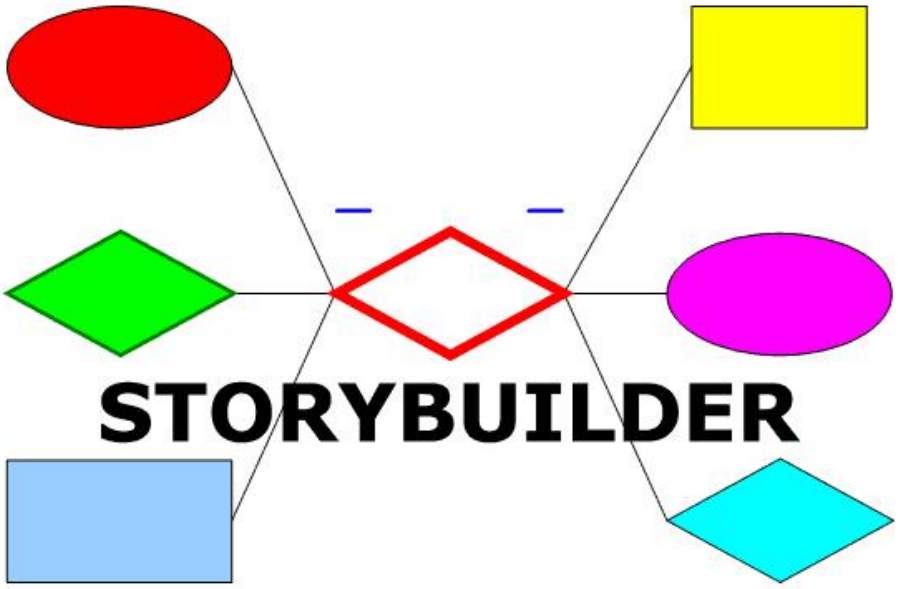
Storybuilder User Manual



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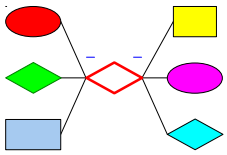

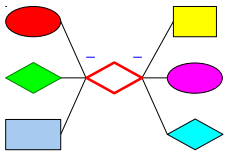

1 INTRODUCTION

Storybuilder™ is a tool with a graphical interface to design and use accident bowties (Bellamy et al 2007, 2008)[1]. Storybuilder can be used to register and analyse accidents, entered as causal paths through these models. The accident paths indicate what, where and why accidents happened.

With the underlying database of Storybuilder analyses can be performed on your own previously entered accident data. Data already available in Storybuilder includes the analysis of approximately 23.000 accidents investigated by the Dutch labour inspectorate. This is covered by 36 StoryBuild Bowties describing 36 occupational hazards.

This manual describes the use of Storybuilder from different perspectives:

1. Chapter two describes how to enter your own accidents
2. Chapter three describes how to get data out: perform trend analysis with the underlying and newly entered accident data
3. Chapter four describes how to use Storybuilder to perform sector specific analysis and to identify workplace hazards and priorities for inspection to reduce these hazards

Appendix I contains glossary with definitions
Appendix II contains some tips for easy use of the Storybuilder software

1.1 Background to Storybuilder

The Workgroup Occupational Risk Model (WORM)[2] project in the Netherlands began in 2003 with limited data for analysis of causes of accidents. Data on occupational accident statistics are plentiful but these data do not describe causes and effects in sufficient detail for the quantitative risk modelling proposed for the WORM project (Papazoglou et al., 2006)[3]. The best data for examining causes and effects are as close and as detailed as possible to the origin of the accident. In WORM these sought after data are called ‘‘horrible stories”.

The issue with horrible stories is how well they are told. The use of language as a summary or explanation of what has happened filters and interprets what actually happened. It was decided early on in the project that instead of the analysts making an allocation of each accident to a set of predefined categories for statistical analysis, they would record as objectively as possible what happened in each accident as a sequence of cause and effect events as they appeared to occur, including any other

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[1] *Bellamy, L.J., Ale B.J.M., Geyer T.A.W., Goossens L.H.J., Hale A.R., Oh J., Mud, M., Bloemhof A, Papazoglou I.A., Whiston J.Y., 2007. Storybuilder—A tool for the analysis of accident reports, Reliability Engineering and System Safety 92 (2007) 735–744*
Bellamy L.J., Ale B.J.M., Whiston, J.Y., Mud M.L., Baksteen H., Hale A.R., Papazoglou, I.A., Bloemhoff A., Damen M. and Oh J.I.H., 2008. The software tool storybuilder and the analysis of the horrible stories of occupational accidents. Safety Science 46 (2008) 186-197

[2] *Now called ORCA (Occupational Risk Calculator) See http://www.weborca.nl/Welkom.aspx*

[3] *Papazoglou I.A., Aneziris O., J. Post, H. Baksteen, B.J.M. Ale, J.I.H Oh, L. J. Bellamy, M.L. Mud, A.Hale & L.Goossens , A. Bloemhoff (2006), Logical Models for Quantification of Occupational Risk: Falling from mobile ladders, PSAM8 Probabilistic Safety Assessment and Management, Los Angeles, May 2006.*

incidental information. When analysts are developing scenarios from many accidents they need a grammar so that analyses are comparable.

To this end a set of rules were developed alongside a piece of software that allowed the data from ‘‘horrible stories” to be recorded as efficiently as possible and enabling frequency counting of occurrences of scenario events with common nodes.

The work of analysing the accident data and the building in StoryBuilder was completed in 2006. The database used was that of the Dutch Labour Inspectorate (Arbeidsinspectie) who electronically store all accidents reported to them since 1998 in a database called GISAI (Geïntegreerd InformatieSysteem ArbeidsInspectie), now upgraded to a system called iNet.

Employers are obliged to report serious occupational accidents. Sometimes this does not happen and the accident is either not notified at all or brought to the attention of the Labour Inspectorate by police, insurance companies or victims. Accidents are reportable according to article 9 of the Dutch Working Conditions Act (Arbowet, 1998) if they are occupational accidents resulting in serious physical or mental injury or death within one year. A physical injury is considered to be serious if the victim is hospitalised within 24 h and for at least 24 h or the injury is permanent whether or not the victim is hospitalised. A reportable accident has to be reported within 24 h. Then there are also criteria concerning whether an injury is permanent or not (physically or mentally).

In phase 1 data were available on 22,892 occupational accidents that were reported between 1 January 1998 and end February 2004. 10,237 of these had no offence or investigation report and were not analysed. The main reason why there was no report was that they were not reportable (82% of the accidents without report). The other cases were waiting to be investigated or were under investigation or too sensitive to be made available. In total 9142 reportable occupational accidents were analysed in 36 StoryBuild Bowties. To achieve this task took five person years of effort. This involved not only analysis but also quality checks on structure and content of the scenario StoryBuild Bowties and adaptation of rules and structures.

In phases 2&3 accidents between March 2004-2009 were analysed, resulting in a total of 23030 unique accidents with 23799 victims.

Only accidents with reports could be used for detailed analysis of causes. There are different kinds of reports and only if a breach has been found is the report complete with respect to witness statements and injury classes. If there is no breach report then there is a summary of the investigation findings and the reason why it is not a breach. The latter were also analysed but contain less information. If the conclusion is that the accident was not an occupational accident e.g. natural death or suicide then these were not included in the analysis.

2 ANALYSE ACCIDENTS

2.1 How to use Storybuilder to analyse an accident

The process of analysing accidents with Storybuilder is described in 5 steps, preceded by an investigation phase, and concluded with a phase where actions are defined and followed-up

Investigation

Step 1 : Identify the Bowtie

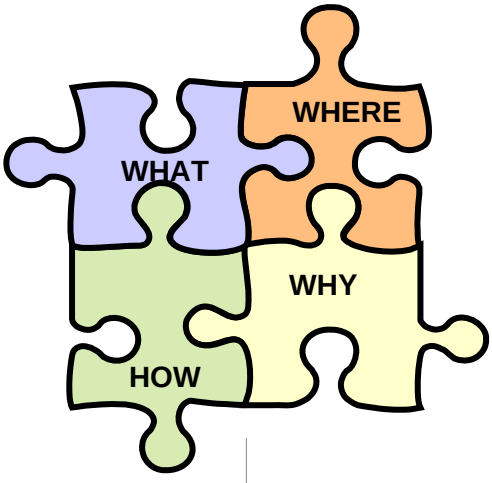
Step 2 : Identify Loss Control Events

Step 3 : Identify Barrier Failures and Incident Factors

Step 4 : Identify (Barrier) Tasks failures

Step 5 : Identify Management Delivery failures

Actions and follow-up



Analysing an accident is like solving a puzzle

*With Step 1 and 2 we capture **WHAT** happened.*

*With Step 3 we capture **WHERE** things went wrong in terms of imperfections in individual barriers.*

*With Step 4 we capture **HOW** it happened, i.e. the underlying task(s) that failed to control the barrier*

*With Step 5 we capture **WHY** it happened, i.e. the underlying management delivery systems that failed to support the task(s) to control the barrier.*

*Note: a classic mistake often made is the focus on the **WHO** question to point out the guilty party. That approach belongs to a crime investigation, and is a no go area for occupational accident investigation.*

2.2 Accident Investigation

The whole purpose investigation is to gather information. The accident investigation itself is not described here in detail. However, investigation procedures should include the following:

- Respond properly (on scene presence)
- Ensure first aid and call for emergency services.
- Take direct remedial actions where necessary (control potential secondary accidents)
- Gather information
- Identify sources of evidence of what happened.
- Preserve evidence from alteration or removal.
- Determine the loss potential
- Notify personnel and agencies where appropriate

Gathering Information

Look over the scene and the environment around it in order to find the mental picture of the activities, processes, equipment, materials, people and environment involved:

- Condition of objects involved (e.g. broken, fallen, damaged, operating mode)
- Position of objects involved *(take photographs, make sketches)*
- Location of actors involved
- Presence of (hazardous) substances, (state of) containments and materials
- Safeguards, e.g. presence and state of guarding, signs, marking and labelling.
- Environmental factors *(weather, light, noise, etc.)*
- Records, logs, files, permits, certificates, procedures, instructions, minutes.

Tips:

√ *Interview actors and/or witnesses separately and in an appropriate place*
√ *put person at ease*
√ *get the individuals version*
√ *ask for facts (activities, equipment, sequence of events, tasks*
√ *end positive: keep the line open*.

2.3 How to enter information into Storybuilder

The relevant information gathered during the investigation phase is now entered into Storybuilder. How to enter a new accident into Storybuilder in Expert mode is explained in this paragraph. For entering paths in Lite mode see Appendix 4.

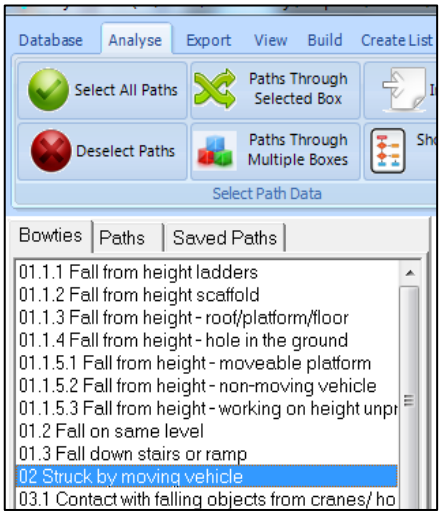


Figure 2.1 Select bowtie

√ Select the applicable bowtie (see §2.4 Step 1: Identify the Storybuild Bowtie). For example 02 Struck by moving vehicle

√ Now choose the bowtie by selecting it with the mouse.

The corresponding model opens.

Note: it may take a few seconds to load the model onto the screen and show the accident path numbers in the Paths tab.

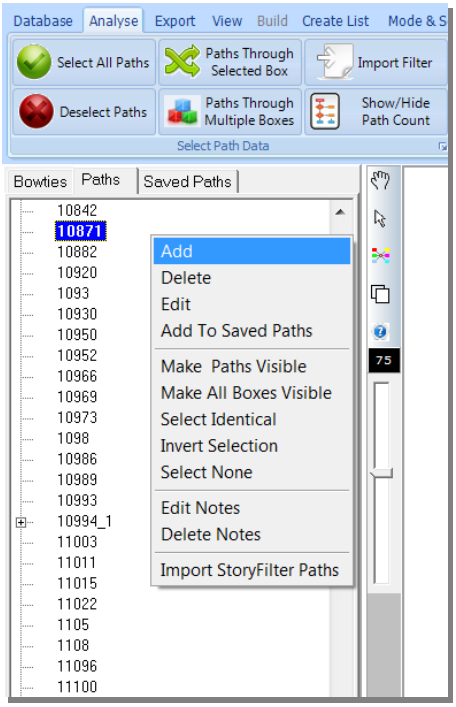


Figure 2.2 R-click in the paths tab to start a new path

Start entering the accident(path) into Storybuilder as follows:

√ Select the Paths tab and right click the mouse in the paths box to open the menu:

√ To enter a new accident select Add, and enter the name/ number of the accident in the Path Name box.

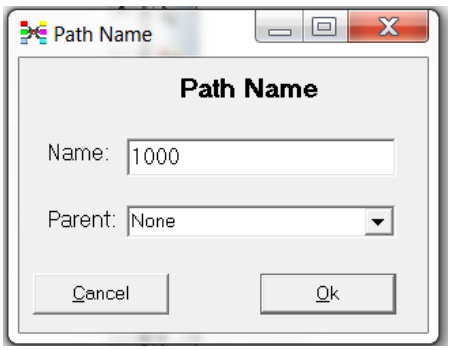
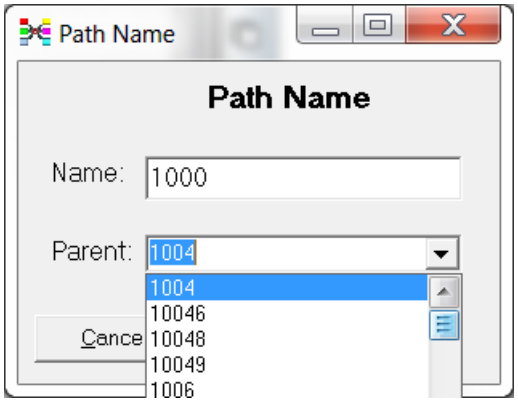


Figure 2.3 Enter tha name of th accident path



√ To link different accident scenarios, e.g. to draw separate accident paths for different victims of the same accident, enter the name of the sub-path and then select the parent accident using the drop down menu

For example a new path 1000 is added to accident 1004

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Figure 2.4 Child path 1000 being added to parent accident 1004

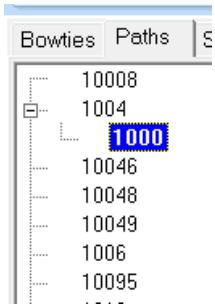
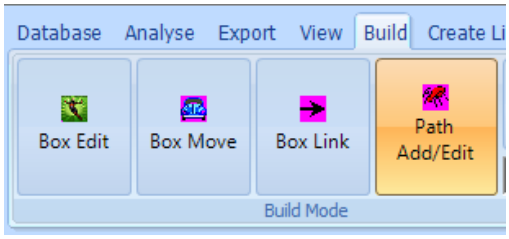


Figure 2.5 Accident 1000 as a subpath of Accident 1004

Events, factors and other information are entered into the selected bowtie that corresponds with the centre event that occurred. All information related to one accident is entered as an accident path, by left mouse clicking the applicable boxes in such a way that the accident story can be told and explained again by looking at its path.

√ The database opens in locked mode. It has to be unlocked to activate build mode

Figure 2.6 Database has to be unlocked for entering paths



√ On the build tab, select Path Add/Edit in the toolbar

Figure 2.7 Path Add/Edit button on the Build tab

√ Draw the accident path from left to right by left mouse clicking the applicable boxes, starting with the activities of the actors at the time of the accident (see *below*).
√ The rectangular group boxes are included as a rule.

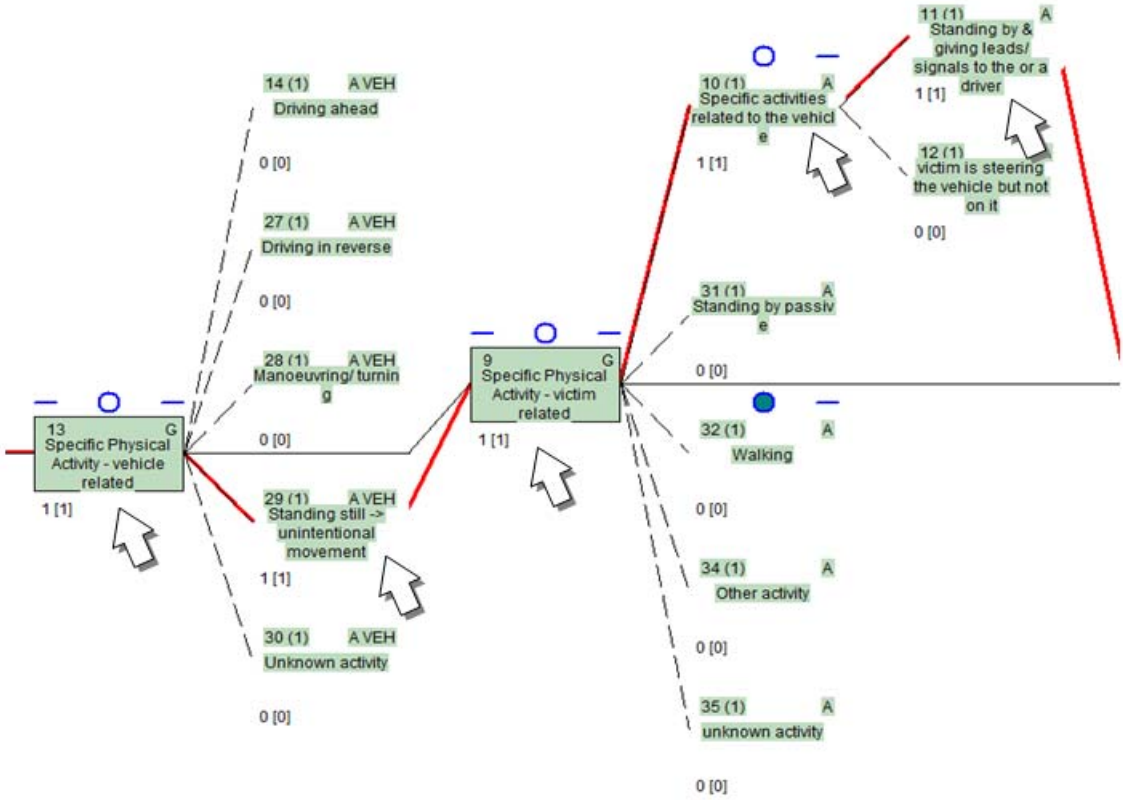


Figure 2.8 This example accident path tells us that a vehicle was involved that was standing still, and later suddenly came into movement, plus a victim that was involved in the activities of the vehicle by giving leads/ signals to the driver.

√ Now that the activities have been selected, select other environmental information of the accident location (not included in all models) and the equipment involved (material agent), in accordance with the ESAW methodology4.

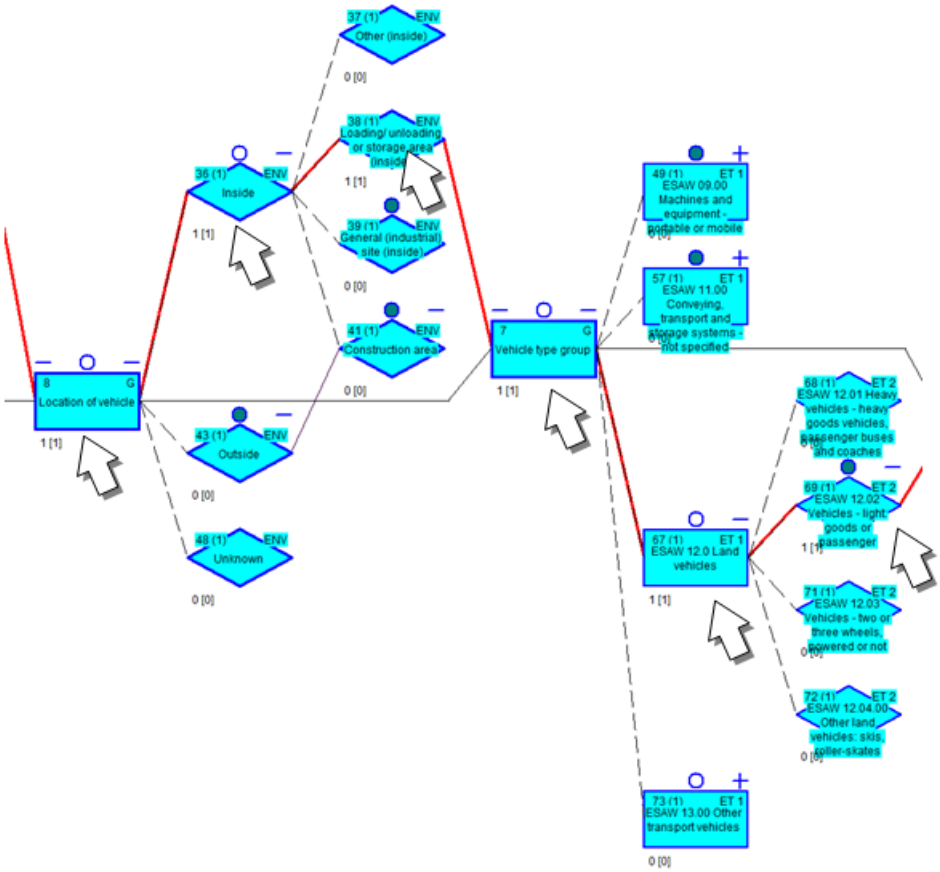


Figure 2.9 The above example path details the location of the vehicle and the vehicle type. Please note that the boxes with the + sign and/or ● on the top indicate that detail is hidden that can be shown by clicking on either of these symbols.

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[4] http://ec.europa.eu/employment_social/publications/2002/ke4202569_en.pdf page 55

√ Similarly, the violated laws and regulations can be indicated. *Here also, click on the + and/or ● symbols to expand the boxes and show further detail*

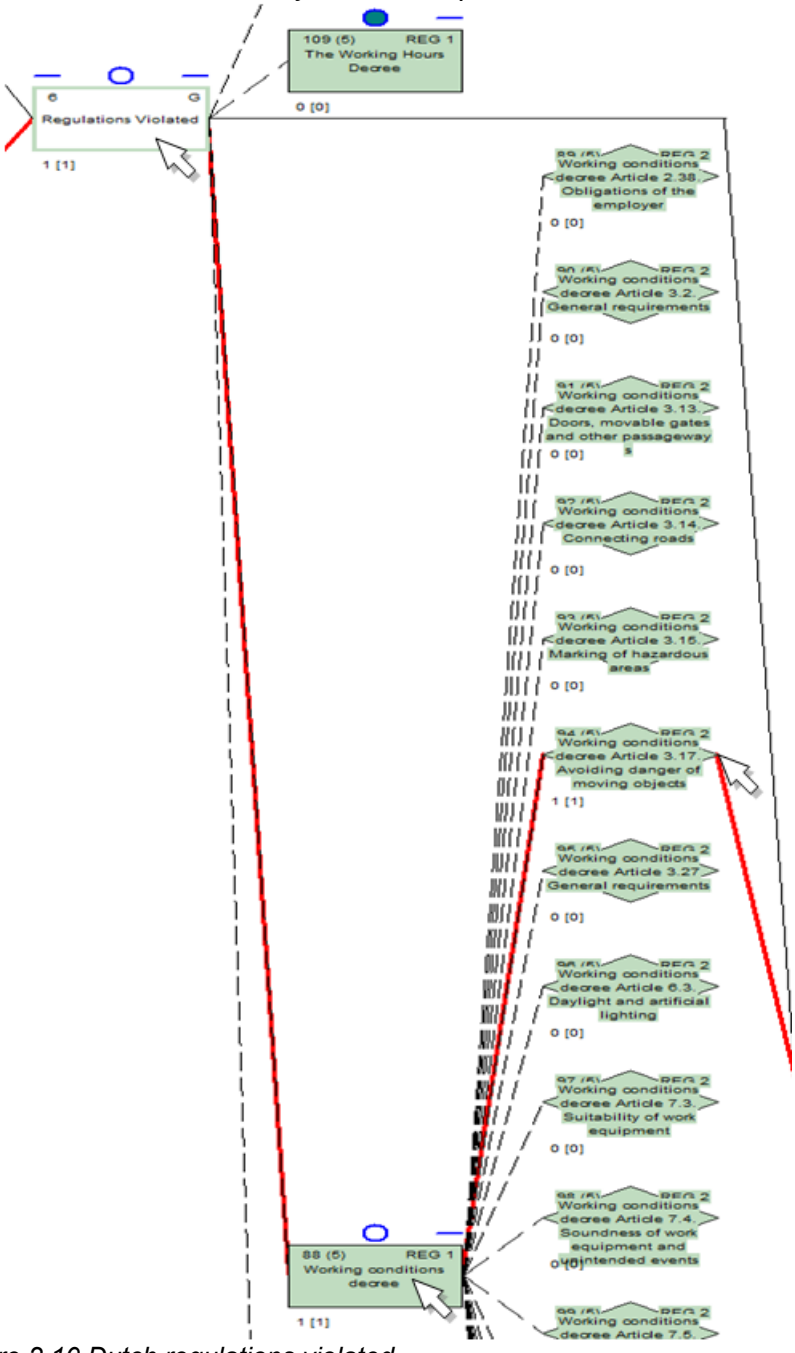


Figure 2.10 Dutch regulations violated

The whole train of information entered so far as accident path in our example is shown in the figure below.

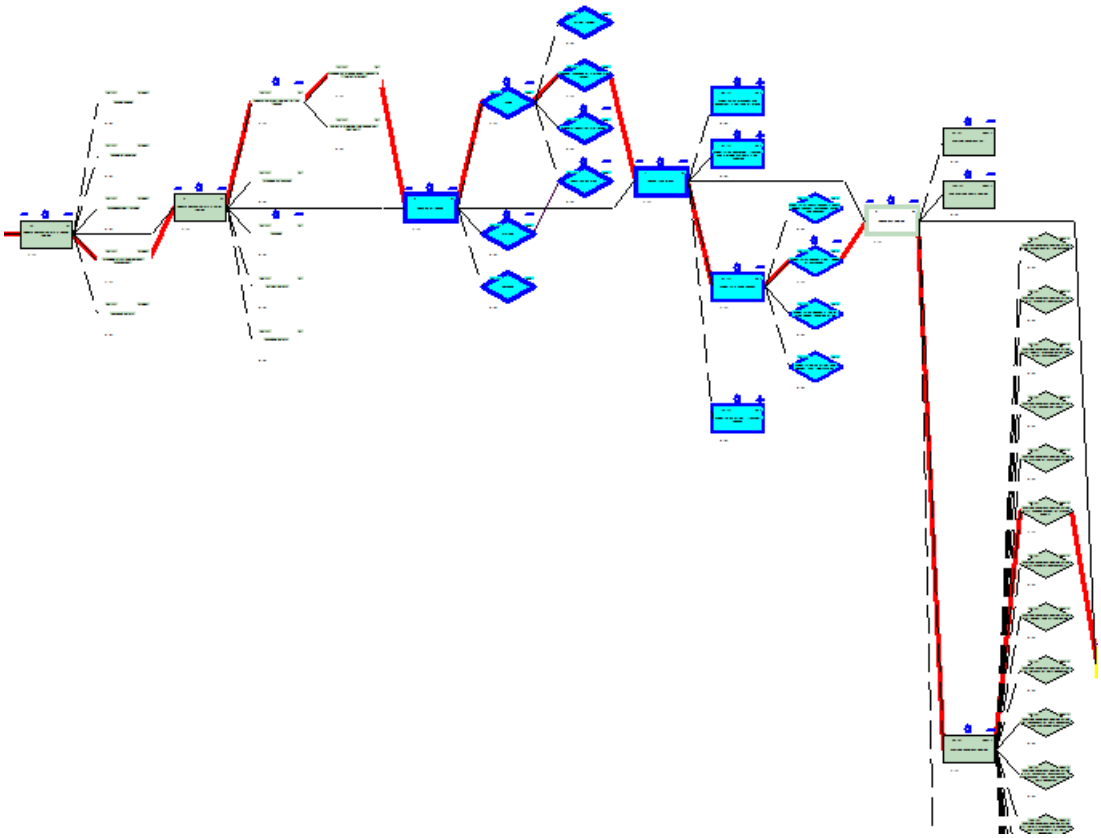


Figure 2.11 Path through the model as entered so far

Besides the Activity, Equipment and Regulations information, other data that can be added by the user includes:

- √ Victim information (nationality and language skills

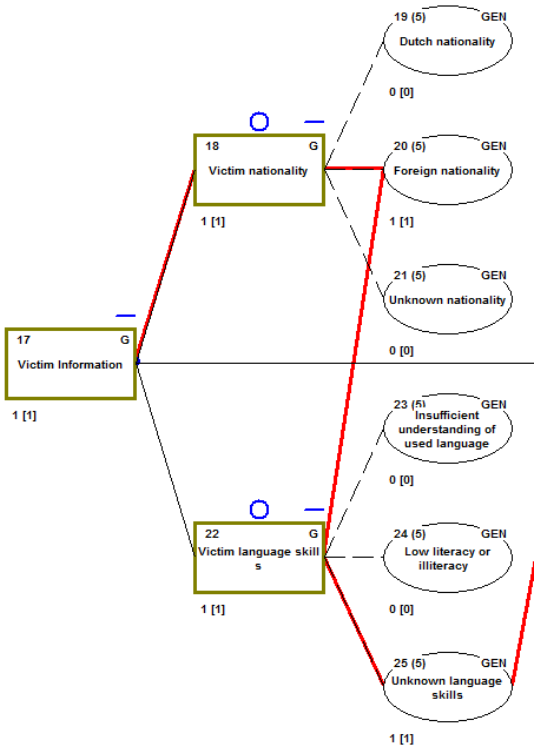


Figure 2.12 Victim information block

√ Incoming Bowties – Whether the scenario enters the bowtie as a domino effect from another bowtie

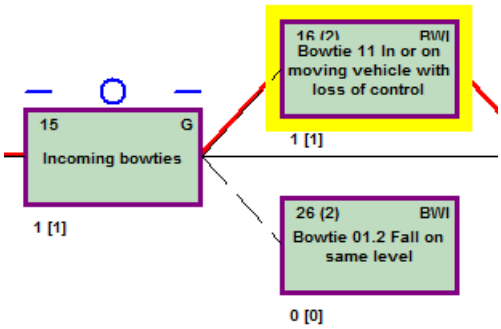


Figure 2.13 Domino effects

2.4 Step 1: Identify the StoryBuild Bowtie

The structures in the supplied database are built as bowties in the graphical Expert Mode. Boxes which are causes of accidents are built on the Left Hand Side (LHS) of the bowtie and those which are the consequences are built on the RHS. Accidents are then constructed as scenarios through a sequence of boxes, so called "paths". The Storybuilder method is supported by 36 different StoryBuild Bowties, representing 36 models of possible accident scenarios. The StoryBuild Bowties are named after their centre event. First, we need to select the applicable bowtie for the accident occurred.

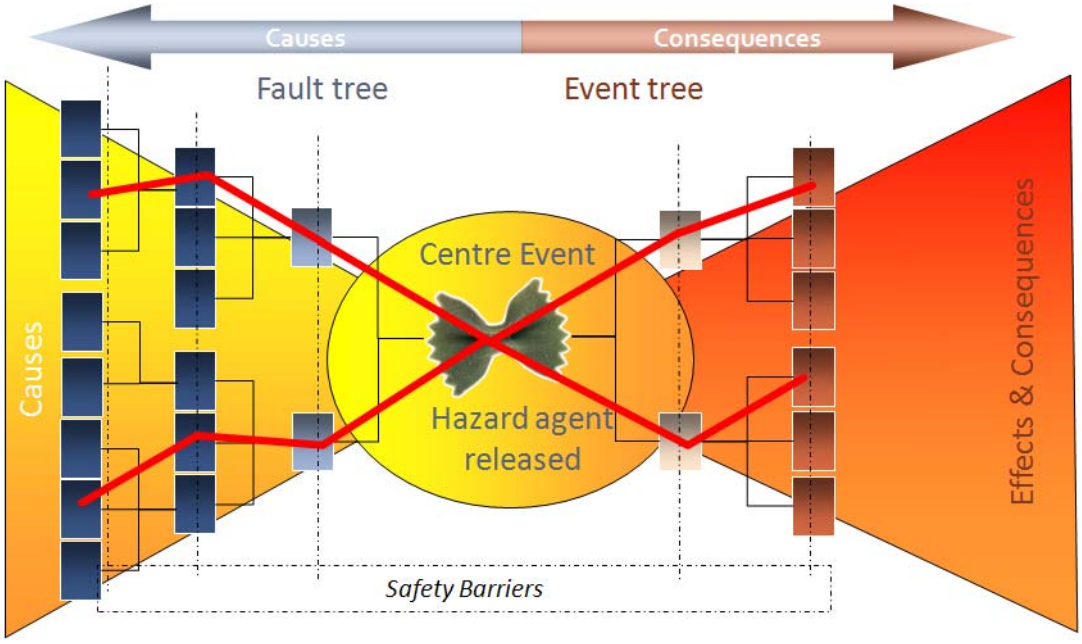


Figure 2.14 Bowtie structure

The Centre Event (=CE) is defined in principle as the release of the hazardous "agent" (energy). Often but not always the centre event consists of both the release of the hazardous agent and contact with the human body.

Examples of centre events are:

- fall from height,scaffold *(e.g. by falling over the edge)*
- release of a hazardous substance out of a (normally closed) containment (*e.g. a runaway reaction in a chemical process vessel causes a toxic gas release)*
- in or on a moving vehicle with loss of control *(e.g. a fork lift truck turning over or a collision between vehicles)*

For some accidents, the hazardous agent released (uncontained) is in itself not accidental, but deliberate and part of normal routine. Examples are the kinetic energy of a moving machine, a hazardous substance applied on a surface, movement of the

human body, etc. In these cases, the centre event of the accident is defined as the contact of the released agent with the human body.

Examples of these type of centre events are:

- contact with moving parts of a machine (*e.g. cut by a sawing machine)*
- struck by moving vehicle (*e.g. pedestrian hit by a truck)*
- contact with a hazardous substance (*e.g. applying a chemical on a surface)*
- impact by immersion in liquid (*e.g. trapped in a car below water)*
- contact with electricity
- contact with a hot surface

Based on accident analysis of 23,000 occupational accidents that have been registered and investigated by the Dutch labour inspectorate, 36 generic bowties have been designed to capture all identified causal paths leading to the centre events including the subsequence consequence paths leading to the final loss (death, permanent injury, non-permanent injury).

Selecting one of those 36 bowties can assist the analyst further in identifying potential causal paths that can explain what happened and why. It is then further up to the analyst to evaluate the applicability of the causal paths provided by these models

The following queries allow the user to identify which Storybuild from the 36 Storybuilds is needed to examine a particular kind of accident. N.B. Each Storybuild bowtie has a number.

Was the victim a victim of....

Uncontrolled fall?

1.1.1 Fall from height - ladder & steps
1.1.2 Fall from height - scaffold
1.1.3 Fall from height – roof/platform/floor
1.1.4 Fall from height - hole in the ground
1.1.5.1 Fall from height - moveable platform
1.1.5.2 Fall from height - non-moving vehicle
1.1.5.3 Fall from height - other
1.2 Fall on same level
1.3 Fall down stairs or ramp

If the person fell with a crane or part of a crane go to:
3.1 Falling object crane, part of crane or crane load

If the person fell from a moving vehicle go to
11 In or on a moving vehicle with loss of control

Contact with an object(s) in the surroundings?

YES

3.1 Falling object/crane, part of crane or crane load
3.2 Falling object other (not crane related)
4 Contact with a flying object
5 Contact with rolling/sliding object or person
6 Contact with object person is carrying or using
8.2 Contact with hanging/ swinging object
8.3 Trapped between/against machine or structure
9 Moving into an object
13 Contact with extreme hot or cold surfaces or open flame

NO

Contact with equipment being worked with?

YES

7 Contact with hand held tool held by self
8.1 Contact with moving parts of a machine

NO

Chemical, fire, explosion, hazardous atmosphere?

YES

14.1 Release from an open containment
14.2 Other - Exposure to hazardous substance without Loss of Containment
15 Release from a normally closed containment
17 Fire
22.1 Exposure to hazardous atmosphere in confined space
22.2 Exposure to hazardous atmosphere through breathing apparatus
27 Explosion

NO

Buried, drowning, or decompression?

YES

10 Buried by bulk mass
23 Immersion in liquid
24 Too rapid (de)compression

NO

Contact with electricity?

12 Contact with electricity

Physical exertion?

25 Extreme muscular exertion

People of animals?

20.1 Victim of human aggression
20.2 Victim of animal behaviour

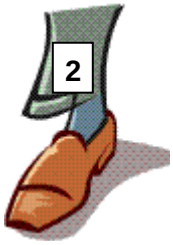
Vehicle accident?

2 Struck by moving vehicle
11 In or on moving vehicle with loss of control

If a person is struck by an overturning vehicle go to "Contact with an object(s) in the surroundings":
3.2 Falling object other (not crane related)

Make own bowtie!

2.5 Step 2 : Identify Loss of Control Events



Once the centre event is known and the model is selected, proceed with the analysis working from the centre event to the left, i.e. the preceeding event(s) that directly led to the centre event. These are named “Loss of Control Events” (LCE).

Examples of LCE’s are:

- *a falling object (with a person underneath)*
- *a ladder that breaks,*
- *a scaffold that turns over*
- *a body part within the planned path of a moving part of a machine*
- *a person with the planned path of a vehicle*
- *an uncontrolled movement towards an object*
- *unintented sudden movement of a vehicle*

The base information gathered during the investiogation phase should be sufficient to select the applicable LCE or LCE’s. Ask yourself which direct events are necessary and sufficient to reconstruct the accident on the scene. If this question cannot be answered, additional information has to be obtained. In complex or unclear situations, fact trees can furher help to structure the sequence of direct events and other related causal factors.

A Loss Control Event indicates failure of a safety function. For example the ladder that breaks means that the ladder strength failed. Or in the example below there is an unintended movement of the vehicle and the victim was in the line of the moving vehicle which means that it was moving towards the (path of) the pedestrian.

Select by mouse clicking in the path mode the LCE’s where applicable. Include the centre event.

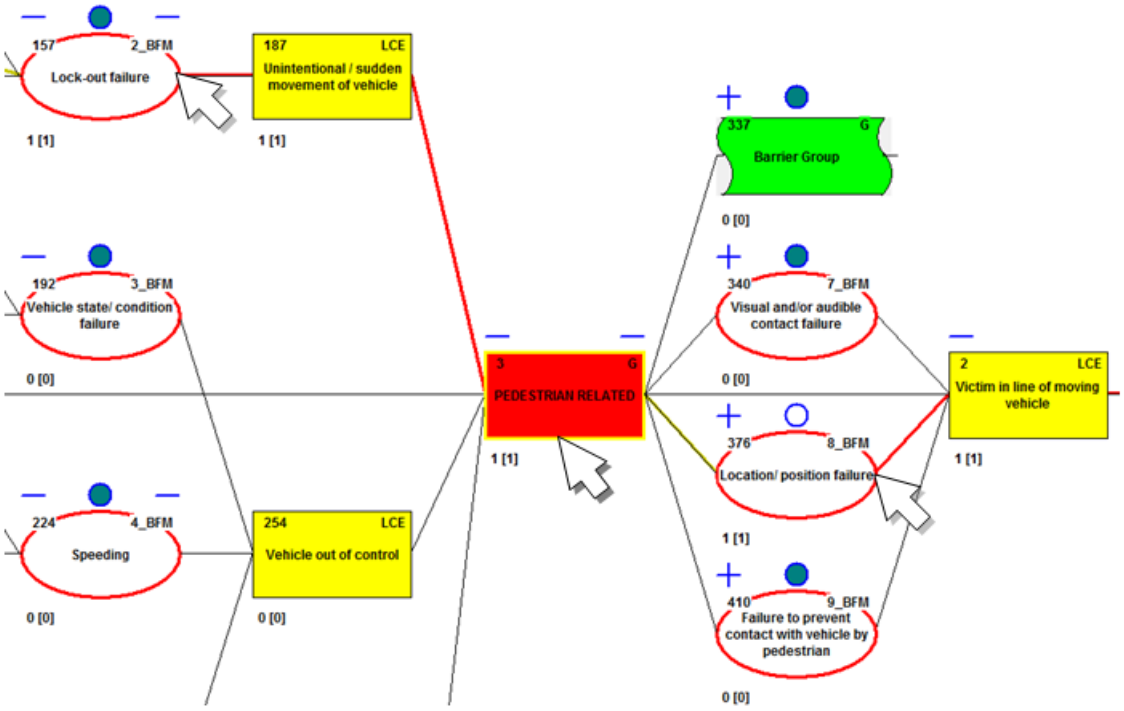
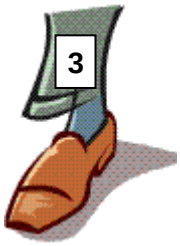


Figure 2.15 Entering the Loss of Control Events that resulted in the Centre Event

2.6 Step 3 : Identify Barrier Failures



With the inclusion of the LCE's and CE in the accident path we have now captured **WHAT** happened, but the next step is to investigate **WHERE** things went wrong. This step involves identifying the barriers that failed, and thus not prevented the centre event.

For more than 30 years accidents have been modelled with the Hazard – Barrier – Target model. In the occupational safety model the target is the human being. The hazard is the physical or chemical phenomenon that causes harm to the target once released outside its design envelope. Barriers are put in place to prevent the hazard from harming the target.

The Hazard – Barrier - Target model is originally based on a paper by William Haddon jr[5]. Haddon identifies a logical sequence of ten principles to achieve loss prevention (Haddon uses the term energy damage process, because the undesired transmission of energy does always seem to be the invariant in damage processes):
I
We now further define a barrier as a physical entity (object, state, or condition) that acts as an obstacle in an accident path. Note that actions or measures are not

[5] *(Haddon 1973) Haddon, William, Jr. "Energy Damage and the ten countermeasure strategies", Human Factors Journal, August 1973.*

included in this definition. Actions or measures can create a barrier or restore its functionality, but in our definition action and measures are not barriers themselves.

Typical Barrier Functions are:

- Prevent presence, build-up, or release of the hazardous agent/ energy
- Separates hazardous agent/ energy in space (safe zone/ danger zone concept)
- Separates hazardous agent/ energy in time (safe moment)
- Prevents the undesired transmission of energy/ hazardous agents
- Prevents incompatibility of materials
- Prevents unsafe physical conditions (pertains to structural integrity, strength, stability, connectivity)
- Prevents unsafe process conditions (pertains to sequence, temperature, pressure, composition). This includes as a barrier the ability of the human body to maintain safe operating limits (e.g. the proper position and timing on parts of the road when steering a vehicle, or the proper position on a ladder that ensures stability, or to operate a machine within operating limits, etc.)

Barriers can be created or enforced by actions (measures) and need to be controlled to be effective (management control loop: provide – use – maintain- monitor).

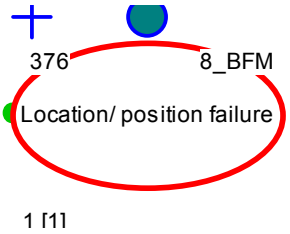


Figure 2.16 Barrier failure mode

√ Barriers are indicated by red ovals. Groups of barriers are indicated by red rectangles. Select the Barrier Failure Mode boxes (BFM) where applicable, by dragging the red path line towards the applicable boxes. Include the rectangular group boxes.

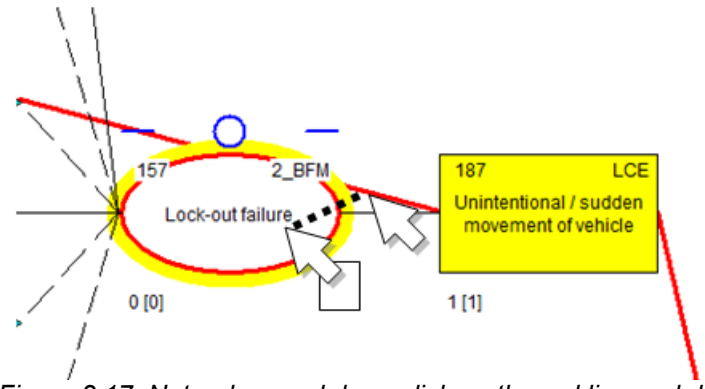


Figure 2.17 Note: drag and drop: click on the red line and drag it, with mouse still clicked, towards the box you want to include.When it is able to drop the path a rectangle will appear under the cursor. Until then a Ø symbol will be shown.

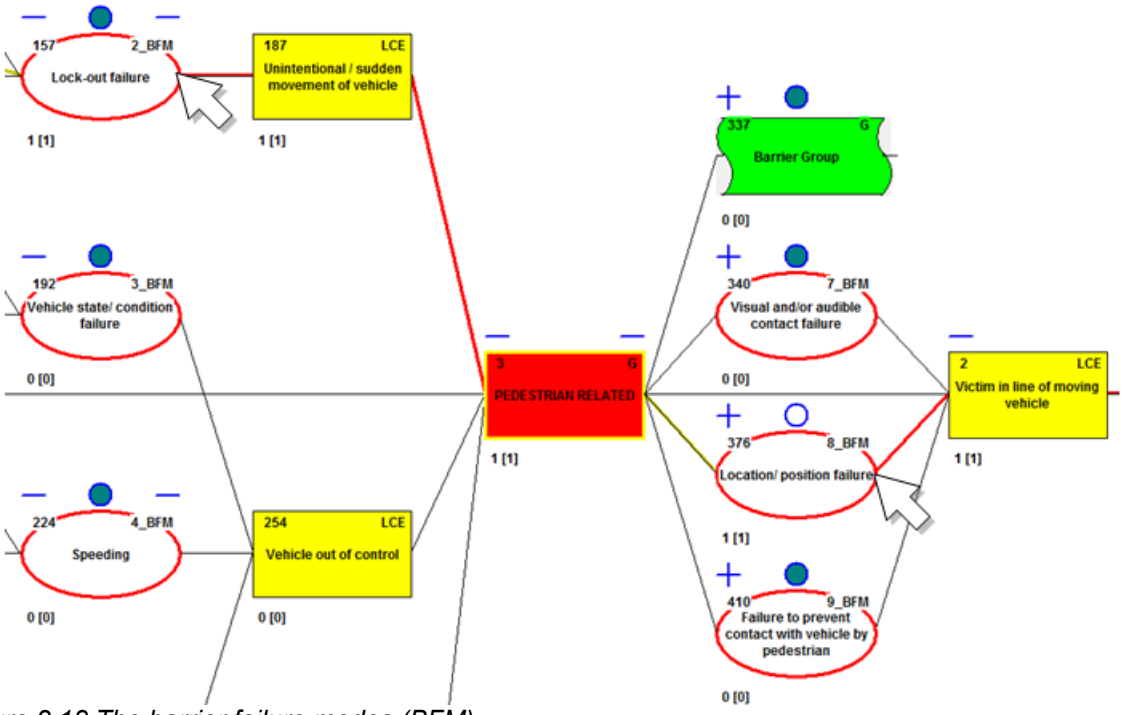


Figure 2.18 The barrier failure modes (BFM)

In the above example the LCE unintended movement of the vehicle was caused by a barrier lock-out failure (i.e. vehicle not on brake, ignition still on, etc.) which caused the vehicle to move towards the pedestrian who was on a dangerous location (e.g. standing just behind the vehicle) and therefore in the line of the suddenly moving vehicle.

√ To add further detail of where the barrier failed, click on the + and ● above the applicable barrier failure to expand the boxes for further detail. The aqua blue rhombuses represent incident factors related to the barrier failure that can included in the accident path by drag & drop the red path (in path mode) towards these incident factors.

Incident factors can be compared with the holes in the barriers of the Swiss cheese model by Reason (1990)[6]. In the Swiss Cheese model, weaknesses are modelled as holes in slices of Swiss cheese. They represent the imperfections in individual barriers, i.e. the critical properties or conditions on where the barrier failed.

[6] *Reason, J.T. (1990) Human Error. Cambridge University Press*

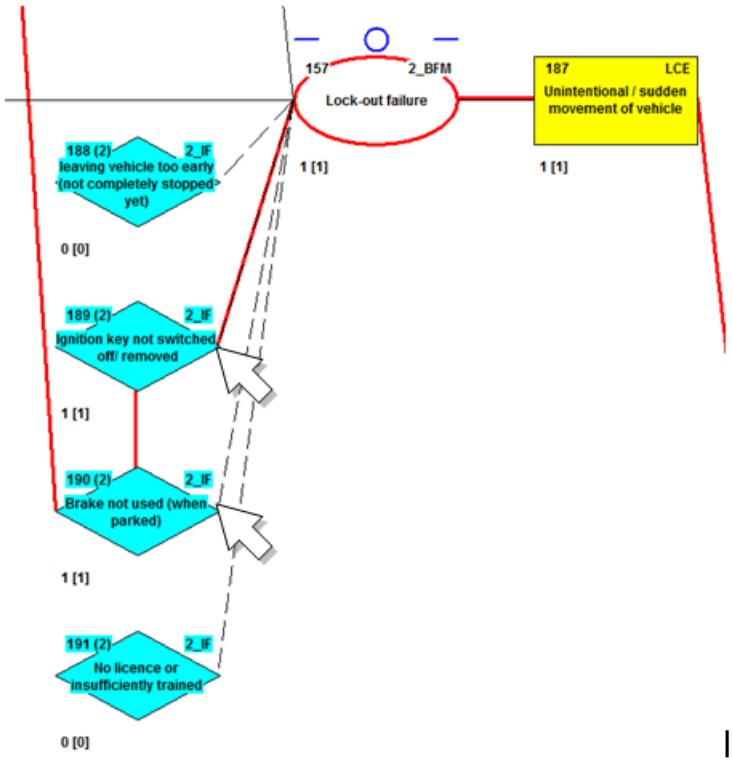


Figure 2.19 Entering incident factors for the barrier failure mode

√ Continue the path drawing process for events on the right hand side of the centre event. On the Right Hand Side (RHS) of the Centre Event, there are also barriers. Unlike the Left Hand Side (LHS), these RHS barriers cannot prevent the centre event, however these can reduce or prevent possible consequences.

Examples of RHS barriers are:

- Emergency Action, which refers to specific emergency actions such as emergency stops
- Emergency Response, which includes first aid, evacuation, etc.
- Personal Protective Equipment *(note: depending on the centre event this barrier can be either a LHS or RHS barrier)*

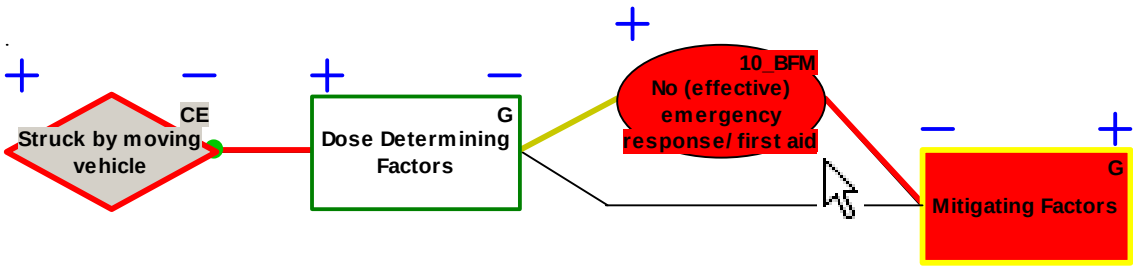
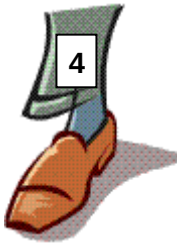


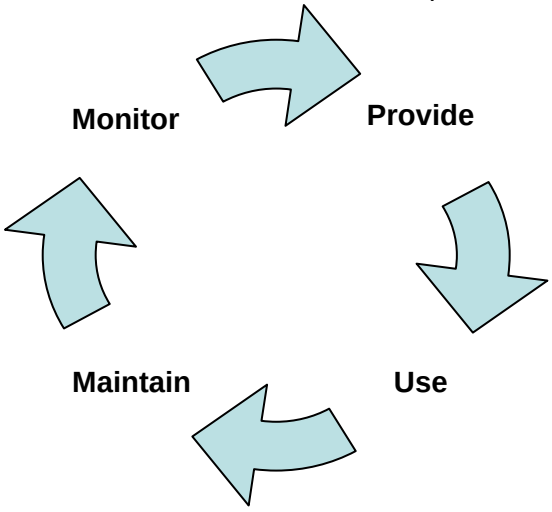
Figure 2.20 Barrier failures also occur on on the right hand side of the centre event

2.7 Step 4 : Identify failing Barrier Tasks



With the previous steps we have determined **WHAT** happened in terms of Loss Control and Centre Events and **WHERE** in terms of failed barriers. In step for we indicate per barrier failure the **HOW,** in terms of the failed tasks that should have controlled the barrier.

We expect the barrier to exert its safety function throughout, but in order to maintain its function to act as a barrier in the accident path, tasks need to be in place all the time to control the barrier safety function. These tasks can be seen as a small individual control loop for each barrier: provide – use – maintain - monitor.



- **Provide-[barrier] failure**
  The barrier does not exist, has not been well designed, or it is not provided and / or sufficiently/easily available when you want to use it. *For example: the correct tools where not provided to carry out the operations safely.*
- **Use-[barrier] failure**
  The correct barrier is provided, but the way in which the provided barrier is used is incorrect, it is only partially used, or it is not used at all. A 'use' failure is also the case, when somebody chooses to use a barrier other than the correct one, despite the correct one being available. *For example: the correct tools were available but not used.*
- **Maintain-[barrier] failure**
  The barrier is not kept available according to its designed function; i.e. in an adequate state. This does not only cover the maintenance aspect but also the management of change aspect of a barrier, i.e. a barrier is modified without ensuring that it maintains its barrier function. *For example: the tools were provided and used but failed because of bad maintenance or due to a change.*
- **Monitor-[barrier] failure**
  The barrier condition is not checked/ measured/observed/inspected. This task relates either directly to the state of the barrier, or to the supervision of the use of the barrier.

√ A rule was introduced to select only one main failing task per barrier. This is done by using the decision scheme below:

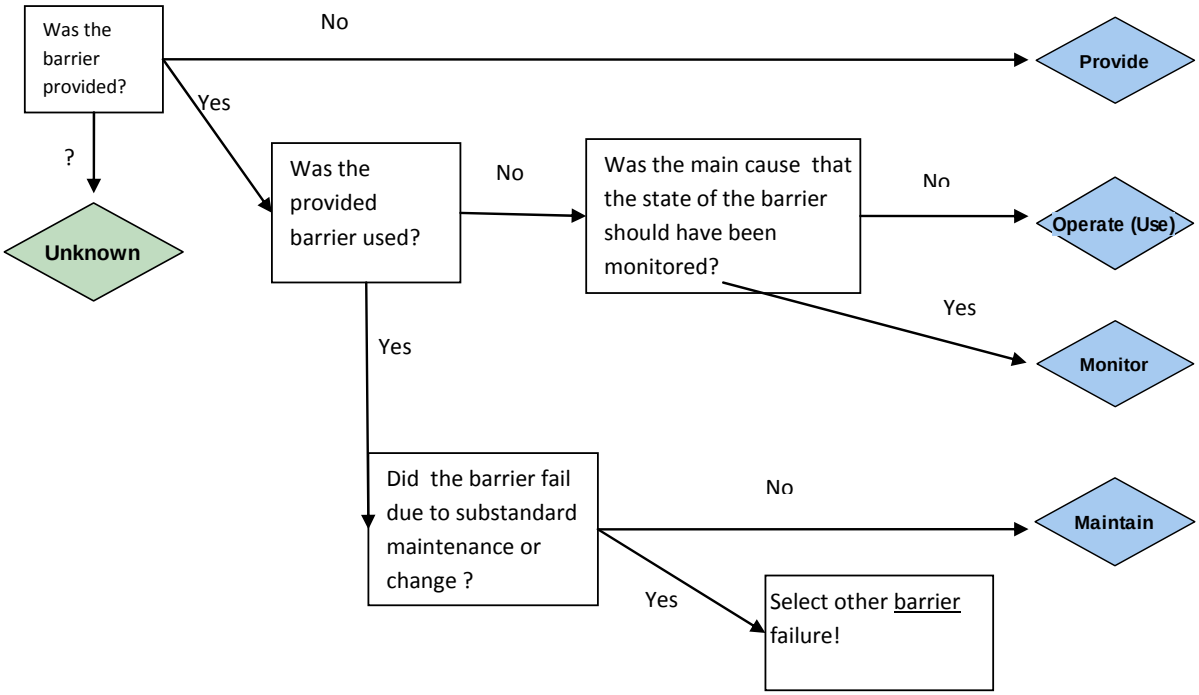


Figure 2.21 decision scheme for selecting failed barrier task

For each barrier failure the main failed task looks in Storybuilder as follows:

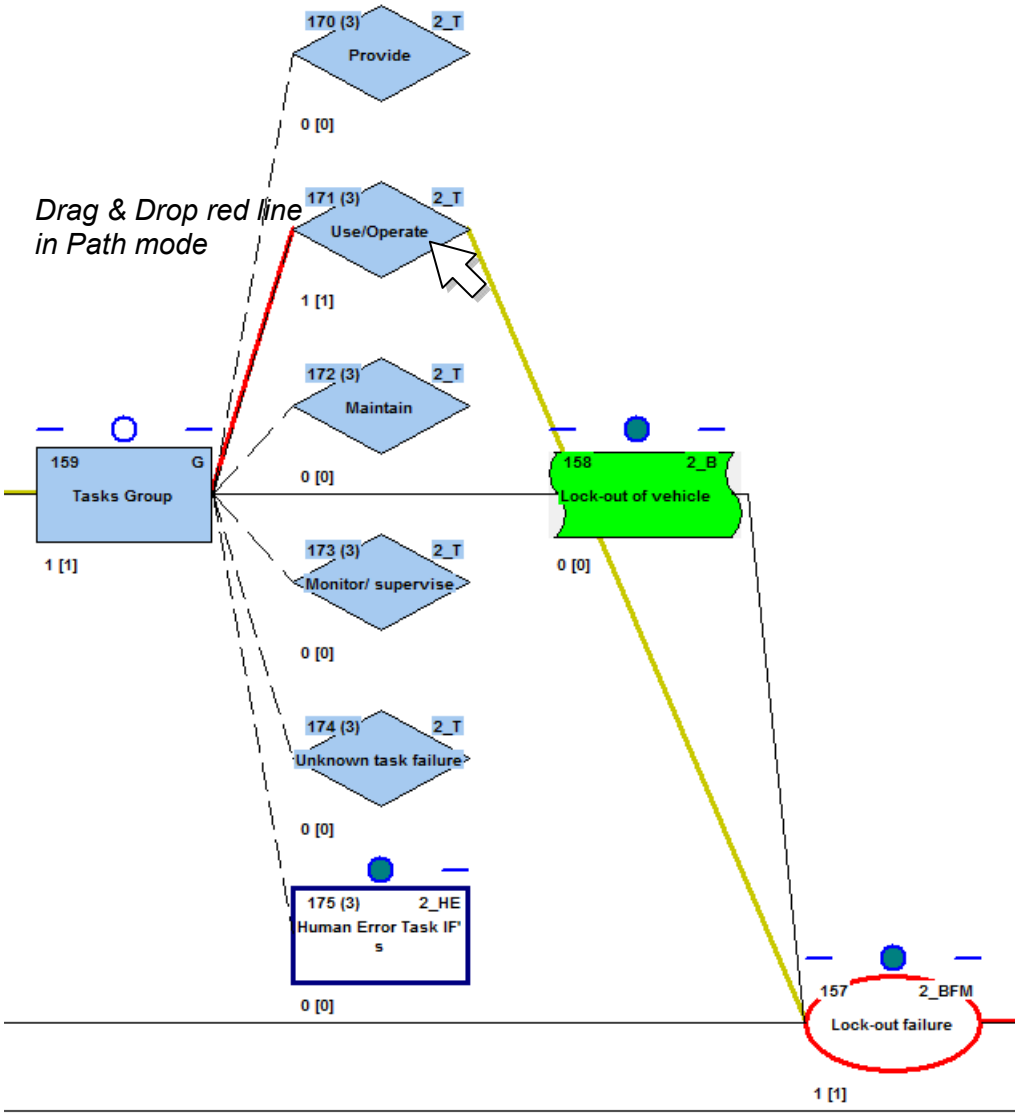


Figure 2.22 Select the failed barrier task for the failed barrier

√ When there is a use failure, it is also possible to enter data about the type of human error that occurred. The classification system that is used is from Reason (1990)[7]. While in the current system only use failures have been further classified foe human error, there is no reason why human errors cannot be identified for any of the task failures. The decision only to identify errors for Use failures was made by the analysts who stated that these were the ones where the inspector was most likely to provide enough information to classify the errors.

[7] *Reason, J.T. (1990) Human Error. Cambridge University Press*

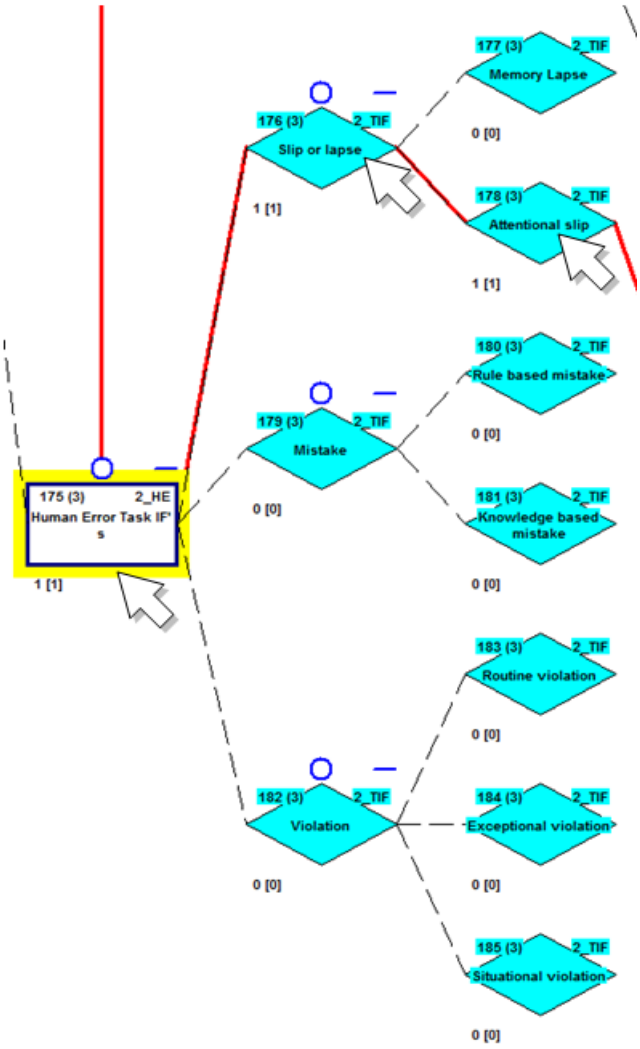
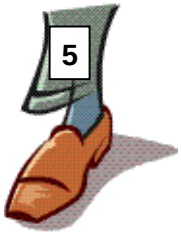


Figure 2.23 Human errors are entered for Use failures. The higher level error can be broken down into a more precise error type if the information is available

2.8 Step 5 : Identify Management Delivery Failures



The management delivery can be seen as the underlying causes of an accident. It is these that have to be delivered by the management systems in place. Management deliveries are the resources delivered through the tasks to the technical system to enforce the barriers that prevent accidents and/or reduce their consequences.

The Management Deliveries are:

- Plans & Procedures
- Availability
- Competence
- Communication

- Conflict Resolution
- Motivation, Commitment and Alertness
- Ergonomics
- Equipment

If one or more of the delivery systems fail, the tasks to control the barrier could fail, and consequently the barrier and its safety function. It can be just a matter of time and use until failure of the barrier will lead to the loss control events that ultimately lead to the centre event and the consequences leading to loss.

Failures of the management deliveries are symptomatic of management system weaknesses, and it is therefore a must to identify these underlying causes.

The Management Deliveries are further described below:

Management Delivery	Description
Plans & procedures	Procedures refer to specific performance criteria which specify in detail, usually in written form, a formalised 'normative' behaviour or method for carrying out tasks, such as: checklist, task list, action steps, plan, instruction manuals, fault-finding heuristic, etc. Plans refer to explicit planning of activities in time: either how frequently tasks should be done, or when and by whom they will be done within a particular time period (month, shutdown period, etc.). It includes: maintenance regime, maintenance scheduling (including shutdown planning), and testing and inspection activities. This delivery system also refers to rules, permits, programs and risk assessments.
Availability	Availability refers to allocating the necessary time (or numbers) of competent and suitable (incl. anthropometrics and biomechanics) people to the tasks to be carried out. It emphasizes time-criticality, i.e. people available at the moment (or within the time frame) when the tasks should be carried out. This delivery system includes the availability of staff for repair work on critical equipment outside normal work hours, incl. coverage for absence and holidays.
Competence	Competence refers to the knowledge, skills and abilities of the people selected for the execution of tasks. It also covers the selection and training function of a company to deliver sufficient staff for overall manpower planning. This delivery system also refers to 'right person for the job', i.e. with the proper knowledge to provide, use, maintain or monitor the barrier effectively.
Communication, collaboration	Communication/ Collaboration refers to internal communication and coordination. Internal communications are those communications which occur implicitly or explicitly, within any primary business activity, i.e. within one task or activity in order to ensure that the tasks are coordinated and carried out according to relevant criteria. This delivery also refers to task instructions and communication

Management Delivery	Description
	channels and means (such as meetings, logs, phones, radio). *Note: this delivery system is only relevant if the activity is carried out by more than one person (or group), who have to coordinate or plan joint activities.*
Motivation, Alertness and Alertness	Motivation/ Commitment refers to incentives and motivation with which people have to carry out their tasks and activities, i.e. with suitable care and alertness and according to the appropriate safety criteria and procedures specified for the activities by the organisation. This delivery system also includes the aspect of alertness, care & attention, concern for safety of self and others, risk avoidance and willingness to learn & improve. *Note* • *This delivery system is fairly closely related to Conflict resolution, in that it deals with the incentives of individuals carrying out tasks not to choose other criteria above safety, such as ease of working, time saving, social approval, etc.* • *Organizational aspects of conflicts are covered by Conflict resolution.* • *More personal aspects, such as violation of procedures, are covered by Motivation/ Commitment.*
Conflict Resolution	Conflict resolution deals with conflicts between safety and other goals within the performance of tasks. It deals with the mechanisms (such as supervision, monitoring, procedures, learning, group discussion) by which potential and actual conflicts between safety and other criteria in the allocation and use of personnel, hardware and other resources, are recognised, avoided or resolved. *Note:* • *This delivery system is closely related to Motivation/ Commitment.* • *Issues of violations within tasks at an individual level are covered by Motivation/ Commitment.* • *Conflict resolution covers the organisational mechanisms for resolving conflicts across tasks, between people at operational level and at management level.*

Management Delivery	Description
Ergonomics	Ergonomics/ MMI deals with the fit between the man and the task. It refers to the ergonomics of all equipment used/ operated by operations, inspection or maintenance to provide, use, maintain or monitor the barriers. This delivery system covers both the appropriateness of the interface for the task and the user-friendliness to carry out tasks. It includes: • *appropriate equipment, tools and software,* • *robust/ appropriate/ good interface and labelling, and* • *operability* and maintainability. Ergonomics/ MMI also covers: • *design and layout of control rooms and manually operated equipment,* • *location and design of inspection and test facilities,* • *the maintenance-friendliness of equipment, and* • *ergonomics* of the tools used to maintain it. *Note: MMI stands for Man - Machine Interface*
Equipment (tools, spares, parts)	Equipment refers to the hardware needed for provision, maintenance and monitoring of barriers. This delivery system covers both the correctness of the equipment for their use (compatibility, suitability, quality), and the availability of equipment where and when needed to carry out the activities. It includes: spares & parts (incl. those needed for maintenance) and adequate & correct stocks.

√ For each failed task enter the applicable management delivery failures. To maintain focus, do not enter more than three delivery failures per failed task.

Example: ergonomics was not delivered to provide a safe location: in our example of struck by moving vehicle it means that the ergonomics of layout was such that it did not enforce safe position/ location of the victim with respect to moving vehicles.

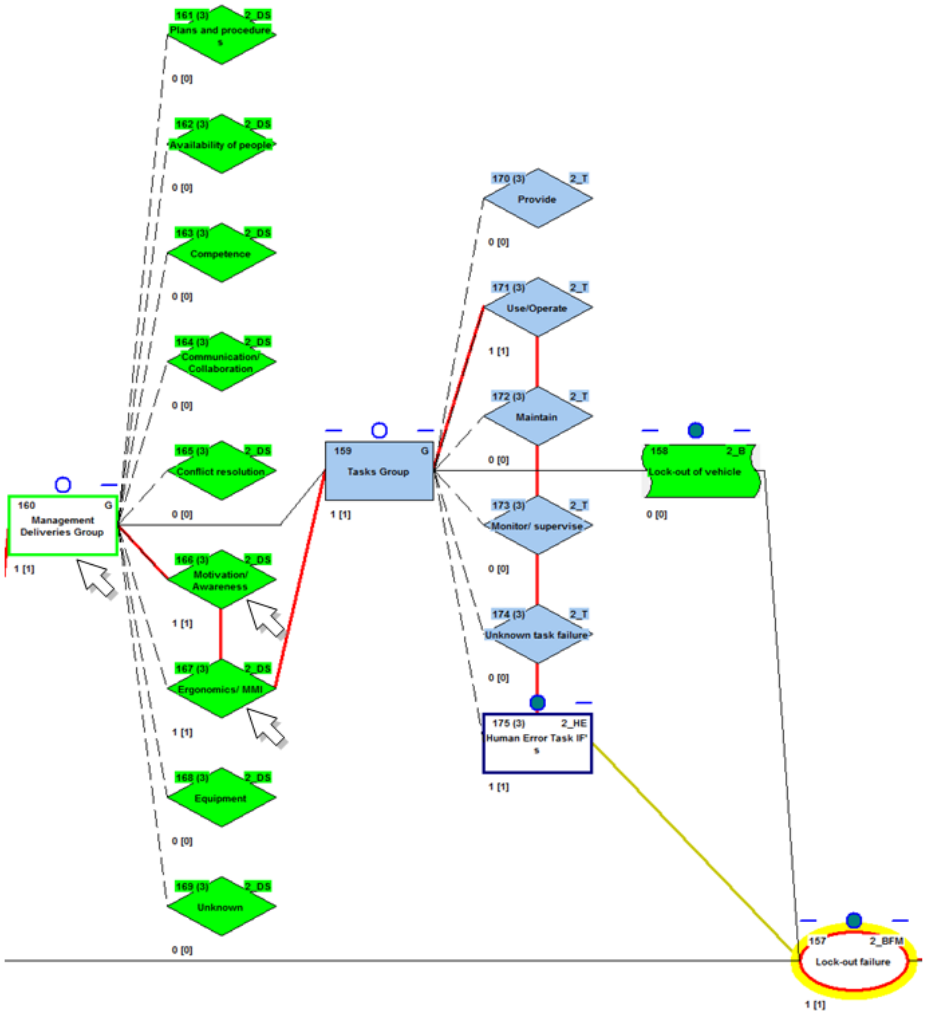


Figure 2.24 Selected management delivery system failures for the failure to use Lock-out of the vehicle

2.9 Step 6: Identify consequences

Additional information about WHAT happened concerns the consequences to the victim.

- √ Dose determining factors
- √ Nature of the Injury
- √ Whether the victim was hospitalised
- √ The resulting consequence (death, permanent injury, recoverable injury)
- √ Length of absence from work.

The first consideration is the hazard “dose” received by the victim, such as at what speed a vehicle hit them, how far they fell, the time for which they were exposed. These are factors which can affect how severe the consequences may be.

√ Dose determining factors can be included on the RHS by clicking on the dose determining factors applicable for the accident.

Examples of Dose Determining Factors (DDF) are, for the scenario struck by moving vehicle: speed of the vehicle, location of the contact (see below)

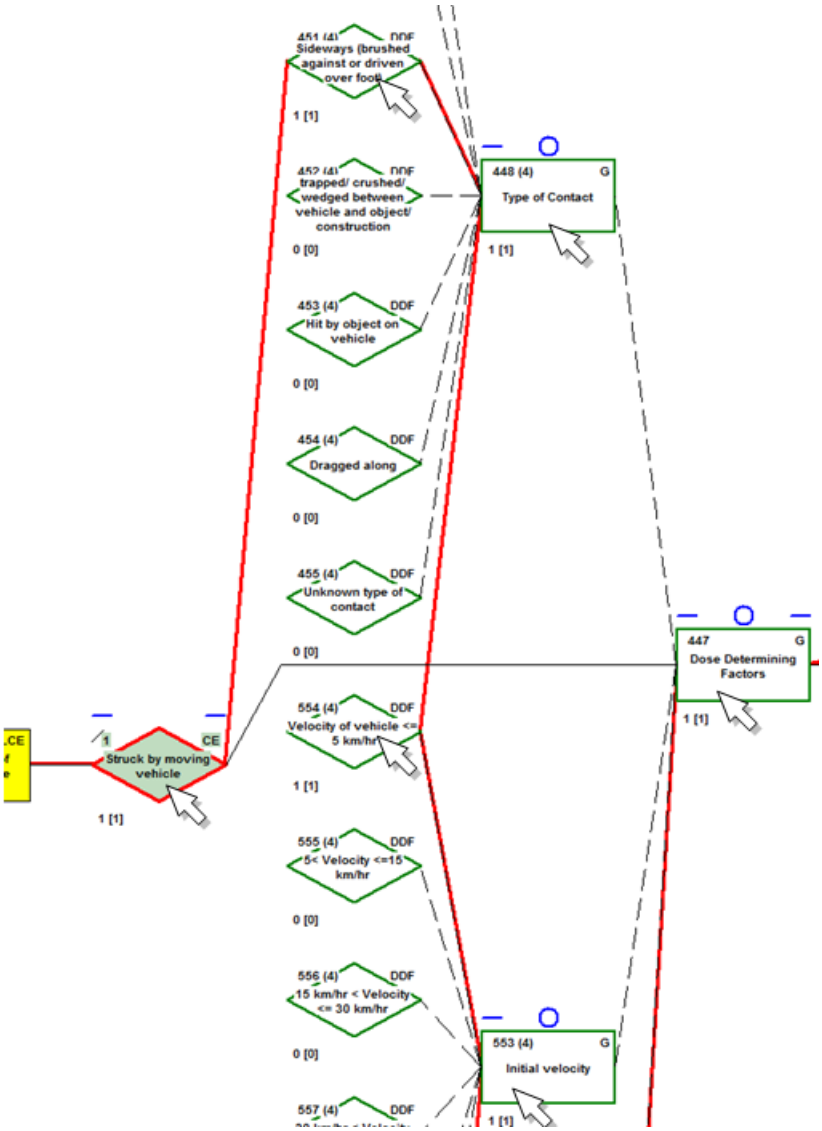


Figure 2.25 Dose determining factors may affect the severity of the consequences. These are the DDFs for the example for Struck by Moving Vehicle. Arrows indicate boxes selected

√ Select the appropriate part of body injured and injury type. Injuries are classified according to the ESAW classification system[8]. ESAW classifies the injuries with 2 variables:
- The injury type
- Injured body part

Every injured body part is coded with a number of 2 characters (ESAW distinguishes 41 body part codes) e.g. 52 Arm, including elbow.
Every injury type is coded with a number of 3 characters (ESAW distinguishes 46 injury type codes). This applies also for unknown injuries and unknown body parts. E.g.020 Bone fractures.

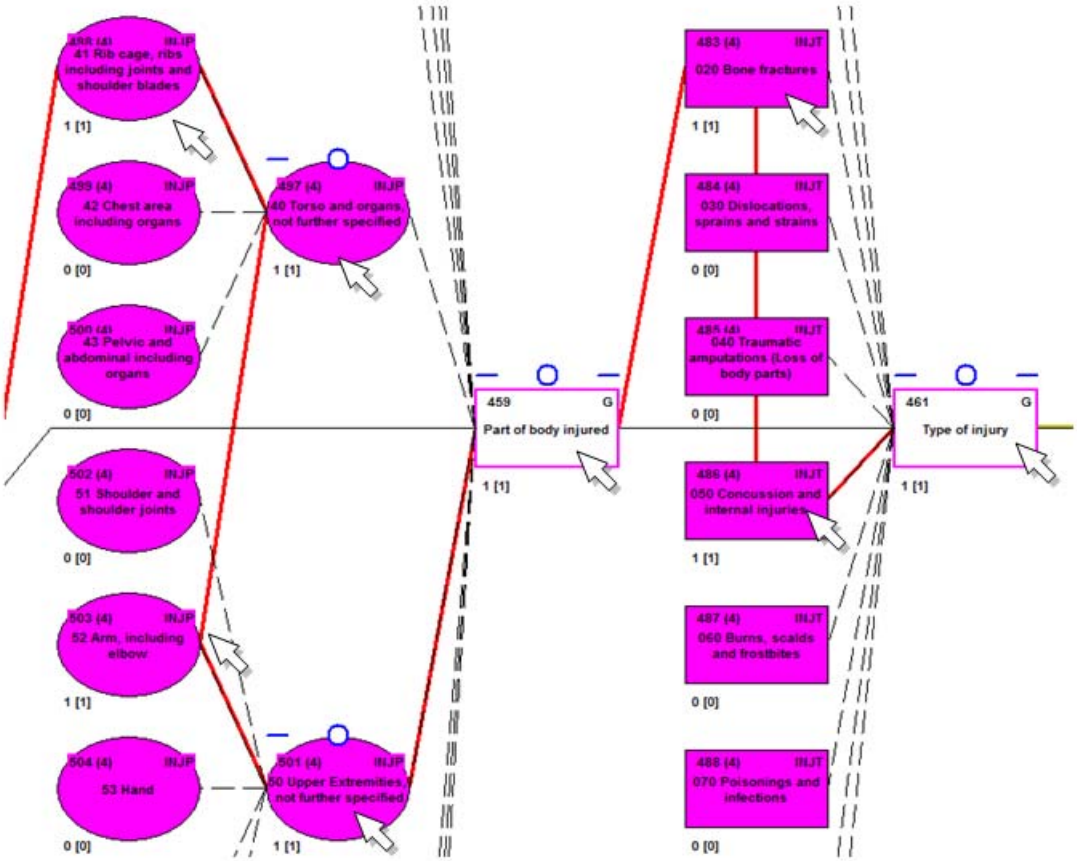


Figure 2.26 Injured body parts and type of injury

[8] *See Europeans statistics on accidents at work ESAW Methodology, 2001 Edition, Appendices B and C; or the Dutch version Europese statistiek van Arbeidsongevallen, Methodiek, Uitgave 2001, bijlagen B en C*

√ Identify if the victim was hospitalised or not. Hospitalised means that a victim is admitted to a hospital for at least one day. Treated in a polyclinic is not hospitalised.

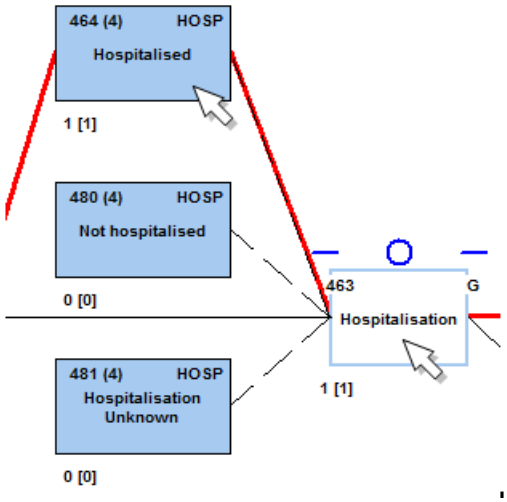


Figure 2.27 Was the victim hospitalised?

√ What was the final outcome?.

- Final Outcome Death (FO)
- Final Outcome Permanent Injury (FO)
- Final Outcome Non Permanent Injury (FO)
- Final Outcome Unknown Injury (FO)

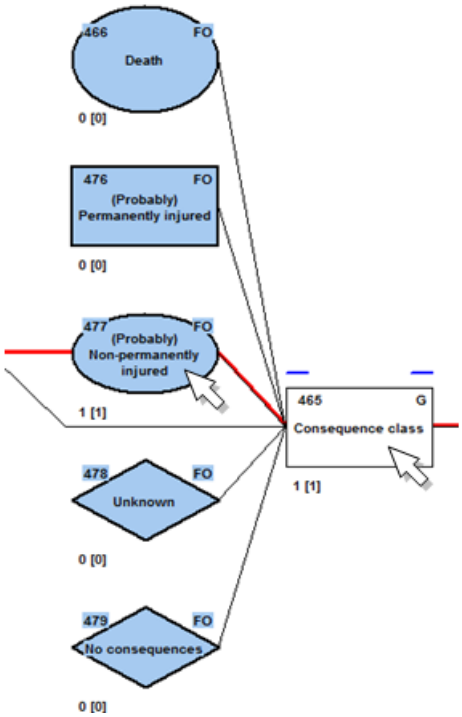


Figure 2.28 Selection of the consequence for the victim

Definition non-permanently injured body-part:
An injured body-part which will totally recover after recuperation or which regains its original function completely.The IP (injured person) can return to work after the period of recuperation.
Definition permanently injured body-part:
An injured body-part which, according to reasonable judgement, will remain longer than two years after its origin.

√ How long was the victim absent from work?

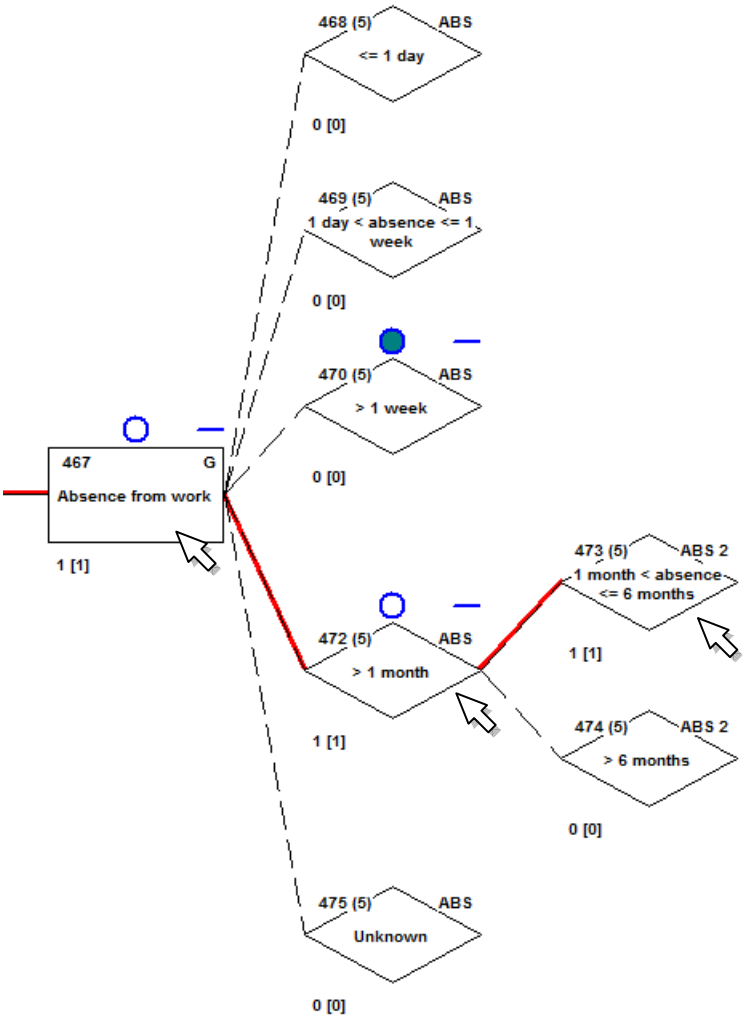


Figure 2.29 Absence from work: the total duration that the victim was absent

In addition to the points described above it may be that due to a domino effect, the accident path dgoes into another bowtie.

√ If the accident path continues to another bowtie where the victim receives injuries use the field: Outgoing bowties. For example, in struck by moving vehicle, some paths continued to a fall from height after the strike

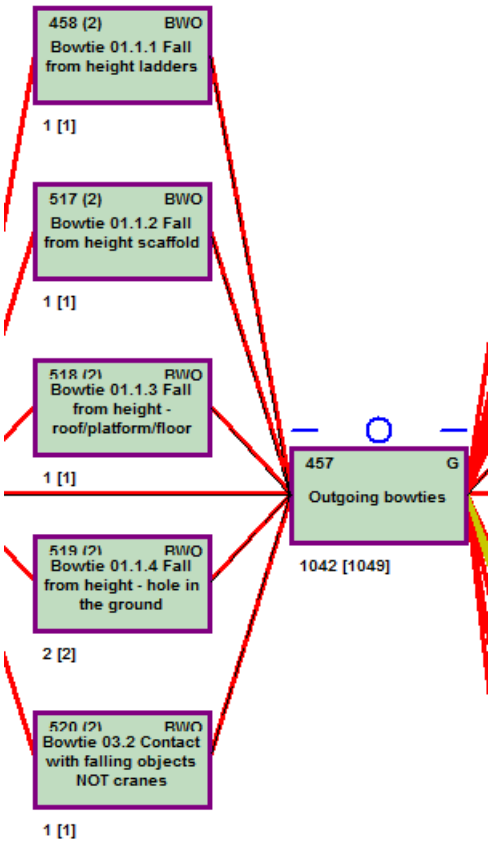


Figure 2.30 Outgoing bowties from Struck by Moving Vehicle

2.10 Actions and follow-up

The accident path is now complete for causes, consequences and underlying factors explaining what, where and why the accident occurred. That is the ideal moment to draw lessons learned for improvement of the organisation.

The usual mistake is to fight the symptoms of accidents rather than their underlying causes. Having analysed these, actions need to be determined to prevent similar accidents occurring. If organisations are poor on follow-up, this might explain why similar occupational accidents keep reoccurring.

Barriers need to be strengthened by carrying out the tasks that ensure the barrier safety function is in place (provide – use- maintain – monitor). This is done by delivering the right resources to these tasks. The management delivery systems are part of the risk management of the organisation.

The accident causation model developed for use in Storybuilder is summarised in the figure below.

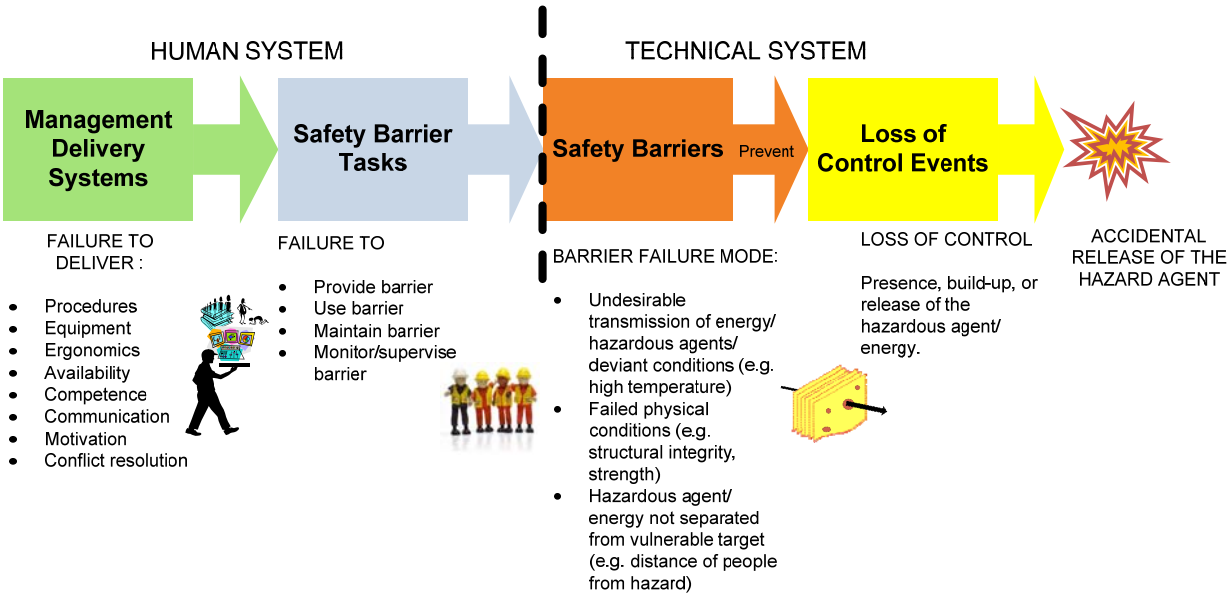


Figure 2.31 Accident model developed for Storybuilder

In the next figure the relation between the safety management system and its interface with the technical system (i.e. the barriers), through the tasks, is shown.

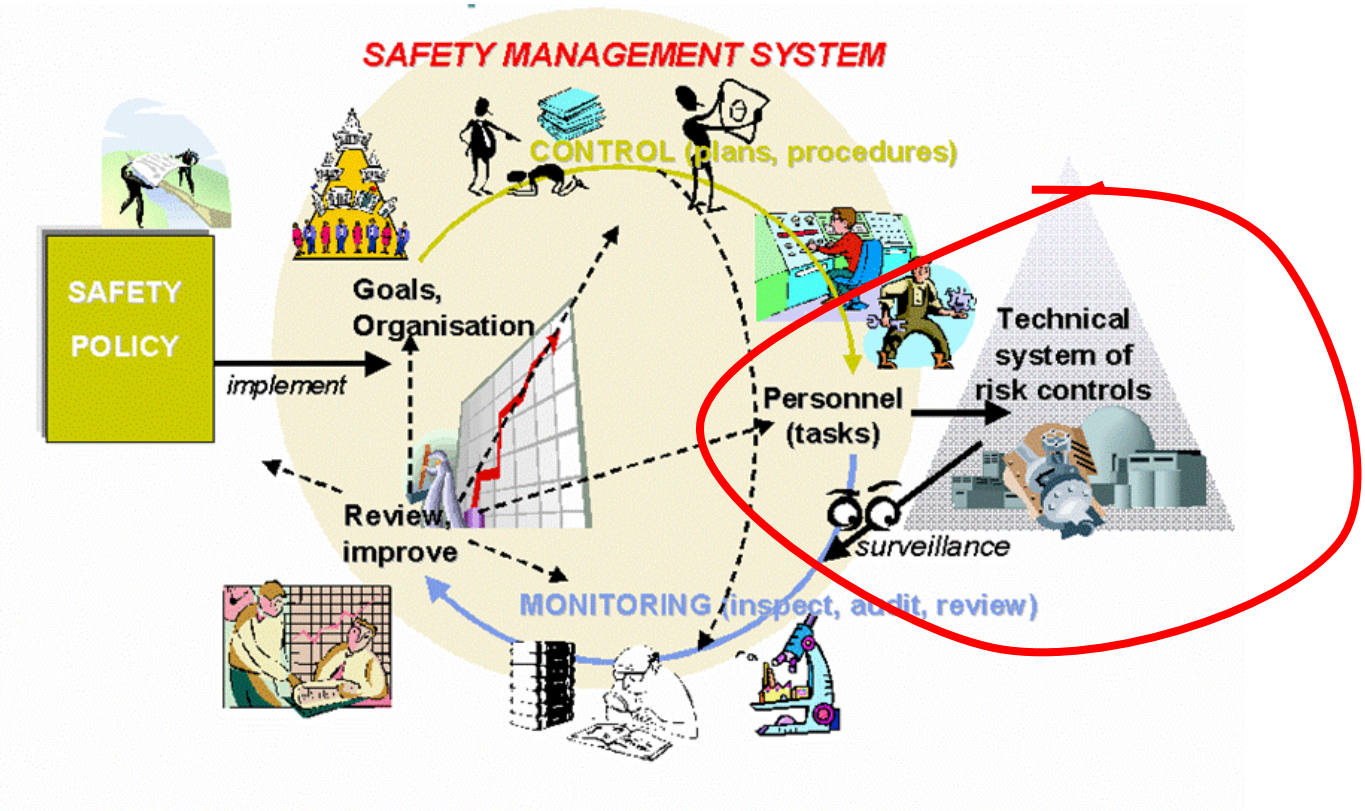
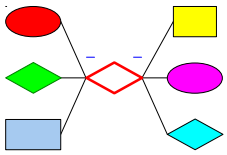


Figure 2.32 The safety management system implements company policy. The system delivers resources (management delivery systems) to the personnel tasks (barrier tasks). Through these tasks the personnel influence the technical system. The way of doing things in the organisation is often referred to as "Organisational Culture" and which is considered to affect safety in a systematic way

The main rule of action is not to condemn the direct actor involved in the last barrier that failed before the centre event occurred, but to strengthen the barriers, tasks and management deliveries of the critical accident path(s).

For example in the struck by moving vehicle accident, common accident paths include lack of visibility and location/ position barrier failures. So it is necessary to take actions that address these, e.g.:

- √ *provide luminous jackets and good lighting*
- √ *provide optimal layout and separation between pedestrians and vehicles*
- √ *ensure people use foot path routes*
- √ *ensure maintaining good visibility by avoiding changes in the environment that decreases visibility*
- √ *monitor the use of the barriers to ensure they stay in proper state*
- √ *train drivers and pedestrians to follow the rules*



3 STATISTICS

This Chapter describes how to get data out, by performing a simple statistical analysis. This chapter describes how to find patterns in the entered data.

3.1 How to perform statistical analysis on a specific StoryBuild

√ Open a specific StoryBuild Bowtie, e.g. 01.1.1 fall from height – ladders.

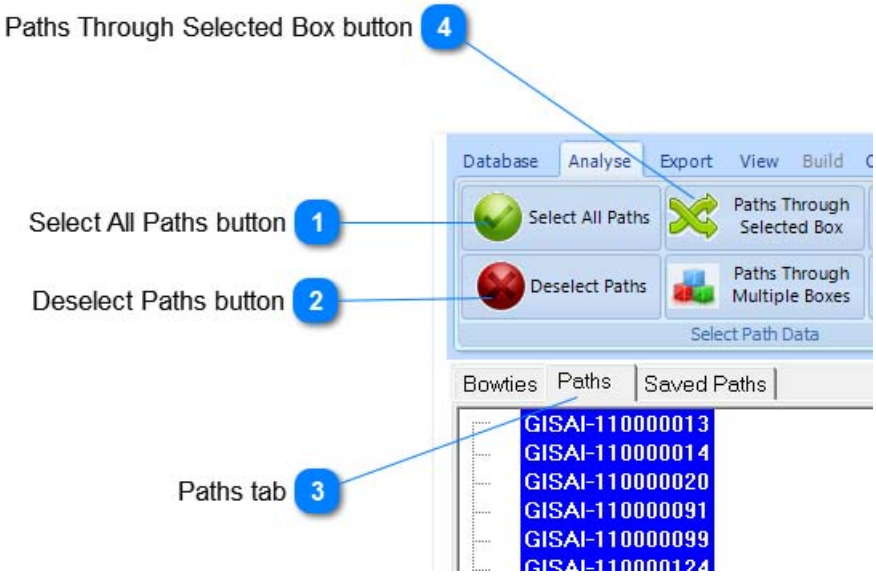


Figure 3.1 Important buttons for analysis

√ Choose 1. Select all paths. The total number of accidents [and victims] is shown pass ing therought the centre event

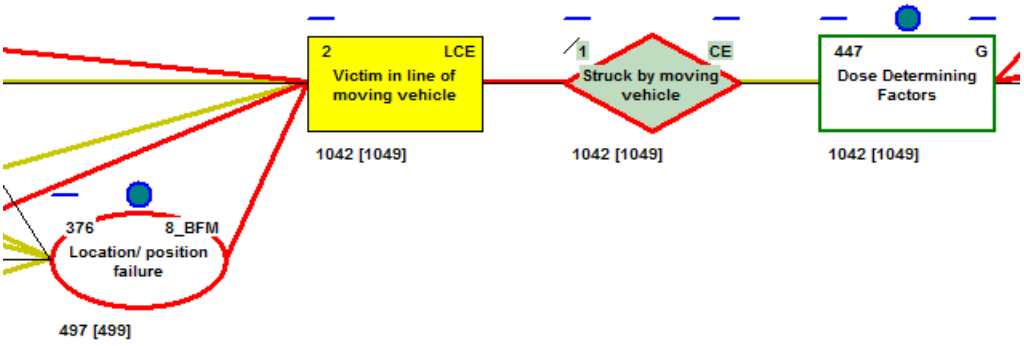


Figure 3.2 Choosing all paths shows the results for all accidents passing through this bowtie

√ Choose 2 Deselect all paths. The paths should disappear.

√ On the Analyse tab choose Paths Through Selected Box

OR

If the database is unlocked…..

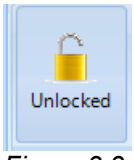


Figure 3.3 The database needs to be unlocked if you want to use the box R-click menu

√ …..R-clicking on a box will provide the R-Click menu which can also be used for path selection. Choose select paths

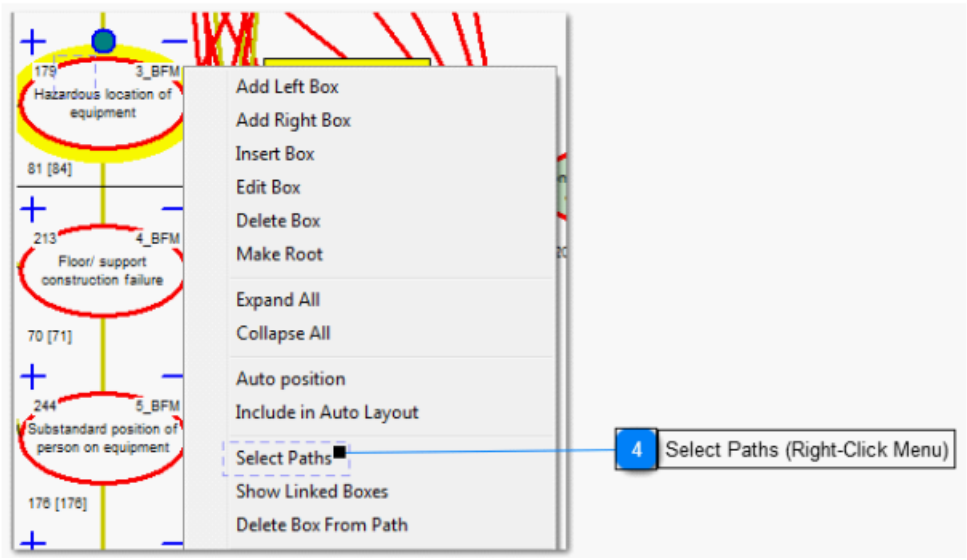


Figure 3.4 R-click box menu

√ Move your cursor over the paths list in the Paths tab. On the left bottom (underneath the numbered accidents) the number of paths (accidents) that have the selected box included is now shown. In the example below it means that 355 out of the 1561 accidents pass through the selected box.

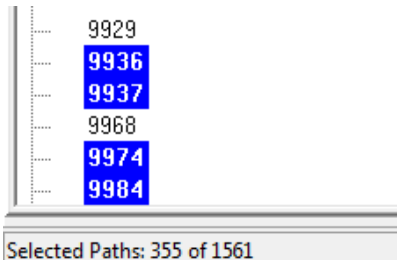


Figure 3.5 Selected paths count appears bottom left when cursor held over the paths list

In principle, an analysis can be performed on any box in the StoryBuild Bowtie, or a combination of boxes.

This feature allows different types of analyses to be performed, such as:

- Analysis of the direct causes (indicated as Loss of Control Events = LCE)
- Analysis of the failed barriers (indicated as Barrier Failure Modes BFM)
- Analysis of the failure mechanisms: failed barrier tasks (indicated as Task failures T)
- Detailed analysis of a particular barrier failure (Incident Factors = IF)
- Analysis of the underlying causes: failed management deliveries (indicated as Delivery System failures DS)
- Analysis of the violated regulations mentioned in the “fine” report by the inspector (REG)
- Analysis of the Equipment Type (ET) involved in the accident
- Analysis of the Activity related to the accident (A)
- Analysis of the consequences

- Injury – location on body (INJP)
- Injury Type (INJT)
- Hospitalisation (HOSP)
- Final Outcome Death (FO)
- Final Outcome Permanent Injury (FO)
- Final Outcome Non Permanent Injury (FO)
- Final Outcome Unknown Injury (FO)

3.2 Accident analysis with multiple criteria using Boolean expressions

In the Analyse tab at the top, select “Paths Through Multiple Boxes“ to open Path Search.

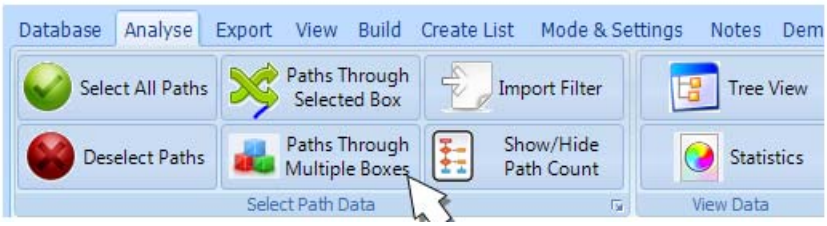


Figure 3.6 Analyse tab

At the bottom in the middle the follow pop-up screen appears:
Click on the boxes and/or type in your selection criteria. All paths fulfilling these criteria can now be selected.

Figure 3.7 Multiple box selection field

For example 114 or 138: all paths that include box nr 114 or box nr 138 can be selected.
For example 114 and 138: all paths that include box nr 114 as well as box nr 138 are selected.
For example 114 and not 138: all paths that include box nr 114 and not box nr 138 are selected.

Brackets can be used to make complex expressions. Ensure that there are no boxes with equal box numbers (this should not be necessary with the supplied database). Renumber the boxes to be sure by using the renumbering button in the Build toolbar.

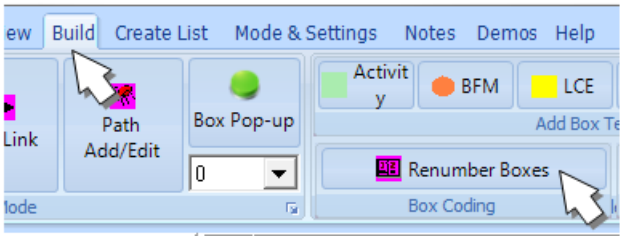


Figure 3.8 Box renumbering

3.3 Show number of selected (accident) paths directly below the boxes

As a default path counts show below the box. This can be changed using the button "Show/Hide Path Count" under the View tab.

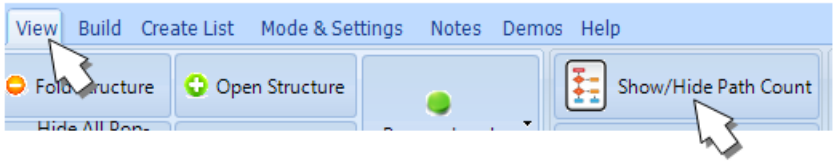


Figure 3.9 The show/hide button on the view tab toggles the path count information on and off

As a result the number of selected (accident) paths for that box is shown at the bottom. Use the menu bar Modes and Setting>User Settings> Box properties to change the location of the box number, box code and number of selected paths.

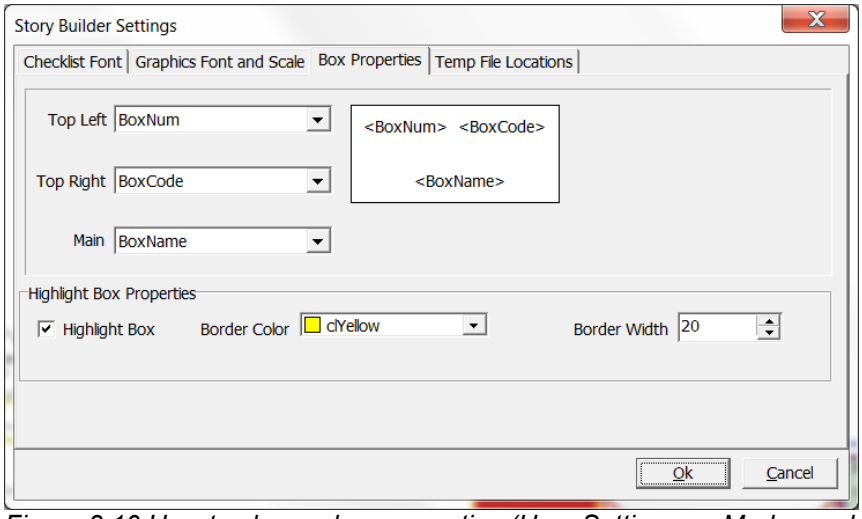
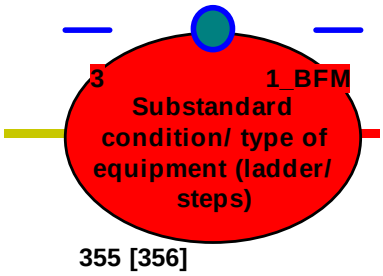


Figure 3.10 How to change box properties (User Settings on Modes and Settings tab)



The number between brackets is the number of victims. So, in the example left there are 355 accidents with 356 victims, that are caused by the barrier failure substandard condition or type of equipment

Figure 3.11 Number of accidents [number of victims] are shown below the box

3.4 Create overview of distribution of accident paths for a current selection

√ To have a good overview of the current selected accident paths, use the Tree View button under Analyse, Export, or View tabs.

√ Drag the window border of the tree view part of the screen to show the number of paths through the various boxes, with their relative percentages of the total. Show/ hide by clicking the + or – signs.

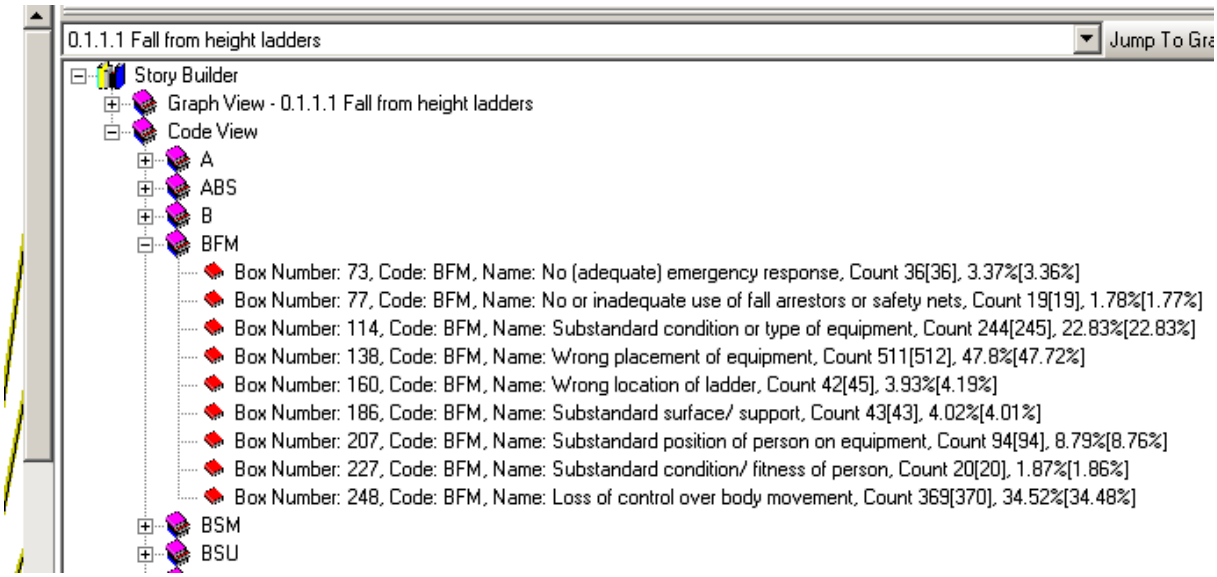


Figure 3.11 Bowties organised in Tree view

IMPORTANT : after making a new selection, right click in the tree view area to open the right mouse menu and select "refresh" to update it.

3.5 Export current selection shown in Tree View directly to Microsoft Word or Microsoft Excel

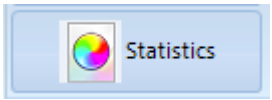
The expanded boxes in tree view can be exported.

- √ Expand the selection you want. The most used is Numberless Code view. E.g. all the Barrier Failure Mode data can be exported if BFMs are opened. Multiple branches can be opened at the same time.

- √ Right click in the tree view area to open the right mouse menu and select "Export Selected Boxes".

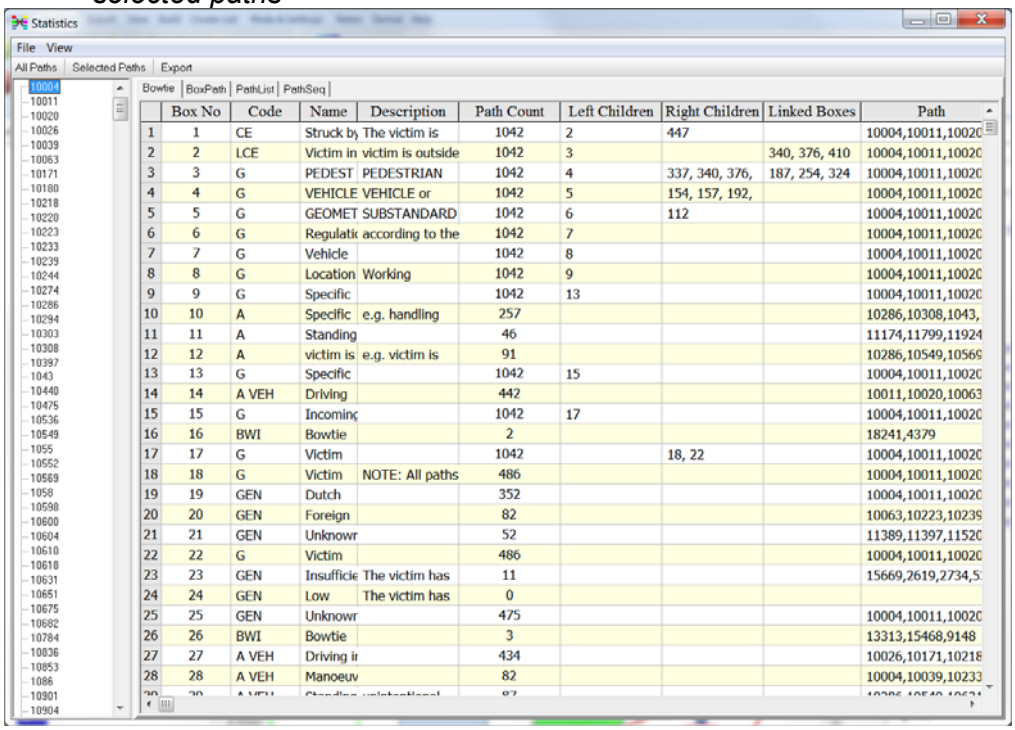
A table in MS Word or MS Excel, depending on the choice, is now automatically generated, based on the current selection .

3.6 Export all the accident data to Microsoft Excel



- √ Use the Statistics button under the Analyse or Export tabs. Different formats can be exported, to be selected by their tabs: Bowtie, BoxPath, PathList, PathSeq. Select "Export" for exporting what you see to MS Excel and wait for it to open your exported data ready for further analysis

Note: In the statistic window use the buttons to also select all paths or selected paths



	Box No	Code	Name	Description	Path Count	Left Children	Right Children	Linked Boxes	Path
1	1	CE	Struck by	The victim is	1042	2	447		10004,10011,10020
2	2	LCE	Victim in	victim is outside	1042	3		340, 376, 410	10004,10011,10020
3	3	G	PEDEST	PEDESTRIAN	1042	4	337, 340, 376,	187, 254, 324	10004,10011,10020
4	4	G	VEHICLE	VEHICLE or	1042	5	154, 157, 192,		10004,10011,10020
5	5	G	GEOMET	SUBSTANDARD	1042	6	112		10004,10011,10020
6	6	G	Regulatic	according to the	1042	7			10004,10011,10020
7	7	G	Vehicle		1042	8			10004,10011,10020
8	8	G	Location	Working	1042	9			10004,10011,10020
9	9	G	Specific		1042	13			10004,10011,10020
10	10	A	Specific	e.g. handling	257				10286,10308,1043,
11	11	A	Standing		46				11174,11799,11924
12	12	A	victim is	e.g. victim is	91				10286,10549,10569
13	13	G	Specific		1042	15			10004,10011,10020
14	14	A VEH	Driving		442				10011,10020,10063
15	15	G	Incoming		1042	17			10004,10011,10020
16	16	BWI	Bowtie		2				18241,4379
17	17	G	Victim		1042		18, 22		10004,10011,10020
18	18	G	Victim	NOTE: All paths	486				10004,10011,10020
19	19	GEN	Dutch		352				10004,10011,10020
20	20	GEN	Foreign		82				10063,10223,10239
21	21	GEN	Unknowr		52				11389,11397,11520
22	22	G	Victim		486				10004,10011,10020
23	23	GEN	Insufficie	The victim has	11				15669,2619,2734,5
24	24	GEN	Low	The victim has	0				
25	25	GEN	Unknowr		475				10004,10011,10020
26	26	BWI	Bowtie		3				13313,15468,9148
27	27	A VEH	Driving ir		434				10026,10171,10218
28	28	A VEH	Manoeuv		82				10004,10039,10233

Figure 3.12 Statistic window shows only accident numbers (not victims) for every box.

WARNING: When the list of path names exceeds the capacity of an excel cell they will be missed from the list.

4 SECTOR SPECIFIC ANALYSIS

Although the accident scenario's and the accident path patterns shown are, within a particular hazard mostly quite generic across sectors for the 23,030 accidents investigated, in practice, a lot of questions related to the analysis of occupational accidents are sector specific.
Unfortunately, the sector information was not included in the original file with the results of the accidents, but are kept separatelyin the underlying register database (of the Dutch Labour Inspectorate).

To identify sector specific data in the storybuilds, a sector specific file can be generated for you on request to Storybuilder@RIVNM.nl

The tool ***Story Filter*** in which the data are held is not currently available to 3rd parties.

Request a specific file that contain parameters you are interested in from the help desk. These parameters can be:
Date: Year of accident
Sex: of victim
Age:, age group: of victims
Sector: Name, preferably with SBI code
Job: Name or ISCO code. Job names are currently not classified, but job titles used instead e.g. Carpenter..

Open a file manager and drag the Story Filter Paths file (extension.sfp) onto the Boxes Workspace for a selected Storybuild.

The appropriate records will be highlighted. You can save this selection in the Save Paths tab by right clicking in the Save Paths workspace and selecting Add. You will then be able to give the selection a name. Clicking on the name in future will automatically select those paths.

Save any specific selection with the R-click menu in the Paths tabs. Right click on one of the highlighted paths

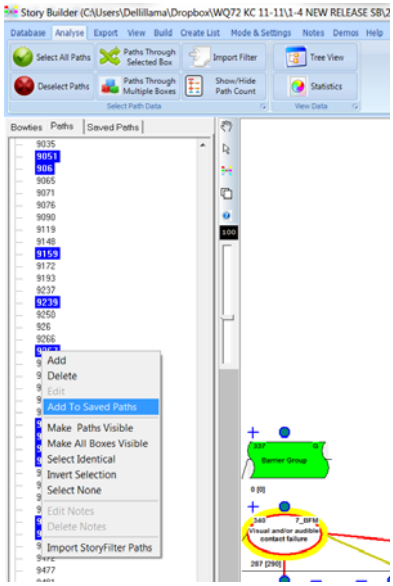


Figure 4.1 "Add to saved paths" can be found by R-clicking on a path in the selection in the Paths tab

'

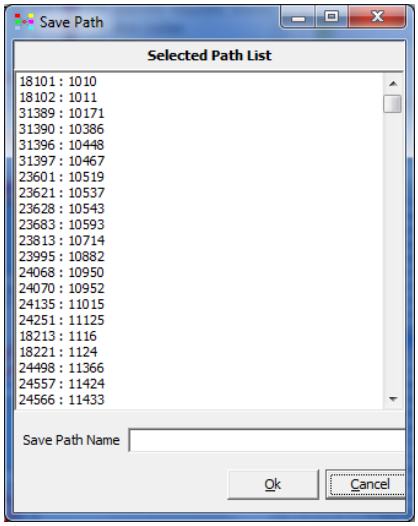


Figure 4.2 Choosing Add to Saved Paths will show this screen - all selected paths are shown which then be gien a name.

Saved path names are listed under the Saved Paths tab

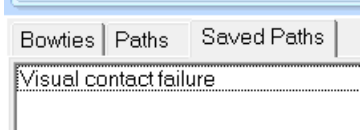


Figure 4.3 Saved paths tab

Appendix 1: Glossary

Accident path
An accident path is a sequence of events leading through an undesired centre event.

Loss of control event
A loss control event is an event(s) that occurs when a primary safety function fails. In the accident path sequence it is the direct cause or causes that leads to to centre event. Loss control events can also be included on the right hand side of our bowties als events that directly lead to the (severity of) the consequences.

Barrier
A barrier is a physical entity (object, state, or condition) that acts as an obstacle in an accident path. Barriers can be created or enforced by actions (measures) and need to be controlled to be effective (management control loop: provide – use – maintain-monitor).

Barrier Task
This is the task to be performed to manage the barrier and its safety function. The barrier tasks together form a management control loop (provide-use-maintain-monitor).

Left Hand Side (LHS)
Indicates the position of a block (factor) in our model. Left Hand Side (LHS) means to the left of the centre event, i.e. previous in time. *For example: a RHS barrier can prevent the centre event to occur (prevention).*

Right Hand Side (RHS)
Indicates the position of a block (factor) in our model. Right Hand Side (RHS) means to the right of the centre event, i.e. later in time. *For example: a RHS barrier can reduce the consequence of the centre event.*

Dose Determining Factor (DDF)
The Dose Determining factor are factors that influence the severity of the consequences of a centre event. By definition they are located to the right of the centre event.

Management Delivery
Management deliveries are the resources and commitments delivered by the management systems in place, through the tasks towards the technical system to enforce the barriers that prevent accidents and/or reduce their consequences.
A management delivery failure can be seen as an underlying (base) cause of an accident.

Appendix 2: Tips for easy use of Story Builder

1. How to manage the amount of boxes shown on your screen
   On opening a StoryBuild bowtie, sometimes the number of boxes is overwhelming. With the standard data file, most boxes are hidden, and can be shown/ hidden by using the pop-up levels features:
   - Scale to 25% (menu bar option Scale or the slider on the vertical bar) to create an overview

     Using the root box finder on the vertical bar or toolbar recentres the bowtie

   - Use pop-up levels 1,2,3,4 and 5 in the toolbar
   - or individually box by box on clicking the blue dots and/or +/- signs on top of each box.

2. How to navigate

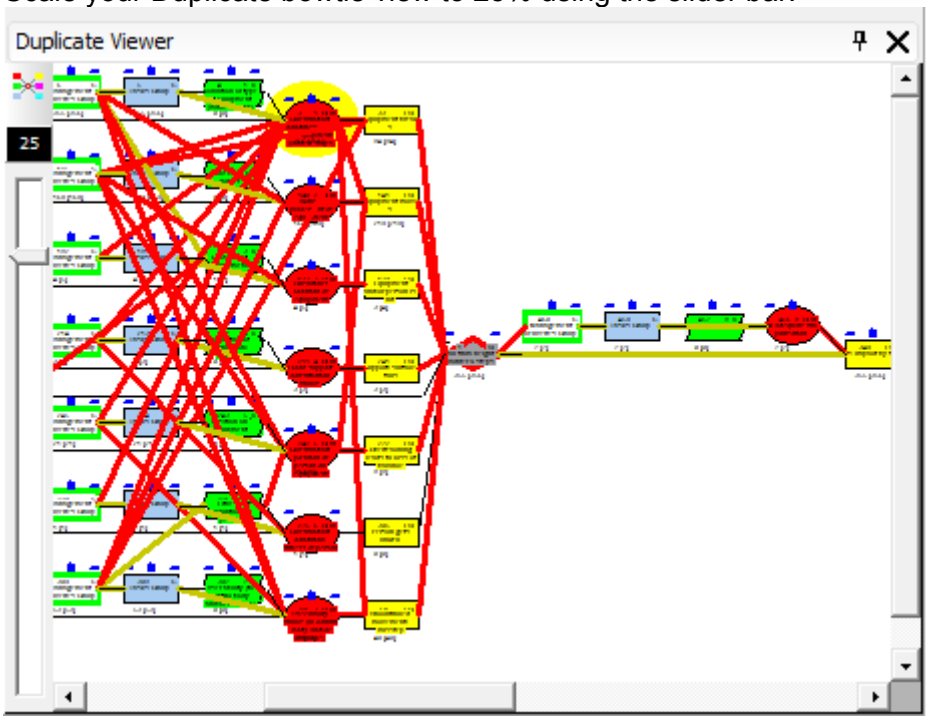
   Method I
   - Use the scroll bars
   - Or: Use the hand on the vertical central toolbar. You can switch bar to the arrow when you want access to other options

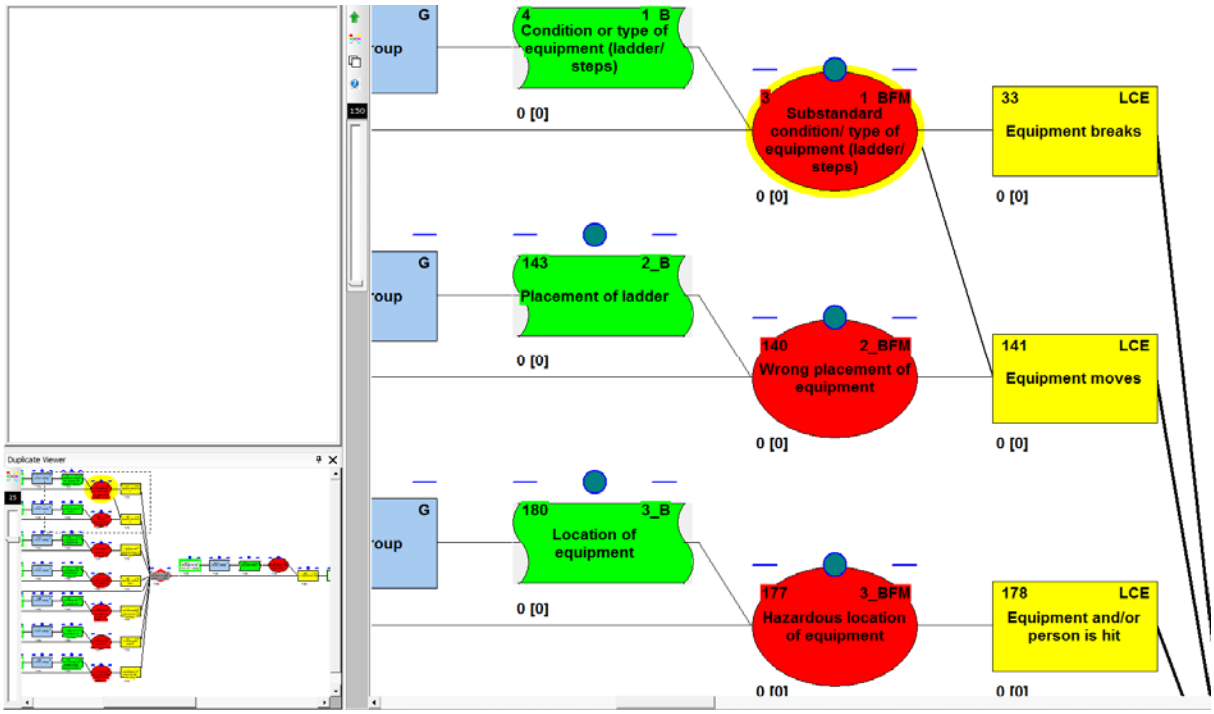
   Method II
   - Use option in the vertical central toolbar : Duplicate view.

- Scale your Duplicate bowtie view to 25% using the slider bar.



- Drag round the area you want to navigate to



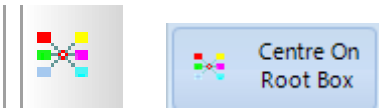
Method III

- Use option in the toolbar : Tree

- Open the tree by clicking on the + signs to find the box you need in either Code View or Numberless code view.
- Double click on the box you want to navigate to (or alternatively use option Jump To Graph)

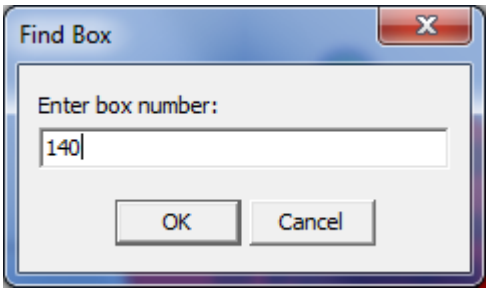
Method IV

- Use option in the vertical central toolbar or the Centre on Root Box button under the View tab.



You will then navigate to the centre event

- Use Ctrl key together with Root to navigate to a box for which you know the box number.



3. How to copy/ paste or print out (parts of) the graphs

Copy & Paste Whole graph

√ Choose copy graphic to clipboard on the Export tab

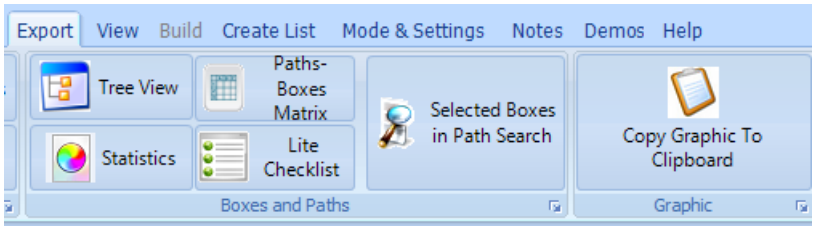


Figure 0.1 Copy graphic to clipboard

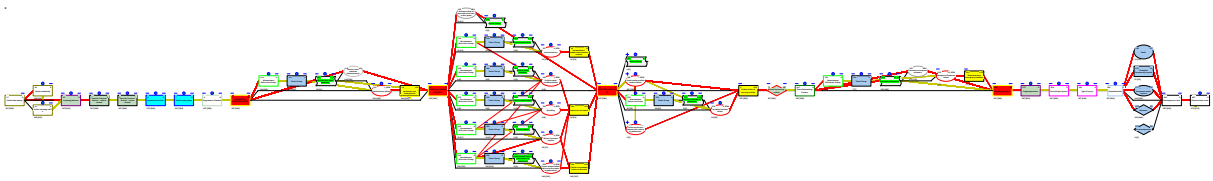


Figure 0.2 What you see is what you get. Paste into MS Excel or Word

- open MS Word or Excel - paste. The copy will be of what you can see. Open it out before copying if you wish to copy more parts. Using items in the View tab or using the +- and pop up circles on individual boxes can individualise your view,

4. Recover lost data

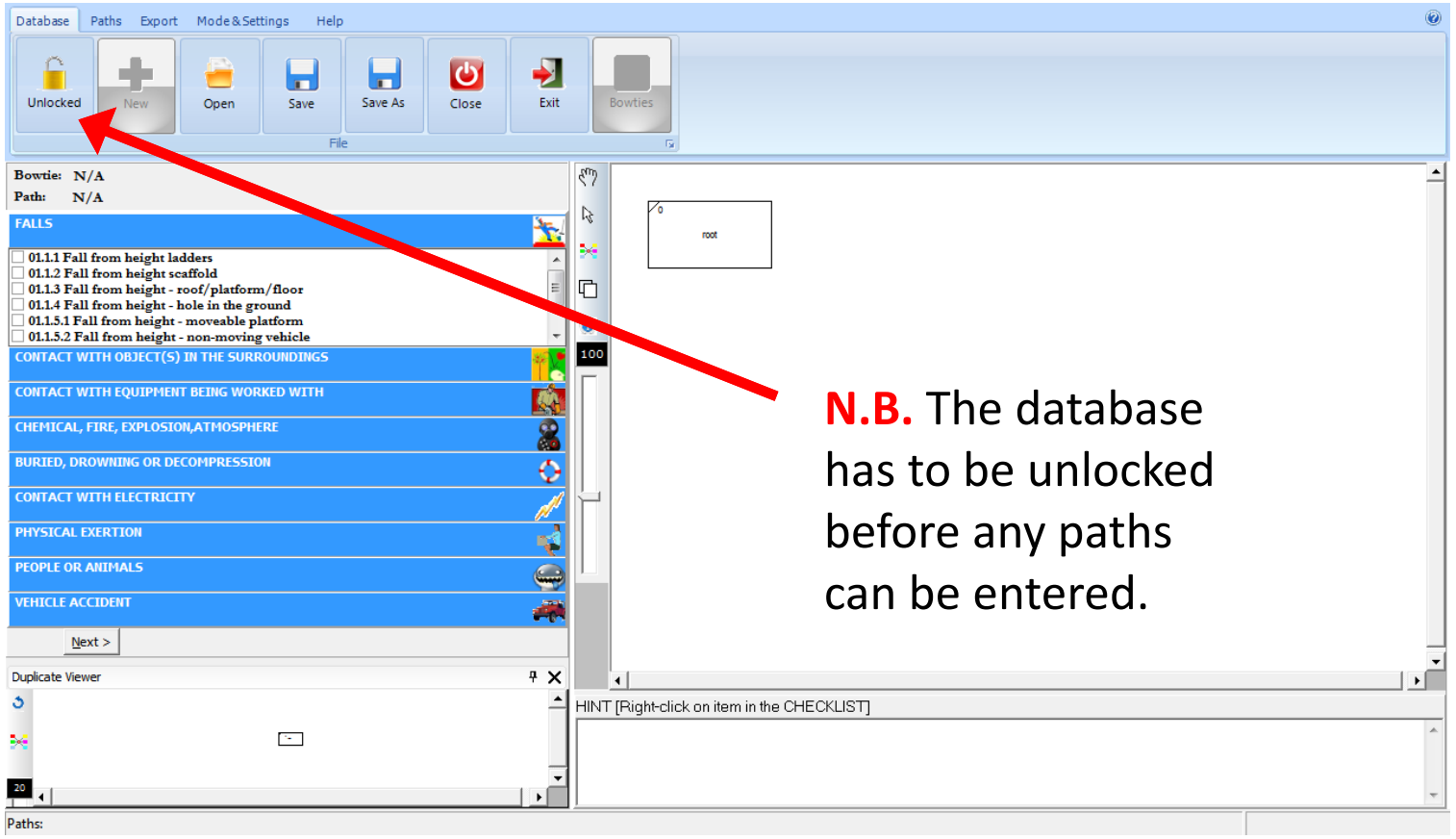
- Upon a crash: save as another file
- Open the .sb file or .old file (automatically saved in same directory as the sb file every 10 minutes)

Appendix 3: Box Codes

Code	Description
A	Activity
ABS	Absence from work
B	Barrier
BFM	Barrier Failure Mode
BSM	Barrier Success Mode
BSU	Barrier
BWI	Bowtie Domino: Incoming scenario
BWO	Bowtie Domino: Outgoing scenario
CE	Centre Event
DDF	Dose Determining Factor
DS	(Management) Delivery System
ENV	Condition in the environment
ET	Equipment Type
FO	Final Outcome (Death, Permanent Injury, Non-Permanent Injuries or Unknown)
G	Group box
GEN	Code used for extra fields
HOSP	Hospitalisation
IF	Incident Factor
INFO	Information detail
INJP	Part of body injured - using ESAW classification
INJT	Type of injury - using ESAW classification
LCE	Loss Control Event
REG	Regulations violated (fined)
T	Barrier Task

Appendix 4: Storybuilder lite mode help for entering paths

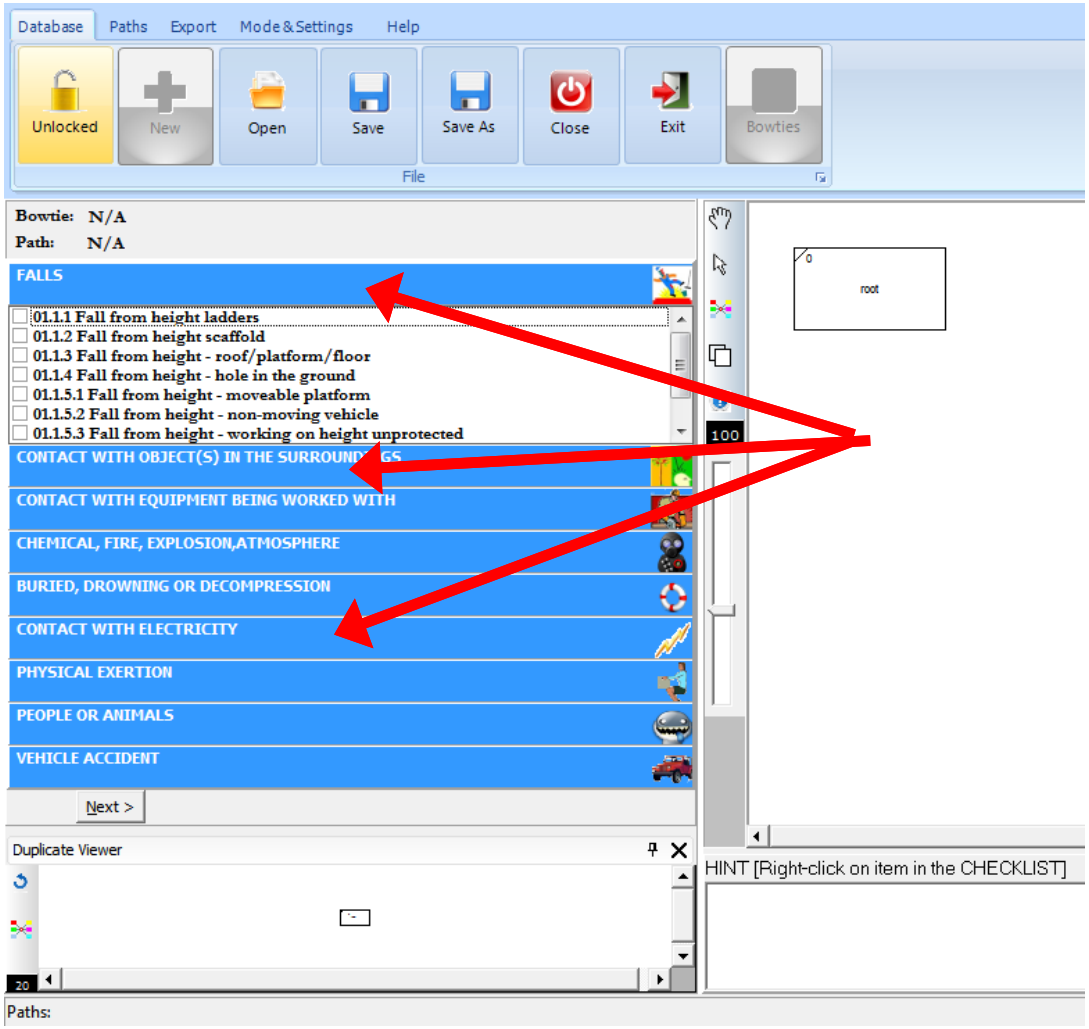
Quick Start: Make a Path



N.B. The database has to be unlocked before any paths can be entered.

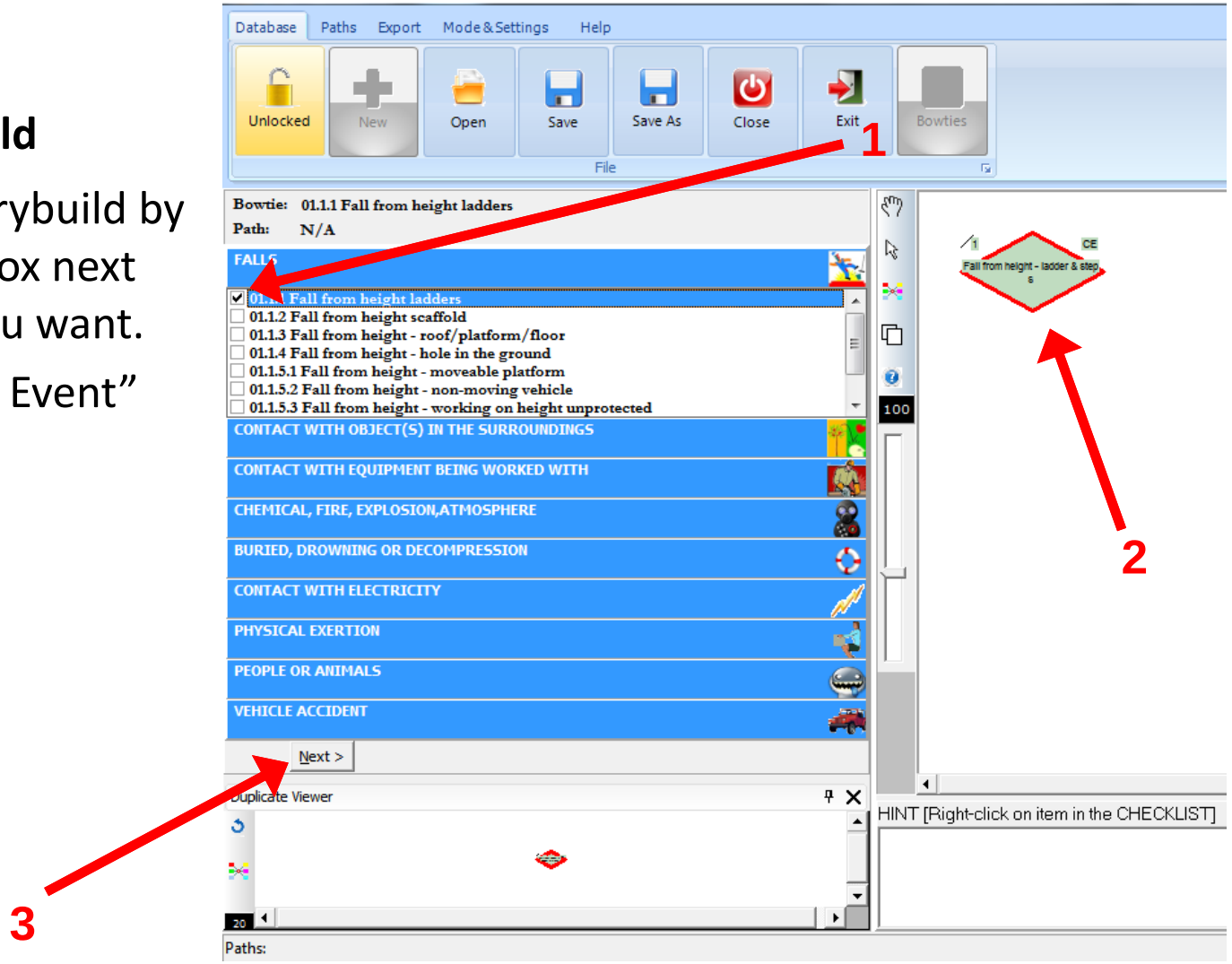
A) Getting started

Browse different Storybuilds by clicking the blue bar headings.



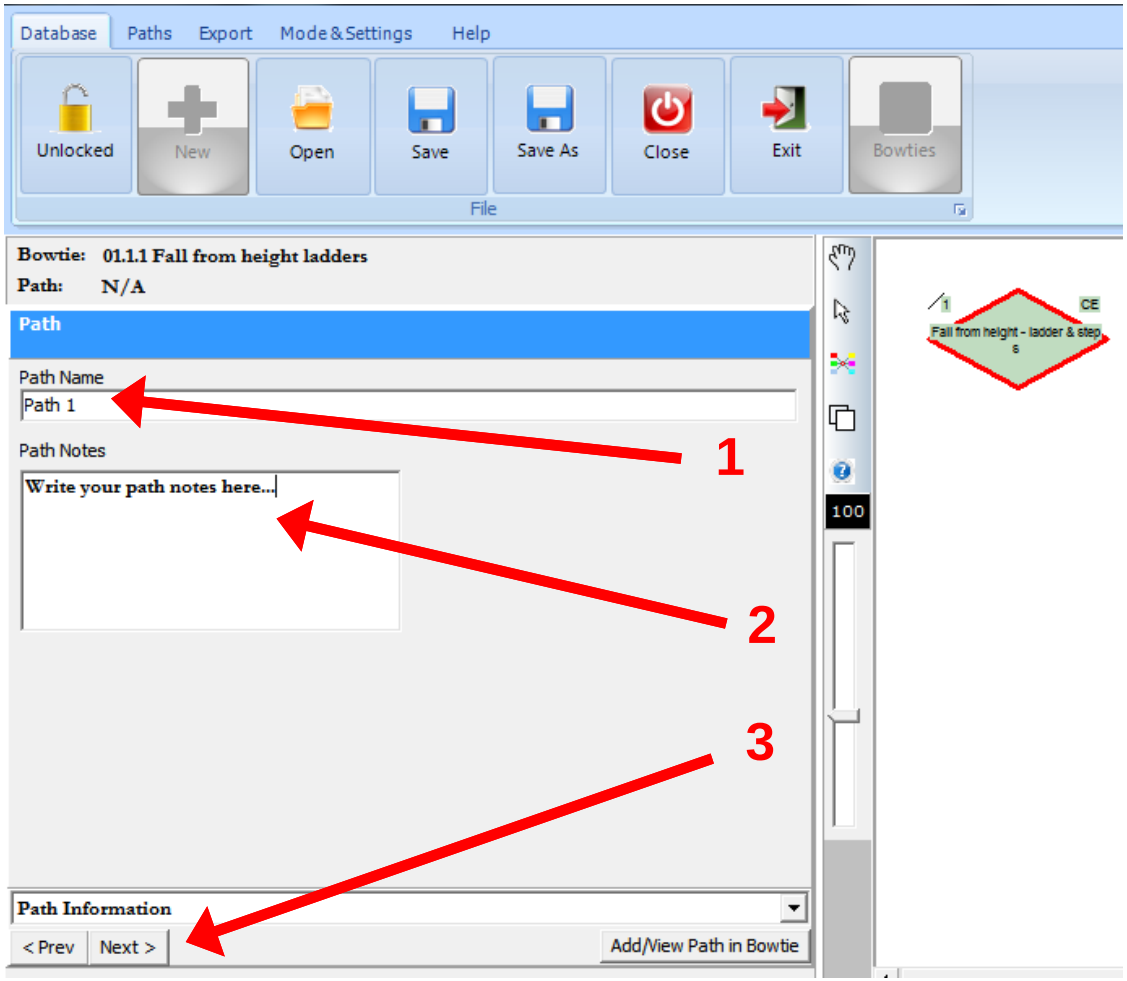
B) Pick a Storybuild

1. Choose a Storybuild by clicking the box next to the one you want.
2. Your “Central Event” will appear.
3. Click “Next”.



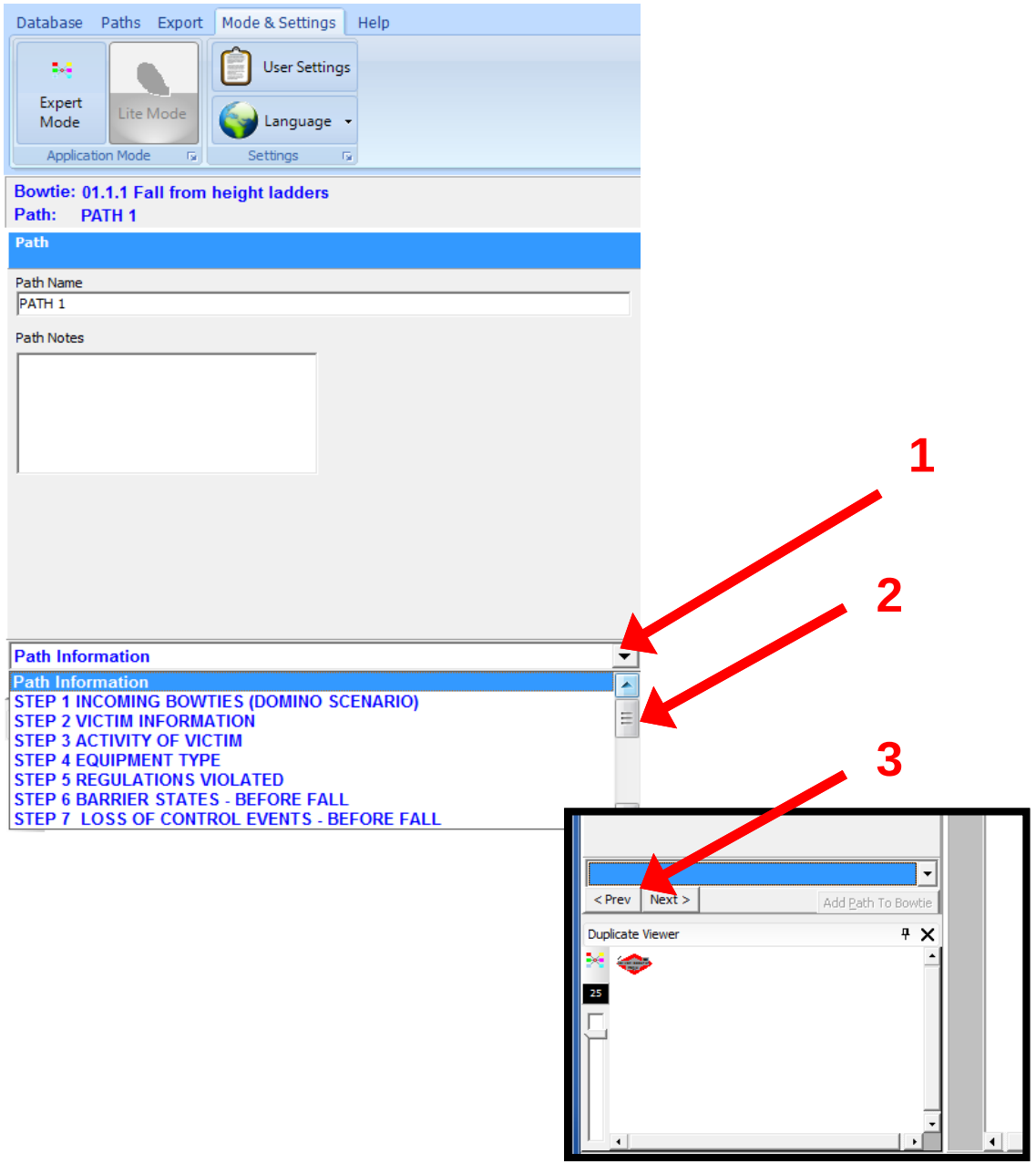
C) Name Your Path

1. Under “Path Name”, enter the name of your accident path.
2. Fill in any other path information in the space below (optional)
3. Click “Next”.



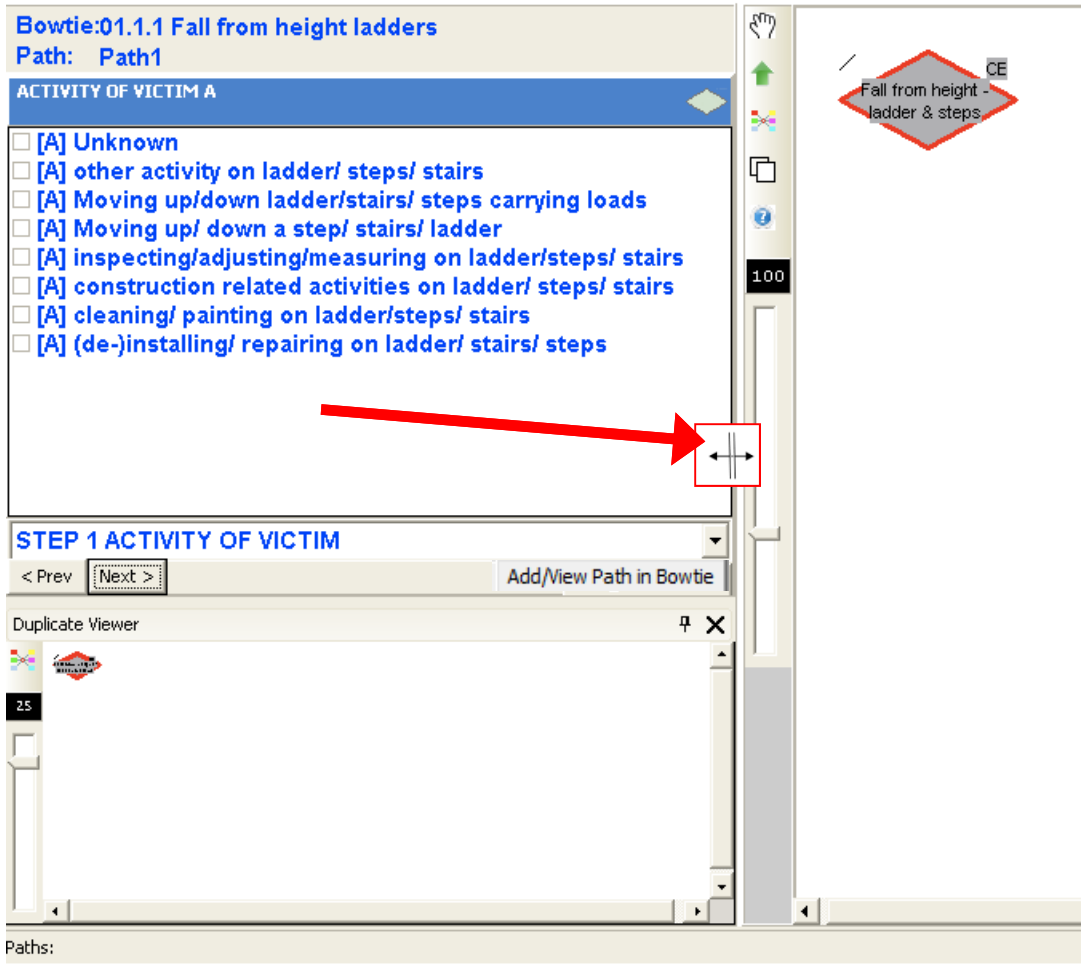
D) Path Information Menu

1. Click here to choose a particular step along the path
2. Use the scroll to see all the steps
3. Skip this to automatically view the steps in order using the “Next” and “Previous” buttons.



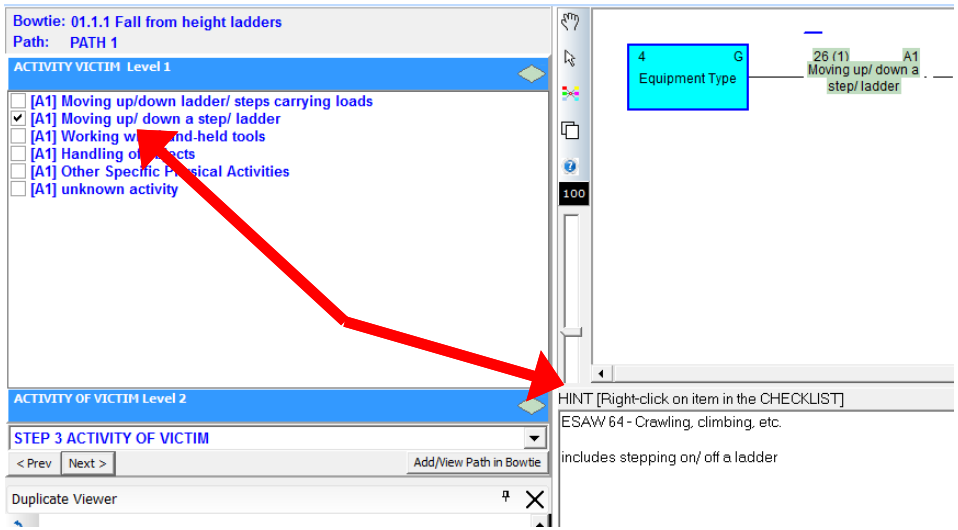
E) Widening the field

Hold your cursor over the edge of the left-hand window, click and drag to the right to make the window larger. Drag to the left to make the window smaller.



F) View Description

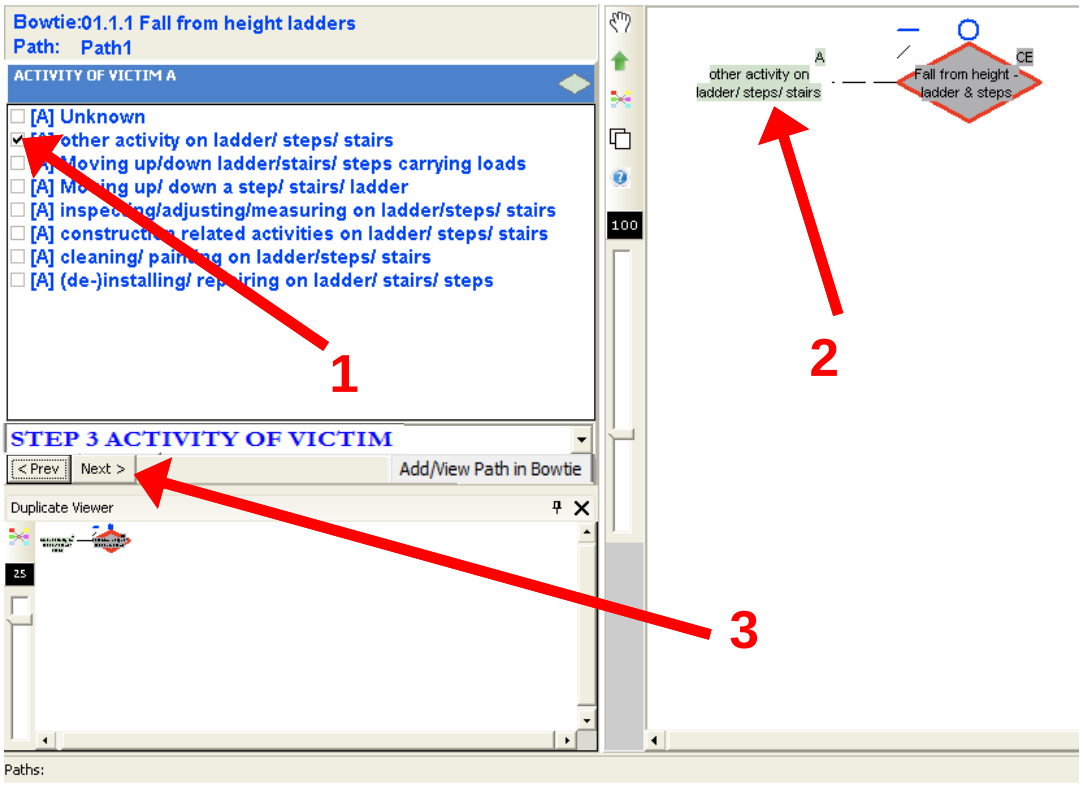
Right-click any box option to see a further description in the field below the graphic (Note: not all items will have a description).



S3) Step 3: Activity of Victim

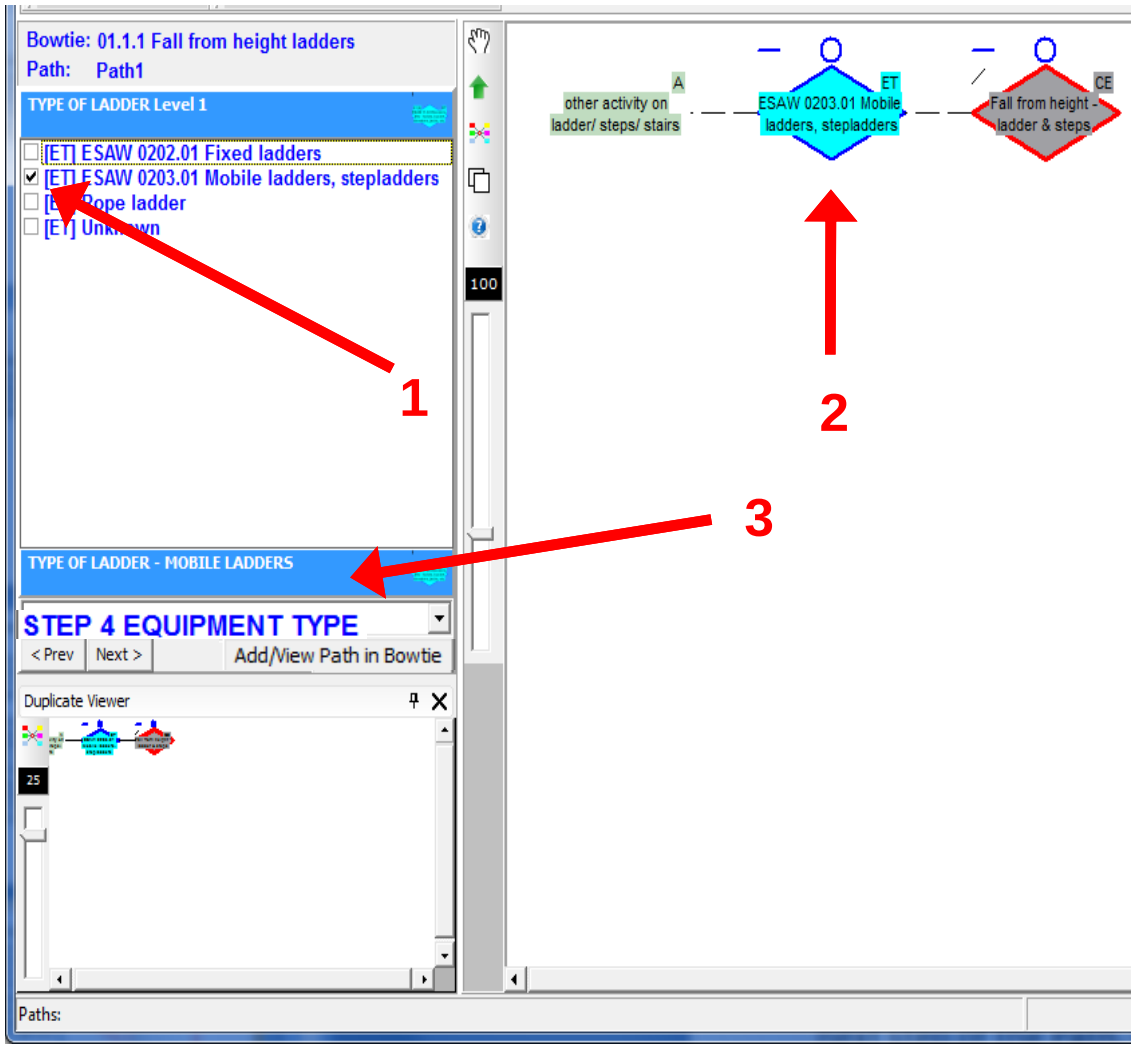
NOTE: NOT ALL STEPS ARE LISTED IN THIS HELP

1. Choose an activity by clicking the box next to the one you want (Click again to de-select).
2. The corresponding box will appear in the appropriate place in the path in the right-hand window.
3. Click “Next” to go to the next step of the Path, or “Previous” to return to the previous screen.



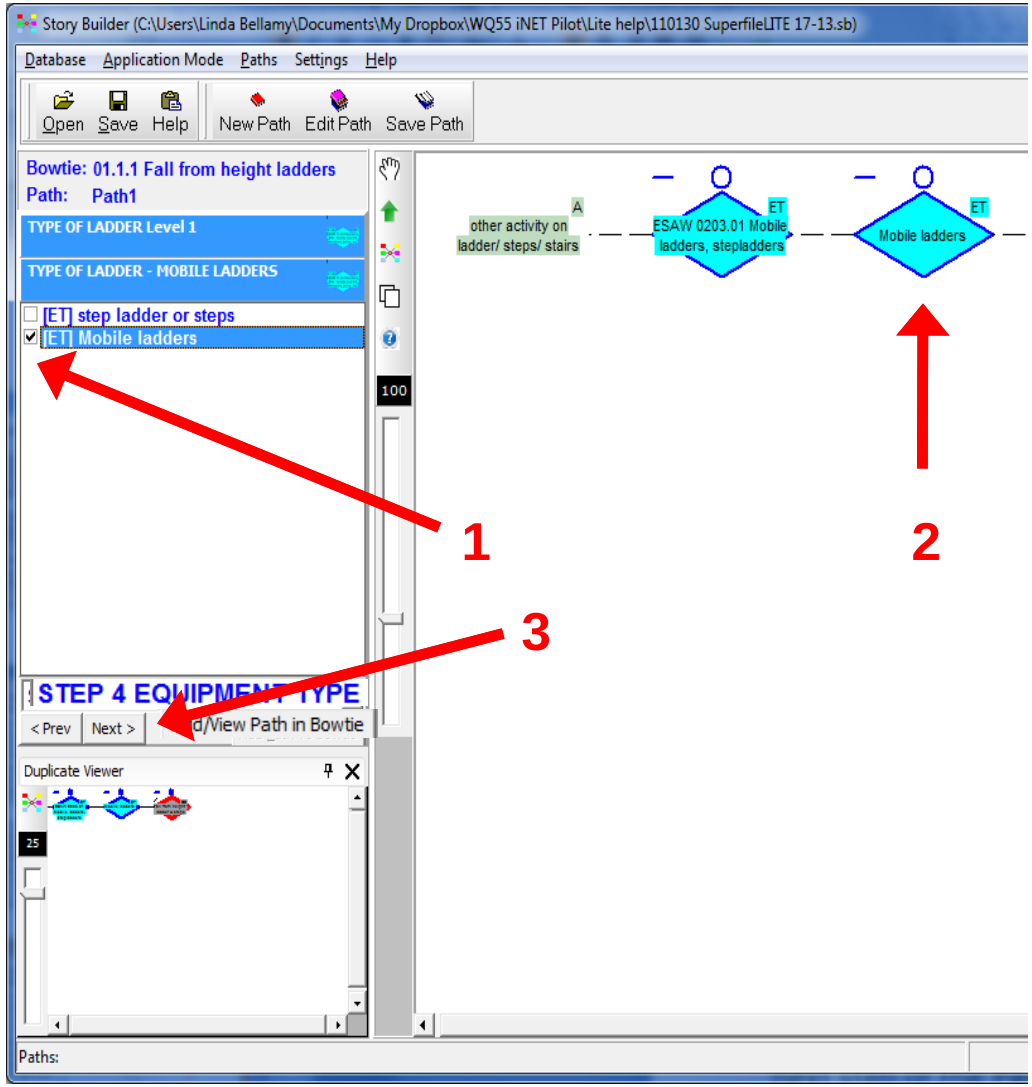
S2) Step 4a Type of Equipment Level 1

1. Choose an item by clicking the box next to the one you want (Click again to de-select).
2. The corresponding box will appear in the appropriate place in the path in the right-hand window.
3. If there are more blue bars visible click here to see if there are further levels of detail



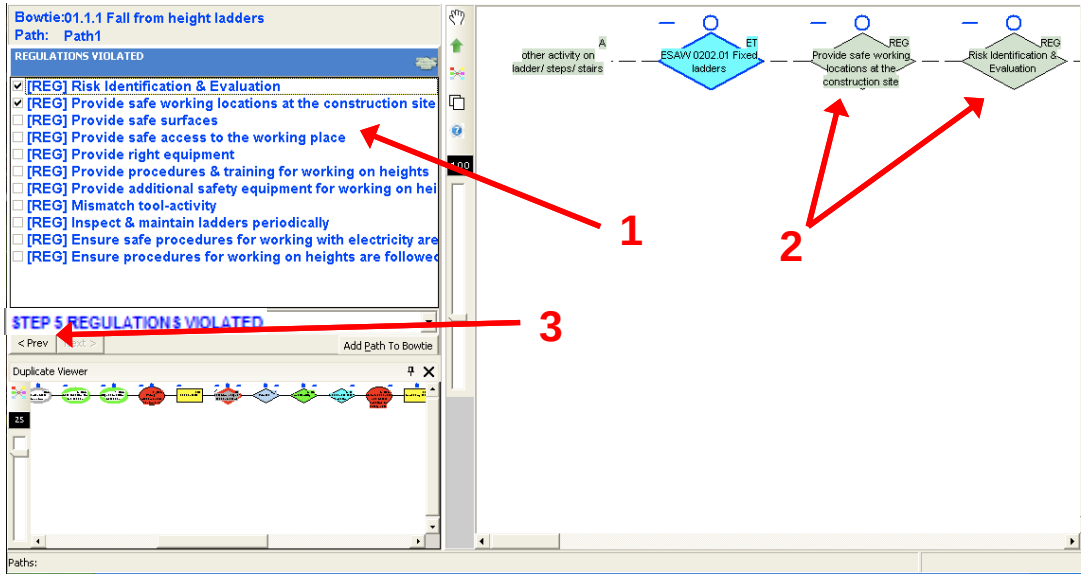
S2) Step 4b Type of Equipment Level 2

1. If available and appropriate choose an item by clicking the box next to the one you want (Click again to de-select).
2. The corresponding box will appear in the appropriate place in the path in the right-hand window.
3. Click “Next” to go to the next step of the Path, or “Previous” to return to the previous screen.



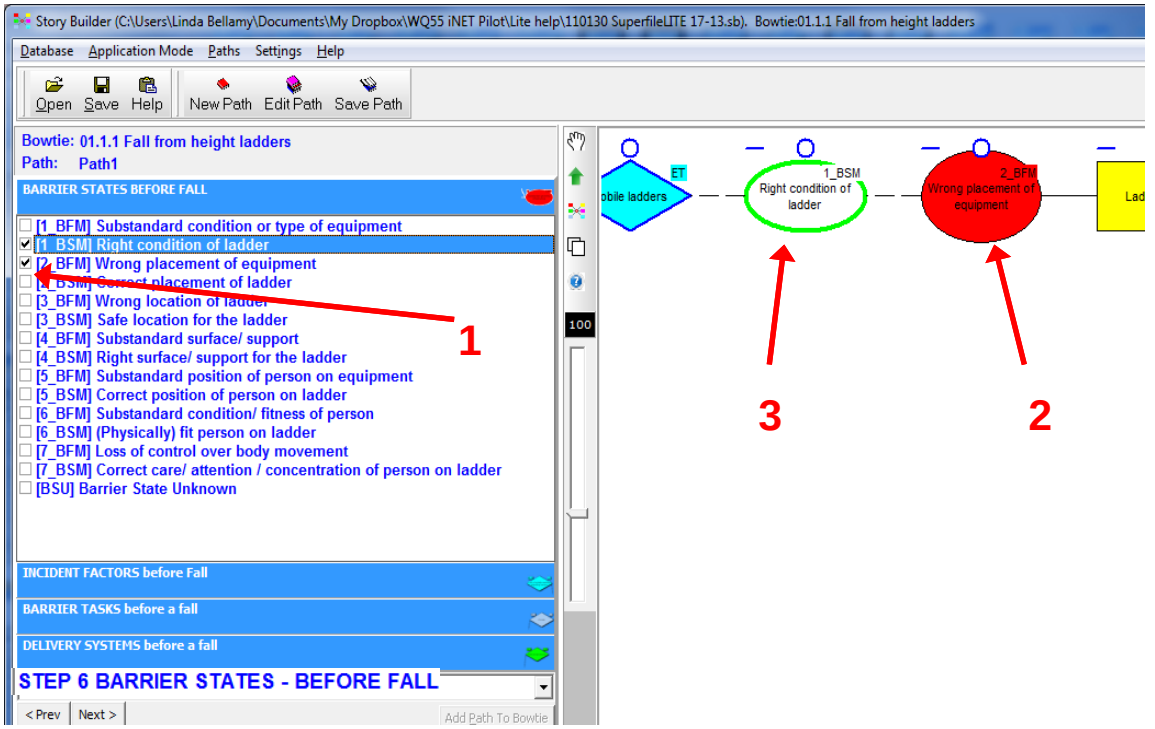
S5) Step 5: Regulations Violated

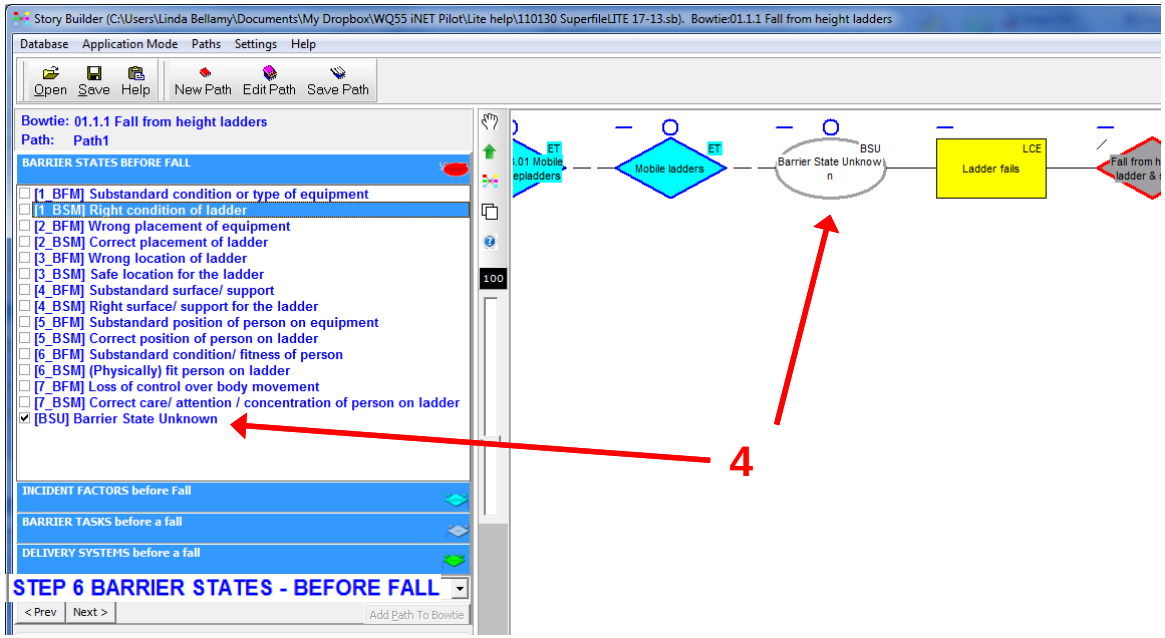
1. Select all regulations violated by clicking the boxes next to the corresponding regulations (click again to de-select).
2. Your selections will appear in the appropriate place in the path in the right-hand window. Note: regulations violated appear on the left-hand side of the bowtie.
3. Click “Previous” to return to previous steps.



S4) Step 6a: Barrier States - Failure Modes [BFM] and Success Modes [BSM]

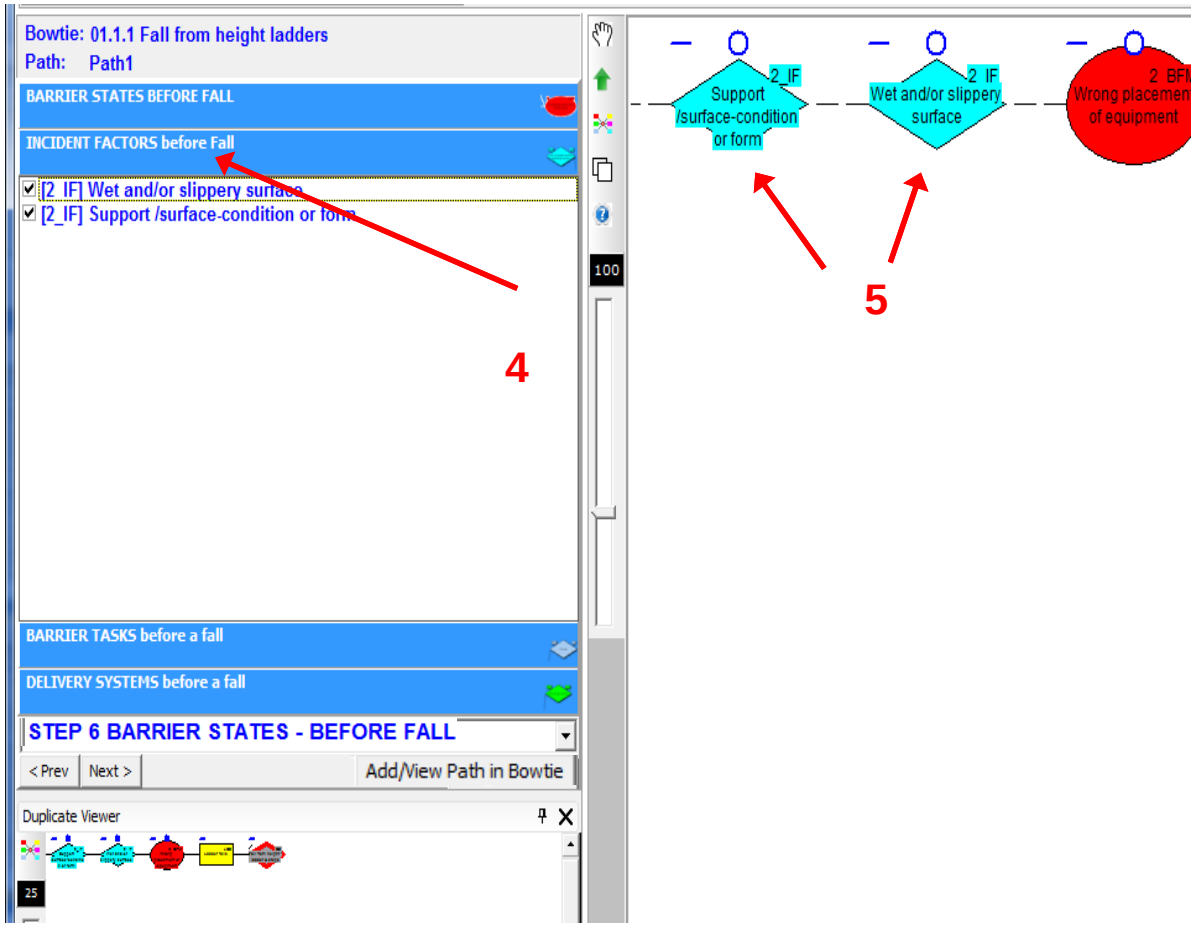
1. Select all appropriate, known Barrier States by clicking the boxes as before (see previous 3 steps). You may select more than one box.
2. Each barrier failure [BFM] will appear as a red filled circle.
3. Sometimes barriers are successful. Each barrier success [BSM] appears as a green unfilled circle.
4. If a Barrier State is unknown, tick [BSU] Barrier State Unknown. This will appear as a grey, unfilled circle in the path.





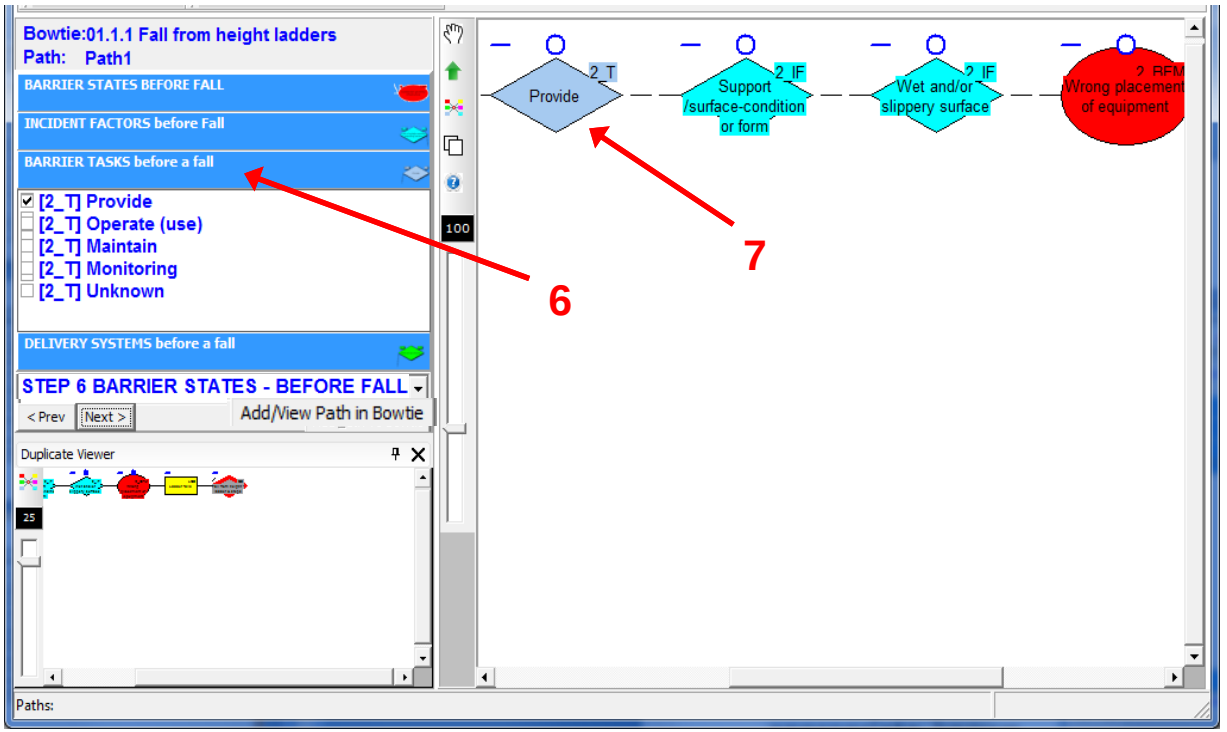
Step 6b: Barrier Failure Modes (Incident Factors)

4. Click the blue bar heading “Incident Factors”, and Storybuilder Lite will automatically show you the incident factors appropriate to the Barrier States you have selected. Tick all appropriate, known incident factors.
5. Each incident factor appears in the path as a turquoise rhombus.



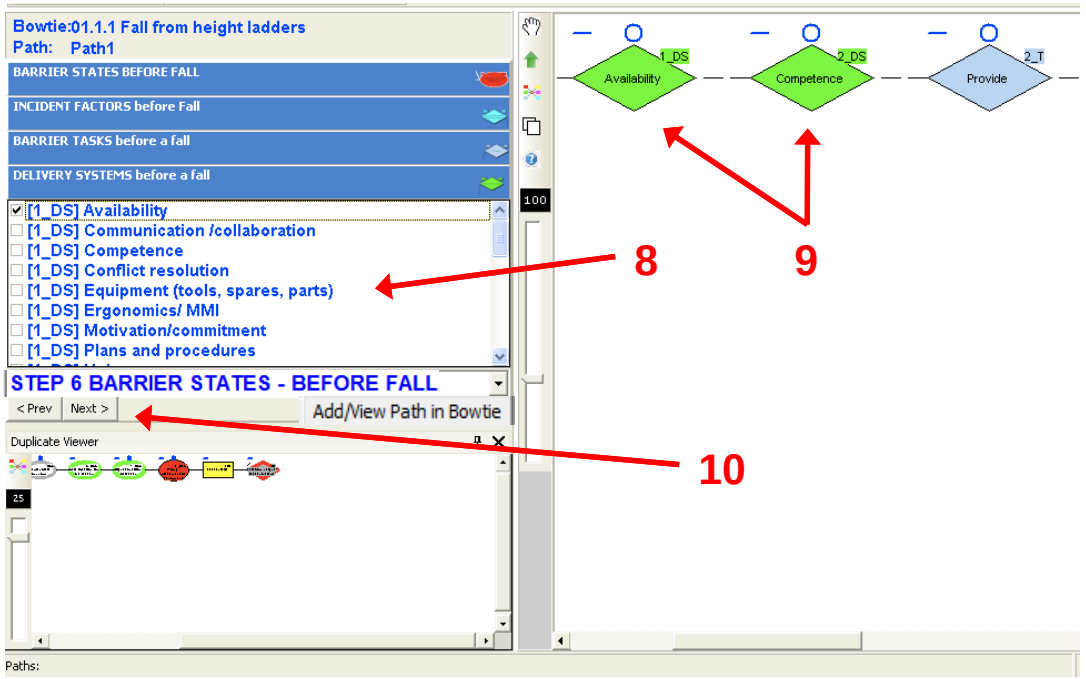
Step 6c: Barrier Failure Modes (Barrier Tasks)

6. Click the blue bar heading “Barrier Tasks”, and Storybuilder Lite will automatically show you the barrier tasks appropriate to the Barrier States you have selected. Tick all appropriate, known barrier tasks.
7. Each barrier task appears in the path as a blue rhombus.



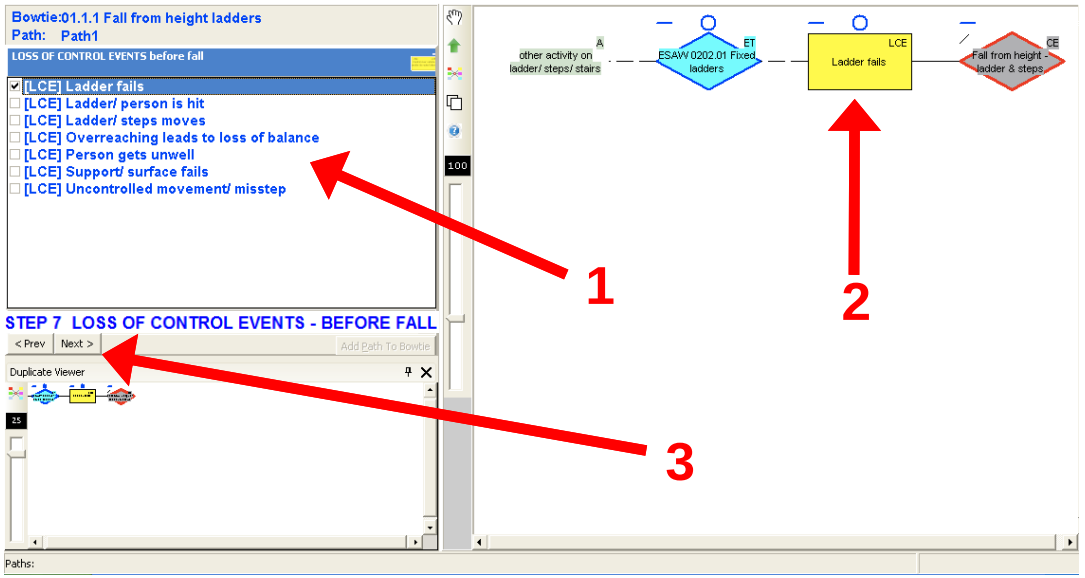
Step 6d: Barrier Failure Modes (Delivery Systems)

8. Click the blue bar heading “Delivery Systems”, and Storybuilder Lite will automatically show you the delivery systems appropriate to the Barrier States you have selected. Tick all appropriate, known delivery systems.
9. Each delivery system appears in the path as a green rhombus.
10. Click “Next”.



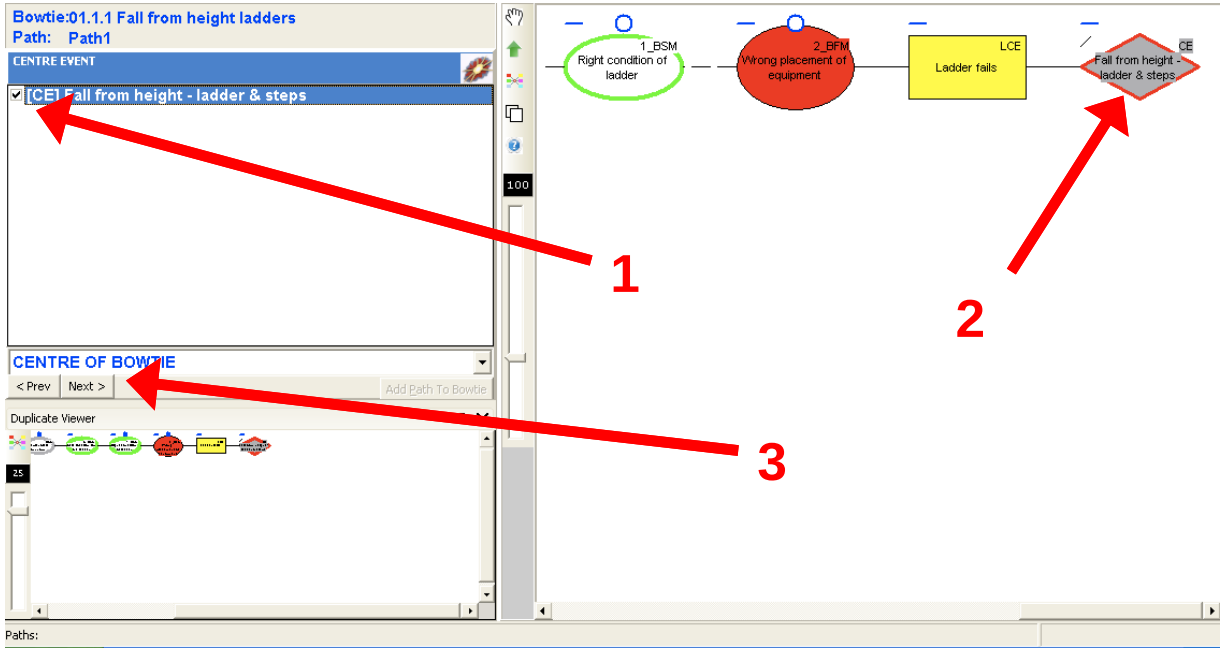
S3) Step 7: Loss of Control Event before Centre Event

1. Choose a loss of control event by clicking the box next to the one you want (Click again to de-select).
2. The corresponding box will appear in the appropriate place in the path in the right-hand window.
3. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



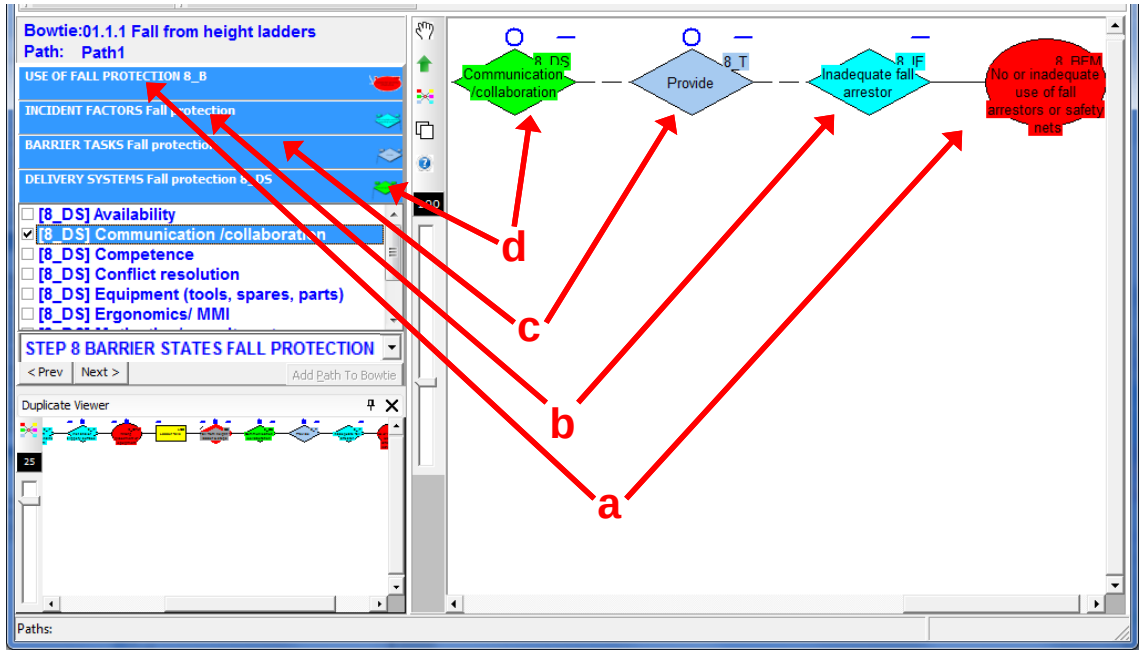
G) Centre of Bowtie

1. This step tells you that you have reached the centre event of the bowtie. Click the box next to the centre event (Click again to de-select).
2. The centre event already exists as a box in the appropriate place in the path in the right-hand window.
3. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



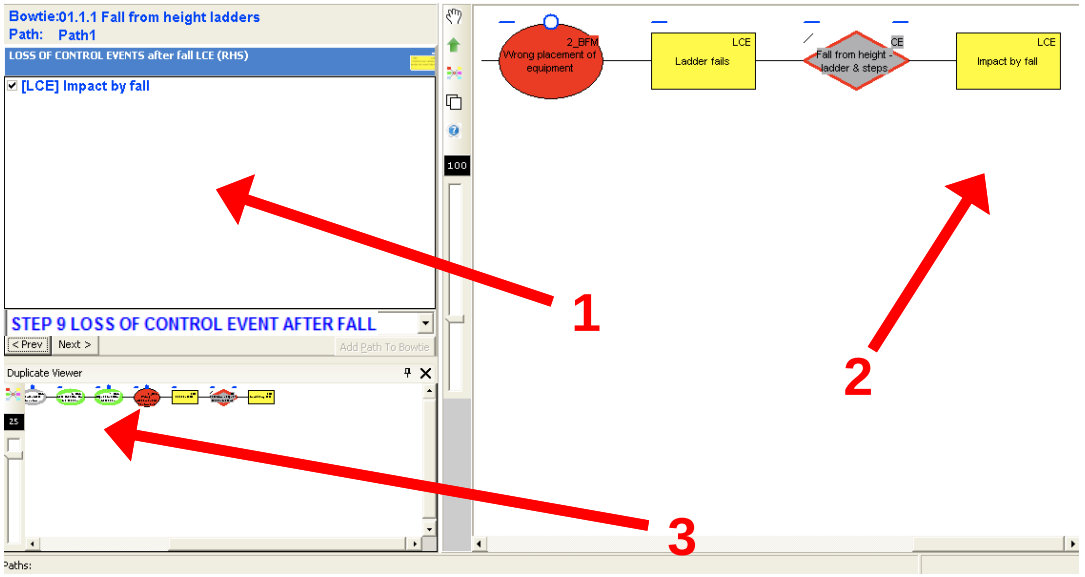
S8) Step 8

For Step 8, repeat instructions for Step 6: Barrier Failure Modes (a through d) in Slides 13 through 16.



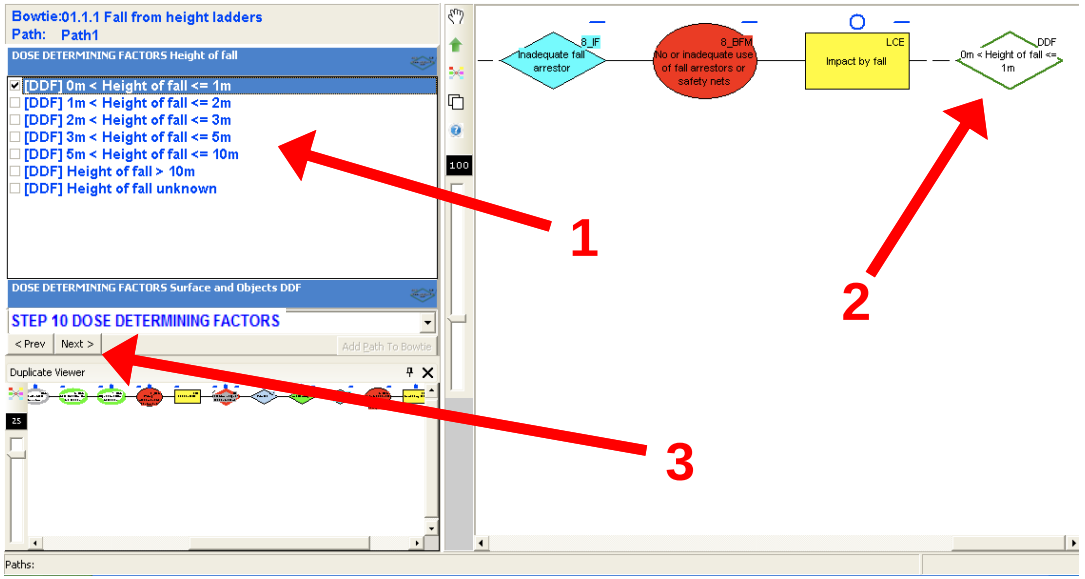
S9) Step 9: Loss of Control Event after Centre Event

1. Choose a loss of control event by clicking the box next to the one you want (Click again to de-select).
2. The corresponding box will appear in the appropriate place in the path in the right-hand window.
3. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



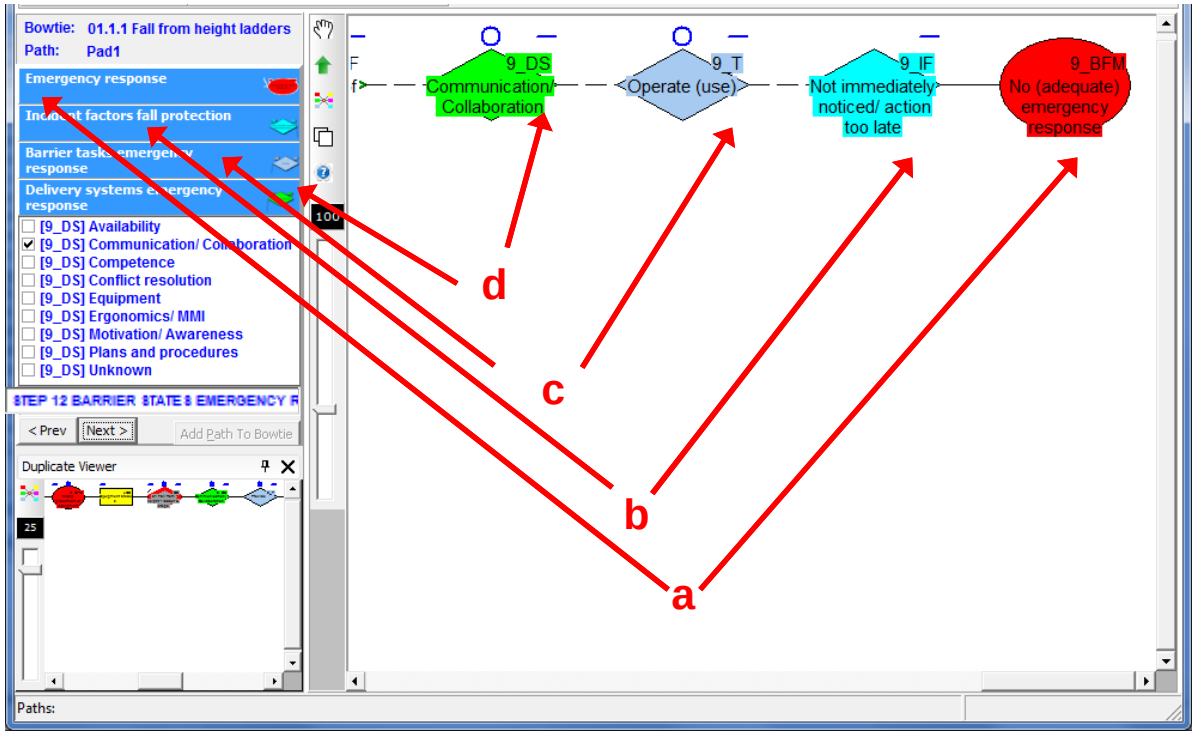
S10) Step 10: Dose Determining Factors

1. Choose a dose determining factor by clicking the box next to the one you want (Click again to de-select).
2. The corresponding box will appear in the appropriate place in the path in the right-hand window.
3. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



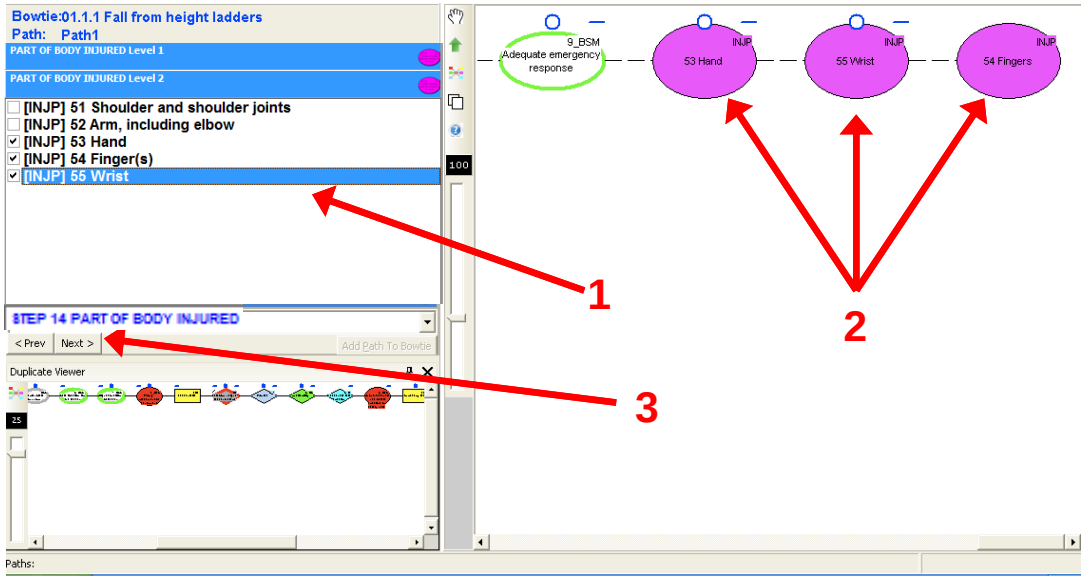
S13) Step 12: Emergency Response

For Step 12, repeat instructions for Step 6: Barrier Failure Modes (a, c, and d)



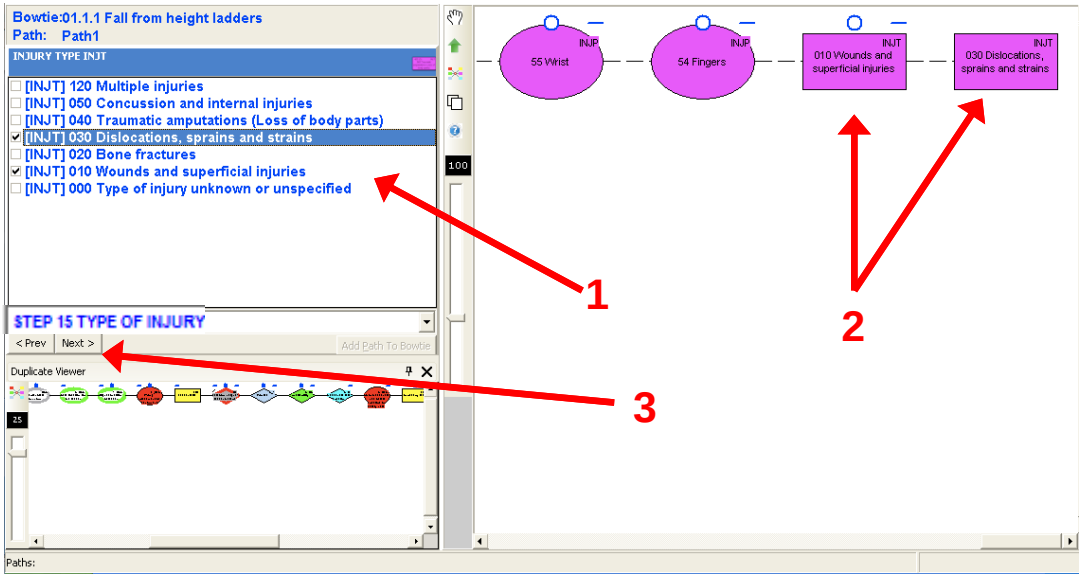
S14) Step 14: Part of Body Injured

1. Select all parts of body injured by clicking the boxes next to the appropriate body parts (click again to de-select).
2. Your selections will appear in the appropriate place in the path in the right-hand window.
3. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



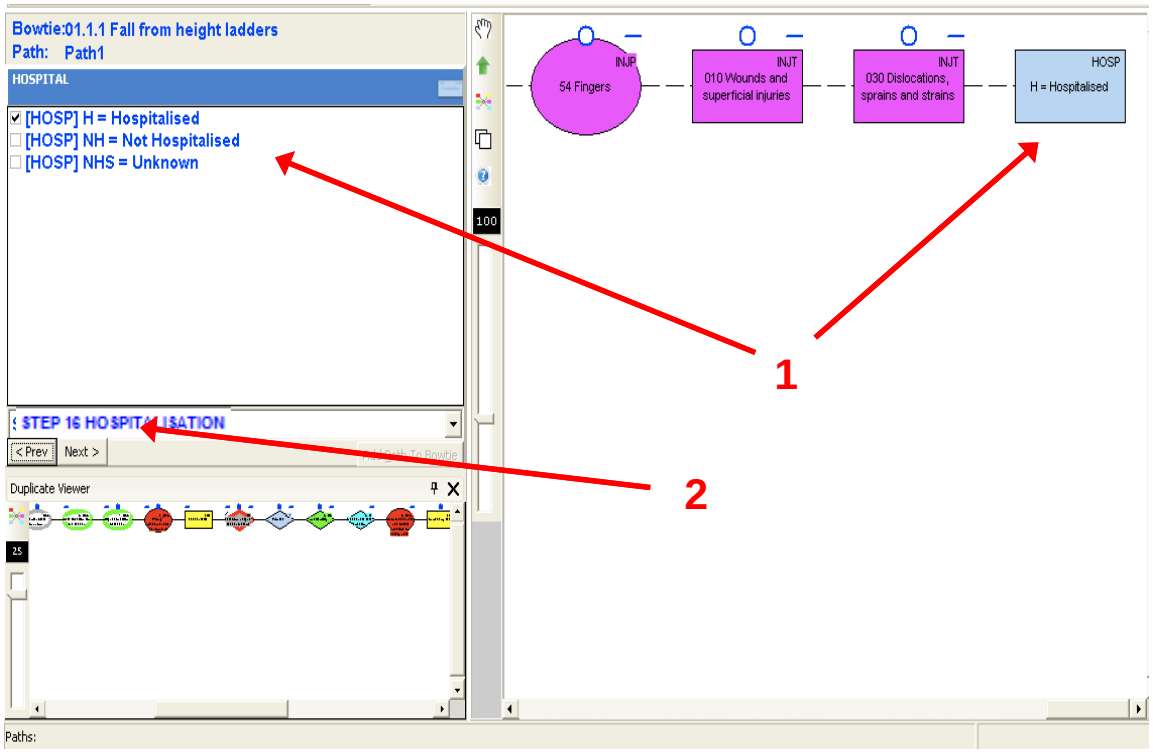
S15) Step 15: Type of Injury

1. Select all occurring types of injury by clicking the boxes next to the appropriate injuries (click again to de-select).
2. Your selections will appear in the appropriate place in the path in the right-hand window.
3. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



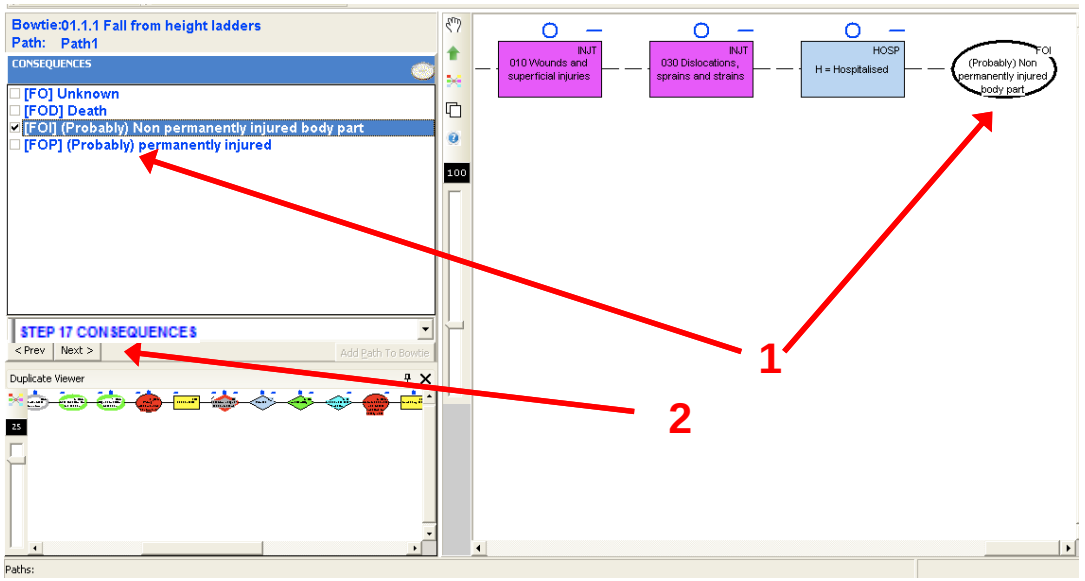
S16) Step 16: Hospitalisation

1. Select either Hospitalised, Not Hospitalised, or Unknown. The corresponding box will appear in the path.
2. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



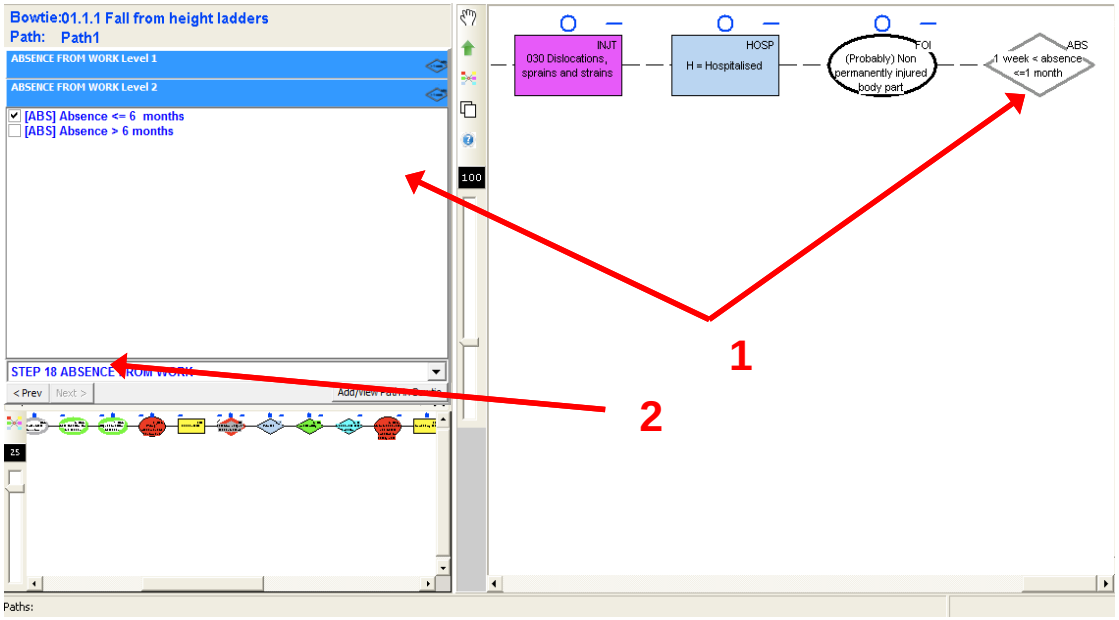
S17) Step 17: Consequences

1. Select what happened to the victim. The corresponding box will appear in the path.
2. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



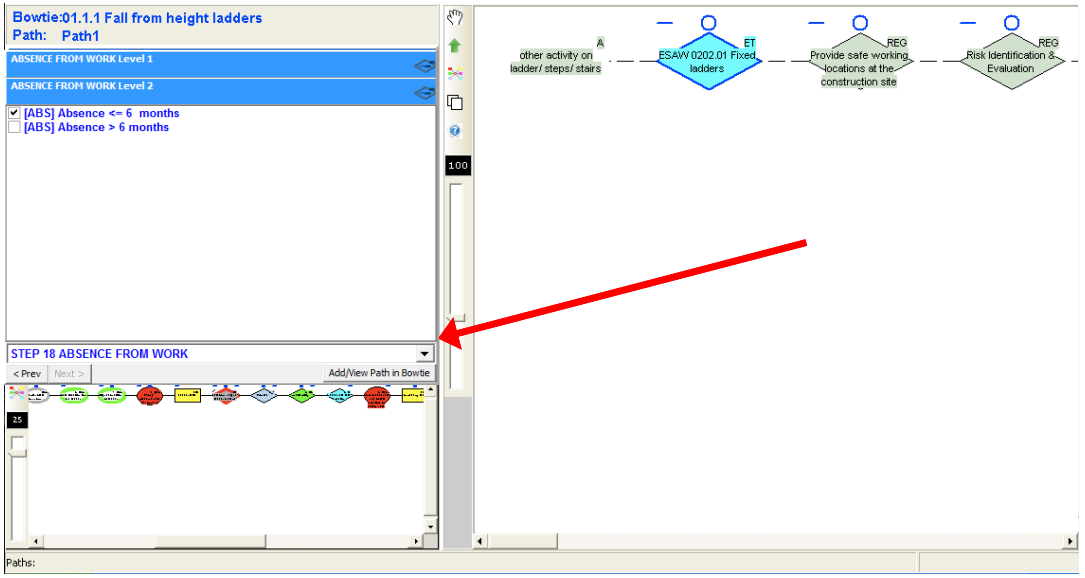
S18) Step 18: Absence from Work

1. Select the length of absence from work. The corresponding box will appear in the path.
2. Click “Next” to go to the next step of the Path, or “Previous” to return to the Previous screen.



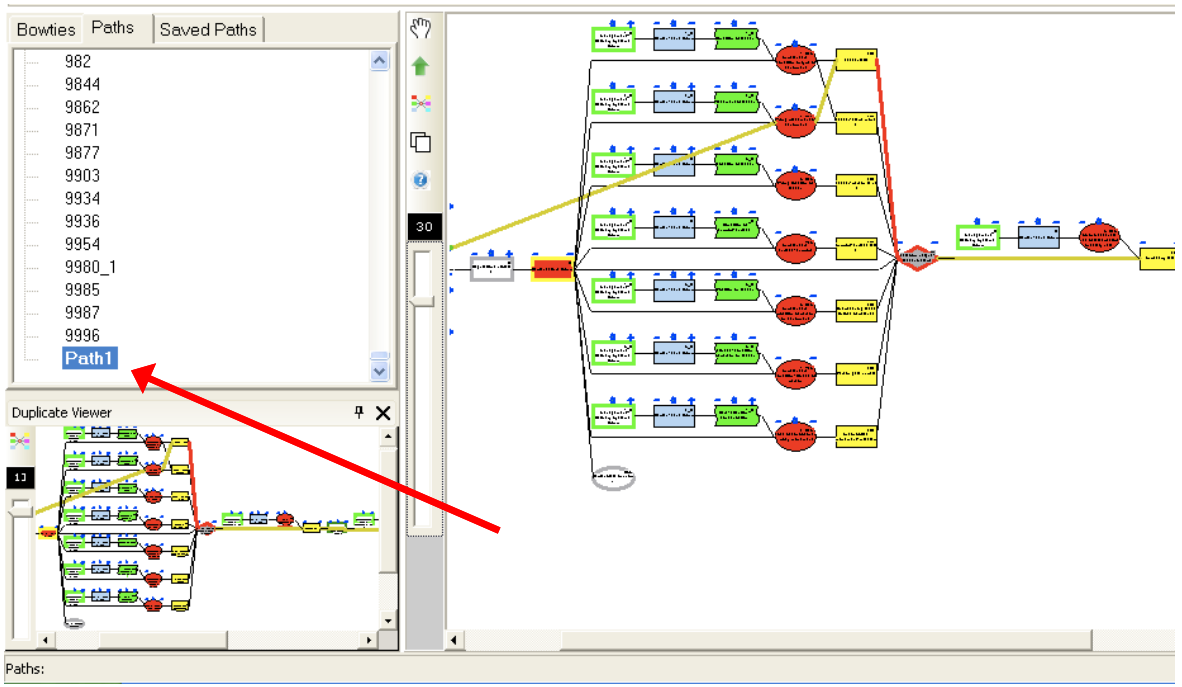
H) Add Path to Bowtie

Click “Add/View Path in Bowtie” to add your path to the bowtie for that root event in Storybuilder. You will be automatically taken to Expert mode.



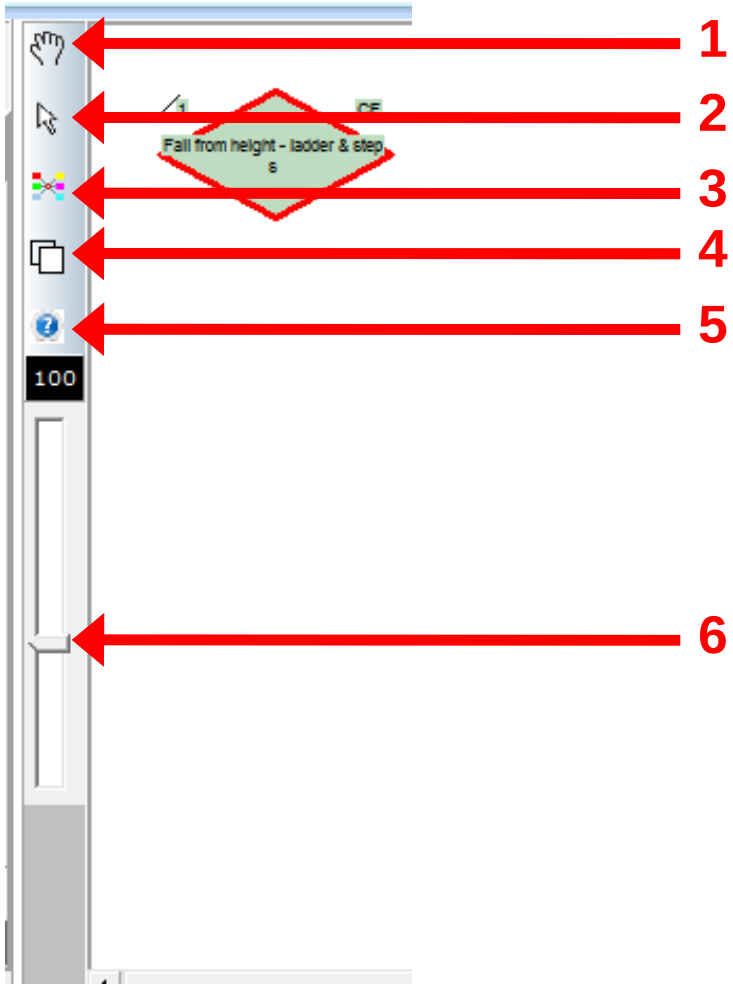
Your Path in Expert Mode

When a user creates a path in Lite mode they can then add it to the bowtie at the end of the process. The application switches to Expert mode and shows the path.



Central Menu Bar

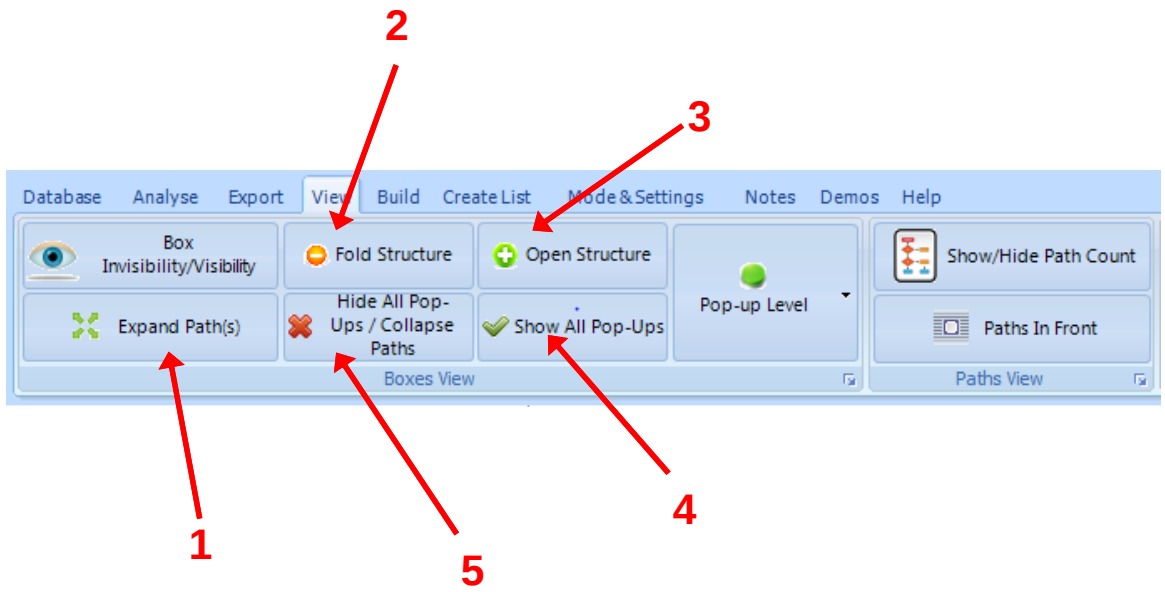
1. Hand tool: Use to drag the graphic around, but not to select paths or boxes.
2. Normal cursor: Use to select boxes. Right-click on a box to get the menu.
3. Root button: Click to centre the graphic on the root event.
4. Duplicate viewer: Click to toggle the duplicate viewer window in the bottom-left corner of your Storybuilder screen.
5. Help button: Click to open the help file.
6. Slider: Use the slider to zoom in and out of the graphic. Up to zoom out, down to zoom in.



Opening out the bowtie in Expert Mode

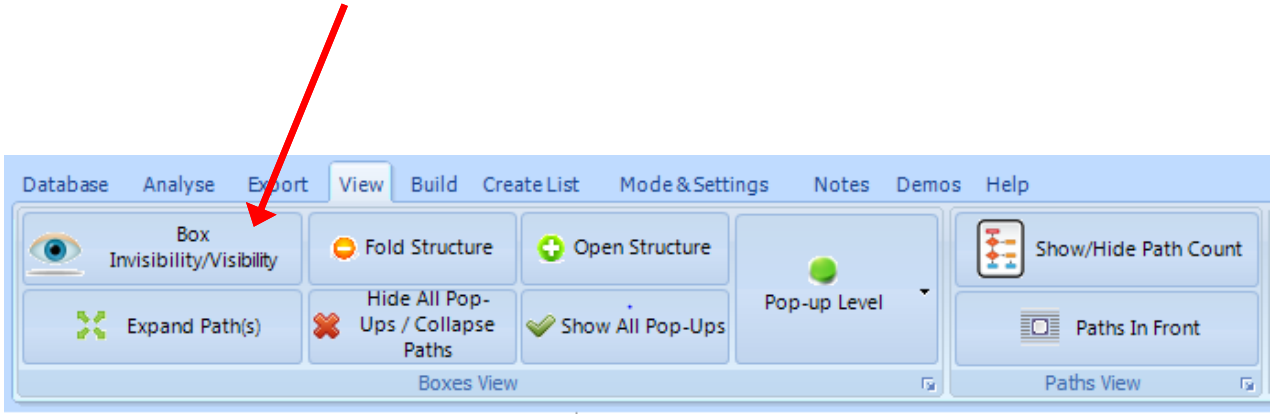
Use the buttons to display or hide parts of the bowtie

1. Make path visible.
2. Folds up the entire structure to the root box.
3. Opens out the structure (but does not affect the pop-ups).
4. Shows all the pop-ups
5. Hides all the pop-ups



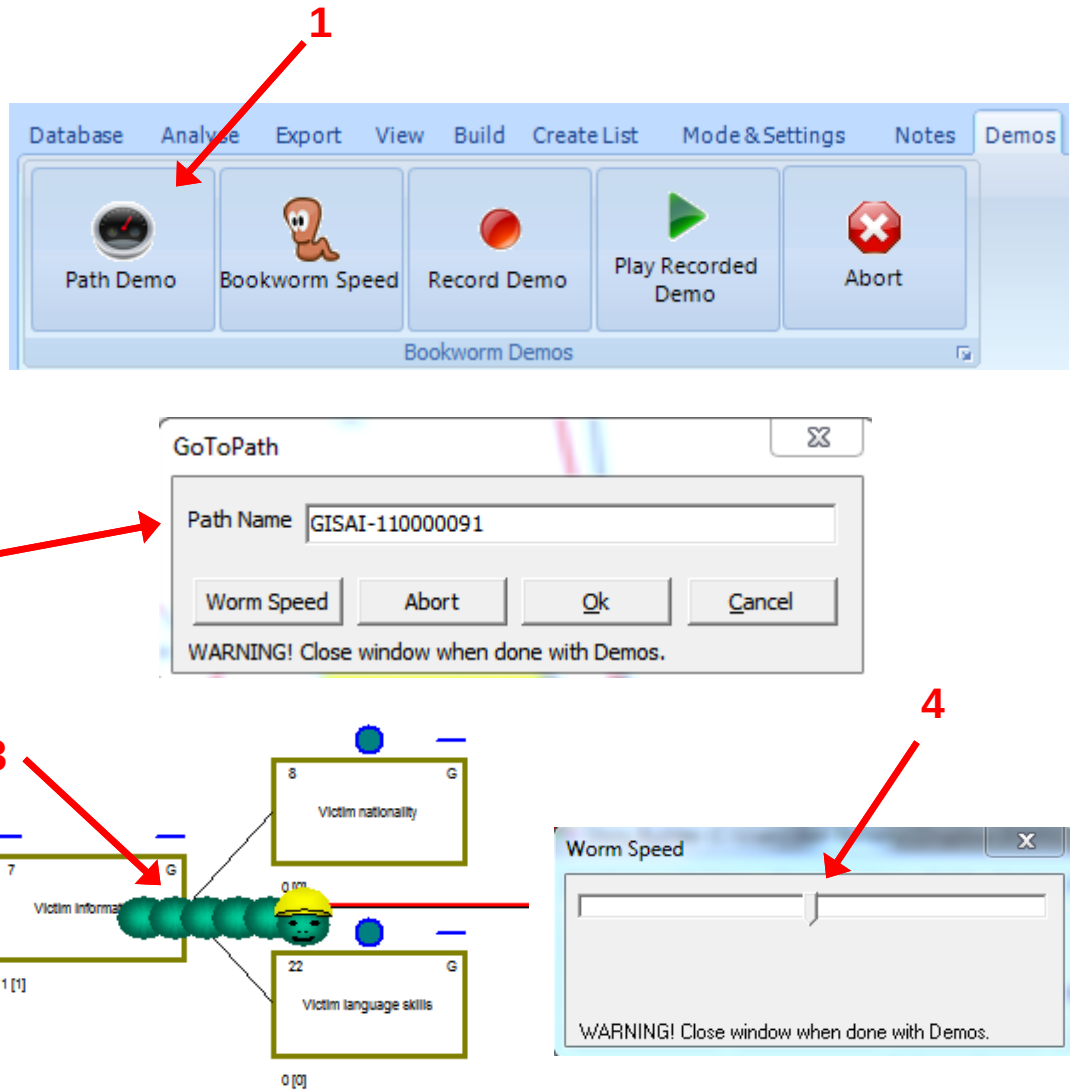
Invisibility Button

Click the Invisibility button (Invis) to switch off all the boxes in the Storybuild not in your path, and see only the boxes in your path. This button allows you to toggle between viewing the entire bowtie and viewing individual paths.



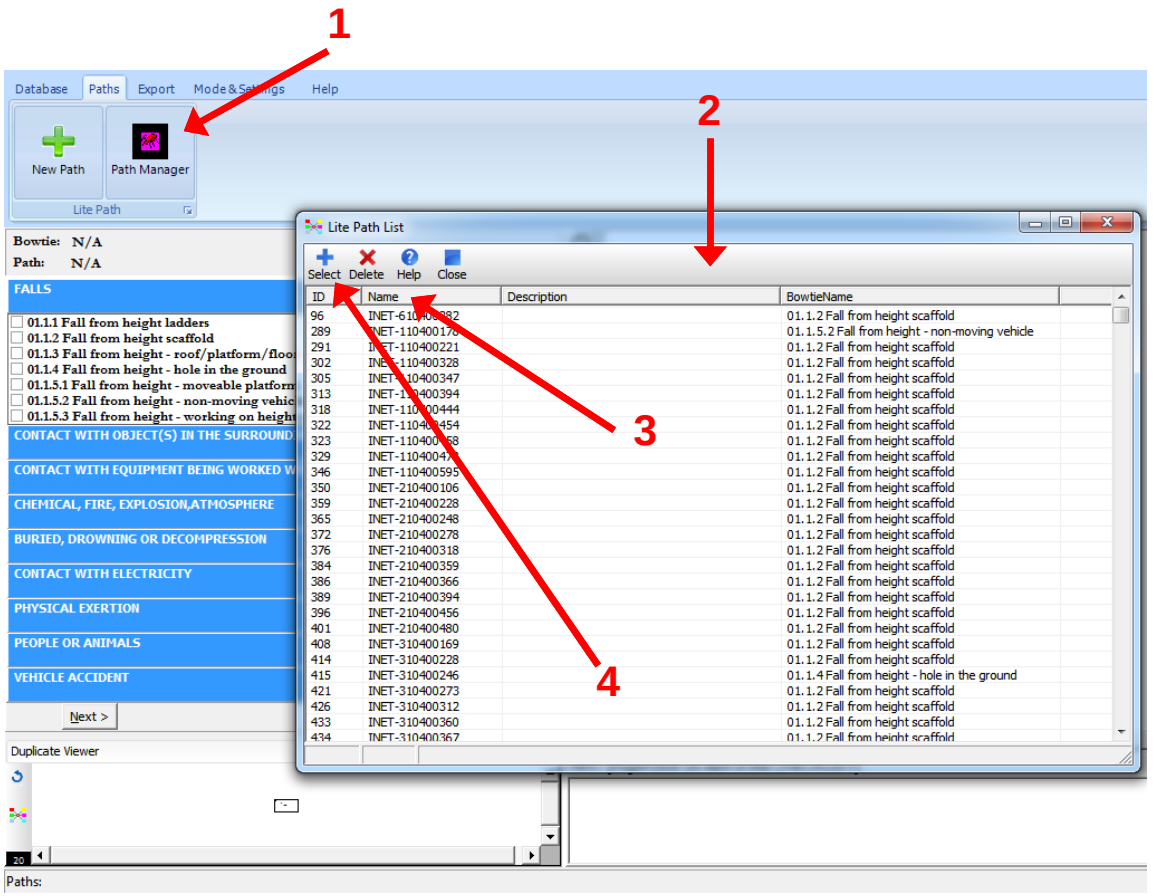
The Storybuilder Bookworm

1. Click “Path Demo” under the Demo tab
2. The Go To Path window will appear. Choose your path and click OK.
3. The Storybuilder bookworm will demonstrate your path by walking along it.
4. Use the Worm Speed window to adjust the bookworm’s speed, pause him, or click abort to stop the demo.



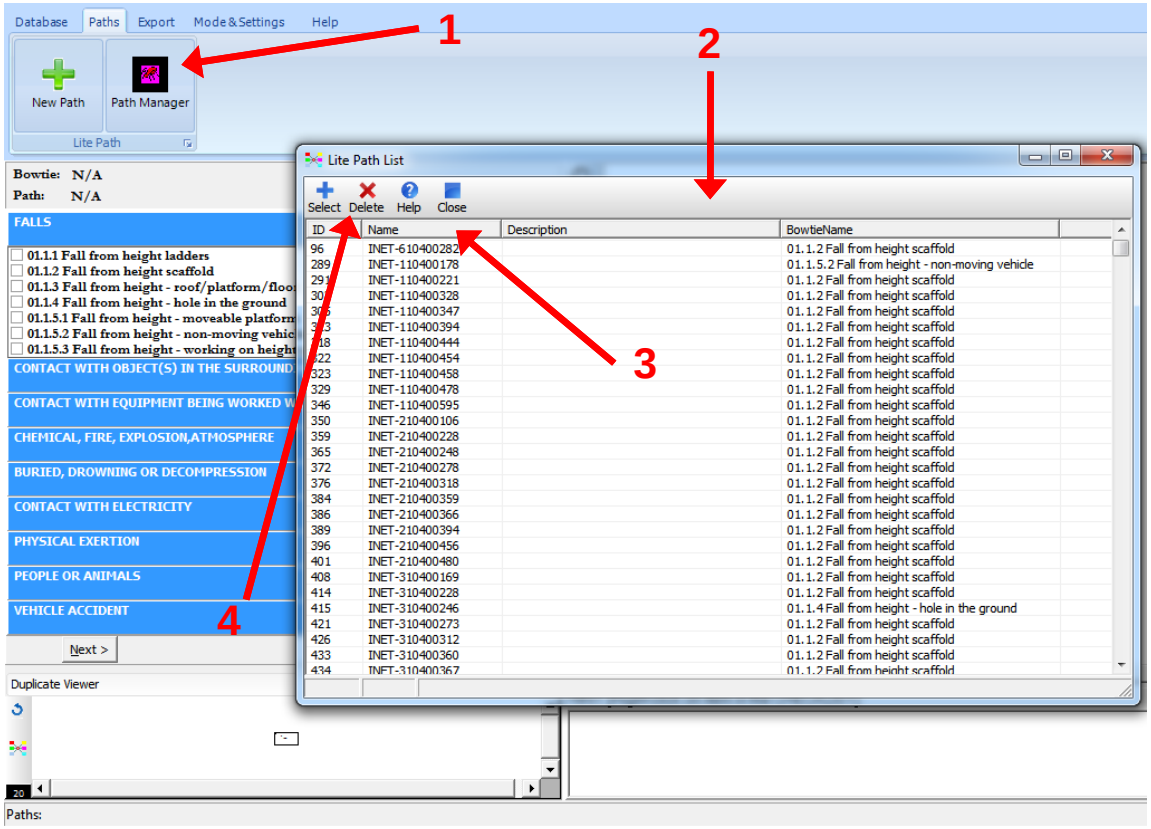
J) Edit Your Path

1. Click “Path Manager”
2. The Lite Path List window will appear.
3. Click “Name” to arrange the path list in name order.
4. Click your path in the list, and then click “Select”.



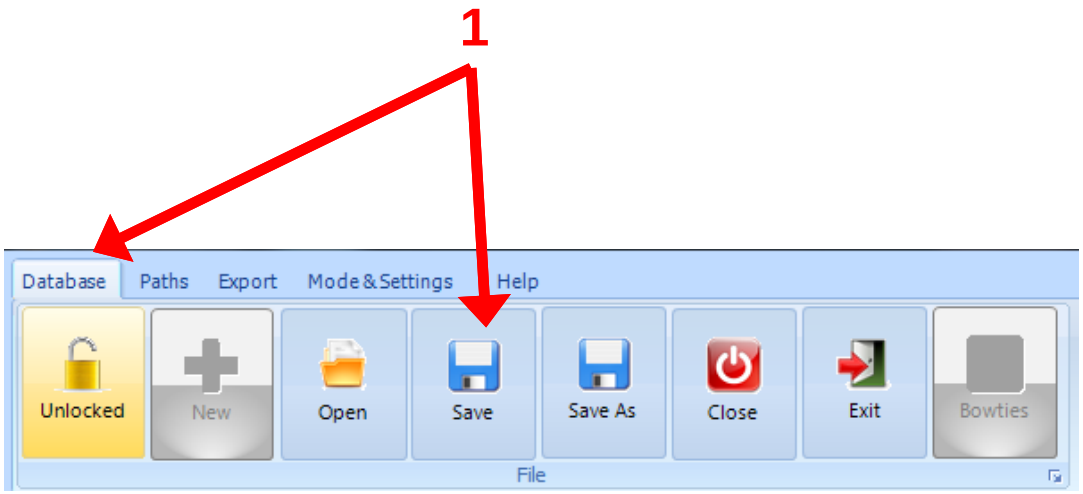
K) Delete Your Path

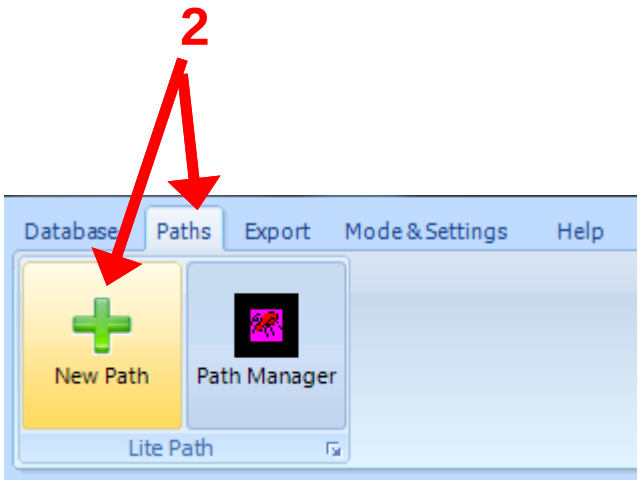
1. Click “Path Manager”
2. The Lite Path List window will appear.
3. Click “Name” to arrange the path list in name order.
4. Click your path in the list, and then click “Delete”.



L) New Path, Save Path

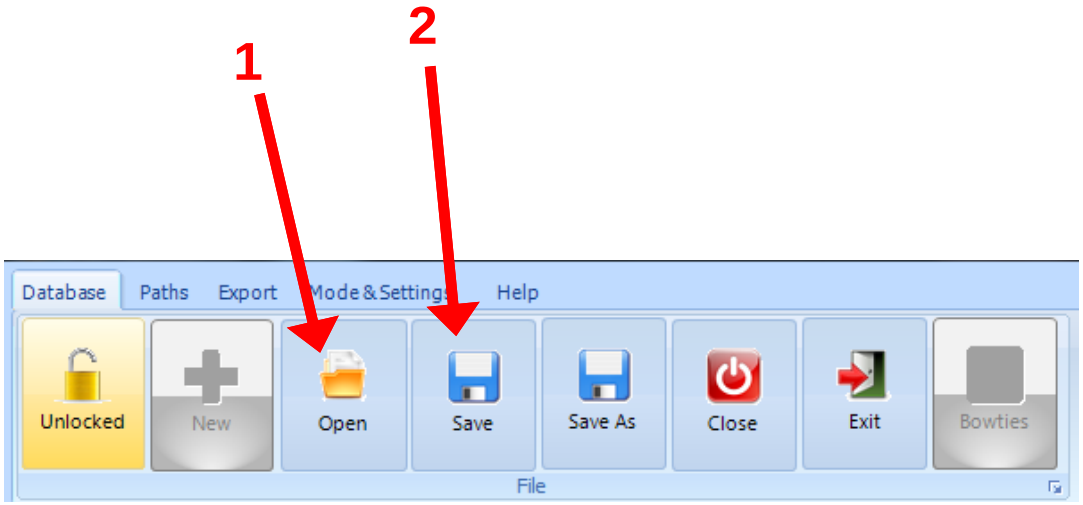
1. To save your path at any time, simply click “Save” under the Database tab to save the database
2. To start a new path, simply click “New Path” under the Paths tab.

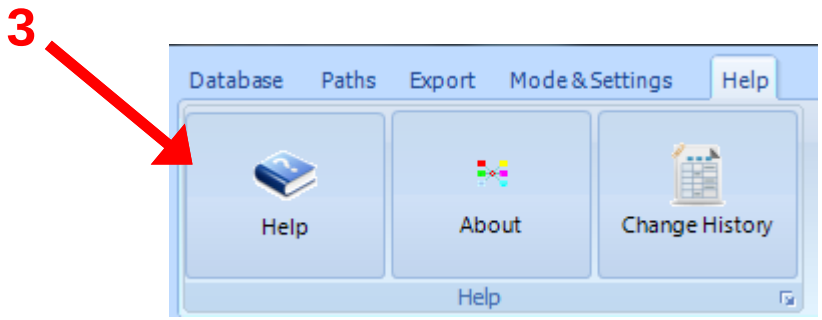




M) Open/Save Database, Open Help Files

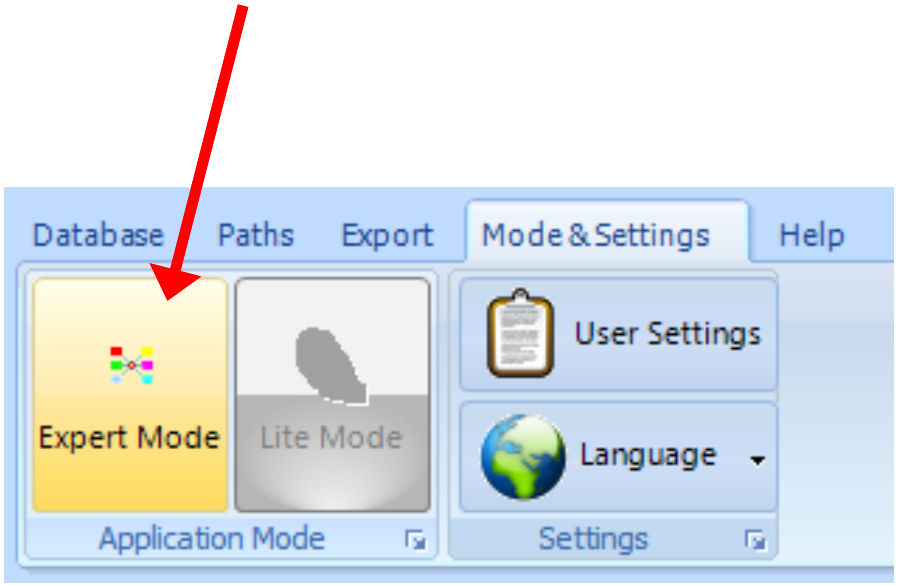
1. Click “Open” to open a different database under the Databse tab.
2. Click “Save” to save database (boxes and paths).
3. Click “Help” under the Help tab to open the help files.





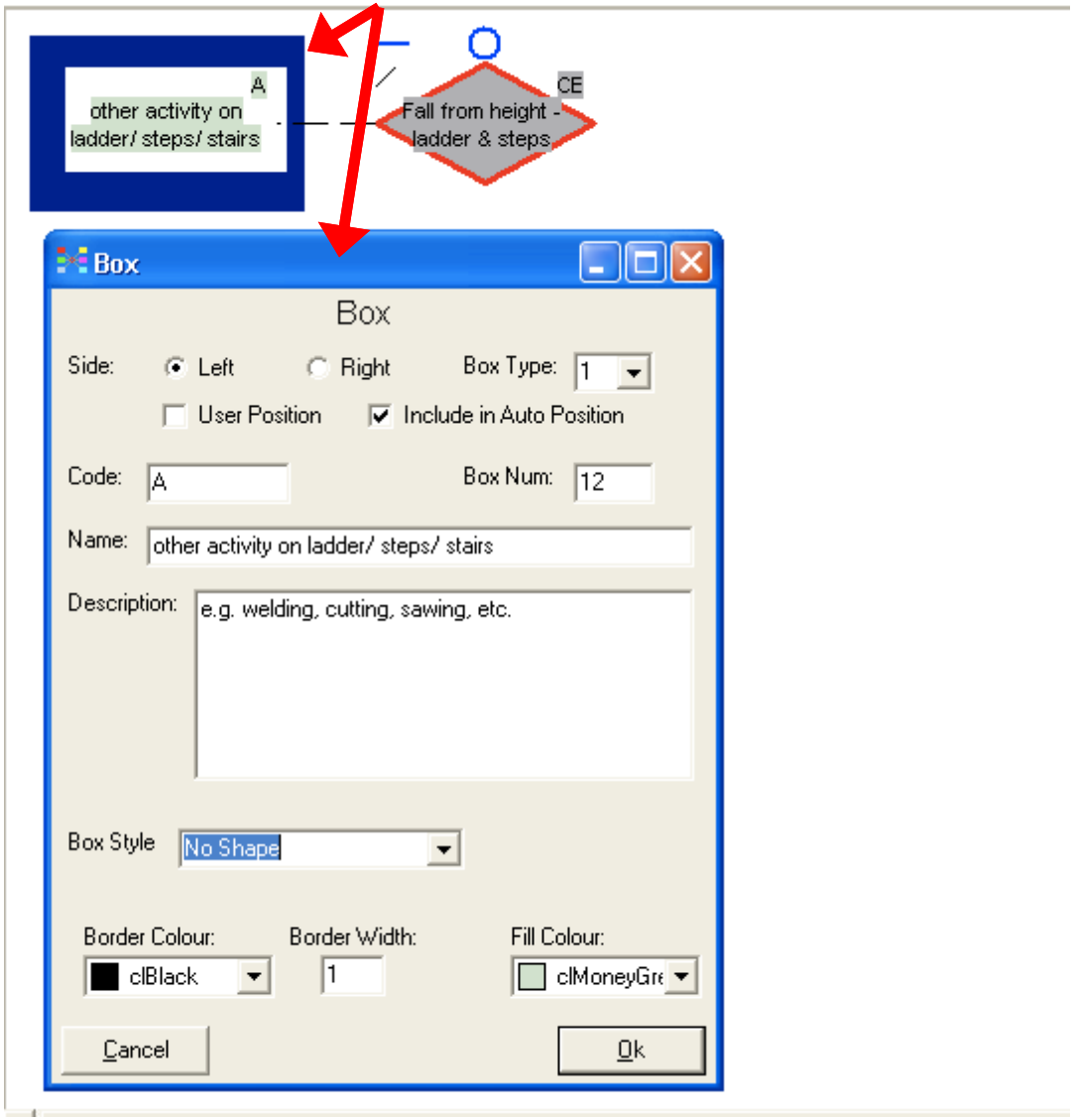
N) Application Mode

Use the “Application Mode” subsection under the Mode & Settings tab to switch between Storybuilder Lite and Storybuilder Expert modes.



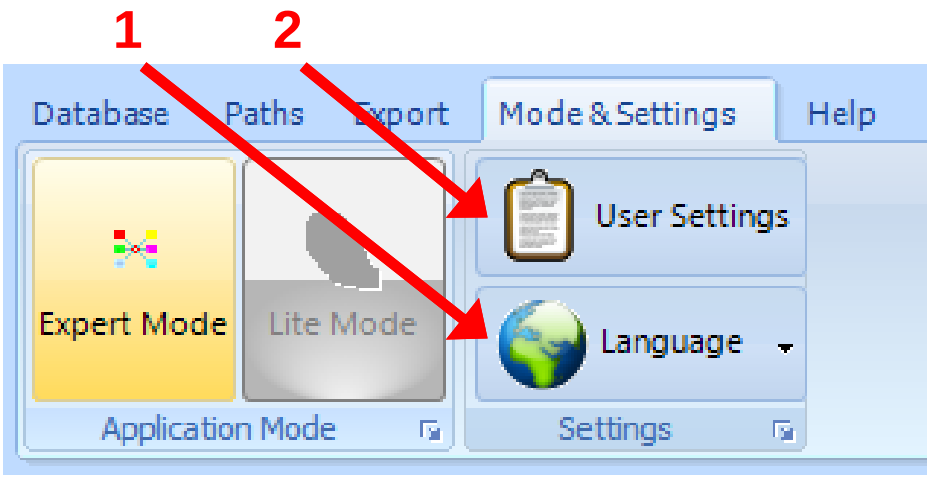
P) Edit Box

Double-click any box in your path to edit that box. You can change side, box type, position, code, number, name, description, style, border colour, border width, and fill colour…if you so choose.

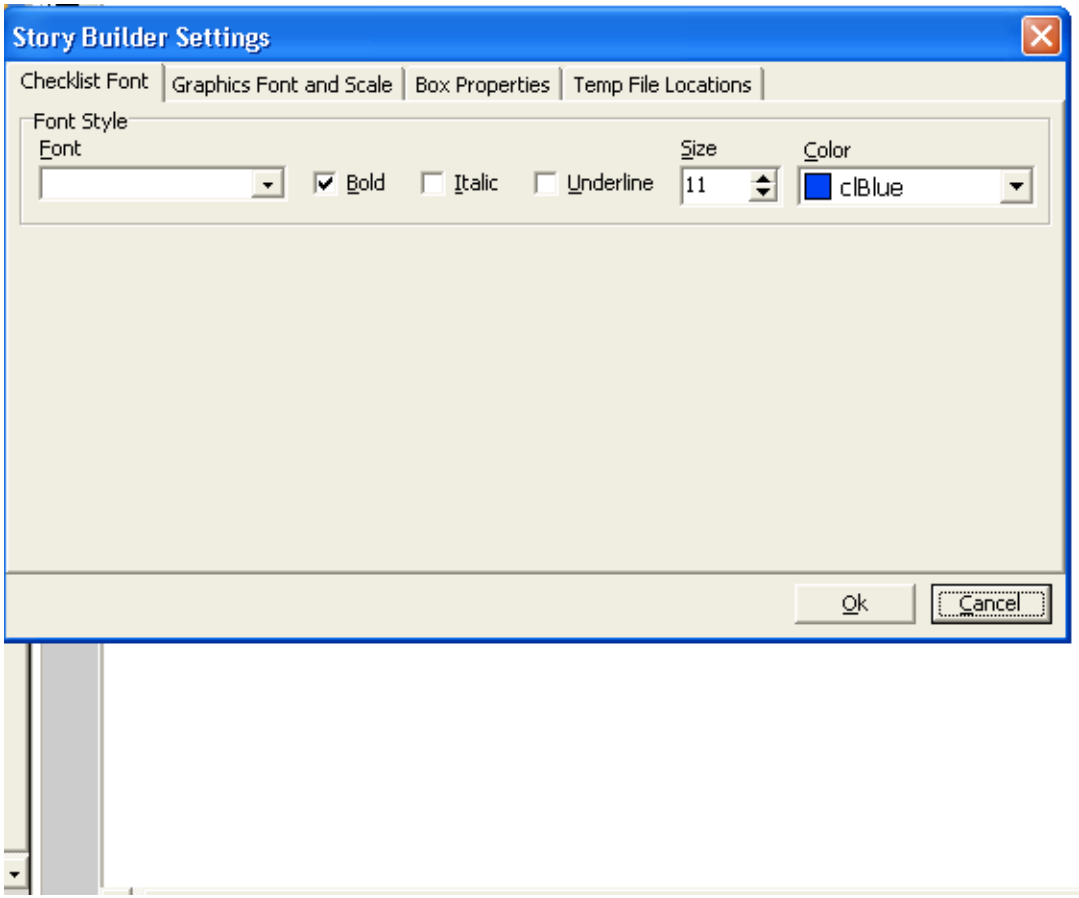


Settings

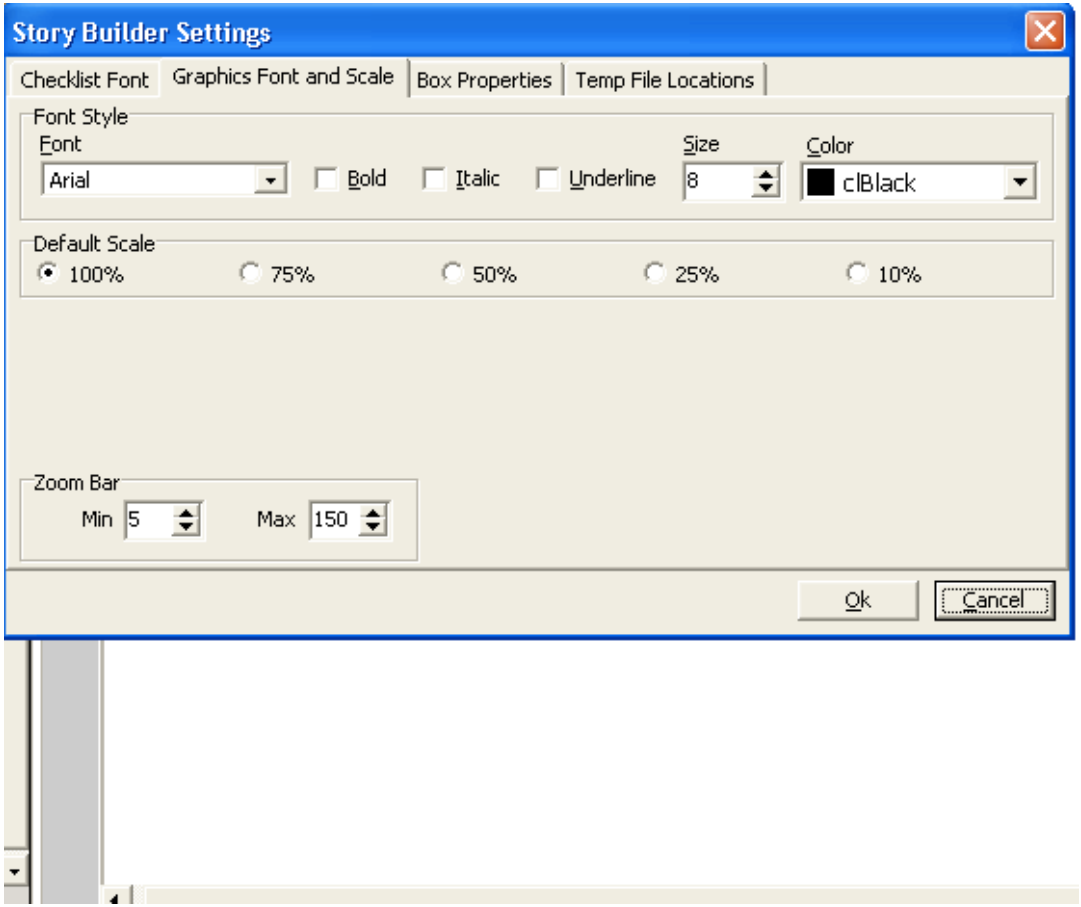
1. Click Language under the Mode & Settings tab to switch between English (EN) and Dutch (NL)
2. Click User Settings to open the Settings window.



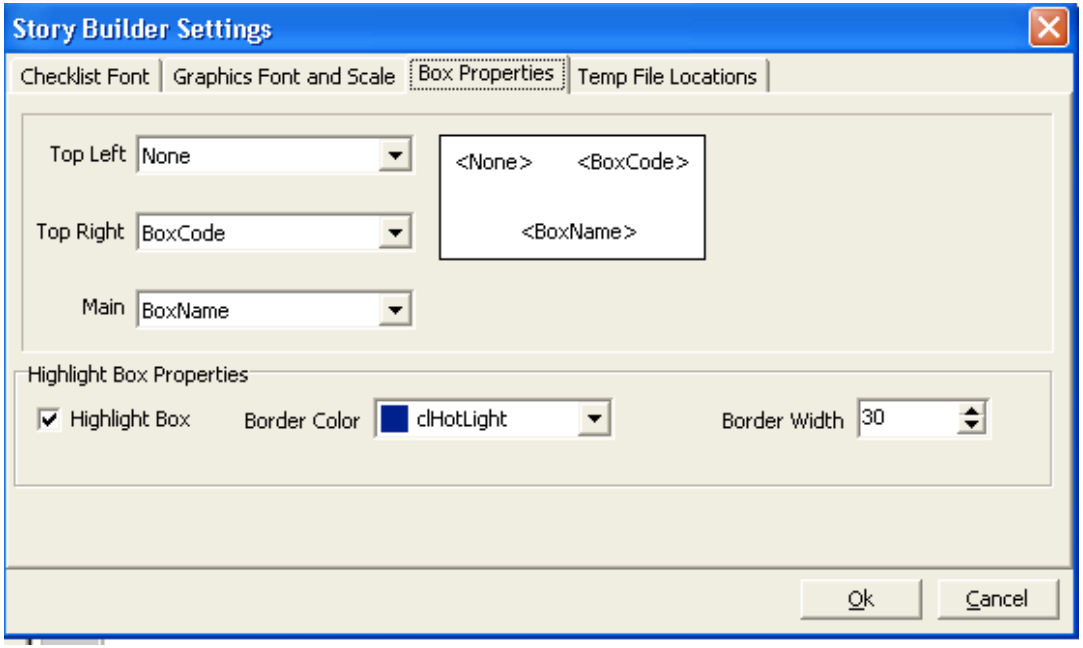
3. Use the Checklist Font tab to change the font of the checklists in Lite mode.



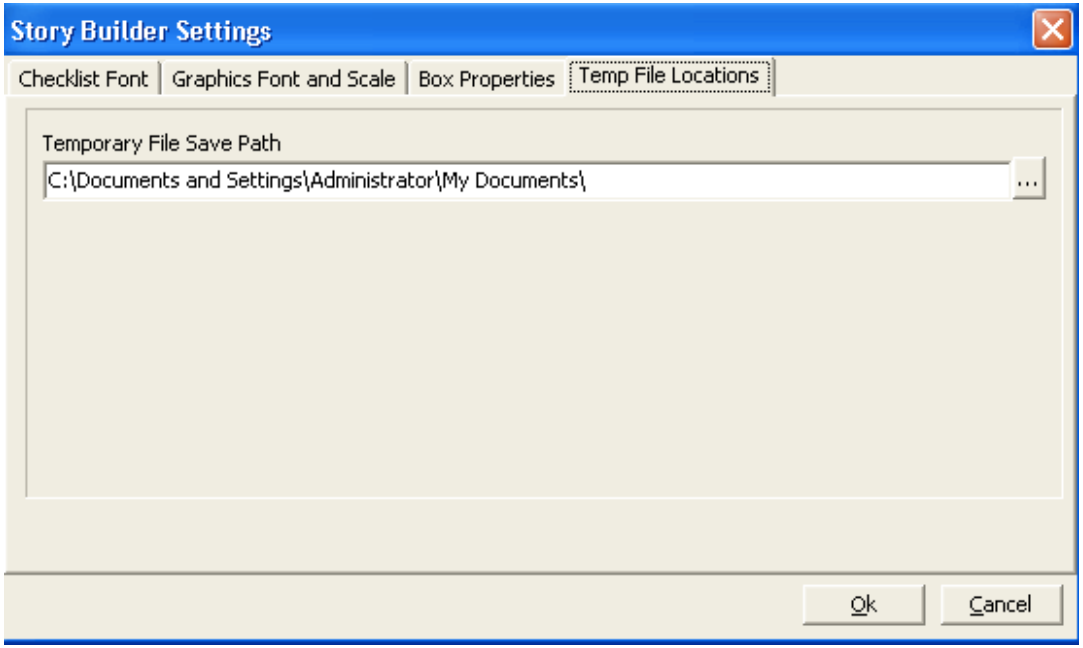
4. Use the Graphics Font and Scale tab to change the appearance of the graphic bowties with respect to font of the boxes, the default scale on opening, the link line colour (for expert building) and the limits of the zoom bar.



5. Use the Box Properties tab to determine what a box in the graphic will display, and how a box will be highlighted when clicked on.



6. Use the Temp File Locations tab to change where Story Builder Lite saves temporary files. This is useful for users with limited access rights. Temp files cannot be created in locations where the user has no rights.



Temp files include:

- SBLite.ini which sets the temp file location.
- A filename.tmp file created of the storybuilder file.
- A filename.ldb file created of the storybuilder file (MS access file).