opening Time (s)	AUTO	
Door Open Time (s)	AUTO	
Door Close Time (s)	AUTO	
Speed (m/s)	SPECIFIED	1.60
Acceleration (m/s²)	AUTO	
Jerk (m/s³)	AUTO	
Start Delay (s)	0.50	
Home Floor	Ground	

PASSENGER DATA

Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Stair Factor (%)	50.00
Arrival Rate as	% building population in 5 mins

Floor Name	*No of people*	*Area (m²)*	*Area/person*	*Arrival Rate*
Car Park	0			1.00
Ground	0			14.00
Level 1	80			0.00
Level 2	80			0.00
Level 3	80			0.00
Level 4	80			0.00
Level 5	80			0.00
Level 6	80			0.00
Level 7	80			0.00
Level 8	80			0.00

GENERAL ANALYSIS RESULTS (SUMMARY)

No. of Elevators	*Speed (m/s)*	*Acceln (m/s²)*	*Jerk (m/s³)*	*Elevator Capacity (kg)*	*Door Type*	*Door Times Pre-Open,Open, Close (s)*	*Prob No of Stops*	*Lowest Reversal Floor*	*Highest Reversal Floor*	*Interval (s)*	*Capacity Factor (%)*
4	1.60	0.70	1.40	1000	CO 1100mm	0.00, 1.80, 2.90	6.4	1.6	9.5	27.9	60.2

ELEVATE

Elevate Version 6.01

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Up peak 2
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
Random number seed for passenger generator	1

BUILDING DATA

Floor Name	*Floor Height (m)*
Car Park	3.30
Ground	5.00
Level 1	3.50
Level 2	3.50
Level 3	3.50
Level 4	3.50
Level 5	3.50
Level 6	3.50
Level 7	3.50
Level 8	

ELEVATOR DATA

No of Elevators	4
Capacity (kg)	1000
Door Pre-opening Time (s)	0.00
Door Open Time (s)	1.80
Door Close Time (s)	2.90
Speed (m/s)	1.60
Acceleration (m/s²)	0.70
Jerk (m/s³)	1.40
Start Delay (s)	0.50
Home Floor	Ground

PASSENGER DATA

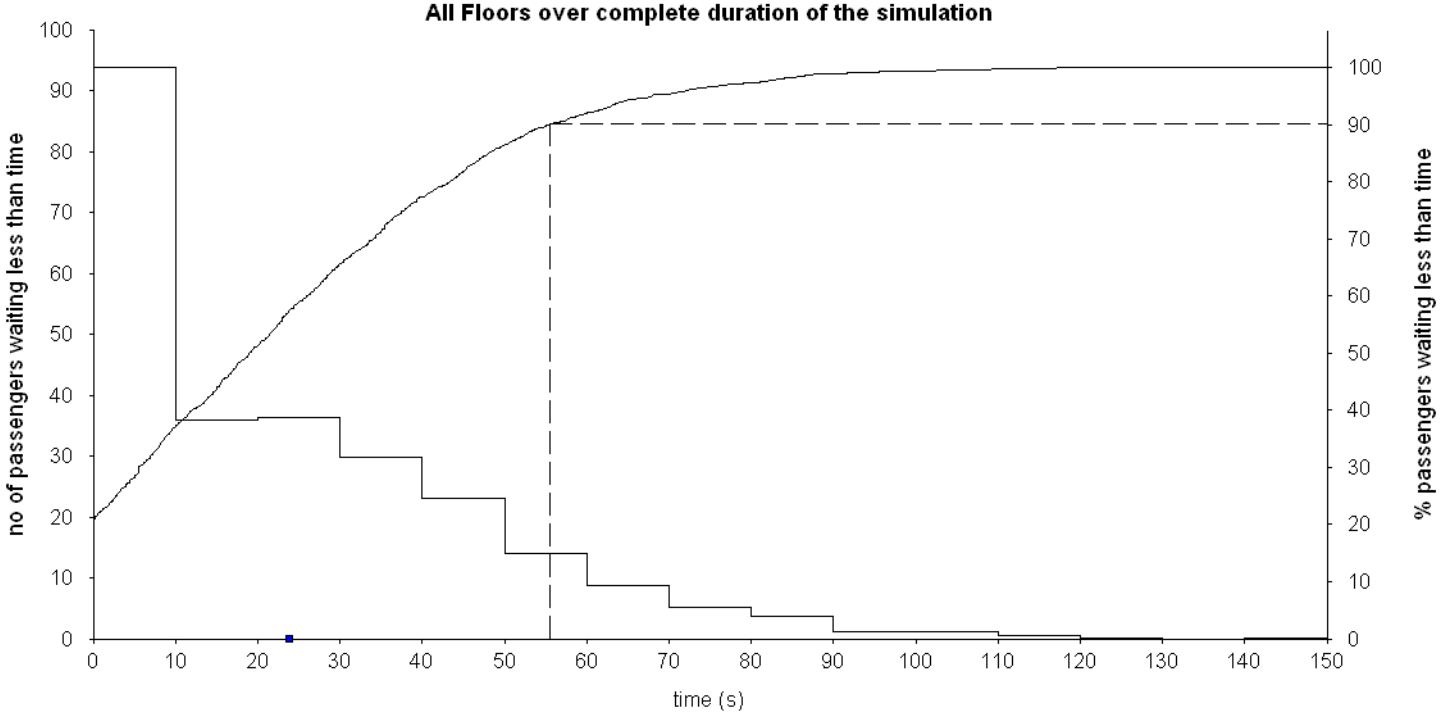
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	50.00
Start Time (hrs:mins)	09:00
End Time (hrs:mins)	09:15
Arrival Rate as	% building population in 5 mins

Floor Name	*No of people*	*Area (m²)*	*Area/person*	*Arrival Rate*
Car Park	0			1.00
Ground	0			14.00
Level 1	80			0.00
Level 2	80			0.00
Level 3	80			0.00
Level 4	80			0.00
Level 5	80			0.00
Level 6	80			0.00
Level 7	80			0.00
Level 8	80			0.00

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

Distribution of Passenger Waiting Times

All Floors over complete duration of the simulation

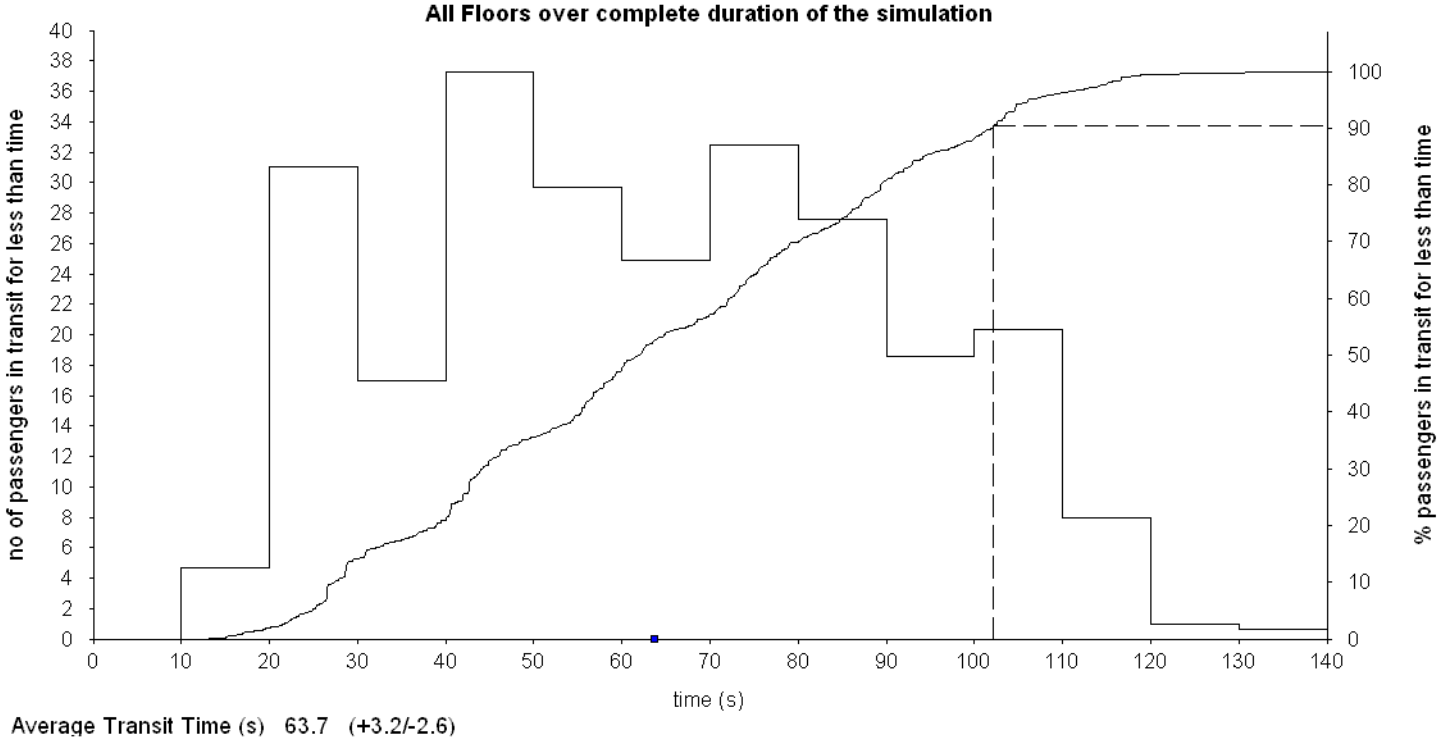


Average Waiting Time (s) 23.9 (+13.1/-9.4)
Longest Waiting Time (s) 92.6 (+55.6/-29.8)

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

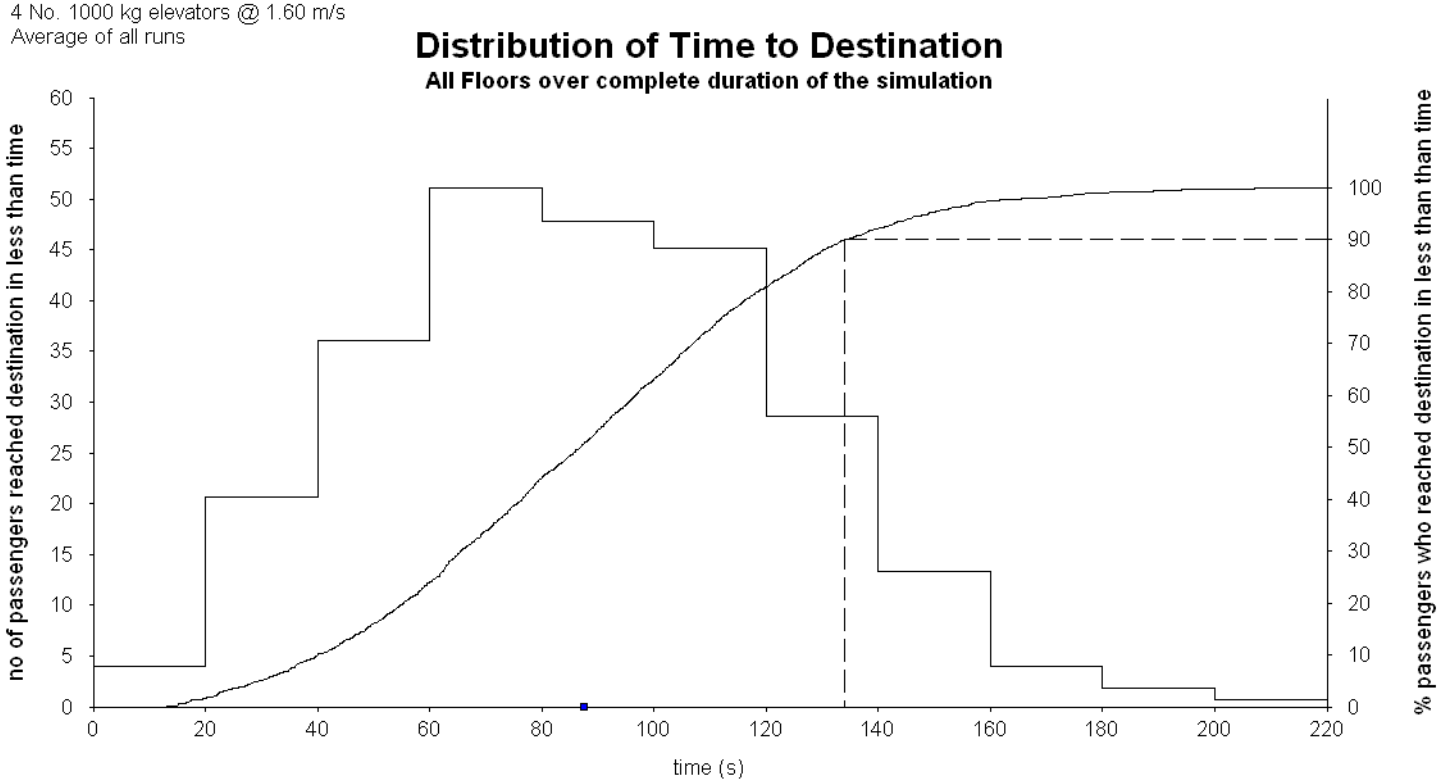
Distribution of Passenger Transit Times

All Floors over complete duration of the simulation



Average Transit Time (s) 63.7 (+3.2/-2.6)
Longest Transit Time (s) 128.0 (+9.1/-11.5)

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs



Average Time To Destination (s) 87.6 (+13.5/-12.0)
Longest Time to Destination (s) 186.0 (+26.6/-28.1)

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Destination Dispatch (ACA)
Cost Function	Minimum journey time
Reduction in number of stops penalty	0.0
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
Random number seed for passenger generator	1

BUILDING DATA

Floor Name	*Floor Height (m)*
Car Park	3.30
Ground	5.00
Level 1	3.50
Level 2	3.50
Level 3	3.50
Level 4	3.50
Level 5	3.50
Level 6	3.50
Level 7	3.50
Level 8	

ELEVATOR DATA

No of Elevators	4
Capacity (kg)	1000
Door Pre-opening Time (s)	0.00
Door Open Time (s)	1.80
Door Close Time (s)	2.90
Speed (m/s)	1.60
Acceleration (m/s²)	0.70
Jerk (m/s³)	1.40
Start Delay (s)	0.50
Home Floor	Ground

PASSENGER DATA

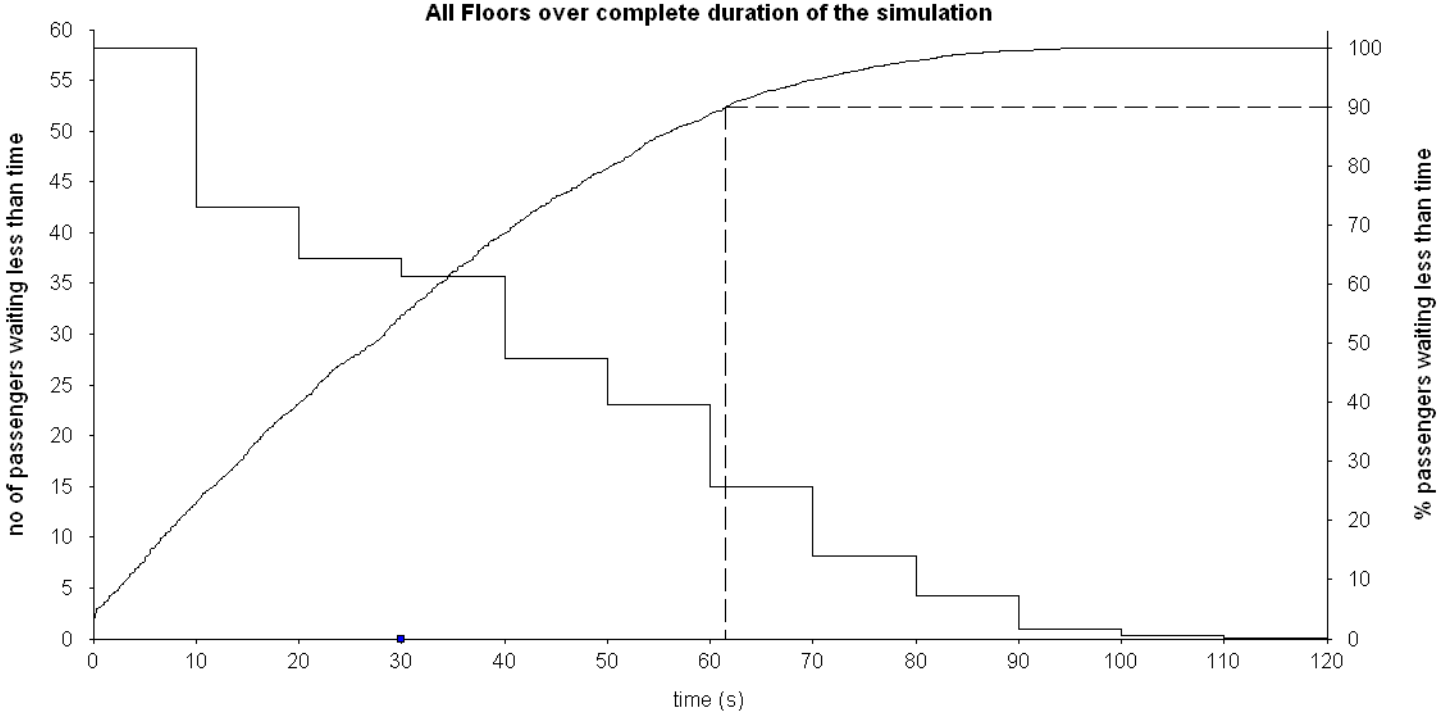
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	50.00
Start Time (hrs:mins)	09:00
End Time (hrs:mins)	09:15
Arrival Rate as	% building population in 5 mins

Floor Name	*No of people*	*Area (m²)*	*Area/person*	*Arrival Rate*
Car Park	0			1.00
Ground	0			14.00
Level 1	80			0.00
Level 2	80			0.00
Level 3	80			0.00
Level 4	80			0.00
Level 5	80			0.00
Level 6	80			0.00
Level 7	80			0.00
Level 8	80			0.00

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

Distribution of Passenger Waiting Times

All Floors over complete duration of the simulation

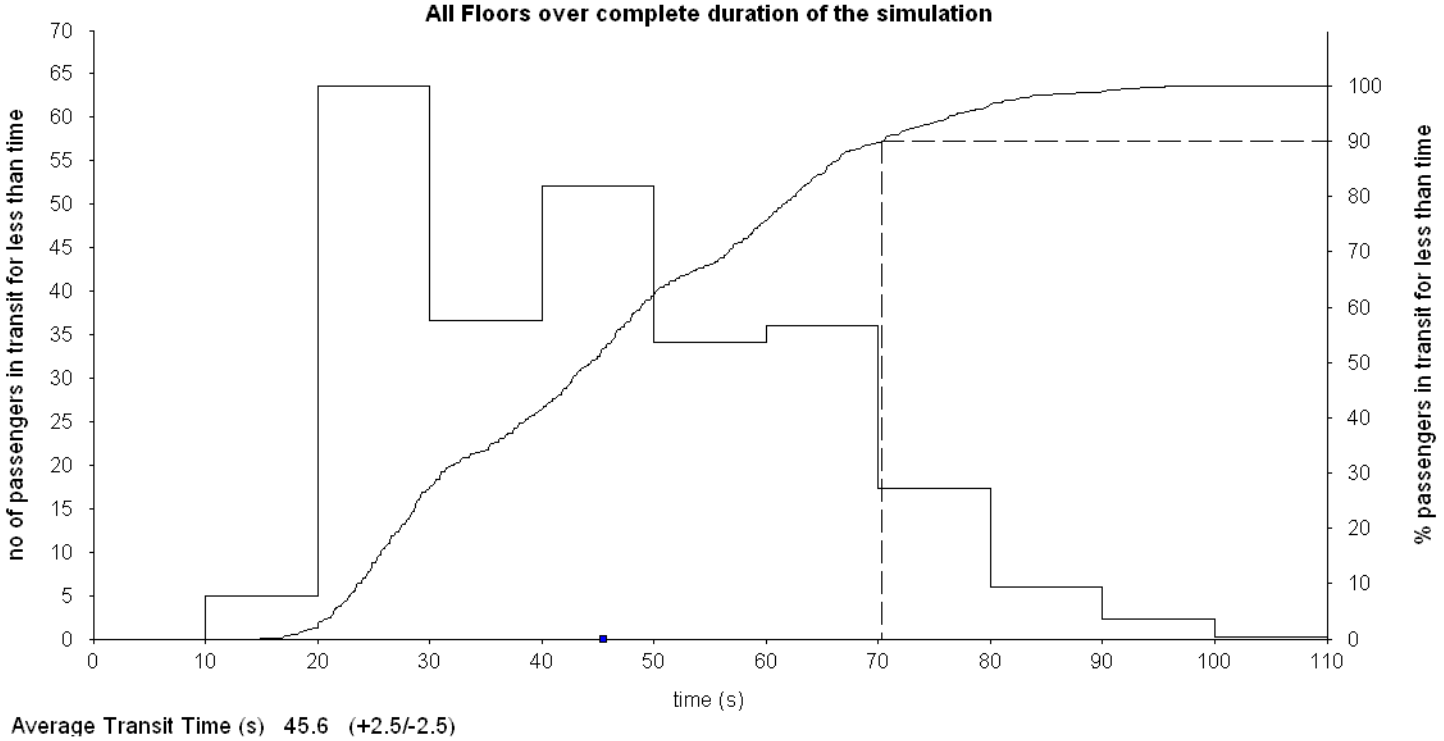


Average Waiting Time (s) 30.0 (+2.7/-3.3)
Longest Waiting Time (s) 92.3 (+18.4/-16.5)

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

Distribution of Passenger Transit Times

All Floors over complete duration of the simulation

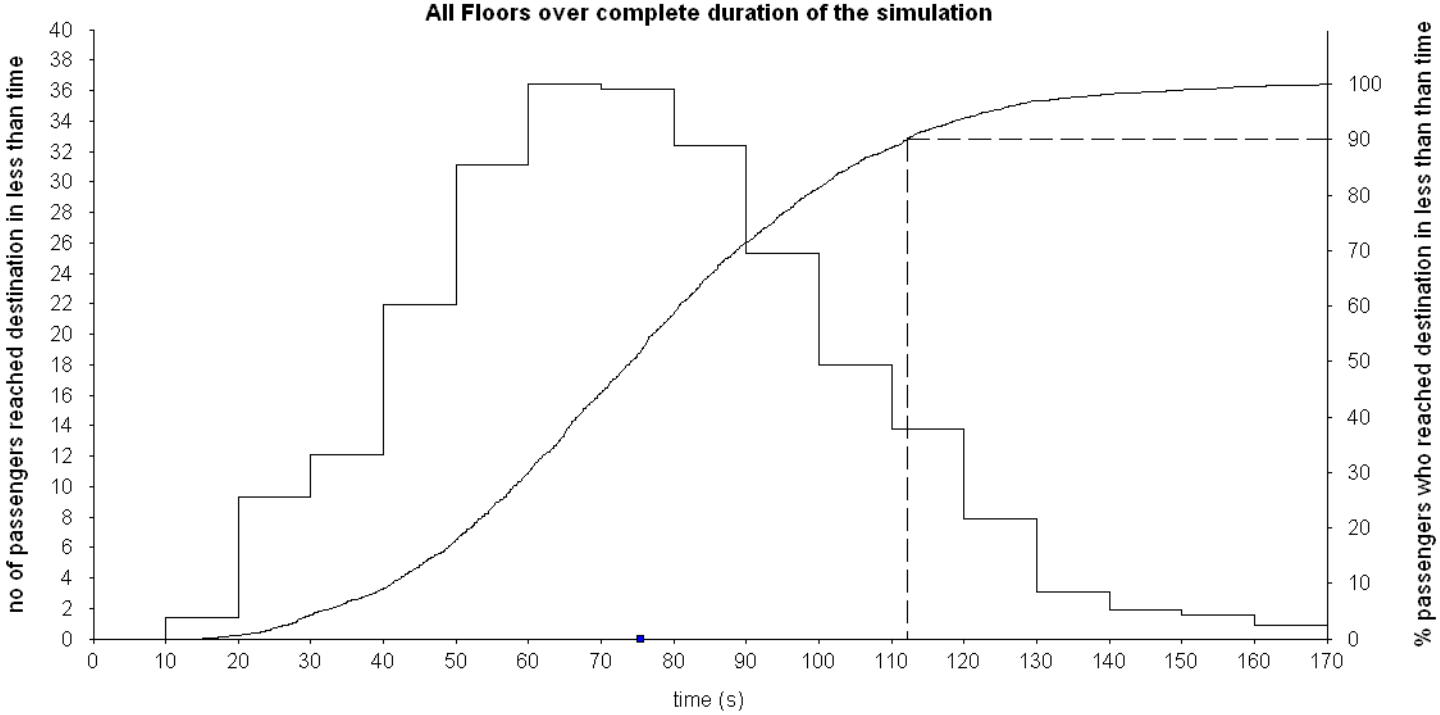


Average Transit Time (s) 45.6 (+2.5/-2.5)
Longest Transit Time (s) 93.9 (+10.8/-6.0)

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

Distribution of Time to Destination

All Floors over complete duration of the simulation



Average Time To Destination (s) 75.6 (+5.2/-5.7)
Longest Time to Destination (s) 159.2 (+10.5/-11.1)

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Up peak 1
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
Random number seed for passenger generator	1

BUILDING DATA

Floor Name	*Floor Height (m)*
Ground	5.00
Level 1	3.50
Level 2	3.50
Level 3	3.50
Level 4	3.50
Level 5	3.50
Level 6	3.50
Level 7	3.50
Level 8	

ELEVATOR DATA

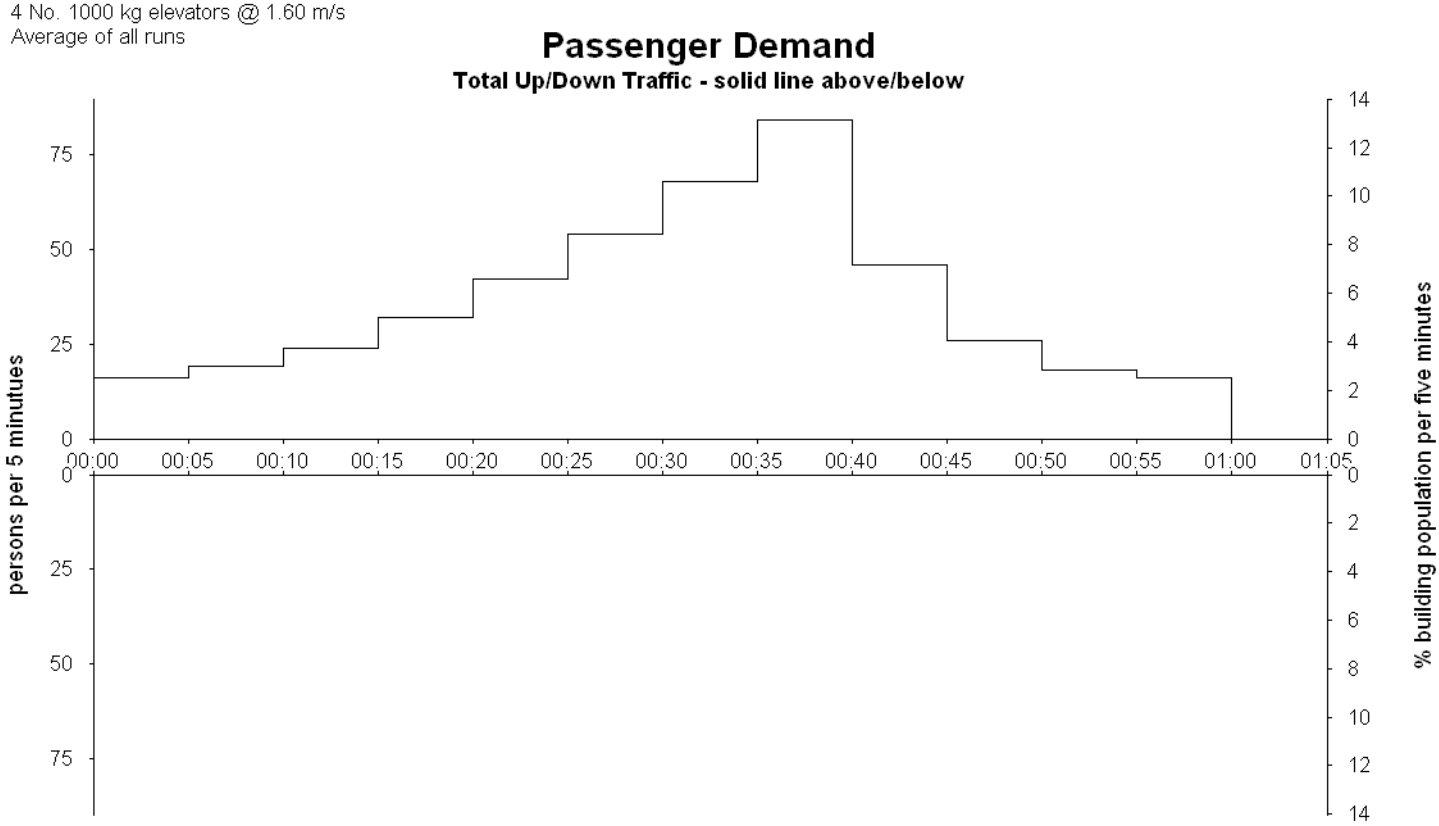
No of Elevators	4
Capacity (kg)	1000
Door Pre-opening Time (s)	0.00
Door Open Time (s)	1.80
Door Close Time (s)	2.90
Speed (m/s)	1.60
Acceleration (m/s²)	0.70
Jerk (m/s³)	1.40
Start Delay (s)	0.50
Home Floor	Ground

PASSENGER DATA

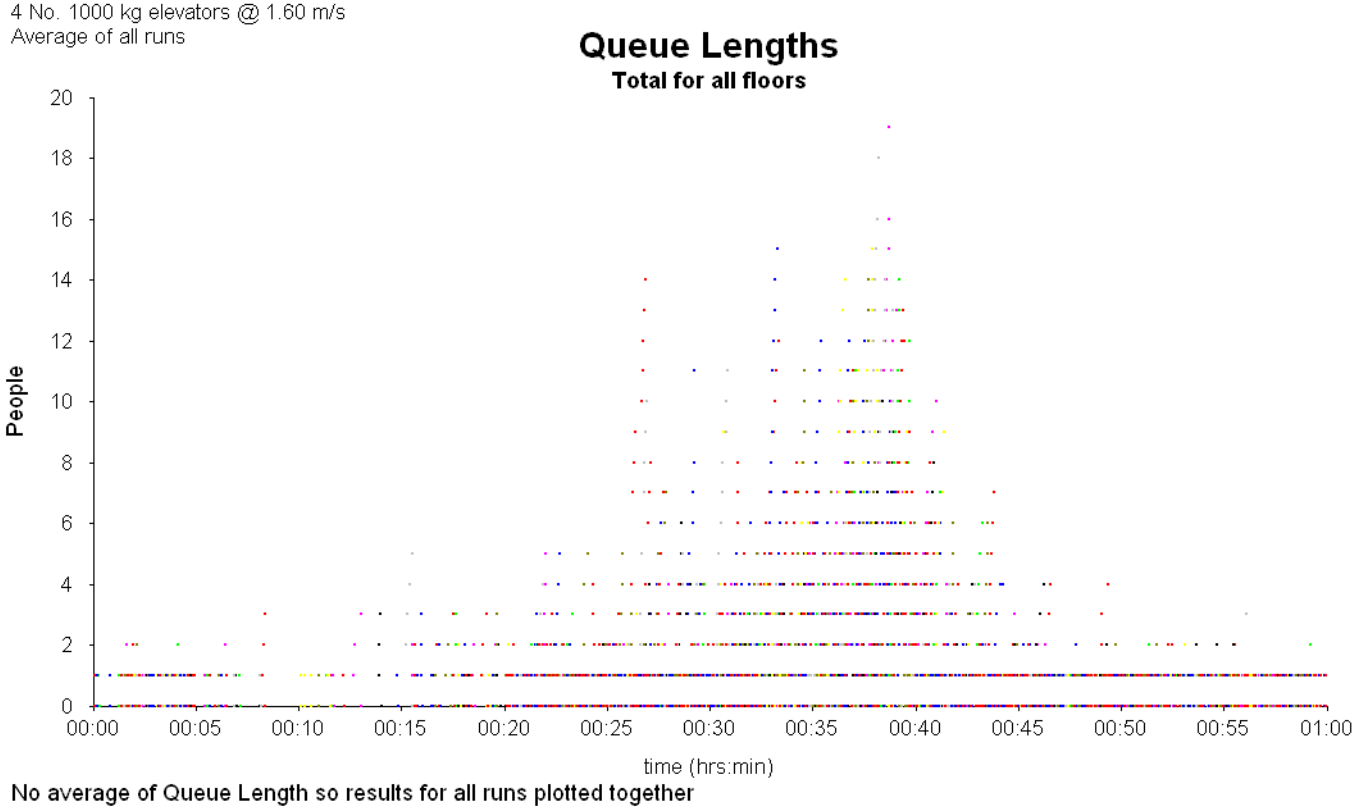
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	50.00
Arrival Rate as	Barney one hour up peak template with peak 15.0 % building pop/5min handling capacity

Floor Name	*No of people*	*Area (m²)*	*Area/person*
Ground	0		
Level 1	80		
Level 2	80		
Level 3	80		
Level 4	80		
Level 5	80		
Level 6	80		
Level 7	80		
Level 8	80		

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs



4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

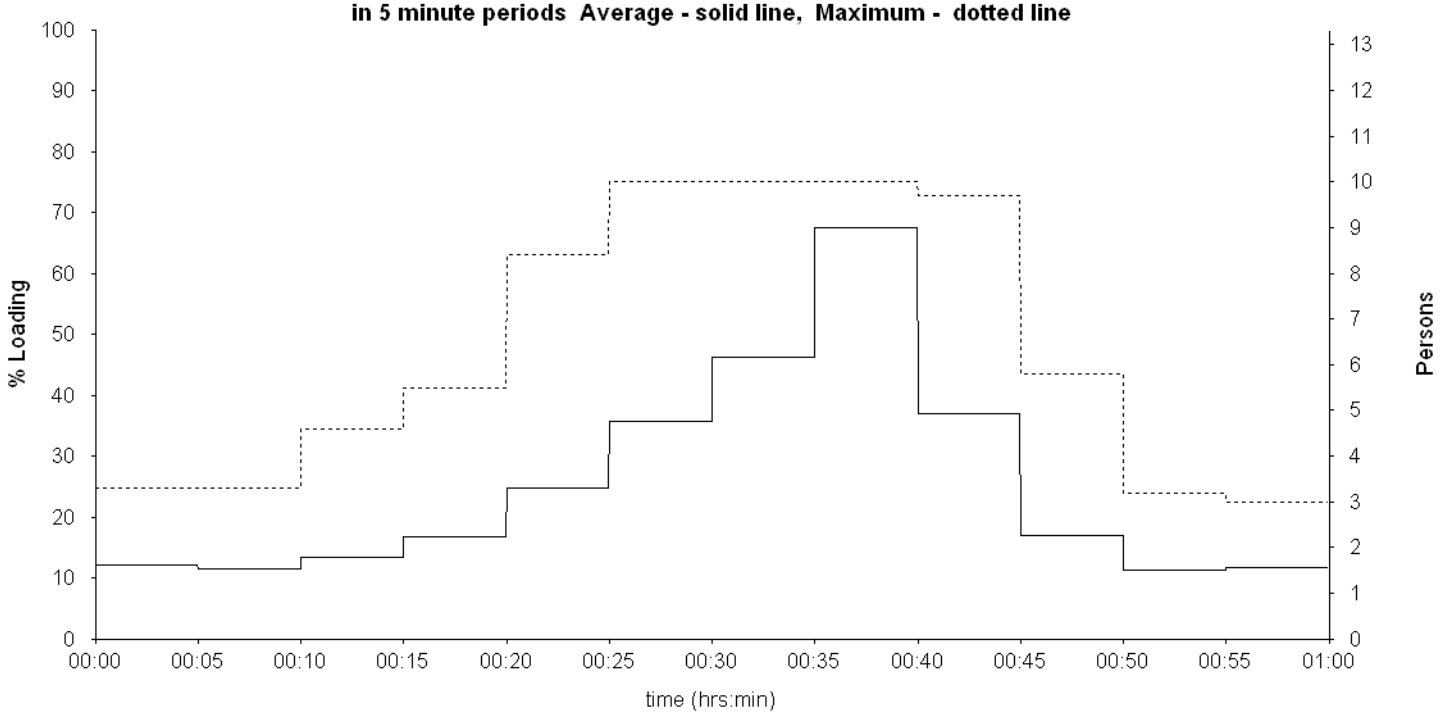


No average of Queue Length so results for all runs plotted together

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

Car Loading on Departure from Home Floor

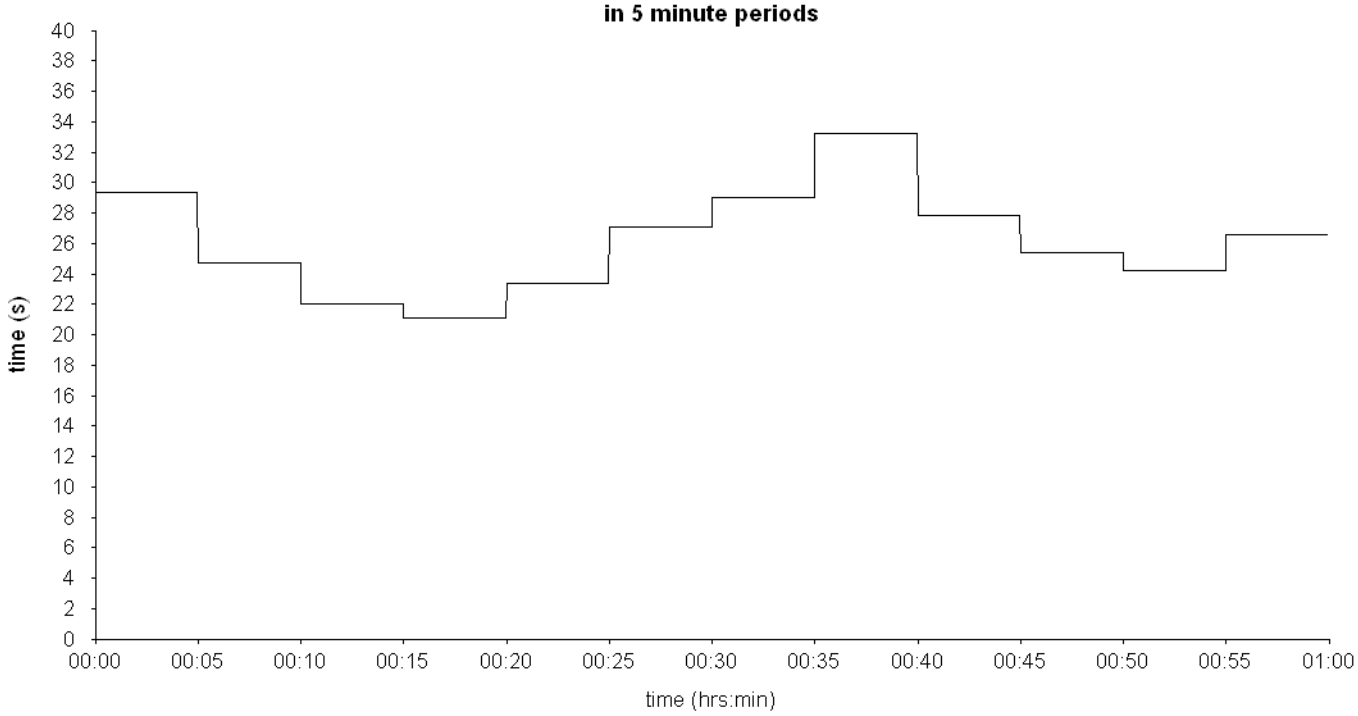
in 5 minute periods Average - solid line, Maximum - dotted line



4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

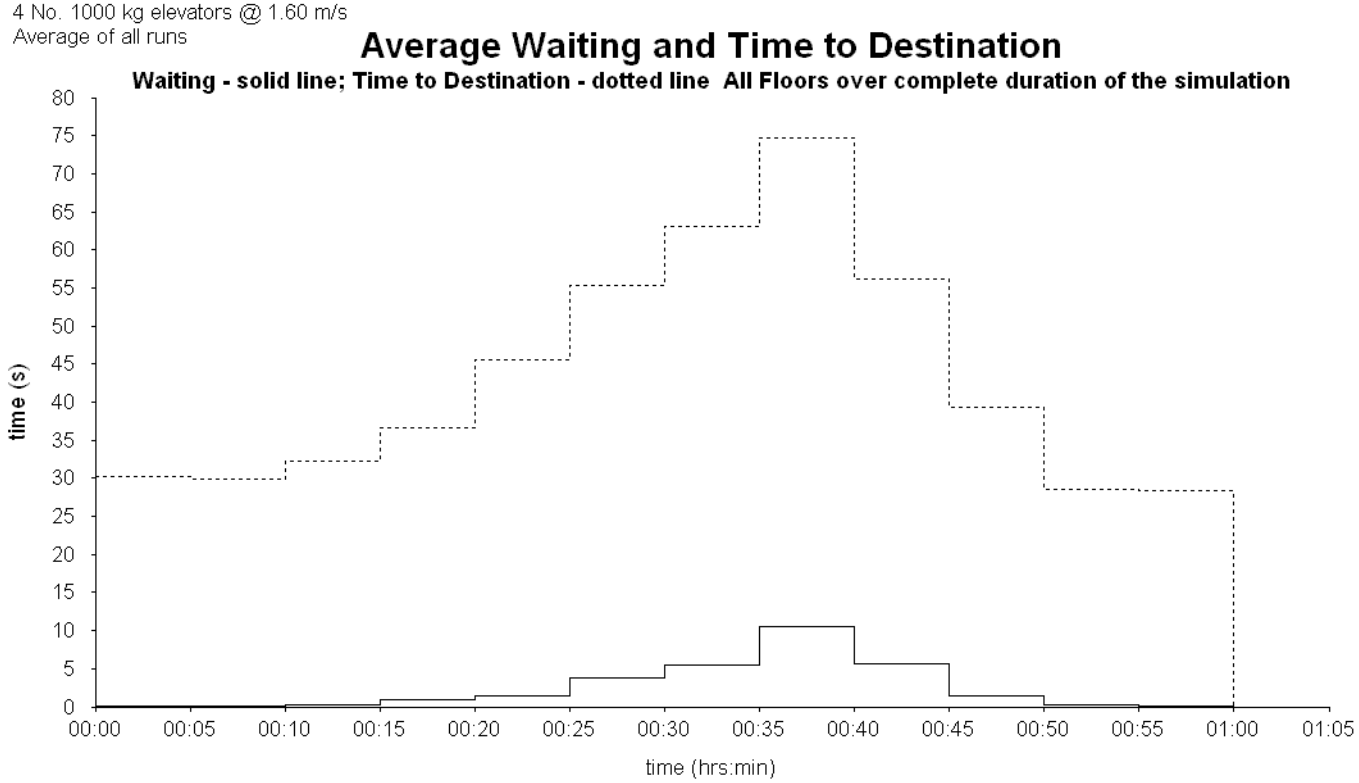
Dispatch Interval from Home Floor

in 5 minute periods



Average Interval 25.4 s (+1.3/-2.1)

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs



EXAMPLE 2

Office Building Lunch Peak

Discussion

This example demonstrates the use of **Elevate** to analyse the lunch time peak in an office building. To load the Elevate document select **File, Open** and then **Example 2a.elv.** (If the file is not there, change the **Look in** drop down to point to the folder in which **Elevate** has been installed.) Repeat to open **Example 2b.elv**.

The required handling capacity is 15% of the building population per 5 minutes. This traffic is slit into three parts: 40% up the building, 4% down the building, and 20% travelling interfloor.

Example 2a provides an analysis of the traffic using the **General analysis**. The **General analysis** is a round trip time calculation, so calculates results including the **Interval**.

Example 2b provides an analysis using **Simulation**. Calculated results include **Average Passenger Waiting Time** and **Average Passenger Transit Time**.

If, for example, there was a staff canteen on the top floor the traffic flow would be more complex, but could still be entered into **Elevate** using arrival rates and destination probabilities.

ELEVATE

Elevate Version 6.01

ANALYSIS DATA

Analysis Type	General analysis
Measurement system	Metric
Losses (%)	5.00

BUILDING DATA

Floor Name	*Floor Height (m)*
Ground	5.00
Level 1	3.50
Level 2	3.50
Level 3	3.50
Level 4	3.50
Level 5	3.50
Level 6	3.50
Level 7	3.50
Level 8	

ELEVATOR DATA

No of Elevators	4
Capacity (kg)	1000
Door Pre-opening Time (s)	0.00
Door Open Time (s)	1.80
Door Close Time (s)	2.90
Speed (m/s)	1.60
Acceleration (m/s²)	0.70
Jerk (m/s³)	1.40
Start Delay (s)	0.50
Home Floor	Ground

Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Stair Factor (%)	50.00

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Ground (%)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*
Ground	38.40	0.00	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
Level 1	7.20	66.67	0.00	4.76	4.76	4.76	4.76	4.76	4.76	4.76
Level 2	7.20	66.67	4.76	0.00	4.76	4.76	4.76	4.76	4.76	4.76
Level 3	7.20	66.67	4.76	4.76	0.00	4.76	4.76	4.76	4.76	4.76
Level 4	7.20	66.67	4.76	4.76	4.76	0.00	4.76	4.76	4.76	4.76
Level 5	7.20	66.67	4.76	4.76	4.76	4.76	0.00	4.76	4.76	4.76
Level 6	7.20	66.67	4.76	4.76	4.76	4.76	4.76	0.00	4.76	4.76
Level 7	7.20	66.67	4.76	4.76	4.76	4.76	4.76	4.76	0.00	4.76
Level 8	7.20	66.67	4.76	4.76	4.76	4.76	4.76	4.76	4.76	0.00

GENERAL ANALYSIS RESULTS (4 No. 1000 kg elevators @ 1.60 m/s)

Main Results

Interval (s)	32.8
Capacity Factor (%)	28.3

Additional Results

Car Capacity (persons)	13
No of Stops (including Home Floor)	8.5
Lowest Reversal Floor (where 1 = lowest floor)	1.0
Highest Reversal Floor (where 1 = lowest floor)	8.7
Average Passenger Transfer Time (s)	1.2
Distance Between Reversal Floors, Excluding Express (m)	28.5
Express Zone Distance (m)	0.0
Time Consumed When Stopping (s)	8.0
Round Trip Time (s)	131.3

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	ETA Traffic mode: Normal
Early car announcement	No
Load bypass (%)	Yes
Load bypass threshold (%)	65.0
Coincident call bonus (s)	10.0
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
Random number seed for passenger generator	1

BUILDING DATA

Floor Name	*Floor Height (m)*
Ground	5.00
Level 1	3.50
Level 2	3.50
Level 3	3.50
Level 4	3.50
Level 5	3.50
Level 6	3.50
Level 7	3.50
Level 8	

ELEVATOR DATA

No of Elevators	4
Capacity (kg)	1000
Door Pre-opening Time (s)	0.00
Door Open Time (s)	1.80
Door Close Time (s)	2.90
Speed (m/s)	1.60
Acceleration (m/s²)	0.70
Jerk (m/s³)	1.40
Start Delay (s)	0.50
Home Floor	Ground

PASSENGER DATA

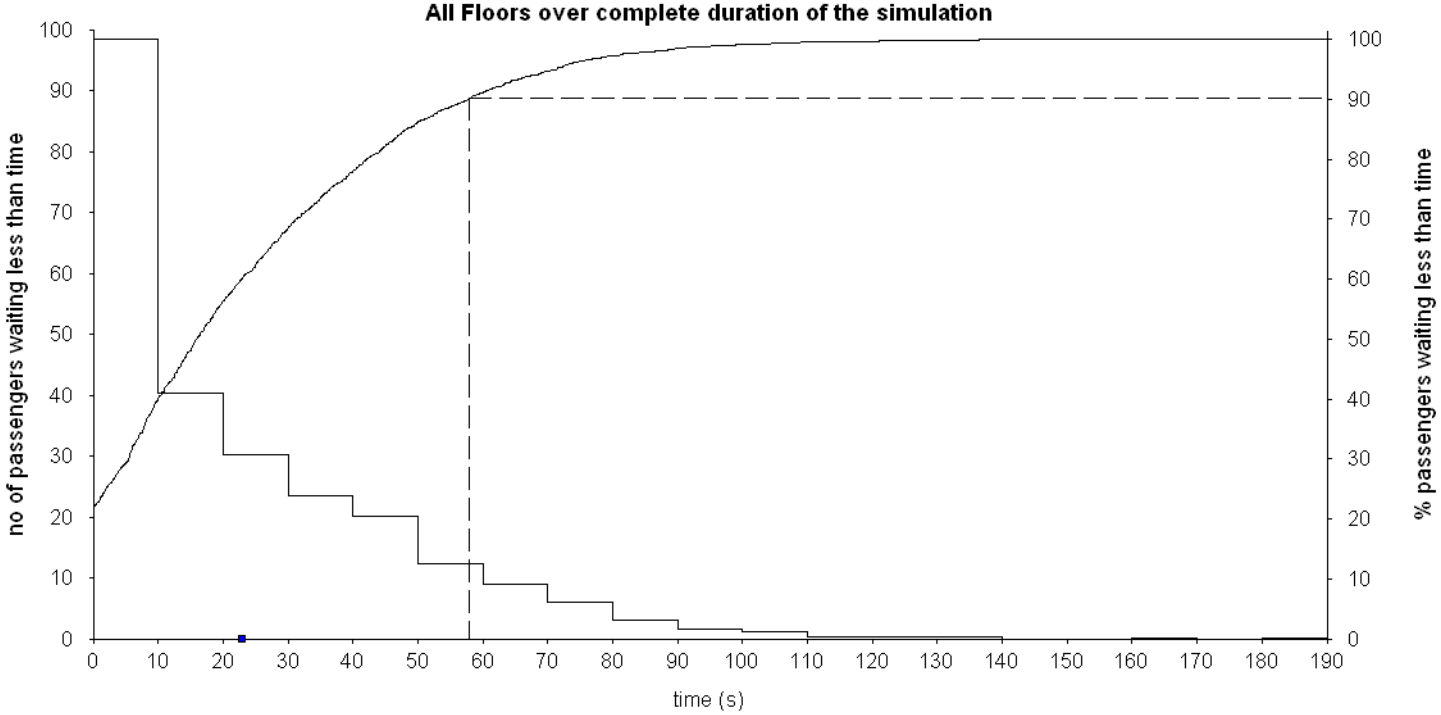
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	50.00
Start Time (hrs:mins)	09:00
End Time (hrs:mins)	09:15
Arrival Rate as	15.0 % building pop/5min with split 40.0 %up, 40.0 %down, 20.0 %interfloor

Floor Name	*No of people*	*Area (m²)*	*Area/person*
Ground	0		
Level 1	80		
Level 2	80		
Level 3	80		
Level 4	80		
Level 5	80		
Level 6	80		
Level 7	80		
Level 8	80		

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

Distribution of Passenger Waiting Times

All Floors over complete duration of the simulation

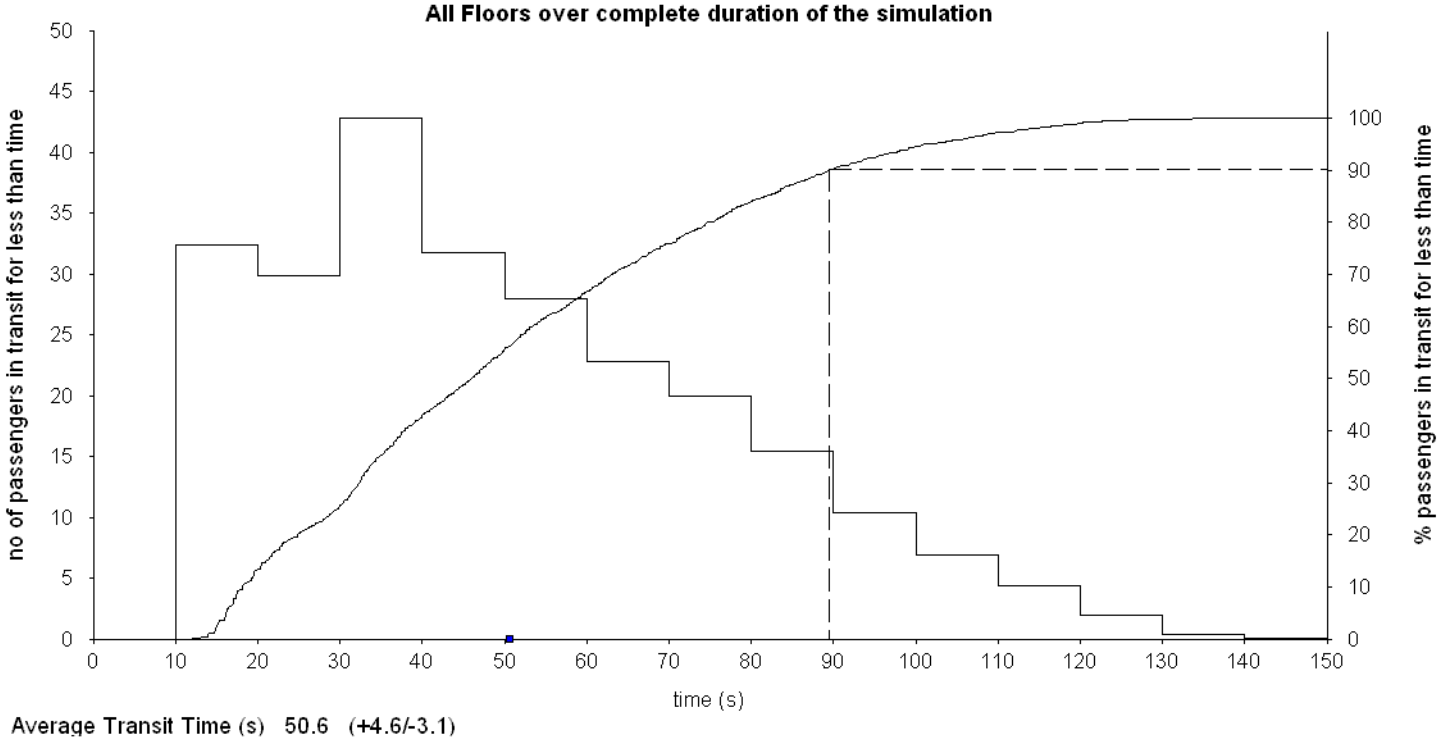


Average Waiting Time (s) 23.1 (+8.5/-4.3)
Longest Waiting Time (s) 116.5 (+67.5/-29.9)

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

Distribution of Passenger Transit Times

All Floors over complete duration of the simulation

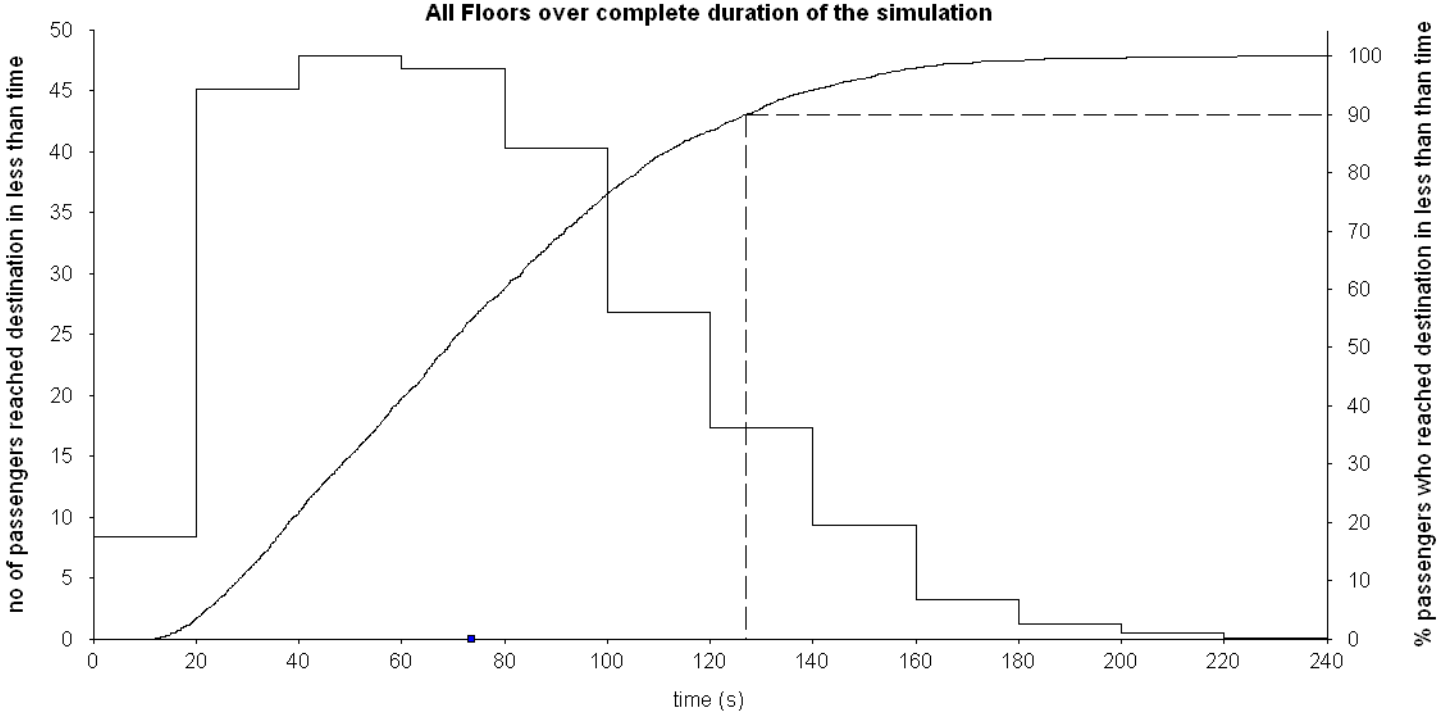


Average Transit Time (s) 50.6 (+4.6/-3.1)
Longest Transit Time (s) 129.9 (+11.2/-9.9)

4 No. 1000 kg elevators @ 1.60 m/s
Average of all runs

Distribution of Time to Destination

All Floors over complete duration of the simulation



Average Time To Destination (s) 73.7 (+13.1/-4.4)
Longest Time to Destination (s) 185.8 (+36.7/-25.2)

EXAMPLE 3

Shopping Centre with Car Park

Discussion

This example demonstrates the use of **Elevate's** simulation to analyse a shopping centre. To load the Elevate document select **File, Open** and then **Example 3.elv.** (If the file is not there, change the **Look in** drop down to point to the folder in which **Elevate** has been installed.)

Elevator Data Advanced mode has been used to specify larger door dwell times than the defaults used in **Standard** mode.

The shopping centre elevators are used by different types of passenger. Using the **Advanced** mode of **Passenger Data**, **Elevate** has been used to define:

- standard adult passengers (**Period 1**)
- adult passengers with child in pram/buggy (**Period 2**)

The later type of passenger takes more elevator capacity (represented by a 150 kg passenger mass), and will take longer to load than a standard passenger.

In this instance both **Period 1** and **Period 2** start and finish at the same time as the different types of passengers are using the elevator at the same time. Please see **Example 5** for use of periods which start and stop at different times.

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Normal
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
Random number seed for passenger generator	1

BUILDING DATA

Floor Name	*Floor Height (m)*
Mall 1	3.80
Mall 2	3.80
Mall 3	3.80
Park 1	3.80
Park 2	

ELEVATOR DATA

	Car 1	*Car 2*	*Car 3*	*Car 4*
Capacity (kg)	1600	1600	1600	1600
Speed (m/s)	1.00	1.00	1.00	1.00
Acceleration (m/s²)	0.40	0.40	0.40	0.40
Jerk (m/s³)	0.80	0.80	0.80	0.80
Home Floor	Mall 1	Mall 1	Mall 1	Mall 1
Start Delay (s)	0.50	0.50	0.50	0.50
Door Pre-opening Time (s)	0.00	0.00	0.00	0.00
Door Open Time (s)	1.80	1.80	1.80	1.80
Door Close Time (s)	2.90	2.90	2.90	2.90
Door Dwell 1 (s)	6.00	6.00	6.00	6.00
Door Dwell 2 (s)	3.00	3.00	3.00	3.00

Floors served	*Car 1*	*Car 2*	*Car 3*	*Car 4*
Mall 1	Yes	Yes	Yes	Yes
Mall 2	Yes	Yes	Yes	Yes
Mall 3	Yes	Yes	Yes	Yes
Park 1	Yes	Yes	Yes	Yes
Park 2	Yes	Yes	Yes	Yes

Period 1

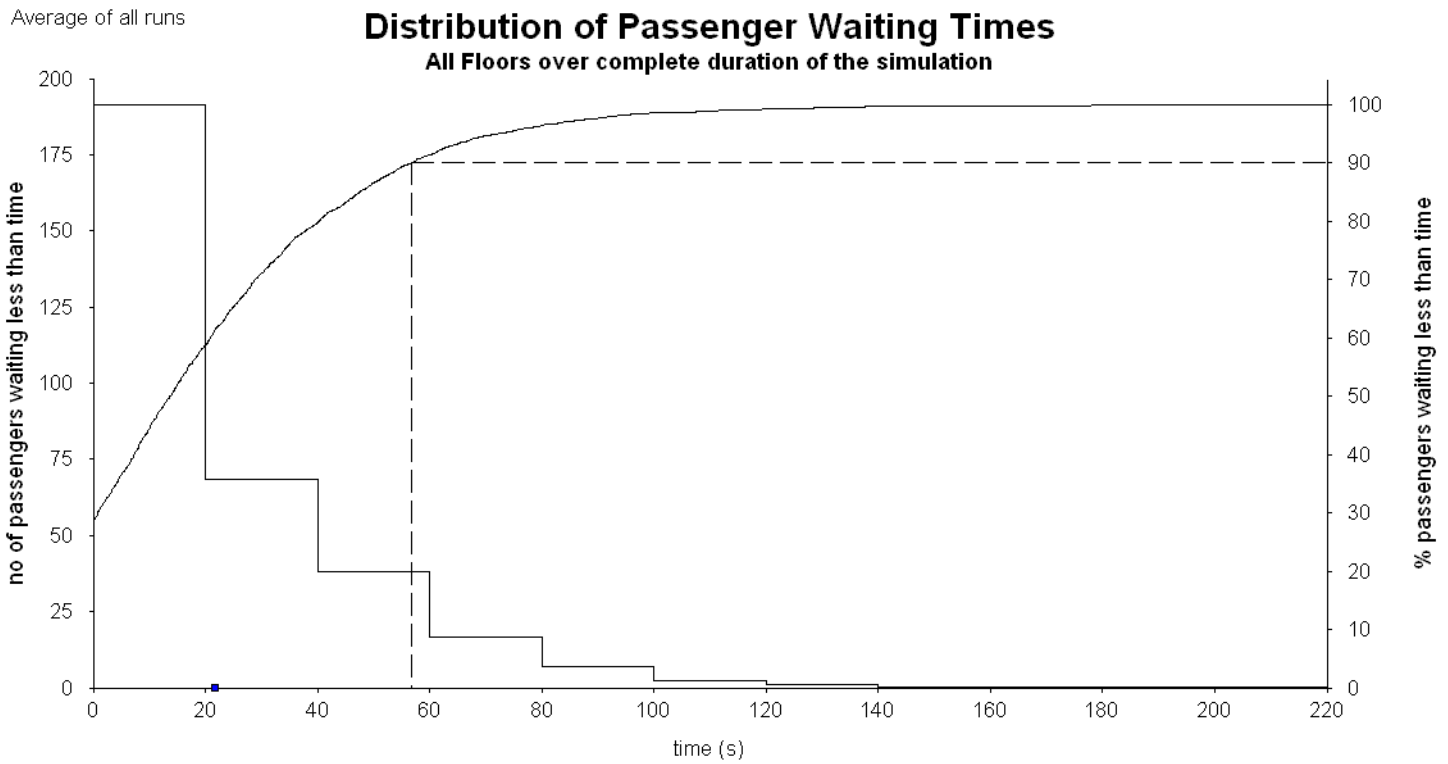
Start Time	0:00
End Time	0:15
Loading Time (s)	1.50
Unloading Time (s)	1.50
Passenger Mass (kg)	75
Capacity Factor (%)	60.00
Stair Factor (%)	30.00
Notes	Passengers

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Mall 1 (%)*	*Dest. Prob Mall 2 (%)*	*Dest. Prob Mall 3 (%)*	*Dest. Prob Park 1 (%)*	*Dest. Prob Park 2 (%)*
Mall 1	20.00	0.00	25.00	25.00	25.00	25.00
Mall 2	20.00	25.00	0.00	25.00	25.00	25.00
Mall 3	20.00	25.00	25.00	0.00	25.00	25.00
Park 1	15.00	33.30	33.30	33.30	0.00	0.00
Park 2	15.00	33.30	33.30	33.30	0.00	0.00

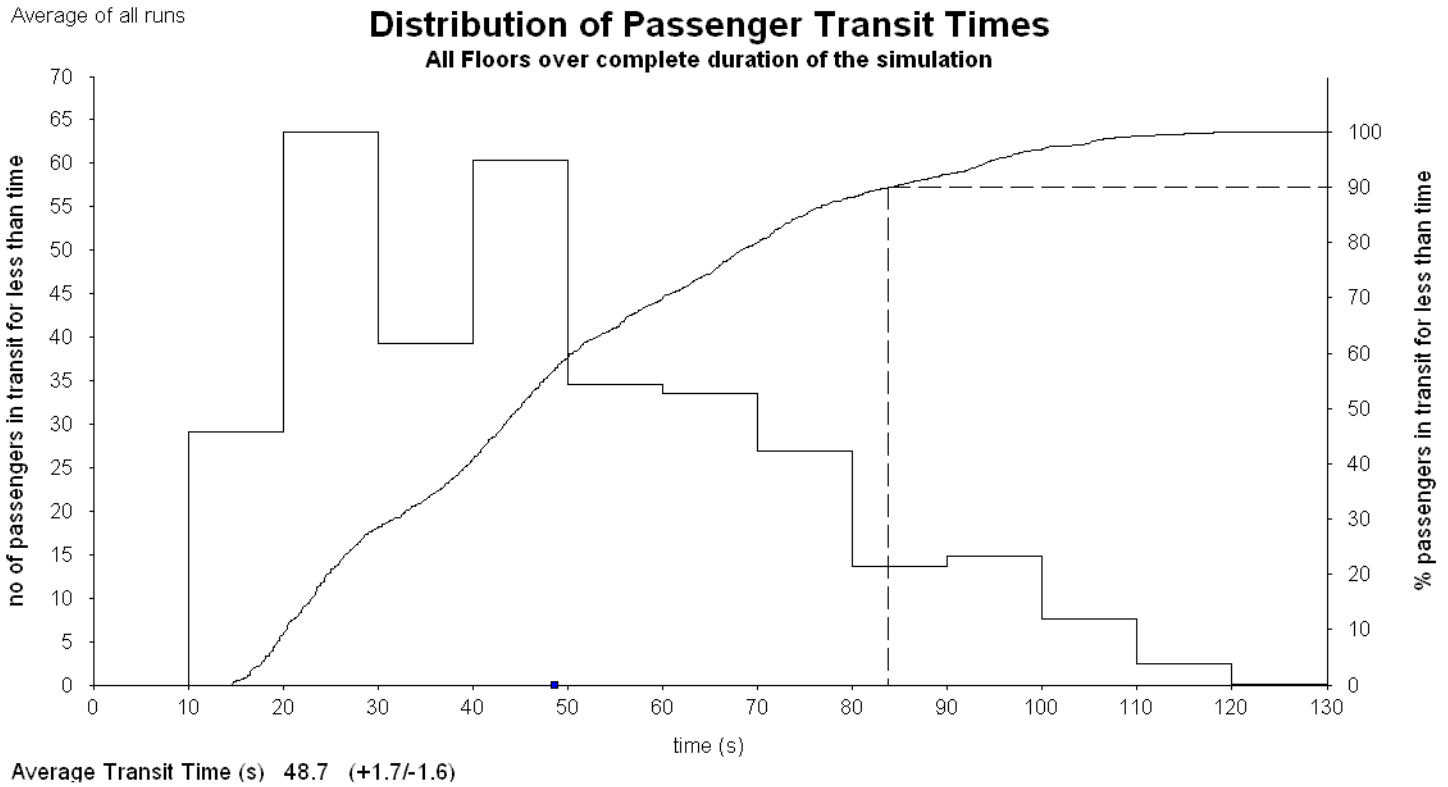
Period 2

Start Time	0:00
End Time	0:15
Loading Time (s)	2.50
Unloading Time (s)	2.50
Passenger Mass (kg)	150
Capacity Factor (%)	50.00
Stair Factor (%)	0.00
Notes	Adult with child in pram/buggy

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Mall 1 (%)*	*Dest. Prob Mall 2 (%)*	*Dest. Prob Mall 3 (%)*	*Dest. Prob Park 1 (%)*	*Dest. Prob Park 2 (%)*
Mall 1	7.00	0.00	25.00	25.00	25.00	25.00
Mall 2	7.00	25.00	0.00	25.00	25.00	25.00
Mall 3	7.00	25.00	25.00	0.00	25.00	25.00
Park 1	5.00	33.30	33.30	33.30	0.00	0.00
Park 2	5.00	33.30	33.30	33.30	0.00	0.00



Average Waiting Time (s) 21.8 (+5.1/-2.4)
Longest Waiting Time (s) 144.6 (+72.6/-46.6)

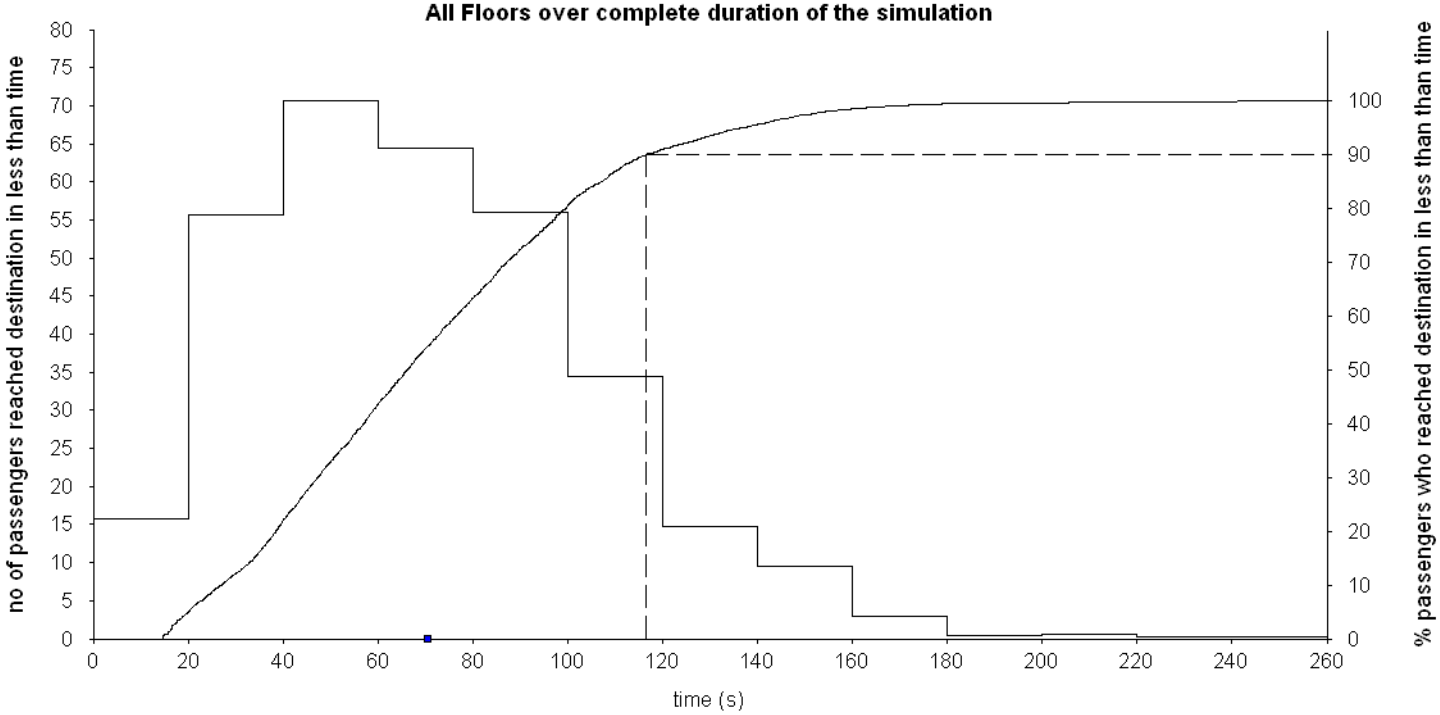


Average Transit Time (s) 48.7 (+1.7/-1.6)
Longest Transit Time (s) 116.4 (+5.6/-6.9)

Average of all runs

Distribution of Time to Destination

All Floors over complete duration of the simulation



Average Time To Destination (s) 70.5 (+6.4/-4.0)
Longest Time to Destination (s) 201.3 (+43.4/-41.5)

EXAMPLE 4

High Rise Zoning

Discussion

This example demonstrates the use of **Elevate** to analyse an office building with zoned elevators. To load the Elevate document select **File, Open** and then **Example 4a.elv.** (If the file is not there, change the **Look in** drop down to point to the folder in which **Elevate** has been installed.) Repeat to open **Example 4b.elv**.

Each elevator bank should be analysed separately. Analysis of the low rise bank would be similar to **Example 1**. To analyse the high rise elevator bank, the floors served have been entered in **Building Data.**

In this example, a range of configurations are selected for analysis in **Elevator Data**.

Example 4a provides an analysis of the traffic using the **General analysis**. The **General analysis** is a round trip time calculation, so calculates results including the **Interval**.

Example 4b provides an analysis using **Simulation**. Calculated results include **Average Passenger Waiting Time** and **Average Passenger Transit Time**.

ELEVATE

ANALYSIS DATA

Analysis Type	General analysis
Measurement system	Metric
Losses (%)	10.00

BUILDING DATA

Floor Name	*Floor Height (m)*
Car Park	3.60
Level 1	5.00
Level 2	3.80
Level 3	3.80
Level 4	3.80
Level 5	3.80
Level 6	3.80
Level 7	3.80
Level 8	3.80
Level 9	3.80
Level 10	3.80
Level 11	3.80
Level 12	3.80
Level 13	3.80
Level 14	3.80
Level 15	3.80
Level 16	

Express Zone

Lowest floor not served by elevators	Level 2
Highest floor not served by elevators	Level 8

ELEVATOR DATA

No of Elevators	SELECT	Min: 3	Max: 5
Capacity (kg)	SELECT	Min: 1000	Max: 1600
Door Pre-opening Time (s)	AUTO		
Door Open Time (s)	AUTO		
Door Close Time (s)	AUTO		
Speed (m/s)	SELECT	Min: 2.50	Max: 3.15
Acceleration (m/s²)	AUTO		
Jerk (m/s³)	AUTO		
Start Delay (s)	0.50		
Home Floor	Level 1		

PASSENGER DATA

Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Stair Factor (%)	0.00
Arrival Rate as	% building population in 5 mins

Floor Name	*No of people*	*Area (m²)*	*Area/person*	*Arrival Rate*
Car Park	0			1.00
Level 1	0			14.00
Level 9	50			0.00
Level 10	50			0.00
Level 11	50			0.00
Level 12	50			0.00
Level 13	50			0.00
Level 14	50			0.00
Level 15	50			0.00
Level 16	50			0.00

ELEVATE

Elevate Version 6.01

GENERAL ANALYSIS RESULTS (SUMMARY)

No. of Elevators	*Speed (m/s)*	*Acceln (m/s²)*	*Jerk (m/s³)*	*Elevator Capacity (kg)*	*Door Type*	*Door Times Pre-Open,Open, Close (s)*	*Prob No of Stops*	*Lowest Reversal Floor*	*Highest Reversal Floor*	*Interval (s)*	*Capacity Factor (%)*
3	2.50	0.80	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	7.1	1.5	9.6	48.3	74.3
3	2.50	0.80	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	7.1	1.5	9.6	48.3	60.3
3	2.50	0.80	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	7.1	1.5	9.6	48.3	46.0
3	3.15	1.00	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	6.7	1.6	9.5	42.4	65.2
3	3.15	1.00	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	6.7	1.6	9.5	42.4	53.0
3	3.15	1.00	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	6.7	1.6	9.5	42.4	40.4
4	2.50	0.80	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	5.5	1.7	9.1	29.5	45.3
4	2.50	0.80	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	5.5	1.7	9.1	29.5	36.8
4	2.50	0.80	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	5.5	1.7	9.1	29.5	28.0
4	3.15	1.00	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	5.0	1.8	8.9	25.2	38.7
4	3.15	1.00	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	5.0	1.8	8.9	25.2	31.4
4	3.15	1.00	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	5.0	1.8	8.9	25.2	24.0
5	2.50	0.80	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	4.3	1.9	8.4	19.7	30.3
5	2.50	0.80	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	4.3	1.9	8.4	19.7	24.6
5	2.50	0.80	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	4.3	1.9	8.4	19.7	18.8
5	3.15	1.00	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	3.8	2.0	8.1	16.4	25.2
5	3.15	1.00	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	3.8	2.0	8.1	16.4	20.5
5	3.15	1.00	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	3.8	2.0	8.1	16.4	15.6

ELEVATE

Elevate Version 6.01

ANALYSIS DATA

Analysis Type	Simulation	
Measurement system	Metric	
Dispatcher Algorithm	Group Collective	Traffic mode: Up peak 1
Time slice between simulation calculations (s)	0.10	
No of time slices between screen updates	10	
No of simulations to run for each configuration	10	
Random number seed for passenger generator	1	

BUILDING DATA

Floor Name	*Floor Height (m)*
Car Park	3.60
Level 1	5.00
Level 2	3.80
Level 3	3.80
Level 4	3.80
Level 5	3.80
Level 6	3.80
Level 7	3.80
Level 8	3.80
Level 9	3.80
Level 10	3.80
Level 11	3.80
Level 12	3.80
Level 13	3.80
Level 14	3.80
Level 15	3.80
Level 16	

ELEVATOR DATA

No of Elevators	SELECT	Min: 3	Max: 5
Capacity (kg)	SELECT	Min: 1000	Max: 1600
Door Pre-opening Time (s)	AUTO		
Door Open Time (s)	AUTO		
Door Close Time (s)	AUTO		
Speed (m/s)	SELECT	Min: 2.50	Max: 3.15
Acceleration (m/s²)	AUTO		
Jerk (m/s³)	AUTO		
Start Delay (s)	0.50		
Home Floor	Level 1		

PASSENGER DATA

Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	0.00
Start Time (hrs:mins)	09:00
End Time (hrs:mins)	09:15
Arrival Rate as	% building population in 5 mins

Floor Name	*No of people*	*Area (m²)*	*Area/person*	*Arrival Rate*
Car Park	0			1.00
Level 1	0			14.00
Level 2	0			0.00
Level 3	0			0.00
Level 4	0			0.00
Level 5	0			0.00
Level 6	0			0.00
Level 7	0			0.00
Level 8	0			0.00
Level 9	50			0.00
Level 10	50			0.00
Level 11	50			0.00
Level 12	50			0.00
Level 13	50			0.00
Level 14	50			0.00
Level 15	50			0.00
Level 16	50			0.00

SIMULATION RESULTS

Based on average of all runs over complete duration of the simulation

No. of Elevators	*Speed (m/s)*	*Acceln (m/s²)*	*Jerk (m/s³)*	*Elevator Capacity (kg)*	*Door Type*	*Door Times Pre-Open,Open, Close (s)*	*Average Waiting Time (s)*	*Longest Waiting Time (s)*	*Average Transit Time (s)*	*Longest Transit Time (s)*	*Average Time to Dest (s)*	*Longest Time to Dest (s)*
3	2.50	0.80	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	46.8	124.1	71.1	131.5	118.0	226.2
3	2.50	0.80	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	26.0	93.1	76.5	147.7	102.5	213.4
3	2.50	0.80	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	19.9	84.6	80.8	157.6	100.7	215.5
3	3.15	1.00	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	35.2	105.5	66.6	125.5	101.9	208.2
3	3.15	1.00	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	20.4	79.9	71.6	138.6	92.0	192.6
3	3.15	1.00	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	14.9	77.7	74.8	152.1	89.7	200.7
4	2.50	0.80	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	13.5	64.0	65.6	130.2	79.0	167.0
4	2.50	0.80	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	9.1	55.5	69.2	144.1	78.3	179.5
4	2.50	0.80	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	8.1	57.7	71.2	155.7	79.3	193.5
4	3.15	1.00	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	8.4	49.6	59.8	126.4	68.2	152.5
4	3.15	1.00	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	7.0	50.5	62.7	134.2	69.6	167.7
4	3.15	1.00	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	6.1	49.6	63.9	147.5	70.1	176.5
5	2.50	0.80	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	5.0	47.9	60.9	127.6	65.8	147.9
5	2.50	0.80	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	4.8	48.5	62.9	141.4	67.7	155.7
5	2.50	0.80	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	4.6	51.6	64.3	149.0	68.9	163.1
5	3.15	1.00	1.60	1000	CO 1100mm	0.00, 1.80, 2.90	3.1	39.0	55.5	124.8	58.6	134.8
5	3.15	1.00	1.60	1250	CO 1100mm	0.00, 1.80, 2.90	3.3	39.0	57.7	141.8	61.0	146.8
5	3.15	1.00	1.60	1600	CO 1100mm	0.00, 1.80, 2.90	2.8	35.3	57.7	148.2	60.5	150.4

EXAMPLE 5

Changing Interfloor Traffic

Discussion

This example demonstrates the use of **Elevate's** simulation to analyse the changing levels of traffic. To load the Elevate document select **File, Open** and then **Example 5.elv.** (If the file is not there, change the **Look in** drop down to point to the folder in which **Elevate** has been installed.)

The **Advanced** mode of **Passenger Data** is used. **Period 1** to **Period 5** have similar data, except the **Arrival Rates**, which increase, then decrease. **Period 6** defines additional traffic (e.g. post trolleys) which are constant in use throughout the whole time period.

The Results give the normal summary of **Passenger Waiting and Transit Times**. A more detailed analysis can be carried out by viewing the Excel output which contains details of the Waiting, Transit, etc. times of each individual passenger.

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Normal
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	1
Random number seed for passenger generator	1

BUILDING DATA

Floor Name	*Floor Height (m)*
Level 1	3.80
Level 2	3.80
Level 3	3.80
Level 4	3.80
Level 5	3.80
Level 6	3.80
Level 7	3.80
Level 8	

ELEVATOR DATA

	Car 1	*Car 2*	*Car 3*	*Car 4*	*Car 5*	*Car 6*
Capacity (kg)	1000	1000	1000	1000	1000	1000
Speed (m/s)	1.60	1.60	1.60	1.60	1.60	1.60
Acceleration (m/s²)	0.70	0.70	0.70	0.70	0.70	0.70
Jerk (m/s³)	1.40	1.40	1.40	1.40	1.40	1.40
Home Floor	Level 1	Level 1	Level 1	Level 1	Level 1	Level 1
Start Delay (s)	0.50	0.50	0.50	0.50	0.50	0.50
Door Pre-opening Time (s)	0.00	0.00	0.00	0.00	0.00	0.00
Door Open Time (s)	1.80	1.80	1.80	1.80	1.80	1.80
Door Close Time (s)	2.90	2.90	2.90	2.90	2.90	2.90
Door Dwell 1 (s)	3.00	3.00	3.00	3.00	3.00	3.00
Door Dwell 2 (s)	2.00	2.00	2.00	2.00	2.00	2.00

Floors served	*Car 1*	*Car 2*	*Car 3*	*Car 4*	*Car 5*	*Car 6*
Level 1	Yes	Yes	Yes	Yes	Yes	Yes
Level 2	Yes	Yes	Yes	Yes	Yes	Yes
Level 3	Yes	Yes	Yes	Yes	Yes	Yes
Level 4	Yes	Yes	Yes	Yes	Yes	Yes
Level 5	Yes	Yes	Yes	Yes	Yes	Yes
Level 6	Yes	Yes	Yes	Yes	Yes	Yes
Level 7	Yes	Yes	Yes	Yes	Yes	Yes
Level 8	Yes	Yes	Yes	Yes	Yes	Yes

Period 1

Start Time	0:00
End Time	0:05
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	30.00
Notes	Passengers

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*
Level 1	1.00	0.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Level 2	1.00	14.30	0.00	14.30	14.30	14.30	14.30	14.30	14.30
Level 3	1.00	14.30	14.30	0.00	14.30	14.30	14.30	14.30	14.30
Level 4	1.00	14.30	14.30	14.30	0.00	14.30	14.30	14.30	14.30
Level 5	1.00	14.30	14.30	14.30	14.30	0.00	14.30	14.30	14.30
Level 6	1.00	14.30	14.30	14.30	14.30	14.30	0.00	14.30	14.30
Level 7	1.00	14.30	14.30	14.30	14.30	14.30	14.30	0.00	14.30
Level 8	1.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30	0.00

Period 1

Start Time	0:00
End Time	0:05
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	30.00
Notes	Passengers

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*
Level 1	1.00	0.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Level 2	1.00	14.30	0.00	14.30	14.30	14.30	14.30	14.30	14.30
Level 3	1.00	14.30	14.30	0.00	14.30	14.30	14.30	14.30	14.30
Level 4	1.00	14.30	14.30	14.30	0.00	14.30	14.30	14.30	14.30
Level 5	1.00	14.30	14.30	14.30	14.30	0.00	14.30	14.30	14.30
Level 6	1.00	14.30	14.30	14.30	14.30	14.30	0.00	14.30	14.30
Level 7	1.00	14.30	14.30	14.30	14.30	14.30	14.30	0.00	14.30
Level 8	1.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30	0.00

Period 2

Start Time	0:05
End Time	0:10
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	30.00
Notes	Passengers

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*
Level 1	10.00	0.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Level 2	10.00	14.30	0.00	14.30	14.30	14.30	14.30	14.30	14.30
Level 3	10.00	14.30	14.30	0.00	14.30	14.30	14.30	14.30	14.30
Level 4	10.00	14.30	14.30	14.30	0.00	14.30	14.30	14.30	14.30
Level 5	10.00	14.30	14.30	14.30	14.30	0.00	14.30	14.30	14.30
Level 6	10.00	14.30	14.30	14.30	14.30	14.30	0.00	14.30	14.30
Level 7	10.00	14.30	14.30	14.30	14.30	14.30	14.30	0.00	14.30
Level 8	10.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30	0.00

Period 3

Start Time	0:10
End Time	0:15
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	30.00
Notes	Passengers

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*
Level 1	30.00	0.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Level 2	30.00	14.30	0.00	14.30	14.30	14.30	14.30	14.30	14.30
Level 3	30.00	14.30	14.30	0.00	14.30	14.30	14.30	14.30	14.30
Level 4	30.00	14.30	14.30	14.30	0.00	14.30	14.30	14.30	14.30
Level 5	30.00	14.30	14.30	14.30	14.30	0.00	14.30	14.30	14.30
Level 6	30.00	14.30	14.30	14.30	14.30	14.30	0.00	14.30	14.30
Level 7	30.00	14.30	14.30	14.30	14.30	14.30	14.30	0.00	14.30
Level 8	30.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30	0.00

Period 4

Start Time	0:15
End Time	0:20
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	30.00
Notes	Passengers

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*
Level 1	10.00	0.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Level 2	10.00	14.30	0.00	14.30	14.30	14.30	14.30	14.30	14.30
Level 3	10.00	14.30	14.30	0.00	14.30	14.30	14.30	14.30	14.30
Level 4	10.00	14.30	14.30	14.30	0.00	14.30	14.30	14.30	14.30
Level 5	10.00	14.30	14.30	14.30	14.30	0.00	14.30	14.30	14.30
Level 6	10.00	14.30	14.30	14.30	14.30	14.30	0.00	14.30	14.30
Level 7	10.00	14.30	14.30	14.30	14.30	14.30	14.30	0.00	14.30
Level 8	10.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30	0.00

Period 5

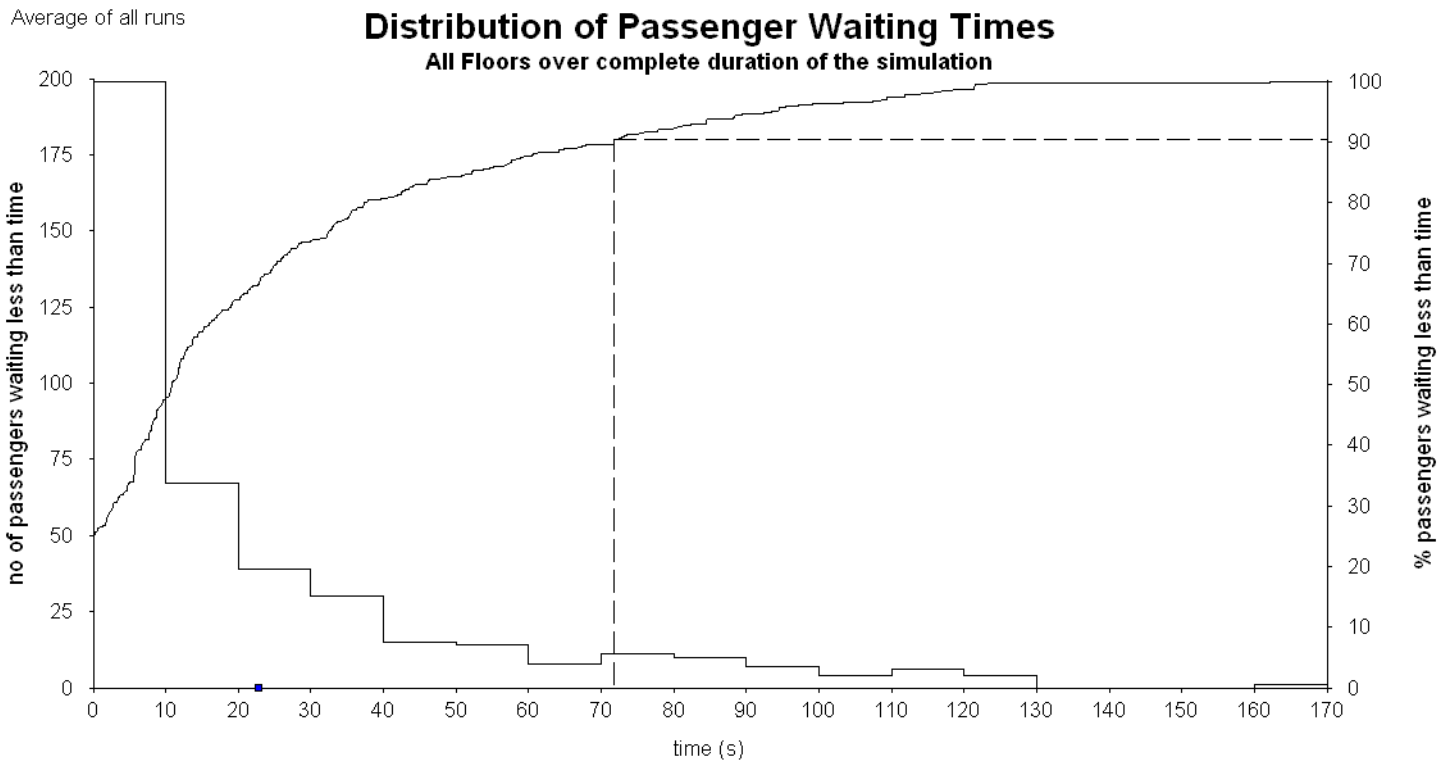
Start Time	0:20
End Time	0:25
Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Capacity Factor (%)	80.00
Stair Factor (%)	30.00
Notes	Passengers

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*
Level 1	1.00	0.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Level 2	1.00	14.30	0.00	14.30	14.30	14.30	14.30	14.30	14.30
Level 3	1.00	14.30	14.30	0.00	14.30	14.30	14.30	14.30	14.30
Level 4	1.00	14.30	14.30	14.30	0.00	14.30	14.30	14.30	14.30
Level 5	1.00	14.30	14.30	14.30	14.30	0.00	14.30	14.30	14.30
Level 6	1.00	14.30	14.30	14.30	14.30	14.30	0.00	14.30	14.30
Level 7	1.00	14.30	14.30	14.30	14.30	14.30	14.30	0.00	14.30
Level 8	1.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30	0.00

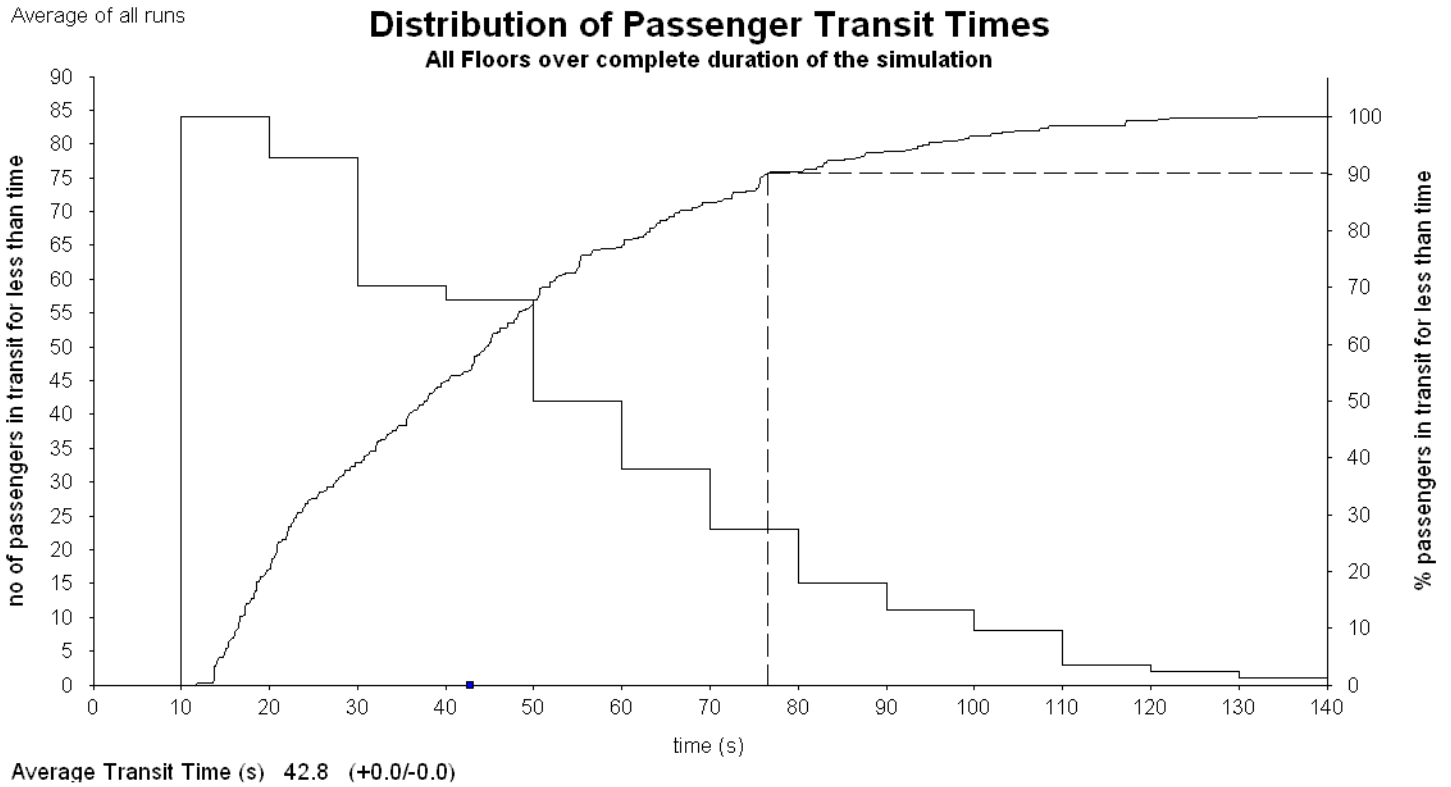
Period 6

Start Time	0:00
End Time	0:25
Loading Time (s)	3.00
Unloading Time (s)	3.00
Passenger Mass (kg)	300
Capacity Factor (%)	60.00
Stair Factor (%)	0.00
Notes	Post Trolley

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*
Level 1	1.00	0.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Level 2	1.00	14.30	0.00	14.30	14.30	14.30	14.30	14.30	14.30
Level 3	1.00	14.30	14.30	0.00	14.30	14.30	14.30	14.30	14.30
Level 4	1.00	14.30	14.30	14.30	0.00	14.30	14.30	14.30	14.30
Level 5	1.00	14.30	14.30	14.30	14.30	0.00	14.30	14.30	14.30
Level 6	1.00	14.30	14.30	14.30	14.30	14.30	0.00	14.30	14.30
Level 7	1.00	14.30	14.30	14.30	14.30	14.30	14.30	0.00	14.30
Level 8	1.00	14.30	14.30	14.30	14.30	14.30	14.30	14.30	0.00

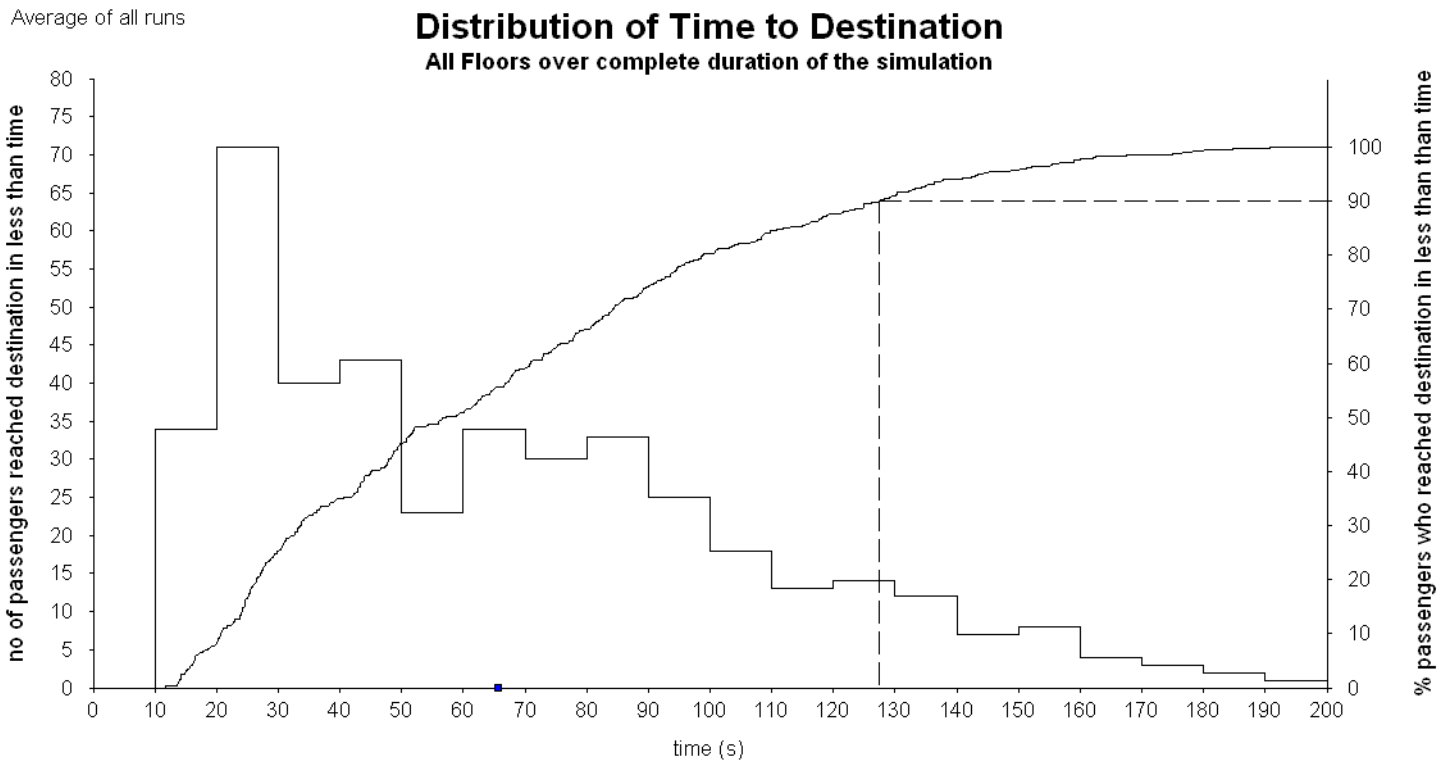


Average Waiting Time (s) 22.9 (+0.0/-0.0)
Longest Waiting Time (s) 162.1 (+0.0/-0.0)



Average Transit Time (s) 42.8 (+0.0/-0.0)
Longest Transit Time (s) 132.1 (+0.0/-0.0)

Average of all runs



Average Time To Destination (s) 65.7 (+0.0/-0.0)
Longest Time to Destination (s) 190.7 (+0.0/-0.0)

EXAMPLE 6

Double Deck Up Peak

Discussion

This example demonstrates the use of **General Analysis Double Deck** to assess the performance of a double deck solution for a 22 storey building with 133 persons per floor and 8 No 1800 kg per deck elevators. In this instance, the analysis is for just up peak traffic.

The total handling capacity is 16% of the building population in five minutes. Note in Passenger Data that 8% arrive at Level 1 and 8% arrive at Level 2.

To load the Elevate document select **File, Open** and then **Example 6.elv.** (If the file is not there, change the **Look in** drop down to point to the folder in which **Elevate** has been installed.)

ELEVATE

Elevate Version 6.01

ANALYSIS DATA

Analysis Type	Double Deck General analysis
Measurement system	Metric
Losses (%)	5.00

BUILDING DATA

Floor Name	*Floor Height (m)*
Level 1	3.60
Level 2	3.60
Level 3	3.60
Level 4	3.60
Level 5	3.60
Level 6	3.60
Level 7	3.60
Level 8	3.60
Level 9	3.60
Level 10	3.60
Level 11	3.60
Level 12	3.60
Level 13	3.60
Level 14	3.60
Level 15	3.60
Level 16	3.60
Level 17	3.60
Level 18	3.60
Level 19	3.60
Level 20	3.60
Level 21	3.60
Level 22	

ELEVATOR DATA

No of Elevators	8
Capacity (kg)	1800
Door Pre-opening Time (s)	0.00
Door Open Time (s)	1.80
Door Close Time (s)	2.90
Speed (m/s)	2.50
Acceleration (m/s²)	0.80
Jerk (m/s³)	2.00
Start Delay (s)	0.50
Home Floor	Level 1

PASSENGER DATA

Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Stair Factor (%)	0.00
Arrival Rate as	% building population in 5 mins

Floor Name	*No of people*	*Area (m²)*	*Area/person*	*Arrival Rate*
Level 1	0			8.00
Level 2	0			8.00
Level 3	133			0.00
Level 4	133			0.00
Level 5	133			0.00
Level 6	133			0.00
Level 7	133			0.00
Level 8	133			0.00
Level 9	133			0.00
Level 10	133			0.00
Level 11	133			0.00
Level 12	133			0.00
Level 13	133			0.00
Level 14	133			0.00
Level 15	133			0.00
Level 16	133			0.00
Level 17	133			0.00
Level 18	133			0.00
Level 19	133			0.00
Level 20	133			0.00
Level 21	133			0.00
Level 22	133			0.00

DOUBLE DECK GENERAL ANALYSIS RESULTS (8 No. 1800 kg elevators @ 2.50 m/s)

Main Results

Interval (s)	25.6
Capacity Factor (%)	75.5
Figure of Merit (%)	74.5

Additional Results

Car Capacity (persons)	24
No of Stops (including Home Floor)	10.7
Lowest Reversal Floor (where 1 = lowest floor)	1.0
Highest Reversal Floor (where 1 = lowest floor)	20.9
Average Passenger Transfer Time (s)	1.2
Distance Between Reversal Floors, Excluding Express (m)	71.8
Express Zone Distance (m)	0.0
Time Consumed When Stopping (s)	8.7
Round Trip Time (s)	204.4

EXAMPLE 7

Complex traffic for Double Deck

Discussion

This example demonstrates the use of **General Analysis Double Deck** to assess the performance of a double deck solution for a complex traffic scenario.

To load the Elevate document select **File, Open** and then **Example 7.elv.** (If the file is not there, change the **Look in** drop down to point to the folder in which **Elevate** has been installed.)

This example is intended to represent the lunch peak in an office building where there are double storey conference and restaurant facilities on the top two floors. The morning conference ends during the lunchtime peak. Conference delegates are visitors to the building. The peak traffic is a combination of:

- Resident passengers travelling from their offices to the restaurant for lunch
- Resident passengers travelling back to their offices after lunch
- Resident passengers travelling to the ground floor to leave the building to buy sandwiches or eat out
- Resident passengers returning from buying/eating lunch out.

The example traffic flow entered in **Passenger Data** has been calculated.

ANALYSIS DATA

Analysis Type	Double Deck General analysis
Measurement system	Metric
Losses (%)	5.00

BUILDING DATA

Floor Name	*Floor Height (m)*
Level 1	3.60
Level 2	3.60
Level 3	3.60
Level 4	3.60
Level 5	3.60
Level 6	3.60
Level 7	3.60
Level 8	3.60
Level 9	3.60
Level 10	3.60
Level 11	3.60
Level 12	3.60
Level 13	3.60
Level 14	

ELEVATOR DATA

No of Elevators	8
Capacity (kg)	1250
Door Pre-opening Time (s)	0.00
Door Open Time (s)	1.80
Door Close Time (s)	2.90
Speed (m/s)	2.50
Acceleration (m/s^2)	0.80
Jerk (m/s^3)	2.00
Start Delay (s)	0.50
Home Floor	Level 1

PASSENGER DATA

Floor Name	*No of people*
Level 1	0
Level 2	0
Level 3	0
Level 4	0
Level 5	0
Level 6	0
Level 7	0
Level 8	0
Level 9	0
Level 10	0
Level 11	0
Level 12	0
Level 13	0
Level 14	0

Loading Time (s)	1.20
Unloading Time (s)	1.20
Passenger Mass (kg)	75
Stair Factor (%)	0.00

Floor Name	*Arrival Rate (Persons /5 mins)*	*Dest. Prob Level 1 (%)*	*Dest. Prob Level 2 (%)*	*Dest. Prob Level 3 (%)*	*Dest. Prob Level 4 (%)*	*Dest. Prob Level 5 (%)*	*Dest. Prob Level 6 (%)*	*Dest. Prob Level 7 (%)*	*Dest. Prob Level 8 (%)*	*Dest. Prob Level 9 (%)*	*Dest. Prob Level 10 (%)*	*Dest. Prob Level 11 (%)*	*Dest. Prob Level 12 (%)*
Level 1	75.00	0.00	0.00	15.00	0.00	17.00	0.00	17.00	0.00	17.00	0.00	17.00	0.00
Level 2	75.00	0.00	0.00	0.00	15.00	0.00	17.00	0.00	17.00	0.00	17.00	0.00	17.00
Level 3	25.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 4	25.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 5	25.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 6	25.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 7	25.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 8	25.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 9	25.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 10	25.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 11	25.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 12	25.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Level 13	120.00	50.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00
Level 14	120.00	0.00	50.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00	10.00

Floor Name	*Dest. Prob Level 13 (%)*	*Dest. Prob Level 14 (%)*
Level 1	17.00	0.00
Level 2	0.00	17.00
Level 3	50.00	0.00
Level 4	0.00	50.00
Level 5	50.00	0.00
Level 6	0.00	50.00
Level 7	50.00	0.00
Level 8	0.00	50.00
Level 9	50.00	0.00
Level 10	0.00	50.00
Level 11	50.00	0.00
Level 12	0.00	50.00
Level 13	0.00	0.00
Level 14	0.00	0.00

DOUBLE DECK GENERAL ANALYSIS RESULTS (8 No. 1250 kg elevators @ 2.50 m/s)

Main Results

Interval (s)	26.7
Capacity Factor (%)	68.2
Figure of Merit (%)	83.4

Additional Results

Car Capacity (persons)	16
No of Stops (including Home Floor)	11.9
Lowest Reversal Floor (where 1 = lowest floor)	1.0
Highest Reversal Floor (where 1 = lowest floor)	13.0
Average Passenger Transfer Time (s)	1.2
Distance Between Reversal Floors, Excluding Express (m)	43.2
Express Zone Distance (m)	0.0
Time Consumed When Stopping (s)	8.5
Round Trip Time (s)	214.0