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## **Software Manual**

For BowTieXP 10.0

Revision 40 (6-Apr-2020)

Please note that this documentation is preliminary and subject to change without notice. The latest version of this document can be obtained via CGE (e-mail [support@cgerisk.com](mailto:support@cgerisk.com)) or via a BowTieXP Value Added Reseller.

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# 1

## Introduction

### 1.1. Thank you

Thank you for your interest in the bowtie methodology and BowTieXP software. Risk management professionals worldwide have discovered the value in implementing this methodology by using BowTieXP; a powerful and easy-to-use tool.

### 1.2. Structure of this document

This document is divided into the following parts:

1. Step by step guides to get you started:

- Chapter 2, Quick installation guide on page 11. This guide quickly describes how to install BowTieXP on your computer.
- Chapter 3, Quick getting started guide on page 15. This guide briefly discusses bowtie methodology and then gives a step-by-step guide on how to create a bowtie diagram using the software. Some important software concepts are explained.

2. Chapter 4, A deeper look at the bowtie method starting on page 38 gives a theoretical background and tutorial in bowtie methodology. The tutorial contains many examples on what to do and what not to do.

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Note: Due to the length of the theory chapter, we have made it into a separate document. Chapter 4 provides an overview of the contents. Contact us at [support@cgerisk.com](mailto:support@cgerisk.com) to see if you are eligible for a copy.

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3. In chapter 5, The different BowTieXP versions on page 39, we give an overview of what features are present in each version of BowTieXP so you can see the differences between the versions at a glance.

4. A full task-based manual describing every detail about the software. All details and features are described in chapters that orient about a specific task:

- Chapter 6, Introducing BowTieXP on page 47.
- Chapter 7, Case File editing on page 57.
- Chapter 8, Configuring the diagram on page 82.
- Chapter 9, Case File analysis on page 93.
- Chapter 10, Linking to documentation on page 105.
- Chapter 11, Bowtie chaining on page 108.
- Chapter 12, Getting data into BowTieXP on page 111.
- Chapter 13, Getting data out of BowTieXP on page 117.
- Chapter 14, Working with templates on page 129.
- Chapter 17, Advanced functionality: diagram display profiles on page 139.
- Chapter 18, Advanced functionality: the Scrap Book on page 142.
- Chapter 19, Advanced functionality: comparing files on page 151.
- Chapter 20, Advanced functionality: type and property descriptions on page 157.
- Chapter 21, Advanced functionality: Soob matrices on page 160.
- Chapter 24, AuditXP on page 192.
- Chapter 25, Compliance frameworks on page 216.
- Chapter LOPA Plug in on page 220.

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- Chapter 27, Introducing BowTieXL on page 235.
- Chapter 28, Calculating with BowTieXL on page 243.
- Chapter 29, IncidentXP and BowTieXP together on page 253.

5. Technical installation reference and frequently asked questions:

- Chapter 30, Installation reference on page 261. This reference describes all available options for installing and activating BowTieXP in all possible settings, as well as all prerequisites and operating system dependencies.
- Chapter 32, Frequently asked questions on page 276. Various frequently asked questions and their answers are collected here. Most have to do with the technical details such as installation and activation.
- Chapter 33, Support on page 285.

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Note: If you are a first-time user and want to get going quickly, we recommend reading the first part containing the quick guides.

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# 2

## Quick installation guide

In this chapter, we will walk you through the steps to install BowTieXP.

### 2.1. Introduction

Installing BowTieXP onto your computer is in most circumstances very simple. If however, you run into trouble and want to have more detailed information about the installation procedure, about the software prerequisites and compatibility, this is available in chapter 30, the Installation reference, on page 261.

### 2.2. Installing BowTieXP

BowTieXP can run on Windows 7 and newer. BowTieXP requires the .NET framework v4.7 or v4.8 to be installed. If you run BowTieXP and the .NET framework is too old, it BowTieXP tell you so. You can then download and install it:

<https://dotnet.microsoft.com/download/dotnet-framework/thank-you/net48-web-installer>

Note that Windows 10 Creators Update (1703) and later come with a new enough version of the framework already installed out of the box.

Open an internet browser and navigate to: <http://www.cgerisk.com/downloads/bowtiexp/>  
Download and run the BowTieXP installer (.msi).

### 2.3. Activating BowTieXP

When you start BowTieXP for the first time, you are asked for either a trial code or an activation code:

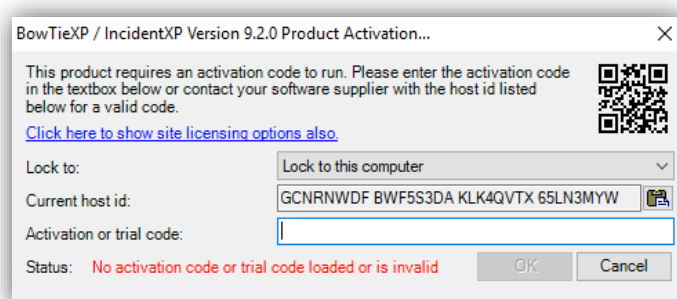


Figure 1 - Activation dialog

If you have a valid trial code, you can enter that in the activation or trial code text box, and BowTieXP will run.

If you have purchased BowTieXP, you will need to obtain an activation code to perpetually activate BowTieXP. Please copy the code shown in the current host id text box and paste it into an email to CGE at support@cgerisk.com. We will then send you an activation code. After entering this code in the activation or trial code text box, BowTieXP will run forever.

Note: CGE offers leasing of licenses as well. In this case, the activation code will have an expiration date that matches the agreed lease period. After this period, the software will stop working and renewal of the lease contract has to be negotiated and agreed.

### 2.3.1. Activating with an old host id

Sometimes, due to the use of a laptop docking station, a switch in Windows version or changes in the computer hardware, it can happen that the host id changes. If that happens, your activation code will no longer match with the host id. If this happens, you will have to activate the software based on the original host id (the original host id that was used for creation of the activation code, the one you sent to CGE).

To do so, select the “Lock to this computer with an old host id” option from the “Lock to” dropdown menu in the Product Activation screen (see Figure 2). The screen will then display the current, as well as the activated host id (the one you sent to us initially) (see Figure 3).

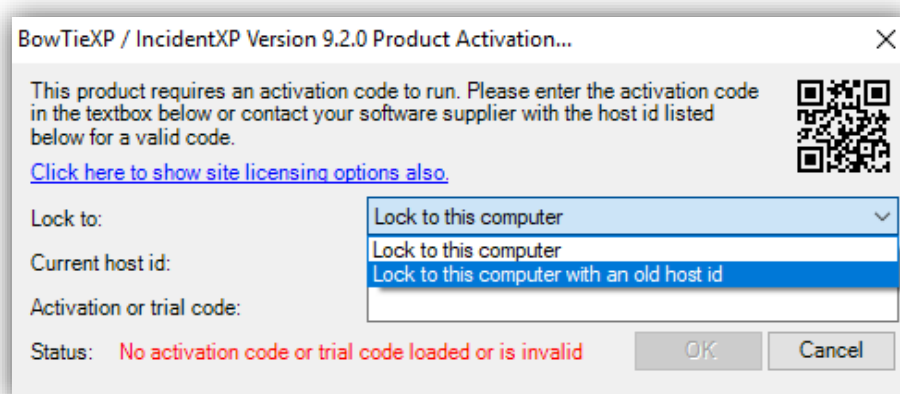


Figure 2 - Activate with original host id

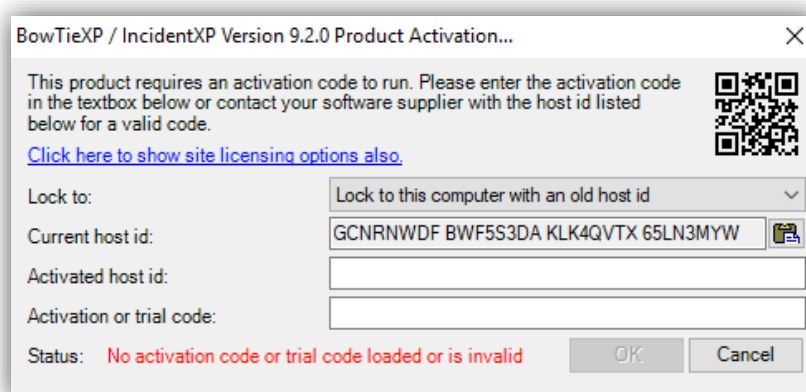


Figure 3 – Host id and activation code do not match anymore

We do not need to send you a new code. You just need to tell it the host id which belongs to the activation code. You can do this by copy/pasting the old host id which was used to generate the activation code into the ‘activated host id’ field. The host id that was used to generate the activation code is always included in the same email as the activation code, usually in a bit of text that looks like Figure 4:

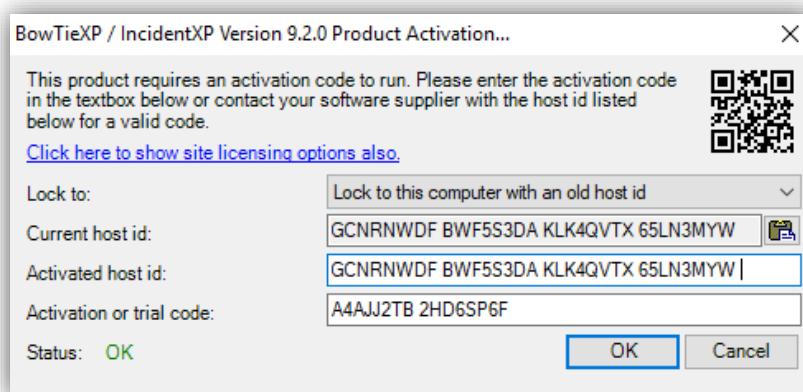


```
Code Type: BowTie Host Locked Code
Host ID: 4Z6PQP7Z RFR22TEN KLK4QVTX 79LJ2PKV ←
Code: B2IQ5XDB 2HCINAUW
Features: BowTieXP and IncidentXP Advanced SharePoint - Spreadsheets Audits - BSCAT Tripod BFA RCA
Expiry: None
```

**Figure 4 - Activation code email message**

The host id that was used to generate the activation code is the one pointed out by the arrow in Figure 4. When this host id is copied into the 'Activated host id' field, the software will pick it up and match it to the activation code. This should result in an accepted code, returning the status 'OK'. Now click the OK button, and the software should be activated once more (see Figure 5).

Please note that BowTieXP will check what has changed on your computer. If too many parts have changed, or you are trying this on a different computer, the code will still not work and you will need to contact us for an updated code.



**Figure 5 – Changed host id**



# 3

## Quick getting started guide

In this section, we will lead you through the steps needed for creating a simple bowtie diagram.

### 3.1. A brief description of bowtie methodology

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Note: Look in the methodology manual (see Chapter 4) for a more thorough elaboration.

---

The bowtie methodology is used for risk assessment, risk management and (very important) risk communication. The method is designed to give a better overview of the situation in which certain risks are present; to help people understand the relationship between the risks and organizational events.

The strength of the methodology lies in its simplicity; the phrase “less is more” is certainly applicable.

Risk management is all about risk-perception management, since most accidents happen because of actions or inactions of people. People working in hazardous environments should be aware of the present organizational risks and should have an accurate understanding of their role in it. This can only be accomplished by sufficient risk communication adjusted to the abilities of that part of the workforce you want to address, leading to the establishment of operational ownership.

Many risk assessments are done using quantitative instruments. These may be sufficient for certain types of equipment but are less valuable for organizational risk assessment. Human beings are less easy to predict than machinery and the operational combination of all factors present (think of people, equipment, time, weather, organizational factors, etc.) leads to even more difficulties. Making accurate predictions of the future in an environment that is as complex as the world itself, is simply impossible. In many organizations, the stakes of certain consequences (resulting from an accident) are too high to leave unmanaged. Therefore, it is wise to be prepared for ‘everything’; think of all possible scenarios and assess how your organization is prepared to deal with them. This is exactly what the bowtie method and BowTieXP will help you accomplish.

Risk in bowtie methodology is elaborated by the relationship between hazards, top events, threats and consequences. Barriers are used to display what measures an organization has in place to control the risk.

#### 3.1.1. Hazard

The word “hazard” suggests that it is unwanted, but in fact, it is the opposite: it is exactly the thing you want or even need to make business. It is an activity or state of something with the potential to cause harm but without it, there is no business. For example, the oil industry; oil is a dangerous substance (and can cause a lot of harm when treated without care) but it is the one the thing that keeps the oil industry in business! It needs to be managed because as long as it is under control, it is of no harm.

#### 3.1.2. Top event

Thus, as long as a hazard is controlled it is in its wanted state. For example: oil in a pipe on its way to shore. However, certain events can cause a deviation of or loss of control over the hazard. In bowtie methodology, such an event is called the top event. The top event is not a catastrophe yet, but the dangerous characteristics of the hazard are now in the open. For example: oil is outside of the pipeline (loss of containment). Not a major disaster, but if not mitigated correctly it can result in more unwanted events (consequences).

### 3.1.3. Threats

Often there are several factors that could cause the top event. In bowtie methodology, these are called threats. These threats need to be sufficient or necessary: every threat itself should have the ability to cause the top event. For example: corrosion of the pipeline can lead to the loss of containment.

### 3.1.4. Consequences

When a top event has occurred, it can lead to certain consequences. A consequence is a potential event resulting from the release of the hazard, which results directly in loss or damage. Consequences in bowtie methodology are unwanted events that an organization 'by all means' wants to avoid. For example: oil leaking into the environment.

### 3.1.5. Barriers (also known as controls)

Risk management is about controlling risks. This is done by placing barriers to prevent certain events from happening. A barrier (or control) can be any measure taken that acts against some undesirable force or intention, in order to maintain a desired state.

In bowtie methodology, there are proactive barriers (on the left side of the top event) that prevent the top event from happening. For example: regularly corrosion-inspections of the pipelines. There are also reactive barriers (on the right side of the top event) that prevent the top event resulting into unwanted consequences. For example: leak detection equipment or concrete floor around oil tank platform.

Note the terms barrier and control are the same construct and depending on industry and company, one or the other is used. In this manual, we will use the term barrier.

### 3.1.6. Escalation factors/defeating factors/barrier decay mechanisms

In an ideal situation, a barrier will stop a threat from causing the top event. However, many barriers are not a 100% effective. There are certain conditions that can make a barrier fail. In bowtie methodology, these are called escalation factors. An escalation factor is a condition that leads to increased risk by defeating or reducing the effectiveness of a barrier. For example: earthquake leading to cracks in the concrete floor around a pipeline.

Escalation factors are also known as defeating factors or barrier decay mechanisms – which term is used is dependent on industry and company. In this document, we will use the term escalation factor.

### 3.1.7. ALARP

If you want to be completely sure that there is no risk present, you have to get rid of the hazard. However, since the hazard is part of normal business, this is simply not possible. We accept there is a risk and we try to do everything possible to keep the risk "*As Low As Reasonably Practicable*" (ALARP). For a risk to be ALARP, it should be demonstrable that the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained.

What ALARP means is different for every organization; it depends on what risks an organization does or does not want to take and what an organization wants to spend (in time & money) on barriers/control measures.

### 3.1.8. Terminology recap

The following terms should now be familiar to you:

- The hazard, part of normal business but with the potential to cause harm, can be released by:
- A top event, no catastrophe yet but the first event in a chain of unwanted events.
- The top event can be caused by threats (sufficient or necessary causes).
- The top event has the potential to lead to unwanted consequences.
- (Proactive) barriers are measures taken to prevent threats from resulting into the top event.
- (Reactive) barriers are measures taken to prevent that the top event leads to unwanted consequences.
- An escalation factor is a condition that defeats or reduces the effectiveness of a barrier.

We will be covering the following steps in the next sections:

- A quick overview of the software layout,

- Adding/defining a bowtie location,
- adding a hazard and top event,
- adding threats,
- adding consequences,
- adding barriers,
- And adding escalation factors.

### 3.2. The BowTieXP screen

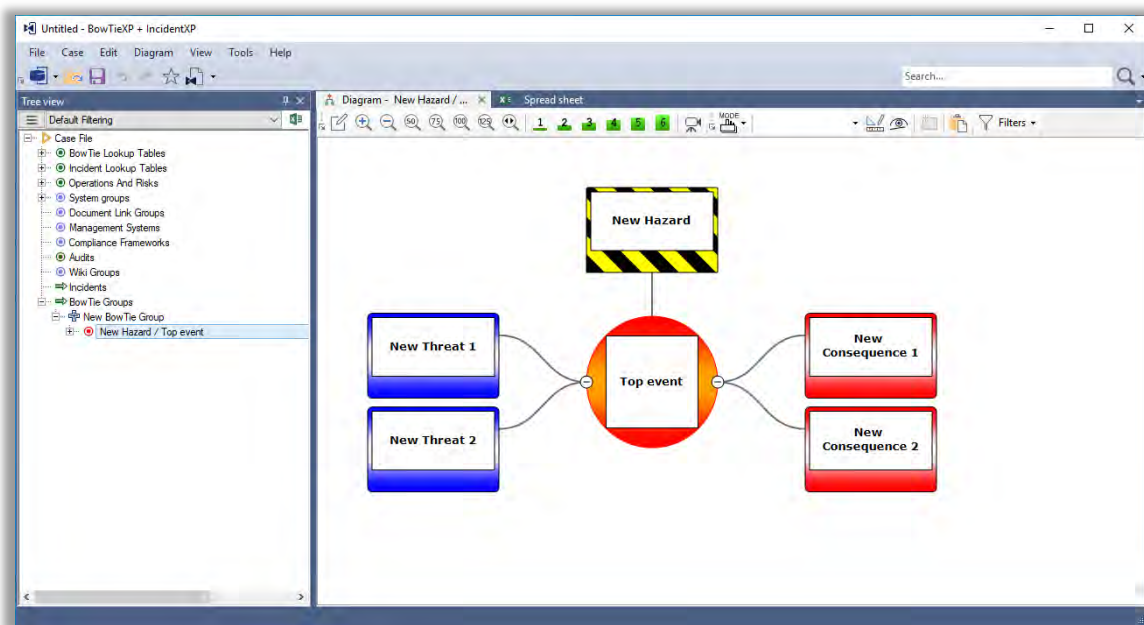
When starting BowTieXP for the first time, you will be asked a couple of questions and given some information:

- If you agree to the End User License Agreement (EULA),
- The version history / release notes are shown,
- If BowTieXP can check for updates and some other preferences,
- What language you want to use.

After agreeing to the EULA, you can leave everything at their defaults.

This screen is only shown the first time. Once it is finished, BowTieXP will start normally.

After starting BowTieXP, the following screen will appear:



**Figure 6 - Main application screen**

This screen consists of several parts that you will need to familiarize yourself with before you will be able to start building your case. They are explained below. Please note the titles in the various windows in the screenshot – throughout the documentation we will refer to these windows by those names.

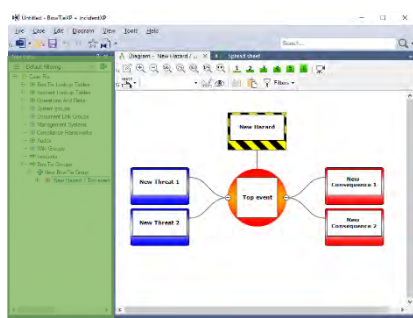
The windows we will need in this chapter are highlighted and discussed below.

---

**Note:** Your screen layout might be slightly different if you are running a different edition of BowTieXP – some extra features will be available if you have purchased the advanced version and/or the IncidentXP and/or the AuditXP add-on. All features that are not in the standard version of BowTieXP will be marked in the text.

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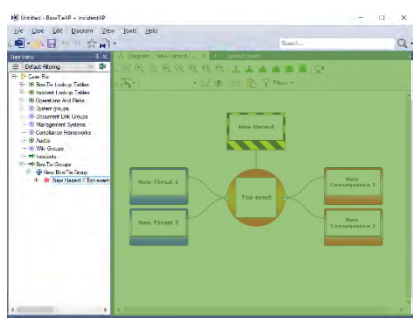
## Screenshot with highlight



## Description

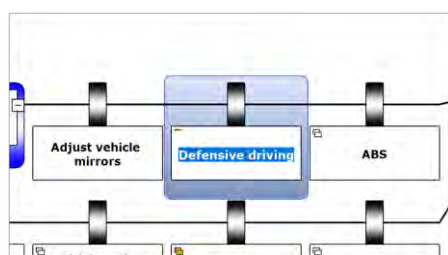
**Tree view** – The Tree view window helps you easily navigate through your bowtie Case File. In this window, you have access to your Case File, including the lookup tables associated with your file, the activities, documents, and bowtie locations. It is also a quick and easy way to jump to different portions of your diagram by clicking on them in the Tree view – the diagram will follow.

Note you can click on the '+' or the '-' icons to expand or hide the details associated with each item.



**Diagram** – The diagram window is where the visual portion of your diagram will take shape.

There are distinct shapes associated with each portion of the bowtie diagram that represent different aspects of your case. Think of the diagram window as your drawing board.



**In place editing ("quick edit")** – You can double click the name on a box, which lets you immediately change the name. This is also the default when you add a new diagram shape. You can also select the item by clicking it, and press F2 to quick edit the item.

If you double click on the shape, not the text, you'll get the full pop-up editor, showing all details. You can also bring the full editor up by right clicking the item and choosing "edit" as opposed to "quick edit". Or you can click the little pen icon in the shape (✎). Or by pressing F4.

The full (pop-up) editor looks like this, and allows you to edit all the details of an item, not just the name.

If you would like to know more about the Tree view, diagram, and editor windows or any of the other windows not covered in this chapter; please refer to the rest of the manual - starting at chapter 6, Introducing BowTieXP on page 45, and continuing in the next chapters, every component is described in detail.

## Some tips if you get lost:

1. Pressing F2 allow you to change the name of the selected item. Double clicking the text does the same.
2. Pressing F4 allows you to edit all the details of the selected item. Double clicking the border of non-text part of the shape does the same.

3. Pressing Shift + F12 restores all windows to their default location – the layout as seen in the screenshots is restored. You can also press the star icon on the toolbar.
4. If you cannot find your diagram, you have not selected a hazard/top event, or you have selected a different tab such as the case overview tab in the diagram window instead of the diagram tab.
5. Pressing the '+' symbol in the Tree view shows the hidden branches, pressing the '-' symbol hides them.

You are now ready to create your first bowtie diagram. A sample bowtie diagram is already created for you – you can change this to your liking. If you want to create a new one from scratch, follow the instructions below.

### 3.3. Quickly adding a diagram

As adding a new hazard is an often done job, you can go into the Diagram menu and choose the “Add new BowTie Diagram” option:

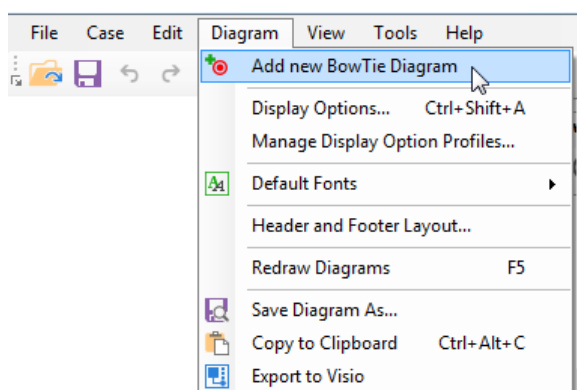


Figure 7 - Add new Bowtie diagram

This adds a new empty bowtie diagram in one go which you can then adjust to suit your purposes. Double click items to edit them. Look for the colored buttons on the diagram to add new items:



Figure 8 - Blue buttons

### 3.4. Step by step - step 1: Add a bowtie group

Each bowtie diagram belongs to a bowtie group. Using the shortcut in the previous paragraph, you might have noticed a new default bowtie group was created to hold the new default diagram. We will now explain how to make them step by step. It is very easy – just right click items to see what you can do to manipulate them.

Adding a bowtie group is how you begin before adding your first bowtie diagram. BowTie Groups give structure to your set of bowties and allows you to group bowties that belong together under a container. BowTie Groups can be created for locations (e.g. Amsterdam, Rotterdam, London), for types of operations (e.g. Transportation, Storage, Processing) or any other grouping structure that makes sense. Each group can contain multiple bowtie diagrams, one diagram for each Hazard/Top Event combination.

To create a bowtie group, go to the Tree view window and do the following:

1. Right click your mouse on the tree node called bowtie group.

## 2. Select 'New BowTie Group...'

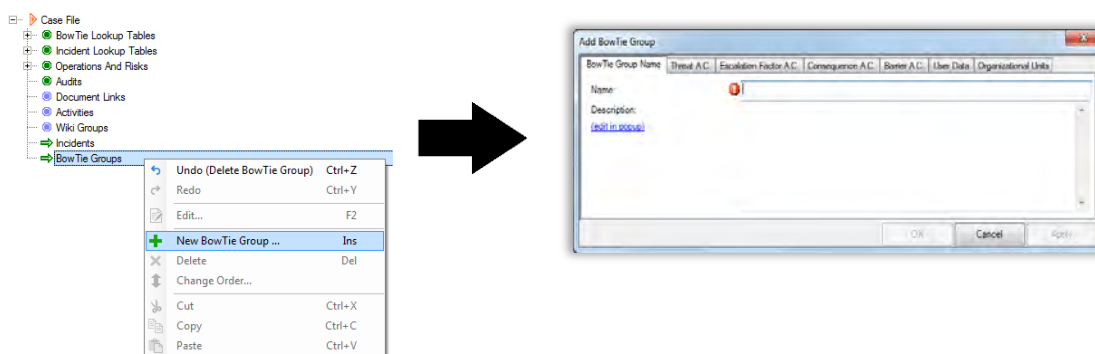


Figure 9 - Adding a BowTie Group

3. The editor dialog box appears.
4. Enter a bowtie group name in the name text box.

**Note:** Notice the name field has a red exclamation mark next to it. This means it is a mandatory field and you must fill it in.

5. Enter a more elaborate description, if desired.
6. Press OK to add the bowtie group.

This new BowTie Group will appear in your Tree view as shown in the figure below.

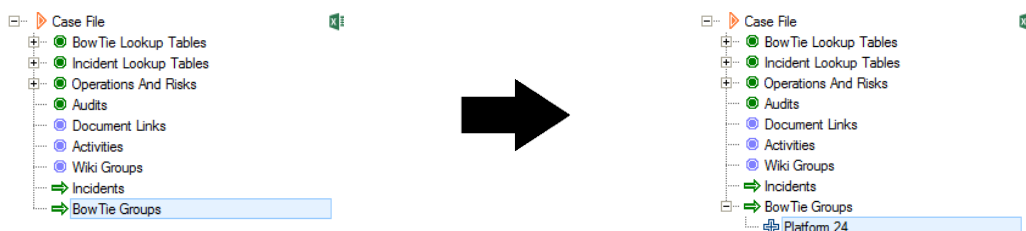


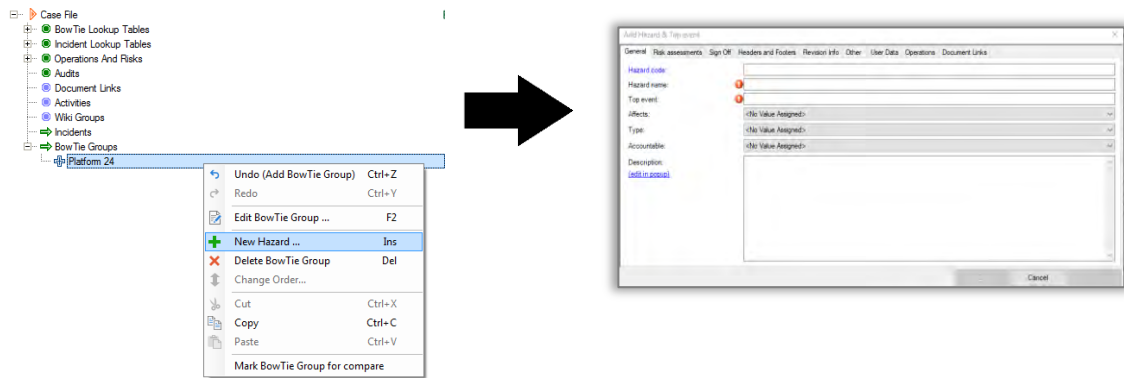
Figure 10 - Adding a BowTie Group - Tree view changes

## 3.5. Step 2: Add a hazard and a top event

Now you need to add a hazard and a top event to your new bowtie group.

1. Look at the Tree view. You will see the bowtie group you created in step 1.
2. Right mouse click on the bowtie group node.
3. Select New Hazard from the menu and the editor dialog will appear.

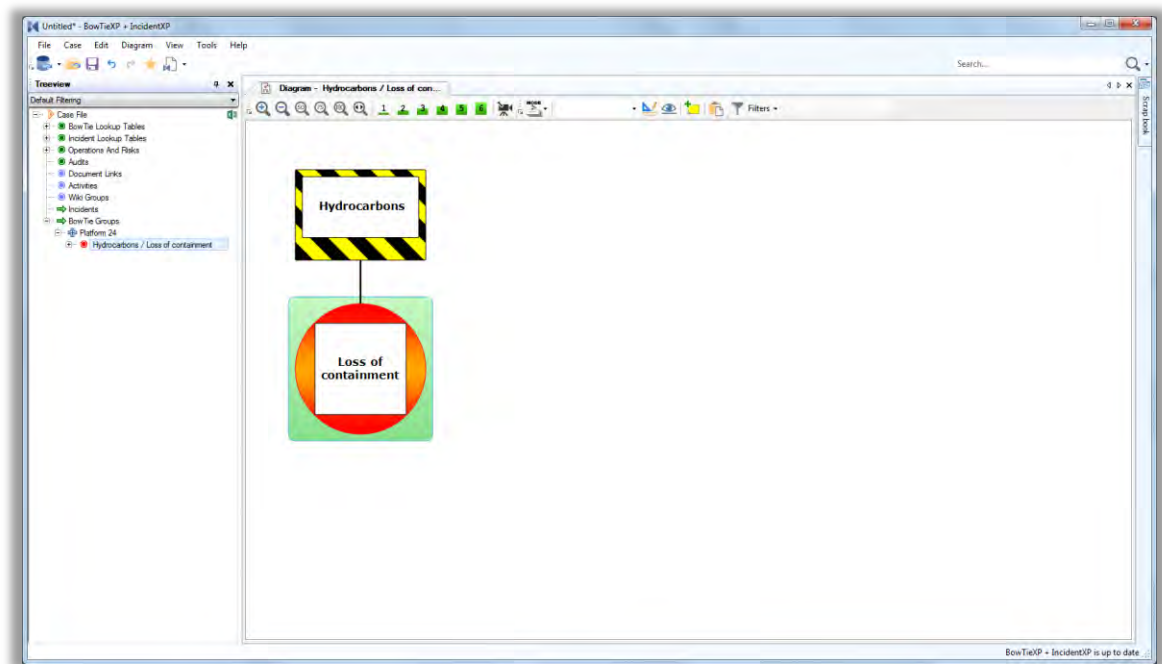




**Figure 11 - Adding a hazard & top event**

4. Enter a hazard name and a top event in the text boxes.
5. Click on the ok button to save.

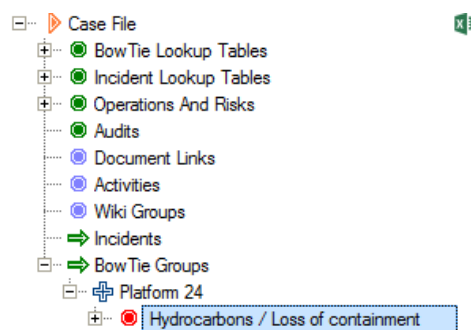
Notice that your hazard and top event now appear in the diagram window. You are now ready to begin working with your bowtie diagram.



**Figure 12 - After adding a hazard & top event**

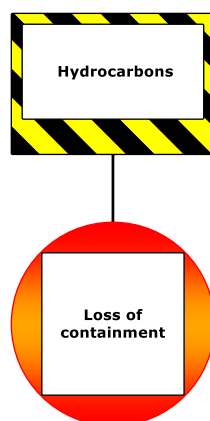
### 3.6. Step 3: Adding threats

Your Tree view window will now look like this:



**Figure 13 – The selected hazard in the Tree view**

Your diagram window will look like this:



**Figure 14 - A minimal bowtie diagram**

Now you can start adding threats to your hazard/top event combination. This can be done directly on the diagram or via the context (right-click) menu.

Move the mouse to the left of the red round top event shape. A little blue button will appear. Clicking this will add a threat. Notice the position of the mouse pointer:



**Figure 15 – Blue buttons (threats)**

The threat is immediately added to the left of your top event and ready to enter a name. Enter a name and hit the Enter key.

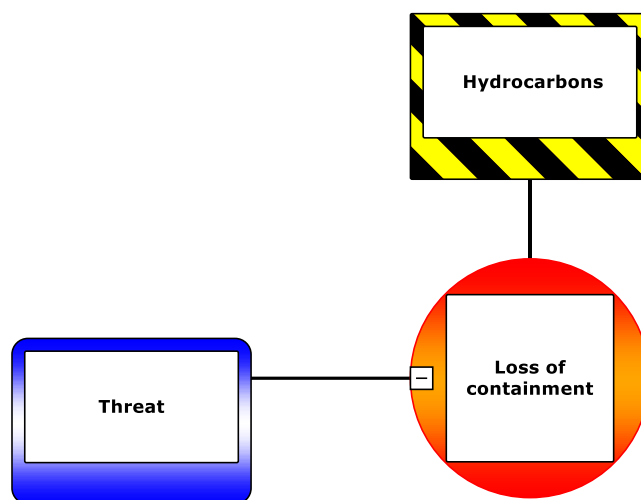


Figure 16 - The newly added threat

You can also right-click the top event and find the Add -> New Threat menu item.

Continue to add threats until you are satisfied you have covered them all.

---

Note: Use the scroll bars and the zoom in/out buttons on the toolbar to navigate through your diagram. You can also use:

- the mouse to click and drag in the background to pan around,
  - use the mouse wheel to scroll vertically
  - use the mouse wheel whilst holding down the shift key to scroll horizontally
  - use the mouse when whilst holding down the control key to zoom in and out
- 

### 3.7. Step 4: Adding consequences

If your top event were to occur, you would want to have an understanding of possible outcomes and necessary reactions to such an event. Consequences in a bowtie diagram allow you to analyze both sides of a top event.

You can add consequences to your diagram similar to how we added threats – click the red button on the right-hand side of the top event:



Figure 17 - Red buttons (consequences)

The consequence will appear and allow you to enter a name. Hit the Enter key. Now your diagram looks like this:

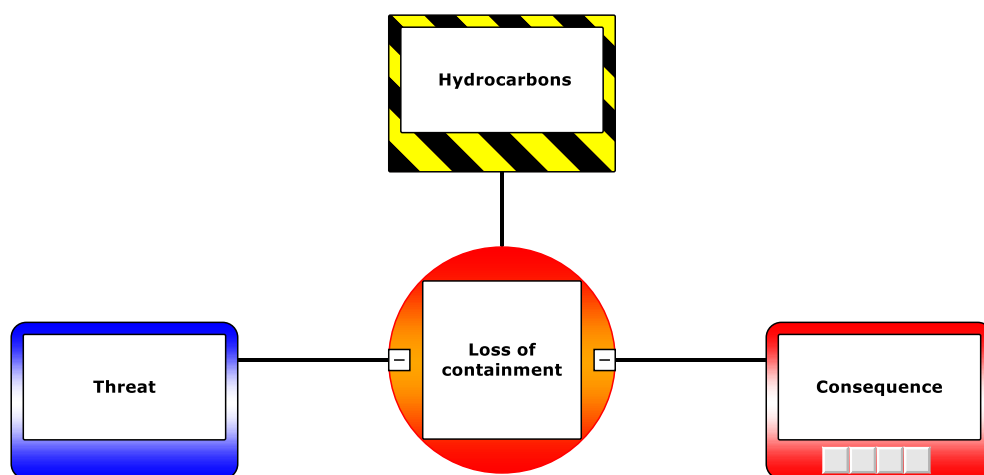


Figure 18 - The newly added consequence

---

Note: You can also right mouse click on the top event in the diagram or Tree view. Then select Add → Consequence.

---

You have now created the bare bones of your bowtie diagram. Next, you need to populate that diagram with information about the measures that are in place to prevent threats from triggering the top event, and what measures are in place to mitigate or prevent the consequences from becoming a reality if your top event has occurred. These measures are known as barriers.

### 3.8. Step 5: Adding barriers

Now, you will add a barrier to your bowtie diagram.

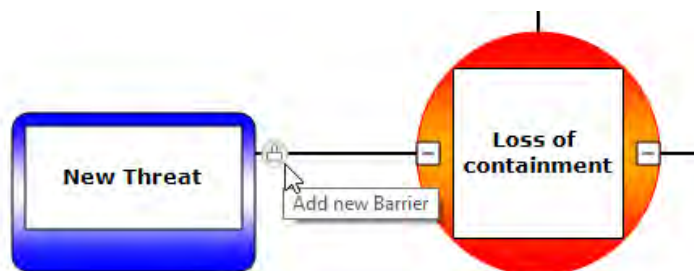
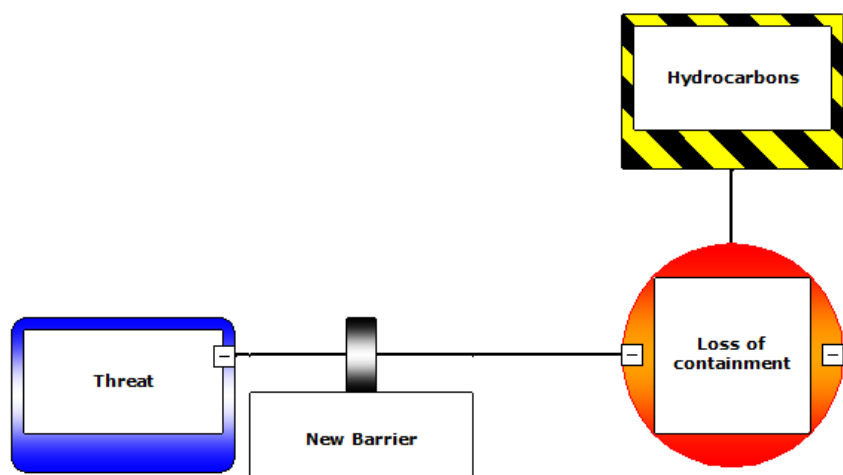


Figure 19 – Grey buttons (barriers)

Click the grey barrier button next to the threat. The barrier will appear. Enter the name of your barrier and hit the Enter key.



**Figure 20 - The newly added barrier**

Continue to add barriers to each threat or consequence until you feel your diagram is complete. You can add barriers to the left or right of existing items.

You can reorder barriers by dragging them around. You can also reorder threats and consequences in the same manner.

Note: You can also add a barrier by right-mouse-clicking on a threat in the diagram. You can also add barriers via the Tree view. Expand the threat and you will see a node titled "Barriers". Right click that and select to add a new barrier.

### 3.9. Step 6: Adding escalation factors

Escalation factors are conditions that lead to increased risk by defeating or reducing the effectiveness of barriers. To add an escalation factor to a barrier in your diagram, click the yellow button beneath a barrier:



**Figure 21 - Yellow buttons (escalation factors)**

If you have barriers in place to prevent this escalation factor from defeating this barrier, they can be added like how barriers are added to threats and consequences.

### 3.10. Bowtie diagram complete

By following steps 1 through 6, you have now completed a simple bowtie diagram. With the diagram laid out, you can now add more variables to each part of the diagram in order to drill down to more specific tasks such as categorizing your barriers and attaching activities, document references and a host of other things. Some are described below.

### 3.11. Taking it to the next level

There is much more to the BowTieXP software than just drawing diagrams. In the next sections, we will give you the background needed for taking your analysis to the next level, and we will do this with examples.

As you have seen in the previous sections, there are different kinds of information in each Case File, which are used in a variety of ways. In this section, we will explain the different types of data and how they interlink: some objects that you create have special ‘abilities’ such as being able to be referenced from other places. We will also talk about the theory behind some of these.

### 3.11.1. Normal entities

In the previous sections, you have created a sample diagram by adding a location, a hazard, threats, consequences, barriers and escalation factors. These items are known as normal entities and have no special abilities like the “special” items we will discuss next. Most normal entities are diagram parts.

### 3.11.2. Lookup tables

One of the things you might have noticed on the editors is that the normal items have various properties, which might be plain text, such as names, descriptions and codes, but also various drop-down lists such as e.g. the effectiveness rating on a barrier.

The options available for the effectiveness ratings are defined in your Case File and you can modify them yourself. Like all data in the Case File, you can find them in the Tree view, in this case under Case File → BowTie Lookup Tables → Effectiveness.

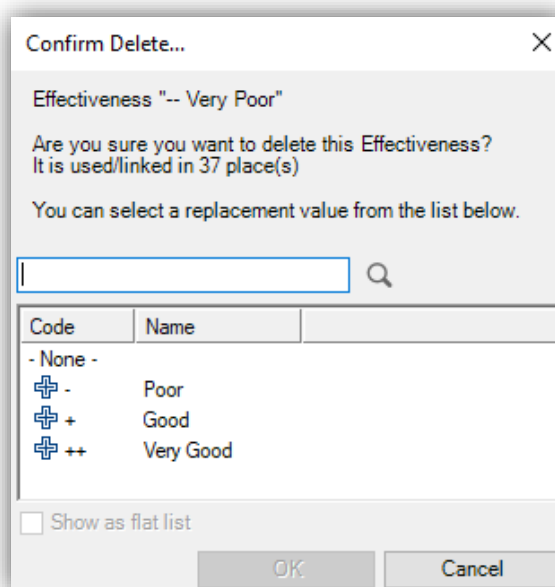
All the different reference information used throughout your Case File is defined under the “BowTie Lookup Tables” node.



**Figure 22 - Lookup tables**

Adding items here will make them available on the various drop-down boxes in the editor.

Removing items here will remove them of course. If a value is in use, you will be warned and asked if you would like to select another value to replace it with, as you can see in Figure 23 - Deleting a lookup table value below.



**Figure 23 - Deleting a lookup table value**

In BowTieXP, the following lookup tables exist:

Lookup table type	Description/usage
Action Categories	Used on actions to categorize the different actions
Activity Categories	Used on activities to categorize the different activities
Activity Types	Used on activities to categorize the different activities into different types
BRF Codes	Used on barriers to indicate the Basic Risk Factor (BRF) the barrier belongs to. For more information on basic risk factors and Tripod theory, refer to the methodology manual.
Plot Plans	Used to add plot plans to organizational units.
Organizational Unit Types	Used to categorize organizational units.
Organizational Units	Used on bowtie groups, audits and incident to indicate to which organizational unit the bowtie diagrams, audit fill outs and/or incident diagrams belongs to.
Hazard Categories	Used on hazards to categorize the hazard.
Hazard Type	Used on hazards to categorize and the hazards into different types.
Build Phases	Used to indicate the build phase of the bowtie.
Threat Categories	Used to categorize and color-code threats.
Threat Types	Used on Threats to categorize the threats into different types.
Consequence Categories	Used to categorize and color-code consequences.
Consequence Types	Used on Consequences to categorize the consequences into different types.
Escalation Factor Categories	Used to categorize and color-code escalation factors.
Escalation Factor Types	Used on escalation factors to categorize the escalation factors into different types.
Priorities	Used on actions to prioritize them.  <u>Priorities must be listed from high to low. This is important for some reports, but mostly for BowTieServer, to be able to prioritize the actions correctly.</u>
Frequencies	Used on activities to indicate the frequency of activity execution.

Effectiveness	Used on barriers to signify the effectiveness of the barrier in preventing the top event or consequence from occurring.  <u>Effectiveness must be listed from least effective to most effective. This is important for various reports, but mostly for BowTieServer, which uses the order to determine if things are improving (or not).</u>
Criticalities	Used on barriers to signify critical barriers.
Barrier Types	Used on barriers to categorize the barriers into different types.
Barrier Categories	Used to categorize and color-code Barriers.
Competencies	Used on activities to show which competencies are needed to perform the activity.
Job Titles	Job titles are abstractions for people tasked with a certain responsibility. Another word for this concept could be post indicator.  They are used on activities to indicate e.g. the person responsible for the activity and the person who signed off on the activity. On barriers and hazards, they indicate the accountable person. On hazards, they are also used for the sign off information. On actions, they are used to indicate the person who has to execute the intended action.
User Systems	Used on barriers to show which systems (e.g. power supply system) are needed to operate a barrier.  <u>Note: User systems are only available in BowTieXP Advanced.</u>
Survey Types	Used to categorize surveys in different types  <u>Note: Survey types are only available in AuditXP.</u>

### 3.11.3. Linkable entities by example: activities

For some properties, it is not enough to be able to select only one value, you need to be able to assign multiple items from a limited list of items.

Let us clarify this abstract idea with an example.

In most organizations, there is a management system of activities/tasks, which define how your organization is run. Many of these management system activities are essential for keeping barriers working correctly – for example, an automatic fire suppression system needs regular maintenance, inspection and testing to ensure it will function correctly when needed.

To leverage the usability of your bowtie diagrams, mapping between your management system and your diagrams is important. It enables you to analyze which tasks and therefore which persons/posts are managing threats, how many different activities and therefore how many people are responsible for this and if any threat is sensitive to single points of failure in your management system.

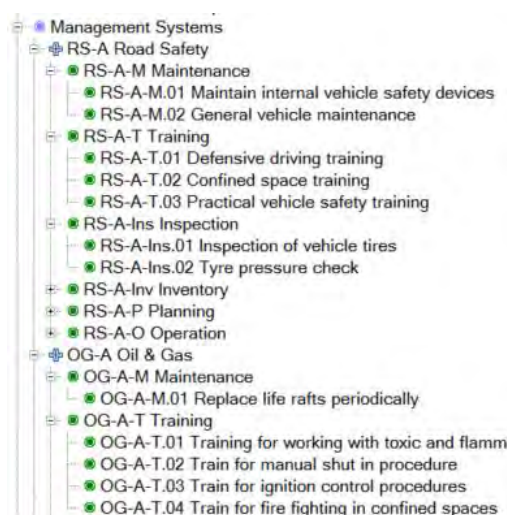
For example, a threat, which is controlled by barriers, which is supported by several activities, which all rely on the same person, might be considered more vulnerable than one with barriers and activities that are not all dependent on one person.

It also allows for better communication on why certain activities are critical, which helps the persons responsible from understanding why they are to do the mentioned task and therefore ensuring better execution.

To support this analysis, you can define management systems that contain a hierarchy of activities within BowTieXP. After creating / inputting this hierarchy of activities into BowTieXP, you can assign various activities to your barriers.

See the example below:





**Figure 24 - An example activity hierarchy with multiple management systems**

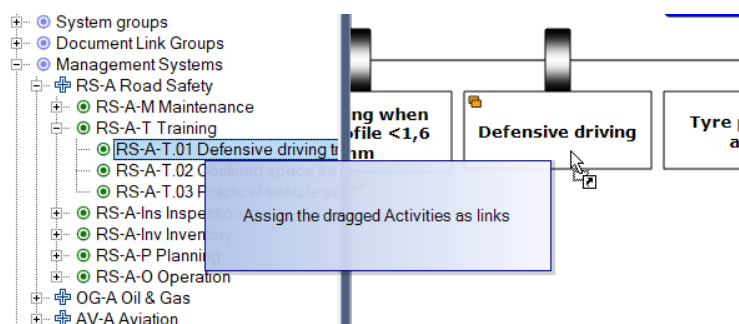
After the hierarchy has been defined, we can now link the activities onto barriers. You can do this in a couple of different ways: Drag and drop and via the Editor.

### 3.11.3.1. Drag and drop

All link assignments can be made using drag and drop, similar to how you move/copy files in Windows Explorer.

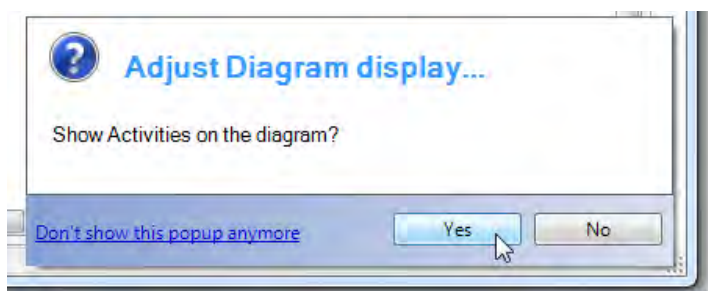
To assign an activity to a barrier using drag and drop, ensure that the barrier you want to assign to, is visible in the diagram and the activity you want to assign, is visible in the Tree view.

1. Left click the activity and keep the mouse button pressed down.
2. Move the mouse over to the diagram whilst holding the mouse button. You will see the mouse pointer indicate when it is valid to let go (Figure 25 - Assign Tree view values to the diagram)
3. Release the mouse button when the mouse pointer is over the barrier where you want to assign the activity.



**Figure 25 - Assign Tree view values to the diagram**

The link has now been made. You might have noticed the following popup when dropping the activity:



**Figure 26 - Diagram display popup**

If you click yes, the assigned activities will be shown on the diagram:

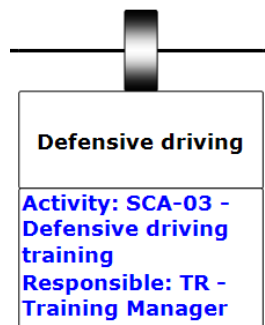


Figure 27 - Activity linked to barrier

If we missed the dialog, we can also manually adjust the display settings. To do so, take the following steps:

1. Click the little eye icon on the barrier:

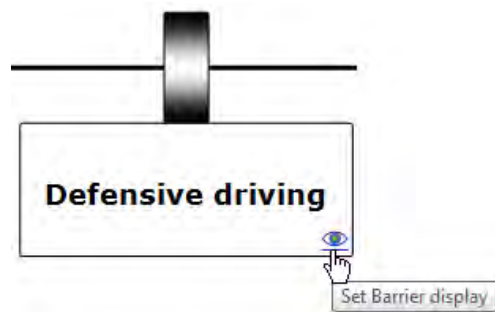


Figure 28 - Barrier display - eye-icon

This will bring up a dialog that allows you to adjust display options for barriers. Note that all shapes have this little icon.

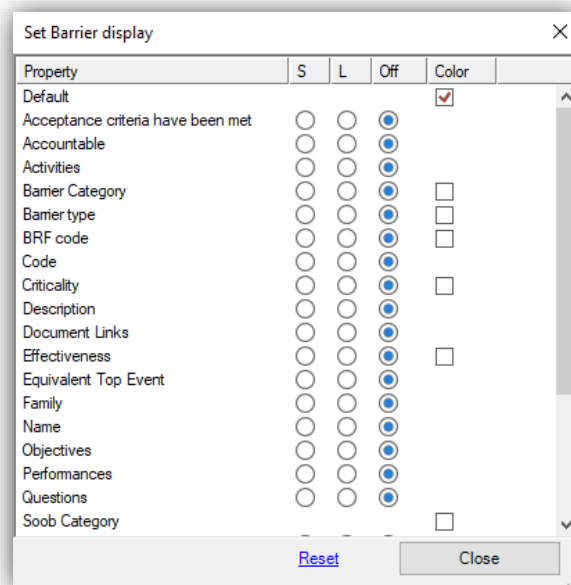


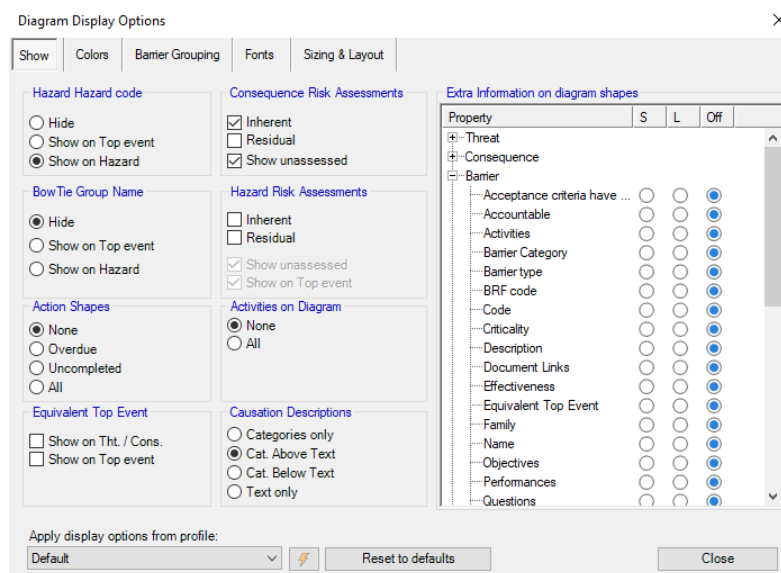
Figure 29 - Set barrier display window

Select the S column for activities – this will show the activities of the barrier in **Short** format. You can also choose L for **Long** format.

If you have many settings to change, you can also open the diagram display options menu:

1. Go to the diagram menu,
2. Choose display options,

3. In the tree, open the barrier settings.
  4. Select the 'S' or 'L' column radio button under barrier for activities.
- The diagram will change and show all the assigned activities below each barrier. Verify the link you just made.

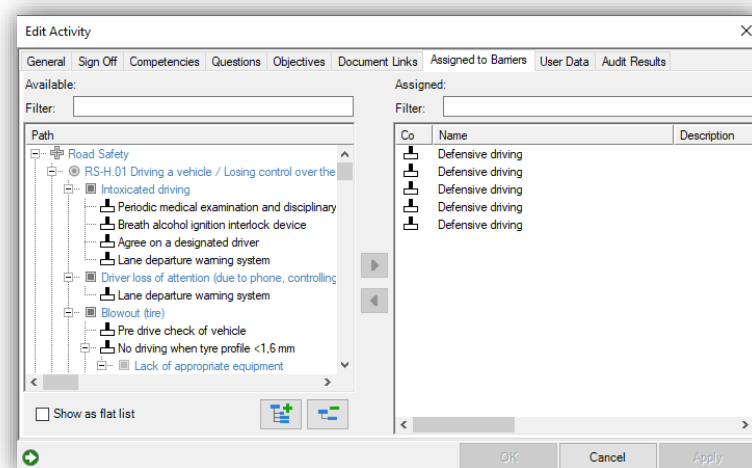


**Figure 30 - Showing activities on the diagram**

The same diagram appears when you click the eye-icon in the toolbar (👁️)

The second method is the method that also allows us also to remove the link: via the activity in the Tree view or via the barrier.

In the Tree view, we can open it up further by clicking the plus sign, which will show all the child collections the activity has. Double click on the activity. On the top of this pop-up you see 'Assigned to Barriers'. The screen will now look like the picture below.



**Figure 31 - Assigning activities to barriers**

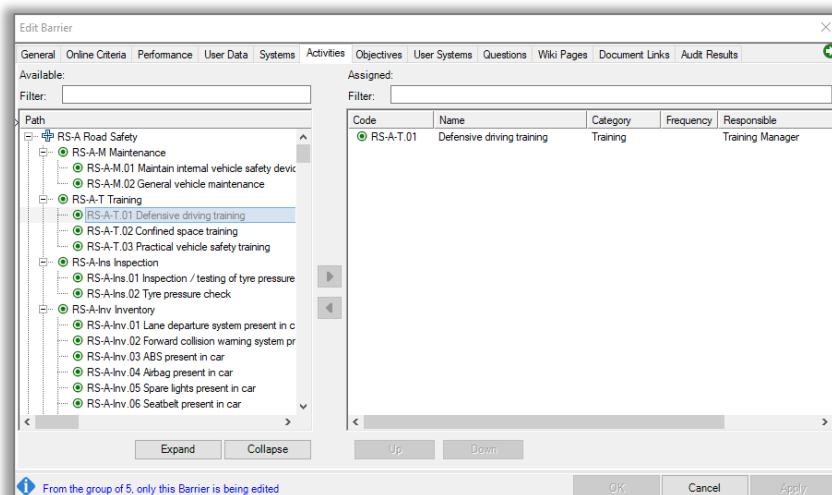
The left column represents all the barriers in the casefile. The right column tells you to which barriers the activity you are currently editing is linked to. You can drag and drop barriers from the left column to the right column to link barriers with the activity. You can also select barriers and use the arrows in the middle to link with the activity. You can unassign barriers by bringing these barriers back to the left column.

Note that items that are drawn in gray have already been assigned / moved to the right-hand side.

Below you find the explanation in how to add activities to barriers from the barrier editor. This process will create the same links but start at the other side of the link.

### 3.11.3.2. Editor

Double click the shape of the barrier, or select the barrier and hit F4, to bring up the editor. Select the activities tab:



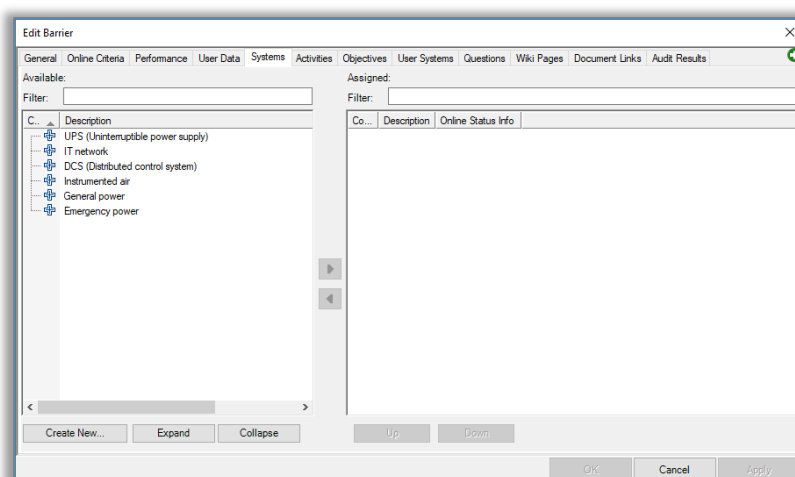
**Figure 32 - Editor window / activities tab**

The left-hand side of this screen shows all the items which can be linked to the barrier. The right-hand side shows all the entities already assigned. To move items between the two sides, you can select them and press the relevant arrow icon between the two halves of the screen. You can also drag and drop items between the two sides. Alternatively, you can double click an item to assign or unassign.

Note that items that are drawn in gray have already been assigned / moved to the right-hand side.

Also, note that you can filter the items shown by typing information into the filters. You can also sort on each column by clicking the headers.

When assigning document links and activities the screen described above is used, due to the hierarchical nature of these items. For flat data such as e.g. systems, the dialog looks slightly different, and can be seen below:



**Figure 33 - The assign links screen showing flat data**

One thing to note is that now assigned items aren't shown in gray on the left-hand side, but are removed and only visible in the right-hand side.

### 3.11.3.3. Deleting linkable items

Note that when deleting an item that has been used, you will get a popup similar to the popup when deleting a lookup table item (see Figure 23 - Deleting a lookup table value on page 27): You are allowed to select an optional replacement value.

### 3.11.3.4. Overview of linkable items

Note that operational risk factors, operations and systems are part of the advanced edition. Compliance frameworks are part of AuditXP.

Linkable entity type	Description/usage
Activity	Described above. Activities are linked to barriers. Activities can be found/created under the Management Systems container on the top level of the Tree view.
Document Link	Document links are references to external documentation, which can be added to various elements in the Case File. Like all linkable entities, they are defined centrally and then referenced from other elements in the form of links. Linking to document links is possible to hazards, threats, consequences, barriers, escalation factors and activities. Document links can be found/created under the Document Link Groups container on the top level of the Tree view.
Wiki Groups / pages	Wiki pages are references to internal documentation, which can be added to barriers in the Case File. Wiki pages are often imported using the Wiki module in BowTieServer, but wiki pages can also be used for BowTieXP only.
Operational Risk Factor	Operational risk factors are used to specify certain dimensions of operations, which need to be considered separately in Soob matrices from the operation as a whole, such as critical equipment and e.g. weather conditions. Operational Risk Factors can be found/created under the Operations and Risks container on the top level of the Tree view.  See chapter 21, Advanced functionality: Soob matrices on page 160 for further details.
Operation	An operation in BowTieXP is used to describe a specific operation, which can take place in your organization and should be present on the Soob matrix. Operations can be found/created under the Operations and Risks container on the top level of the Tree view. See chapter 21, Advanced functionality: Soob matrices on page 160 for further details.
Systems	Systems are used to visualize maintenance data on barriers. A system can contain sub-system and each system consists of multiple parts. These parts can either be online or offline (or the status is unknown). Systems can be found/created under the System groups container on the top level of the Tree view.  See chapter 22, Advanced functionality: Live on/offline system states on page 175.
Compliance frameworks	Compliance frameworks are used to link objectives from the compliance framework to the bowtie to understand whether the framework is fully implemented using maturity levels. Objectives can be linked to barriers and activities.  See chapter 24, AuditXP add-on on page 192 for details.

### 3.11.4. Show usage references / backlinks

When an activity is referenced on a barrier, there's a virtual arrow pointing from the barrier to the location in the Tree view where the activity is defined. The figure below demonstrates this. It shows a part of a bowtie diagram. Listed below each barrier are the activities assigned to that barrier.

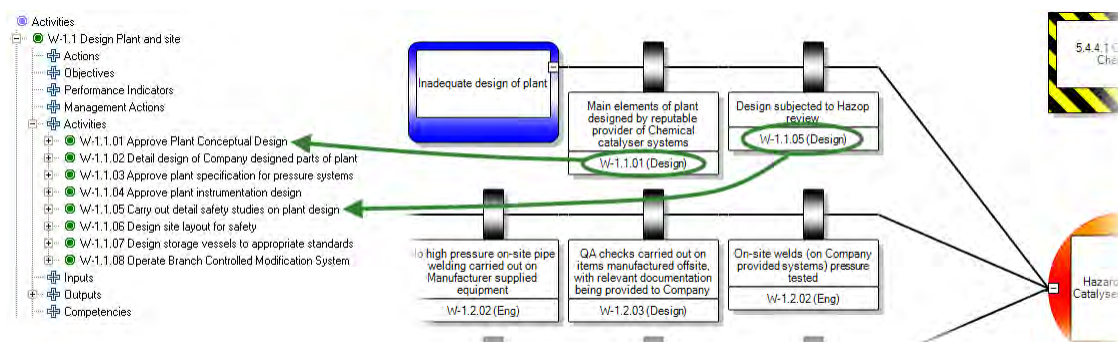


Figure 34 - Tree view and diagram, explaining links

This arrow is called the link. We can also follow this arrow in the *reverse* direction, from the activity to *all* the barriers where it is used. These are called the backlinks.

A similar concept applies to lookup table values.

For each linkable entity and each lookup table value, we can find out where they are used by showing us their backlinks / usage references.

This is done by right clicking the item of which you want to see where it is referenced and selecting the option in the context menu called "Show usage references". The Listview (that appears if not enabled already) will show all the places where the item is in use.

See also section 7.9 starting on page 72, the Listview window.

## 3.12. Actions

Actions are one-time actions (and thus do not reoccur) on a bowtie. They can be used in several ways. Two examples are to use them as TODO items when developing a bowtie, or as an improvement plan on an existing bowtie.

### 3.12.1. Actions as a TODO list

Let us say you have a barrier in your bowtie, but you are unsure who is accountable for it. Creating an action lets you track all the elements in your bowtie that need more investigation.

### 3.12.2. Actions as improvements

You could also use actions as a more formal improvement plan. After completing the bowtie and seeing how your organization manages risk currently, there are often scenarios that could be improved by adding new barriers or improving existing ones. You can use actions to highlight those areas.

Some examples of actions as improvements are: correcting an error in a procedure, adding a new smoke detector or changing the accountable party for a barrier. These are performed once to improve safety, but do not need to be repeated regularly.

Actions to create a new barrier are usually displayed on the associated Threat or Consequence, while improvements on existing barriers are usually put on the barrier itself.

### 3.12.3. The difference between actions and activities

BowTieXP also allows you to add activities, and there is often confusion about the difference between actions and activities. Activities are used to describe regular recurring tasks like maintenance and training. These are part of your (safety) management system.

Actions on the other hand, are one-off improvements on a (safety) management system or barrier. For example, an activity could be maintenance on an engine, an action for that activity could be to create a new checklist to make the maintenance less error prone.

### 3.12.4. Adding an action

Adding an action is done by selecting any element in the bowtie and either clicking the action icon in the toolbar or right clicking on the element → Add → Action

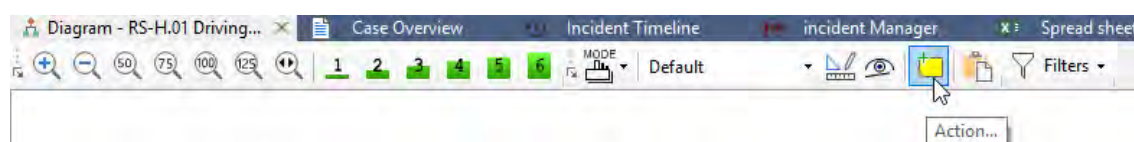


Figure 35 - Action button in the toolbar

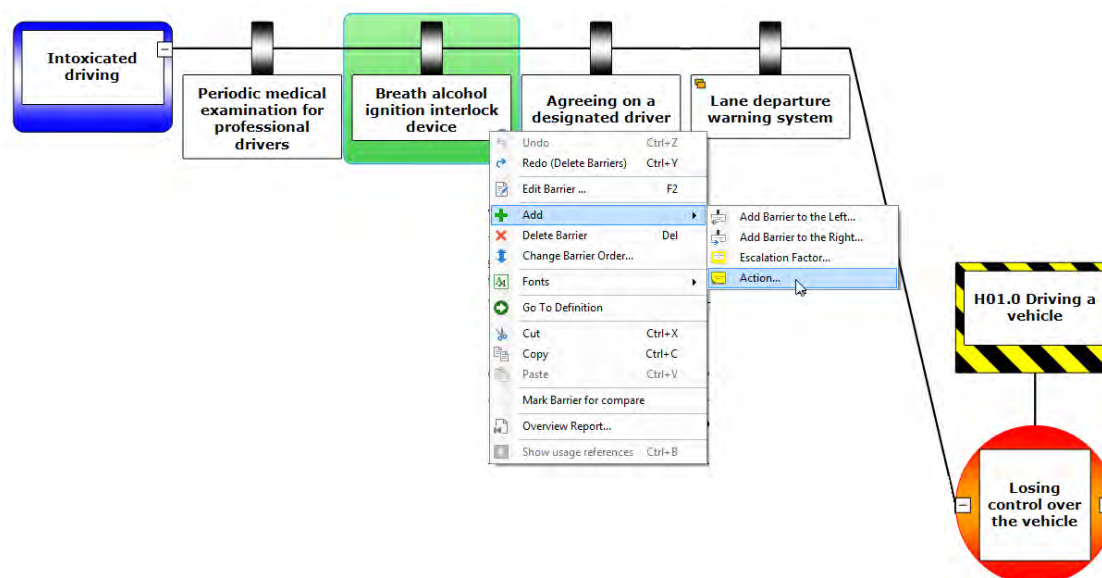


Figure 36 - Add action by right clicking

#### 3.12.4.1. Action properties

The fields on an action are:

- **Code:** the action code is displayed on the diagram.
- **Name:** describes what the action is about.
- **Description:** a detailed description of the action.
- **Category:** categorizes actions (e.g. TODO's or improvements).
- **External Reference:** this field can be used to fill in a reference to an external action tracking system.
- **Action party:** the job title is responsible for completing this action. The job titles are defined in the Lookup tables
- **Organizational Unit:** indicates for which organizational unit this action is created.
- **Priority:** gives a priority to an action. The list of priorities is defined in the Lookup tables
- **Target:** gives the date before which the action must be completed.
- **Sign off comment:** an optional field to provide comments when signing off an action.



- **Sign off authorized by:** the job title that authorized the completion.
- **Sign off date:** the date on which the action was signed off.
- **Completed:** this box is ticked once the action has been completed.

Figure 37 - Add action window

### 3.12.5. Visualizing actions

Actions are visualized on the bowtie as post-it shapes. The code is also displayed.

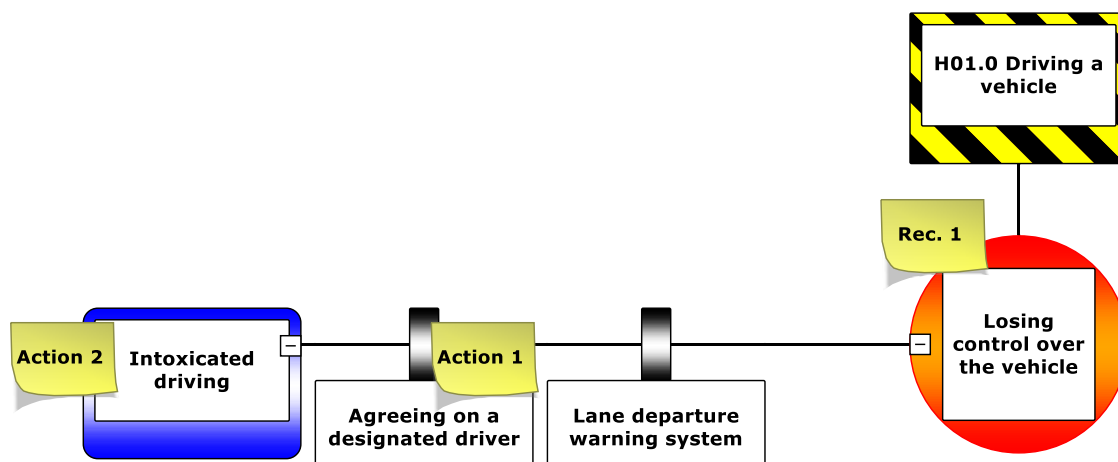


Figure 38 - Display of actions

Go to Diagram → Display options and under Action Shapes, select either None to hide all actions, Overdue to show all uncompleted actions with the target overdue, Uncompleted to show only uncompleted actions or All to see both completed and uncompleted actions.

In the Colors tab, you can also select Action Colors. Coloring can be done by Priority, Category and Overdue or Completed status.



### 3.12.6. Action reports

Go to Tools → Reports and expand the Actions section to see the following action reports:

- **Actions in XL:** a flat list of Actions, opens in Excel
- **Actions in BowTie context:** Actions in BowTie context, with empty fill in lines, opens in Excel
- **Actions in BowTie context, condensed version:** Actions in BowTie context, opens in Excel. No empty fill in lines, only listing the objects that actually have Actions descendants
- **Action of a selection of hazards:** a report with all actions for particular Hazards, opens in Word
- **All actions:** a list of all actions in alphabetical order based on code, opens in Word
- **Actions by action party:** a report that prints out all actions sorted by Action party, opens in Word
- **Actions by priority and action party:** a report with all actions sorted by Priority, opens in Word
- **Actions of a specific action party:** a report with all actions for a specific job title, opens in Word

# 4

## A deeper look at the bowtie method

Due to the length of this chapter, we decided to make it into a separate document. Please contact [support@cgerisk.com](mailto:support@cgerisk.com) to see if you are eligible to receive a copy.

This document aims to educate the reader on the bowtie method as it is used in the industry at the moment. It is both a practical reference for everyday users of the method and a theory guide. This means that theoretical concepts are elaborated with practical tips and examples on how to use the method.

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Note: Another good source of bowtie information, guidelines and best practices is the book “Bow Ties in Risk Management: A Concept Book for Process Safety” that was a collaborative effort of the Center for Chemical Process Safety (CCPS) and the Energy Institute (EI). The book was co-authored by CGE staff.

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Please find a rough outline of the chapters in the method manual below:

- 1 Introduction
- 2 Discussion of related methods
- 3 The application of bowties, today and tomorrow
- 4 Before getting started
- 5 Building a Bowtie
  - 5.1. A Bowtie Diagram in 8 Steps
  - 5.2. Hazards
  - 5.3. Top Events
  - 5.4. Threats
  - 5.5. Consequences
  - 5.6. Barriers
  - 5.7. Escalation factors and escalation factor barriers
  - 5.8. Linking management system activities to barriers
  - 5.9. Escalation factor guidelines
  - 5.10. Completing barrier information
- 6 Risk evaluation
  - 6.1. Overview of ALARP
  - 6.2. ALARP in Bowtie
- 7 Bowtie implementation
  - 7.1. Implementation
  - 7.2. Monitoring
  - 7.3. Revisions and change management
- Appendix 1 Sample SMS outlines
- Appendix 2 A sample bowtie

# 5

## The different BowTieXP versions

In this chapter, a quick overview is offered of the extra functionality available in the various versions of BowTieXP.

### 5.1. Introduction

BowTieXP comes in three versions:

- BowTieXP Standard Edition
- BowTieXP Navigator Edition (read-only)
- BowTieXP Advanced Edition

The following add-ons are available:

- Spreadsheet add-on (BowTieXL)
- AuditXP add-on
- IncidentXP add-on

The IncidentXP add-on is an incident analysis add-on, which features the DNV BSCAT method, the Tripod Beta method, the Barrier Failure Analysis (BFA) method as ways of doing barrier-based incident analysis. IncidentXP also includes the non-barrier based Root Cause Analysis (RCA) and Kelvin TOP-SET RCA methods. Although RCA is not barrier-based by definition, IncidentXP allows to link RCA elements to bowtie barriers. IncidentXP can be used as a stand-alone tool, but is also available in combination with BowTieXP<sup>1</sup>, allowing you to link reactive incident analysis to proactive risk analysis (i.e. incident analysis diagram to bowtie diagram).

### 5.2. Navigator edition

Not everybody who needs to access bowtie information needs to be a full licensed bowtie user. BowTieXP Navigator allows non-bowtie builders to access all information in a bowtie file (.btf), without being able to change the content. The workforce or management often uses the Navigator version. They need the bowtie information, but are not designated or trained to modify the bowtie diagrams.

- Features which are present in the Navigator edition of BowTieXP:
  - Change display settings
  - All export functionality (generating reports, save diagram, print diagram)

### 5.3. Advanced edition

The advanced edition of BowTieXP offers many extras for the power users of BowTieXP. These extras consist of:

- Extra features which are not present in the standard edition of BowTieXP:
  - File and tree compare
  - Customizable type and property descriptions (terminology)
  - Relationship diagrams, including how bowties interrelate
  - Configurable Tree view filtering and tooltips

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<sup>1</sup> Actually, BowTieXP and IncidentXP are both inside the same program. The license key determines what you get to see – BowTieXP, IncidentXP or both.

- Barrier visual bundling, to group barriers together based on a similar characteristic
  - Diagram display profiles (switch quickly between modes)
  - Edit Advanced Filter criteria
  - Soob matrices (also known as MOPO or SimOps)
  - Live On/Off-line states based on barrier parts
  - Compliance frameworks
- Enhancements to how you edit your data:
  - Edit multiple items at the same time
  - Automatic group detection – edit all the instances of the same barrier across many diagrams at once
  - The Scrap book
  - Import data from e.g. Excel files
  - Full import of data from other BowTieXP Case Files
  - Copy/paste between multiple files
- Improvements in how you gain insight into your Case Files via extra reports and Case File overviews:
  - Advanced Case File overview perspectives
  - Advanced reports
  - Ability to search the contents of document links

---

**Note:** For a more detailed overview on the differences between BowTieXP Standard and Advanced, please ask your CGE contact to provide you with the BowTieXP Feature Matrix.

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### 5.3.1. Soob matrices

The Summary of Operation Boundaries matrix is a record of operations used to determine under which circumstances extra caution should be taken or work should no longer be allowed to proceed. This is to help the decision process of whether to proceed with operations when encountering suboptimal conditions.

For a full explanation about Soob matrices, please refer to chapter 21, Advanced functionality: Soob matrices on page 160. This chapter describes what Soob matrices are, how they are used and constructed.

### 5.3.2. Type and property descriptions

Each Case File contains a large table containing the names of all object types and their properties present within BowTieXP. This allows customers to make slight adjustments to various names and allows them to tailor-fit the software to their company. For example, you could rename barriers to be labeled as controls.

See chapter 20, Advanced functionality: type and property descriptions on page 157 for full details.

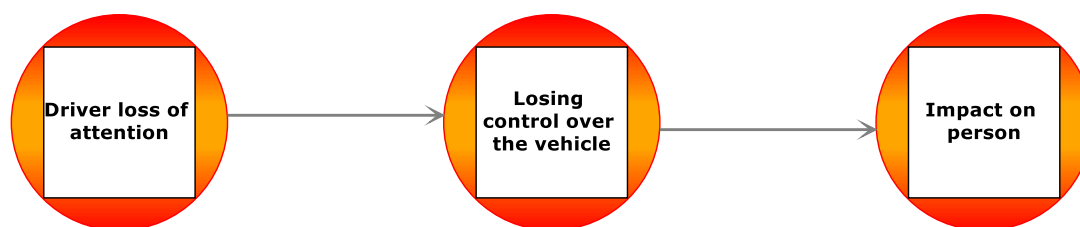
### 5.3.3. Relationship models / diagrams

The relationship diagram functionality can draw many different diagrams based in the data you have entered into your Case File, visualizing the relationships between the data. For example, barriers can be assigned activities, and activities have responsible persons. How do the responsible persons relate to the different hazards via the barriers and activities defined?

With the relationship model functionality, this question is answered easily with just a few clicks of the mouse.

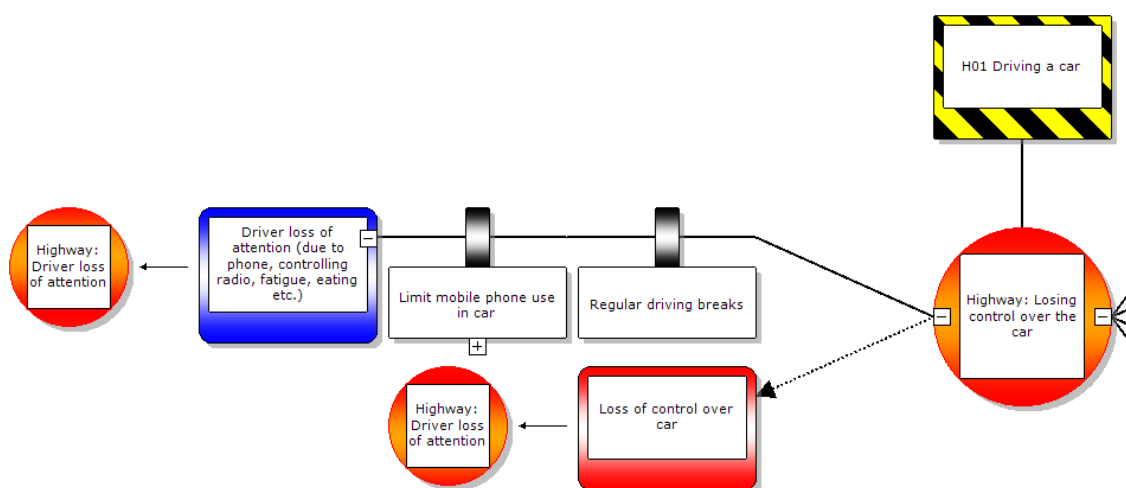
More than 20 different diagrams are offered.

Now bowties can interrelate, you can also create diagrams showing how one bowtie flows into others:



**Figure 39 - Relationship diagram - Bowtie chaining**

You can also easily navigate from diagram to diagram using on-screen aids:



**Figure 40 - Bowtie chaining**

These are explored in depth in chapter 9.5, Advanced functionality: relationship models on page 98.

### 5.3.4. Compare files side by side

On many occasions, you want to find out what your colleague changed in the latest revision of the Case File. Do you need to see what the differences are between two versions of the same Case File in your document management system? Then compare the files side by side, see the differences visually or generate a report of these changes. You can do it all with the file compare function in BowTieXP advanced.

See full details in chapter 19,

Advanced functionality: comparing files and parts of files on page 151.

### 5.3.5. Tree view filtering and Tree view tooltips

The Tree view contains every available option for adding data into BowTieXP, some of which you will never use and some that you will only use during certain phases of bowtie building. You can make the Tree view a lot compact by temporarily hiding these collections and objects by means of the Tree view filter profiles. See section 7.11, Tree view filtering on page 73.

Note for BowTieServer users: Tree view filtering profiles cannot be saved into the BowTieServer database.

### 5.3.6. Barrier visual bundling (barrier grouping)

Long lines of barriers can be reduced in size by bundling barriers together if they share a similar characteristic. This could be based on barrier type, job title, effectiveness, criticality or the barrier family name.

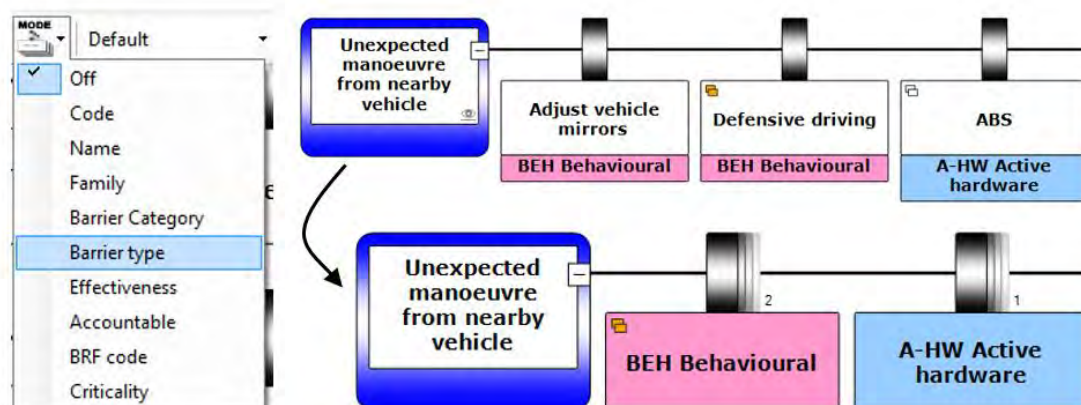


Figure 41 - Barrier Families

### 5.3.6.1. Diagram display profiles

As the number of configurable display options has grown very large over the last years and setting up the wanted display can take quite some time, the diagram display profiles were introduced.

Each Case File can hold a list of diagram display profiles, and you can easily switch between them using a drop-down box above the diagram.

See chapter 17, Advanced functionality: diagram display profiles on page 139 for details.

### 5.3.7. Enhancements to editing your Case Files

Apart from the enhancements discussed above, the advanced edition also offers extra functionality for editing your Case Files, such as improvements to import functionality, the ability to find and replace and enhancements to working with multiple Case Files.

#### 5.3.7.1. Edit multiple items at once

The advanced edition allows you to edit multiple items at once:

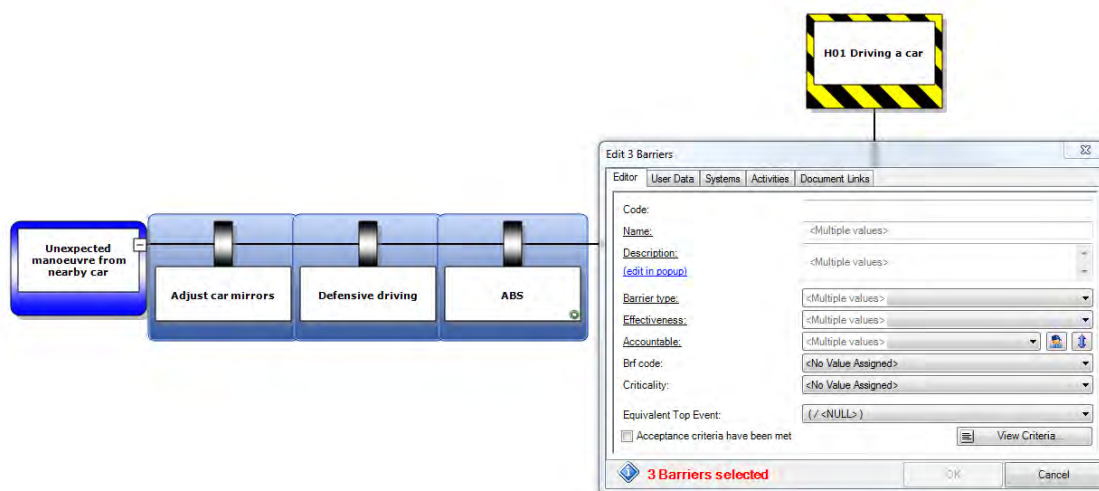


Figure 42 - Edit multiple items

This allows you to edit a single property of multiple items at once – i.e. set the effectiveness or the responsible to the same value while leaving the descriptions untouched. Hold the control button on your keyboard to select multiple items.

### 5.3.7.2. Automatic group detection – edit all the instances of the same barrier across many diagrams at once

BowTieXP automatically recognizes barriers with the same code and name and allows you to edit all of them with the press of a single button. This simplifies keeping barriers in sync over multiple diagrams.

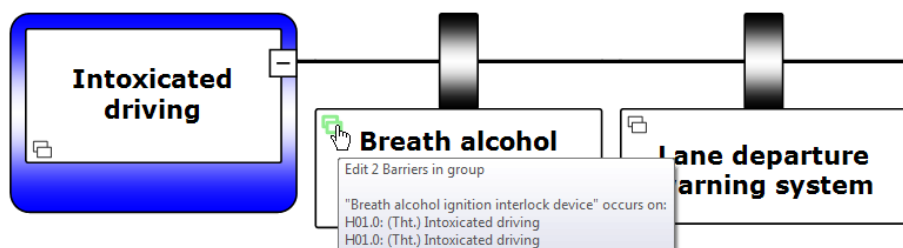


Figure 43 - Edit barrier groups

### 5.3.7.3. The Scrap book

BowTieXP advanced offers the Scrap book. A dockable window which allows you to:

- Copy entities there to keep them around for a while, and later drag them back into any Case File (might be a different one).
- Drop data files (Excel, BowTieXP) and read the info on them into BowTieXP.
- Convert items from one type to another.
- Items that cannot be given a place within the current Case File yet can be temporarily stored.
- Store frequently used items - e.g. make a short list of frequently assigned activities.

Items on the Scrap book such as bowtie groups, hazards and consequences serve as templates. When you drag an item from the Scrap book onto a bowtie diagram, a copy is made which is placed in the Case File.

Because the contents of the Scrap book are independent from your Case Files, you can use it to build a library of often-used templates.

You can also place reference information on the Scrap book, such as activities or document links. When you drag these items onto a shape in the diagram, you add a link to the corresponding reference item in the Case File.

Learn more about Scrap book in chapter 18, Advanced functionality: the Scrap Book on page 142.

### 5.3.7.4. Find and replace

The advanced edition of BowTieXP allows you to do single or mass find and replace operations in your Case File. See section 9.4.1, Text find and replace on page 97 for details.

### 5.3.7.5. Import data from files

BowTieXP advanced offers more and different methods of getting data into BowTieXP, such as importing data from Excel and tab- and comma-delimited files.

See section 12.2, Importing data from Excel on page 114.

### 5.3.7.6. Full import from other BowTieXP Case Files

BowTieXP standard edition is limited to importing only the diagrams and cannot import other details such as assigned responsibilities and activities.

The advanced edition allows you to import everything from a Case File, including linked information such as activities on barriers and assigned responsibilities. It can also update data that is already in the Case File.

See section 12.1.2, Importing entities with BowTieXP advanced on page 112 for details.

### 5.3.7.7. Copy/paste between multiple files

Similar to importing data from a Case File, you can also start another copy of BowTieXP, open the file you would like to copy data from, and use copy and paste.

See section 12.1.3, Copying entities from one file to another using the clipboard on page 113 for the details.

### 5.3.8. Enhancements to gain insight into your Case Files

BowTieXP advanced does not only add enhancements to editing, but also to analyzing and gaining understanding and knowledge into the data and relations within your Case Files.

Some extras here are specifically meant for the extra data you can put in using the other advanced options while others work on all data in your Case Files.

#### 5.3.8.1. Advanced Case File overview perspectives

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**Note:** for details on the Case File overview, see section 9.2, Case overview on page 93.

---

The Case File overview has two extra perspectives:

- “Operations”. The operations overview shows all operations that exist and where they are referenced.
- “Management System (Activities, Barriers, Hazard categories)”. This overview shows a powerful alternate view of all defined activities, which allows you to drill down and see to which barriers they are assigned, drill down into the barriers’ parents all the way up to the hazard. A cumulative overview of the hazard categories is also shown.

#### 5.3.8.2. Advanced reports

To accommodate the extra information, you can input in Advanced, and to gain some more complex insights into your data, the advanced edition has a number of extra reports:

Eight extra reports:

- “Activities linked to Barriers as hierarchical list”
- “Activities of a specific Operation grouped by Activity. Responsible (Short version)”
- “Activities of a specific Operation grouped by Activity. Responsible (Long version)”
- “Required Competencies for a specific Operation, grouped by Activity. Responsible”
- “Hazard register complete”
- “Traditional Hazard register”
- “Operations overview”
- “Formatted Soob Matrix report”

For details, please refer to section 13.2.2, BowTieXP reports on page 118.

### 5.4. Case FileSpreadsheet add-on (BowTieXL)

BowTieXL introduces a Microsoft Excel compatible spreadsheet into BowTieXP, which exposes the majority of the information in the Case File as tabular data in this spreadsheet. This allows you to use that data to do spreadsheet calculations based on that data and feed the results back into your bowtie model.

Apart from being able to do calculations based on the bowtie model data, you can also use BowTieXL to:

- Store reference information in spreadsheets, which are stored in the Case File,
- Add notes and calculations which serve as underpinning of the analysis in the Case File,
- Add general reference information into the Case File,
- Use the tabular representation of the bowtie model data to quickly edit data in bulk,
- Use Excel formulas to create custom aggregated displays of data on the diagram,
- And many more.

See chapter 27, Introducing BowTieXL on page 235 and chapter 28, Calculating with BowTieXL on page 243 for details.



## 5.5. IncidentXP as an add-on

IncidentXP is stand-alone tool allowing you to create incident analysis diagrams. It can also function in conjunction with BowTieXP, allowing you to create both incident diagrams and bowtie diagrams and relate those to each other.

By mapping incidents onto proactive bowtie diagrams, more can be learned from incidents than when they remain isolated in the reactive domain. This deepening of the understanding works in two directions:

1. By having the applicable proactive risk assessments on hand during the incident analysis, quicker barrier identification is possible and hindsight bias might be lessened, and more importantly,
2. By identifying the proactively defined barriers that have failed, we are measuring real-world performance and helping identify weak spots in our barriers and management systems as well as discrepancies between pre-incident effectiveness assessment and actual barrier performance.

There are five different methodologies available in IncidentXP: BSCAT, Tripod Beta, Barrier Failure Analysis (BFA), Root Cause Analysis (RCA), and Top-Set RCA. This makes IncidentXP a multi method investigation platform within BowTieXP.

Each method adds a completely separate incident diagram, consisting of events and barriers (in the case of BSCAT, Tripod and BFA). Having a separate incident diagram allows for flexible mapping between the bowtie barriers and the incident barriers, allowing variation in detail level to exist between the incident investigation and the risk analysis.

For more details on IncidentXP specifically, please refer to the IncidentXP manual available for download on

<http://www.cgerisk.com/downloads/bowtiexp/>

For more details about IncidentXP in conjunction with BowTieXP, please see chapter 29, IncidentXP and BowTieXP together on page 253.

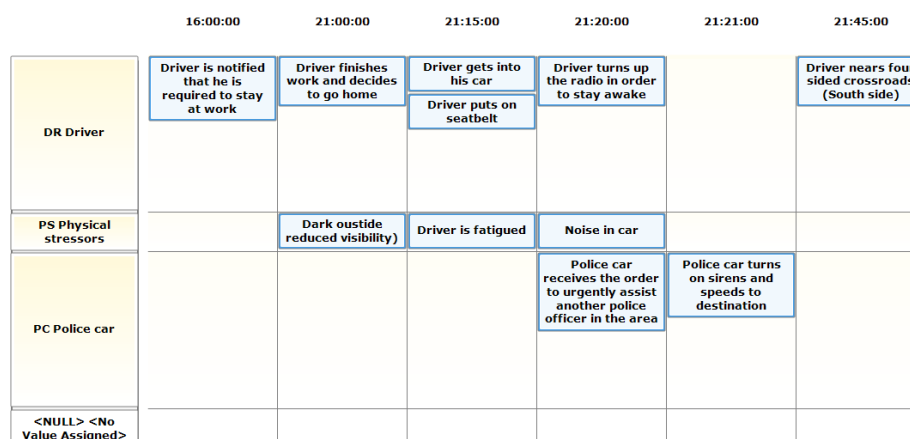


Figure 44 - An IncidentXP timeline

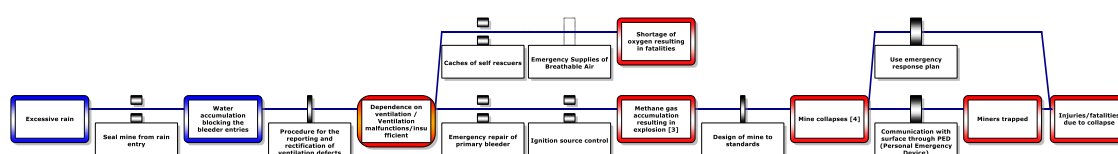


Figure 45 - a BSCAT diagram

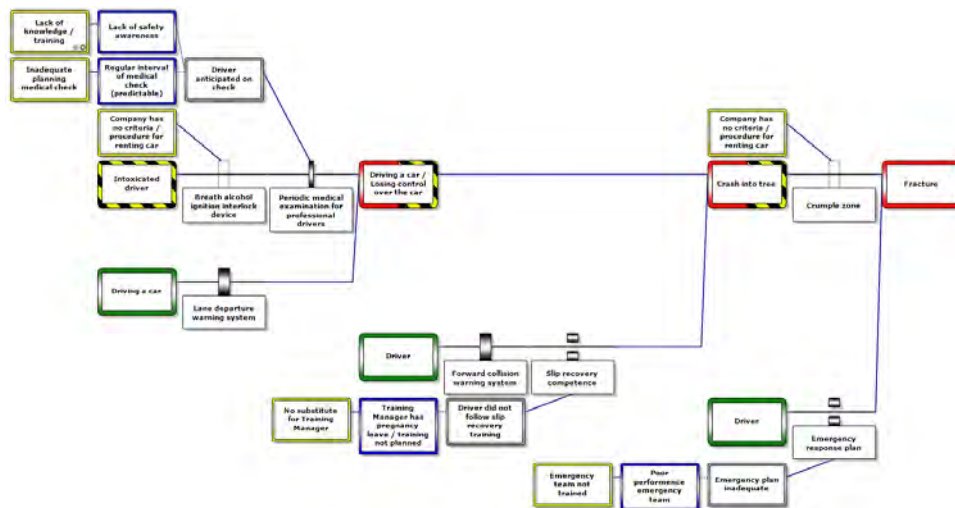


Figure 46 - A Tripod Beta diagram

## 5.6. AuditXP as an add-on

With the AuditXP add-on, users can define verification questions for barriers. The questions can then be grouped into surveys (questionnaires) which can be sent out to individuals to get feedback on the effectiveness of barriers. Once the surveys have been filled out, the results can be graphically displayed on the bowtie diagram in the form of easy red and green bar charts. For more information about AuditXP, please refer to section 24.

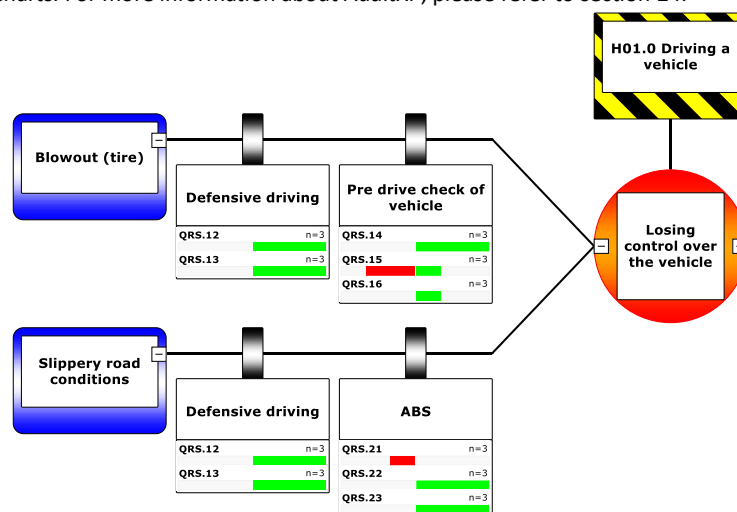


Figure 47 - AuditXP add-on

# 6

## Introducing BowTieXP

This chapter gives a quick overview of how the software is set up and will show how to get the most out of it.

### 6.1. Introduction

In this chapter, we will discuss some design points about BowTieXP – how the software is designed to work and how to get the most out of it.

It will cover starting and quitting the application, customizing the user interface, working with files and templates, importing Case Files, undoing and redoing modifications and other basic tasks.

This chapter assumes you have basic knowledge of Microsoft Windows operating systems and bowtie methodology and helps you to more quickly create better Case Files.

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Note: The symbol → denotes menu traversal paths, e.g. Help → Release Notes refers to the menu option Release Notes in the Help menu.

---

### 6.2. Starting and exiting BowTieXP

#### 6.2.1. Starting BowTieXP

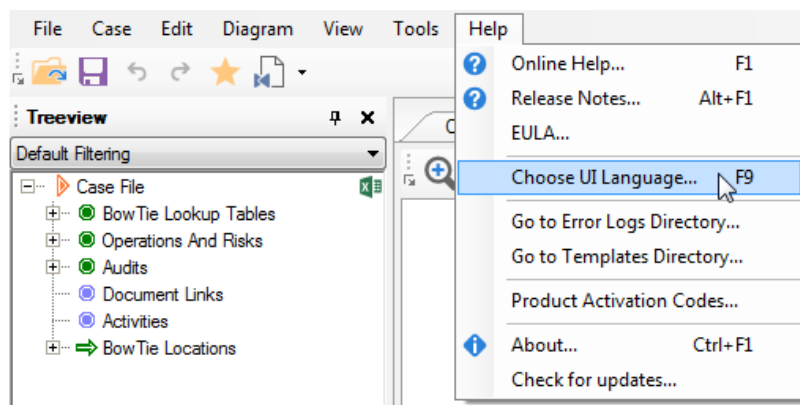
You can either start BowTieXP from the start menu, desktop shortcut, or by double-clicking a BowTieXP Case File.

#### 6.2.2. Exiting BowTieXP

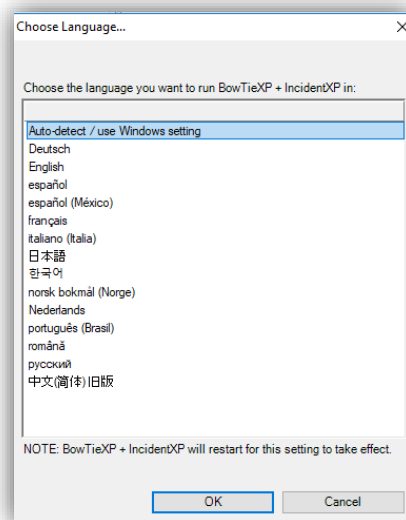
To exit BowTieXP, choose File → Exit or click the close button in the window title bar. If the open file has unsaved changes, you will be prompted to save those before continuing.

### 6.3. Changing the user interface language

BowTieXP has a multi-lingual user interface. In order to change the current language, you first start BowTieXP. Choose Help → Choose UI Language or press F9:



**Figure 48 - Changing the UI language**



**Figure 49 - Choosing a UI language**

After selecting your language of choice, click ok. BowTieXP will restart for these settings to take effect.

The topmost one (Auto-detect / use Window settings) makes BowTieXP auto detect the language.

At the time of writing, the following languages are available:

- German
- English
- Spanish
- Spanish (Mexican)
- French
- Italian
- Japanese
- Korean
- Norwegian (Bokmål)
- Dutch
- Polish
- Portuguese (Brazilian)
- Romanian
- Russian
- Turkish
- Chinese (Simplified)

## 6.4. Working with files

The following section explains how to work with files within BowTieXP.

### 6.4.1. BowTieXP Case Files

You can open BowTieXP files via File → Open on the main menu. After loading a file, the Tree view, diagram, case overview and all other windows in BowTieXP will be populated.

Select a hazard in the Tree view window under a BowTie Group in order to make your diagram visible.

---

**Note:** The way BowTieXP works with files is very similar to how you open and save files in Microsoft Word. Similarly, you can attach your BowTieXP Case Files to your e-mail messages, transfer them to an USB stick, etc.

---

Creating a new file can be done by selecting File → New... By default, this will create a new file based on the built-in BowTieXP Case File template. If you have configured custom templates, you will be asked which template to base the new file on. For more details see chapter 14, Working with templates on page 129.

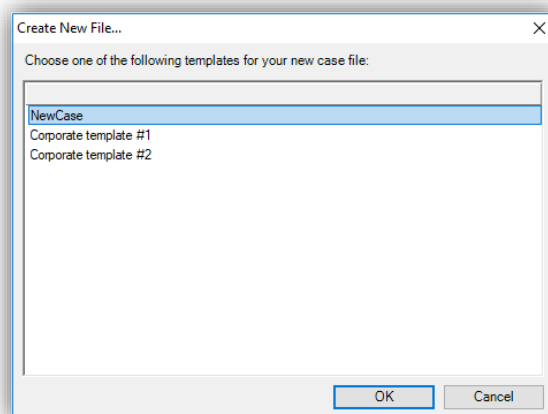


Figure 50 - Choosing a new file template

### 6.4.2. Importing Thesis™ files

You can import Thesis™ files into BowTieXP by clicking on File → Import Thesis from the drop-down menu. After you have imported a Thesis™ file and saved it as a BowTieXP file, you can open it via the normal method (File → Open).

---

**Note:** BowTieXP has support for importing Thesis™ versions up until version 6.

---


If you already had a file open when choosing Import and have made changes, you will be asked whether you want to save your changes before continuing.

---

**Note:** Check your imported Case File for a correct result of the import and make sure all relevant information is present. Not all information can be imported.

---

### 6.4.3. Saving files

To save the changes you made to a file, choose File → Save or choose the save button  on the tool bar.

To save your changes under a different file name, choose File → Save As.

To discard changes, choose File → Close and confirm that you will lose your changes.

You can easily see if you have made changes to the current file by looking at the filename in the title bar at the top of your screen. If there are changes, an asterisk (\*) is displayed after the filename.

#### 6.4.4. File recovery

BowTieXP automatically makes a backup copy of the current file every 10 minutes. This occurs to minimize the damage done by an unexpected shutdown of the software due to power failure, operating system crash or an unhandled exception in the software.

If you start BowTieXP and it detects there is a backup copy, you will be prompted to save the backup copy to a different name. Then inspect the file to make sure you have not lost any data.

**Note:** The auto save is done to a special directory and does not modify the original file you opened. After auto saving you can still abandon your changes by closing the file.

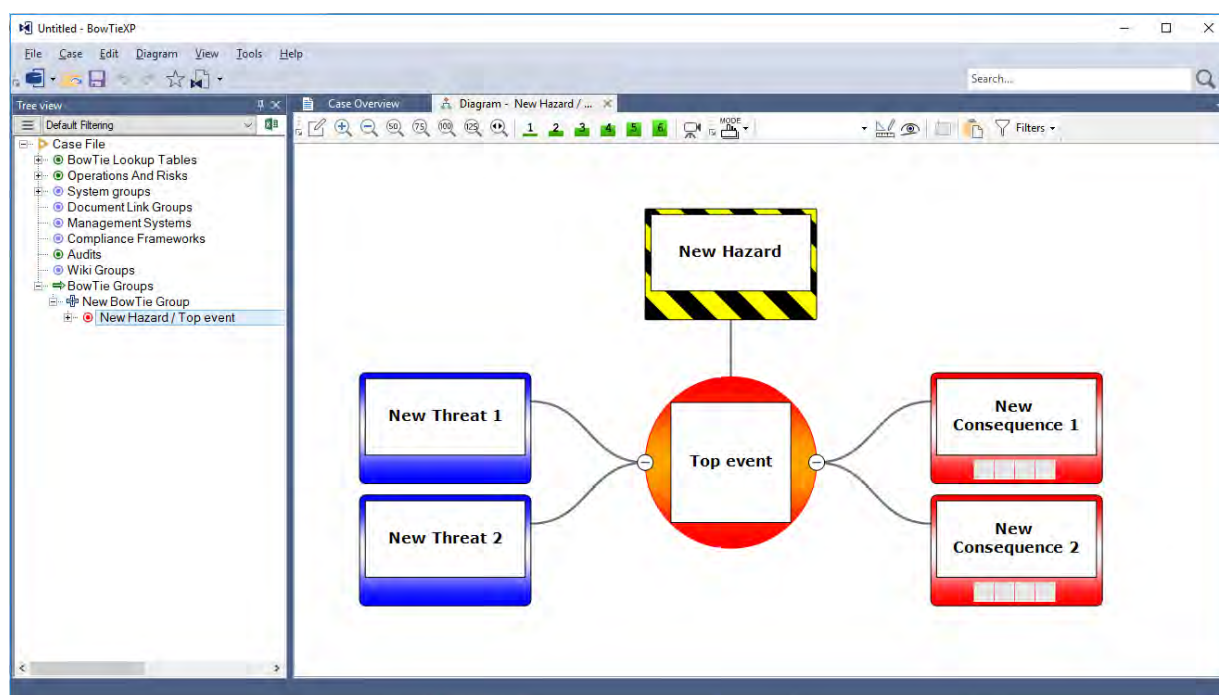
### 6.5. The undo and redo system

BowTieXP, like every modern Windows application, has an advanced undo and redo system, which tracks all your changes and allows you to undo any modifications.

The undo and redo system in BowTieXP is unlimited, you can go back as far as you want and move up again to actions which you have just undone, enabling you to review your latest edits.

### 6.6. Navigating around the software

The picture below shows the main window of BowTieXP. It contains several sub windows, which display various aspects of a Case File and have different uses.



**Figure 51 - The default window layout of BowTieXP**

The table on the next page describes each portion of the main window and its purpose. You can find each window in View → Windows. More detailed information on each window follows in the table, and each will be addressed in more detail in the following sections.

Window	Purpose
<i>Tree view Window</i>	<p>The Tree view window allows you to easily navigate through your diagram and to drill down to very specific parts. The Tree view is most useful for navigating between bowtie groups in a Case File, adding and deleting elements in your lookup tables, and defining and keeping track of activities.</p> <p><u>Note: Every piece of information present in the Case File has a place in the Tree view; it is the central directory of the Case File.</u></p> <p>You can use the export button in the top right-hand corner of the Tree view window to export the contents to an Excel file.</p>
<i>Diagram Window</i>	The diagram window is where you usually build your bowtie diagrams by adding consequences, threats, barriers and other elements.
<i>Overview Window</i>	<p>The overview window gives you a complete map of your current diagram.</p> <p>If you have a large bowtie diagram, you can navigate around it quickly using this window. Just grab onto the green box and drag or expand it over the area you wish to focus on in the diagram window or drag a new box in an area you want to see in the main diagram window.</p>
<i>Listview Window</i>	<p>When you select an item in the Tree view, the Listview window displays a list of the item's children.</p> <p>The Listview is made for working with multiple items at the same time.</p> <p>You can use the export button in the top right-hand corner of the Listview window to export things to an Excel file.</p>
<i>Editor Window</i>	<p>The editor window displays the details of the currently selected item.</p> <p>This allows you to easily edit your work by clicking on a part of your diagram in the diagram window or another item in the Tree view and then editing any information for the selected item in the editor window.</p> <p>You can edit and view details about your selection in various ways in BowTieXP:</p> <ol style="list-style-type: none"> <li>1. In place edit – double click the text in the diagram to change it</li> <li>2. In place edit – select an item and press F2 to change the text</li> <li>3. Popup editor – double click the non-text part of a shape to bring up the full popup editor</li> <li>4. Popup editor – select an item and press F4 to bring it up</li> <li>5. Popup editor – click the little pen icon on a shape to bring it up</li> <li>6. Docked editor – use the view menu to show the docked editor, and this window will show details for the currently item</li> </ol>
<i>Scrap book Window</i>	<p><u>Note: This functionality is advanced only</u></p> <p>The Scrap book window is like a clipboard on steroids – it allows very intuitive Case File editing using drag and drop. See chapter 18, Advanced functionality: the Scrap Book on page 142.</p>
<i>Quality Checks Window</i>	The quality checks window allows you to do different checks of your Case File to make sure it is complete and show areas that need more attention.
<i>Find Results Window</i>	The find results window is used to show the results from your search command.
<i>Case Overview Window</i>	The case overview window offers insight from different perspectives into the relations between the data in your Case File.

### *Color Legend*

The color legend shows an overview of the different colors in use on the diagram.

### *Relationship Diagrams*

---

**Note: This functionality is advanced only**

---

The relationship diagrams allow you to visualize the different relationships between data in your Case Files from different perspectives.

### *Spreadsheets*

---

**Note: This functionality is in BowTieXL only**

---

The spreadsheets are the heart of BowTieXL – they are a Microsoft Excel compatible spreadsheet into BowTieXP, which exposes the majority of the information in the Case File as tabular data in this spreadsheet.

This allows you to use that data to do spreadsheet calculations based on that data, and feed the results back into your bowtie model.

## **6.7. How to configure your main window**

BowTieXP has a reconfigurable user interface built around dockable windows. You can:

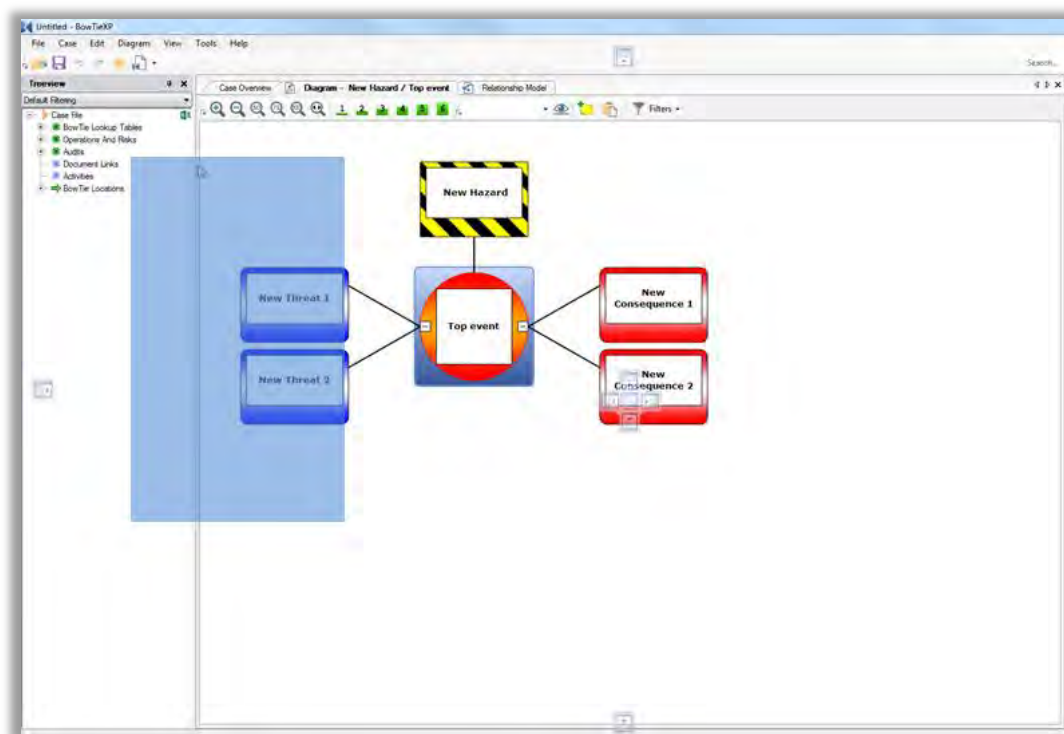
- Float windows on top of the main window and above the other dock windows.
- Drag each window to dock it at another position in the main window.
- Drag each window to resize it.
- Set windows to automatically hide if not used.
- Save and load your preferred layouts for various tasks.

The sections on the following pages describe how to create the ideal working space for your needs when creating a bowtie diagram.

To float a window or to change its docking position, click and hold the title bar of the window you wish to move, and whilst holding down the mouse button, move the mouse, dragging the window out of position.

As shown in the graphic below, a transparent blue box will appear to represent the window once you drag it out of its original position.





**Figure 52 – Re-docking the Tree view**



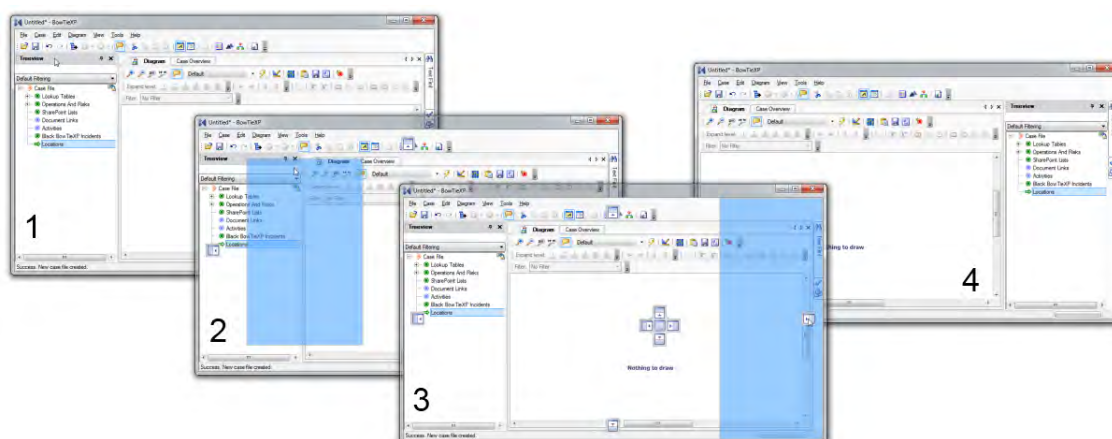
Arrow symbols will appear in the center of your screen and around the edges, as shown above and on the left. These arrows help you to position your window. They define different locations within BowTieXP where you can dock your floating window.

Experiment by dragging the mouse pointer and the blue box over the different arrows. BowTieXP will show you the position of the selected window if you release your hold on it. This feature allows you to see what your new screen would look like with the window positioned in a new place without committing to the change.

Find a suitable position for your window and release your hold on the title bar. The window will snap into place in the area you have chosen.

If you wish to place a window between two windows, drag the blue box toward the solitary arrow on the selected edge of the screen.

Remember, BowTieXP will always show you where the window will be located before you commit to the change.



**Figure 53 - Re-docking the Tree view step by step**


---

Note: If you wish to float your window on your screen, just double-click the title bar. This allows you the freedom to manipulate its location anywhere it is convenient. To re-dock, simply double-click the title bar again.

---

Also, do not forget you can reset the windows to the default by pressing CTRL + SHIFT + F12.

---

To configure a docked window to auto-hide you can click on the pushpin icon in the title bar (  ). When the pin is horizontal, the window disappears into a tab on the side of the main window. To make the window reappear, hover your mouse over it or click it.

---

Note: Auto-hiding dock windows help you gain a lot of screen real estate.

---

To close a window, click on the X icon in the title bar.

You can reopen any closed window by clicking View → Windows in the drop-down menu and selecting the window you want to reopen.

To save time, you can save your favorite layout for later use. This also allows you to have multiple layouts for different tasks.

How to save a layout: Arrange the windows the way you prefer. From the drop-down menu, select View → Windows → Save Layout As... Name your layout and click Save.

To restore the default screen layout:

Select View → Windows → Defaults from the drop-down menu.

OR

Use the key combination **CTRL + Shift + F12**.

Also, if you lose a window, select View → Windows on the drop-down menu to restore it to the layout.

---

Note: To simplify this process, use the Layout A – Layout B option. This option allows you to switch quickly between two different layouts.

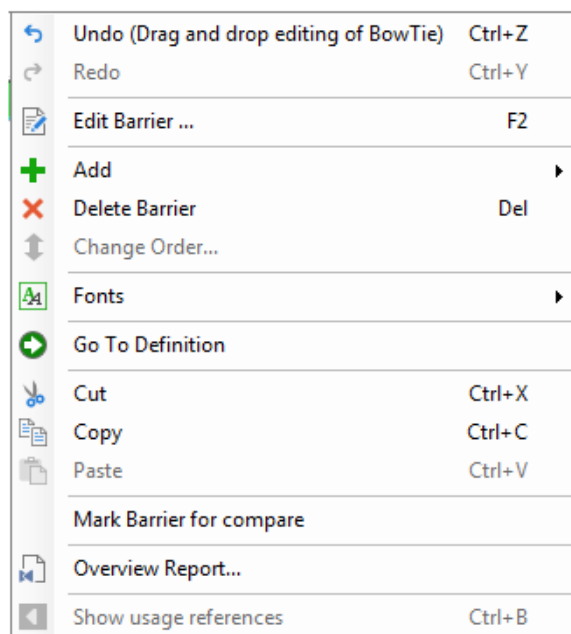
---

To select Layout B, just go to View → Windows → Switch to Layout B, or use the toolbar button.

---

## 6.8. Context menus

BowTieXP has context menus for each element in the bowtie software. When you right-click on an element, a menu appears with related actions. The graphic below is a context menu for a barrier:



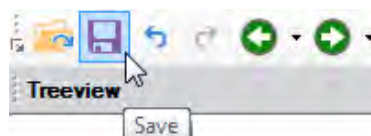
**Figure 54 - The diagram context menu**

If you want to know how you can interact with an item, simply right-click it.

## 6.9. Toolbars

Some windows have a toolbar at the top, which allows quick access to the most commonly used functions. Hover your mouse above a button and a tooltip will popup, which describes the function and mentions the keyboard shortcut, if the button has one.

In the image below, the mouse is hovered over the Save button on the main application toolbar.

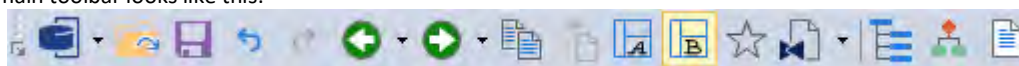


**Figure 55 – The main application toolbar with tooltip**

All toolbars are described in the relevant section about each window. The main application toolbar is described below.

### 6.9.1. The main application toolbar


The main toolbar looks like this:

















**Figure 56 - The main application toolbar**

**Note:** In the default toolbar, some less frequently used buttons are hided. See section 6.9.2 Hide / unhide toolbar buttons on page 56.

From left to right it contains the following buttons:

Icon	Description
	Open file

	Save file
	Undo
	Redo
	Navigate back in the Tree view
	Navigate forward in the Tree view
	Copy
	Paste
	Show inter-process clipboard import errors (Advanced only)
	Switch to layout A
	Switch to layout B
	Restore default Dock layout
	Show diagram
	Show reports
	Server Explorer (BowTieServer only)

### 6.9.2. Hide / unhide toolbar buttons

Any toolbar can be customized by clicking the small button on the far left (see Figure 57). Some more advanced

functionality is actually hidden from view in these menus ( ).

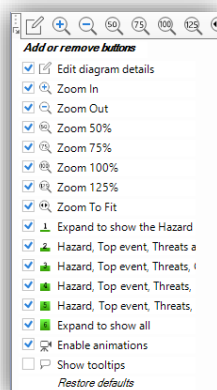


Figure 57: Customizing a toolbar

# 7

## Case File editing

In this chapter, all the windows that pertain to editing your Case File will be discussed.

### 7.1. Introduction

After we have reviewed how the BowTieXP user interface works, how to create, open, close files and how we can navigate through the software, we will look into how we can build and edit our Case Files.

In this chapter, we will discuss in detail among others the Tree view, the editor and the diagram.

### 7.2. The Tree view – anatomy of a Case File

The Tree view window contains all the information held in your Case File.

You can expand and collapse details in this window by clicking on the plus/minus symbols.

There are a number of main parts / top-level nodes in the Tree view window: Case File, BowTie Lookup Tables, incident Lookup Tables (only when IncidentXP is activated), Operations and Risks (only in Advanced version), Audits (only when AuditXP is activated), Document Links, Management Systems, Compliance Frameworks, System Groups, Wiki Groups, Incidents (only when IncidentXP is activated) and BowTie Groups. Each part is explained below.

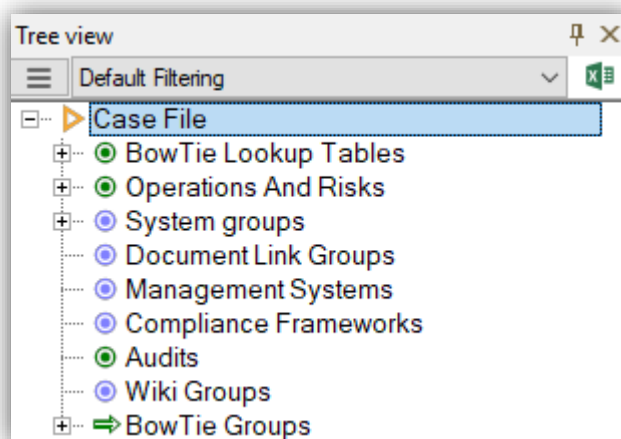


Figure 58 - The Tree view window

**Case File** – This part of the Tree view presents your Case File, which contains all other elements of your BowTieXP file.

**BowTie Lookup Tables** – The lookup tables define all the pick lists in your bowtie diagram - generic information used across the whole case. You can add or remove values from each of the tables as needed. The lookup tables allow you to tailor your bowtie diagram so that it fits your organization perfectly.

**Incident Lookup Tables** – The lookup tables define all the pick lists in your incident diagram - generic information used across the whole case. You can add or remove values from each of the tables as needed. The lookup tables allow you to tailor your incident diagram so that it fits your organization perfectly.

**Operations and Risks** – The operations and risks section houses all the information pertaining to the summary of operational boundary matrix functionality. This is a part of the Advanced BowTieXP edition. See chapter 21, Advanced functionality: Soob matrices on page 160 for further details.

**System groups** - System groups are used to visualize maintenance data on barriers. A system can contain sub-system and each system consists of multiple parts. These parts can either be online or offline (or the status is unknown). Data from systems like SAP or Maximo can be imported into BowTieXP to visualize real-time data on barriers.

**Document Links** – Document links are references to external documentation that can be added to various elements in the Case File. If the information is available on-line, it can also be opened directly from within BowTieXP.

**Management Systems** – A key feature of BowTieXP is the ability to define activities and sub-activities and link them to the barriers in your diagram. By right clicking the activities node, you can add, delete, and change the order of your activities. You can also insert information about objectives, management Actions, performance indicators, competencies and actions.

**Compliance Frameworks** – Compliance frameworks are used to install standards like the ISO27000, API, JCI standard, into your bowties. Specific parts of these standards can be linked to barriers, with a view to tracking and demonstrating compliances.

**Audits** – The Audits node contains the audits, if AuditXP is enabled. See chapter24 about the AuditXP add-on for further details.

**Wiki groups** –Wiki pages are references to internal documentation that can be added to barriers in the Case File. They can be linked to barrier in the same manner as the document links. The main difference between document links and wiki pages is that the document links refer to external documents and wiki pages can actually contain documentation. Note that the wiki functionality is mostly useful for when working with BowTieServer, which can display this documentation properly.

**Incidents** – The incidents node contains the incident diagrams, if IncidentXP is enabled. See chapter 29, IncidentXP and BowTieXP together on page 253 for further details.

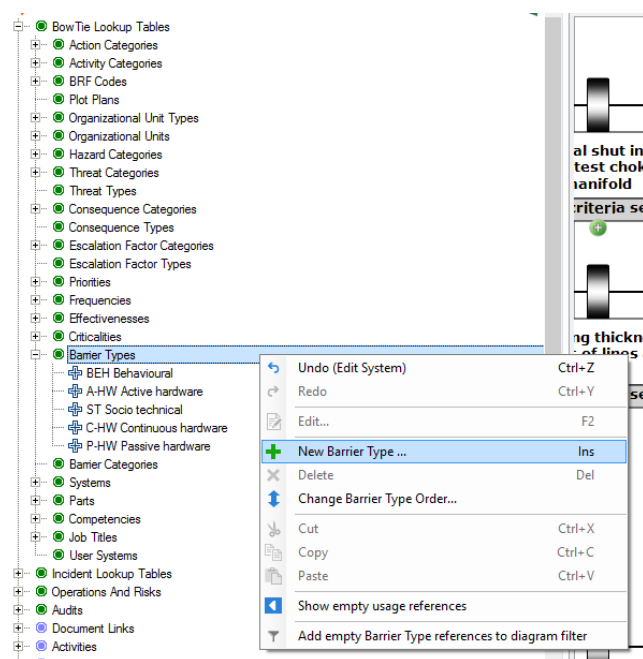
**BowTie Groups** – This node contains information relating to hazards and bowtie diagrams. Here, you will add all your groups, which BowTieXP uses as a starting point for building risk management models.

Keyboard Shortcuts	
Right arrow	Expand the currently selected node.
Left arrow	Collapse the currently selected node.
* (on numeric keypad)	Expands the selected node and all children recursively.
/ (on numeric keypad)	Collapses the selected node and all children recursively.

You can export the contents of the Tree view to Excel by clicking the little Excel icon in the top right corner.

## 7.3. Editing the lookup tables (taxonomies etc.)

All taxonomies in the form of dropdown selectors and link collections such as system and user systems are customizable and configurable in the software. The contents of those dropdown lists can be changed, deleted and added via the Tree view. To do so, find the relevant taxonomy in the BowTie lookup tables (or incidents lookup tables in case you want to define incident taxonomies). You can browse through the lookup tables by expanding and collapsing the nodes as described in the previous section.



**Figure 59 - Adding a new instance to a taxonomy list**

Once you have found the taxonomy node, right click the parent node of that taxonomy (green dot) to open the context menu in which a new instance within that taxonomy can be created. Newly created instances are added to the bottom of the list but can be reordered with the change order option in the right-click menu.

In the example shown in Figure 59, you can see the green parent node “Barrier Types” with the currently existing children represented by the blue crosses. Right clicking will the parent node as indicated will add a new instance (blue cross) to that list.

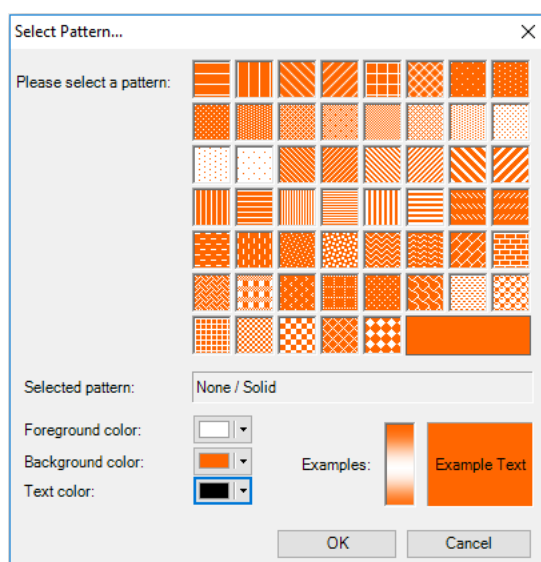
### 7.3.1. Add lookup table values

Once you hit the ‘add barrier type’ button a screen like in Figure 60 appears. You can fill in the code of this barrier type, this becomes useful when you want to display the values on your bowtie in the short description format.

**Figure 60 - Add barrier type**

The name of the barrier represents the long format in the display options. The description is not displayed on the bowtie, but this becomes useful in what is meant exactly with this barrier type.

It is possible to indicate barrier types (or other lookup table values, e.g. effectiveness) with colors. You can do this when you click on ‘Choose’. A screen like the figure below appears.



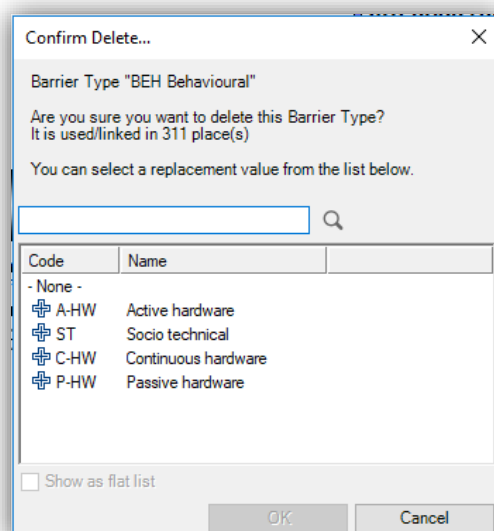
**Figure 61 - Color pattern**

The pattern appears in the top bar of a barrier. You can choose any color when you use the little arrow on the right side of the colors. If you then click on 'more colors' you can be even more specific in the color you choose.

### 7.3.2. Delete lookup table values

If you want to delete values in the lookup table, you can right click on the value that you want to delete and right-click with your mouse and press delete or select the value and press delete on your key board.

If the value is already used in the bowtie than the software gives you a warning like the figure below. If you want to delete the value without a replacement, you choose –None-. If you want to replace it by another value, you can select the others in the list.



**Figure 62 - Deleting a lookup table value**

If the replacement value is not in this list, click cancel. First add the value to this list, then delete the old value.

## 7.4. The popup editor and the editor dockable window

When you select an item in any window such as the Tree view, you can use the editor to change the name and fields of the selected item or node.



In general, there multiple ways to edit items in BowTieXP:

1. In-place edit
  - a. Double click the text on a shape
  - b. Select a shape and press F2
2. The popup editor
  - a. Double click the non-text part of a shape
  - b. Select a shape and press F4
  - c. Click the small pen icon on a shape
3. The docked editor
  - a. Make sure the docked editor is visible and select a shape in the diagram

The docked editor is not visible by default to save screen space, but you can make it visible by selecting View → Windows → Editor. The docked editor is then always visible and will show the contents/details of the currently selected shape.

Here are screenshots of the popup and docked editors:

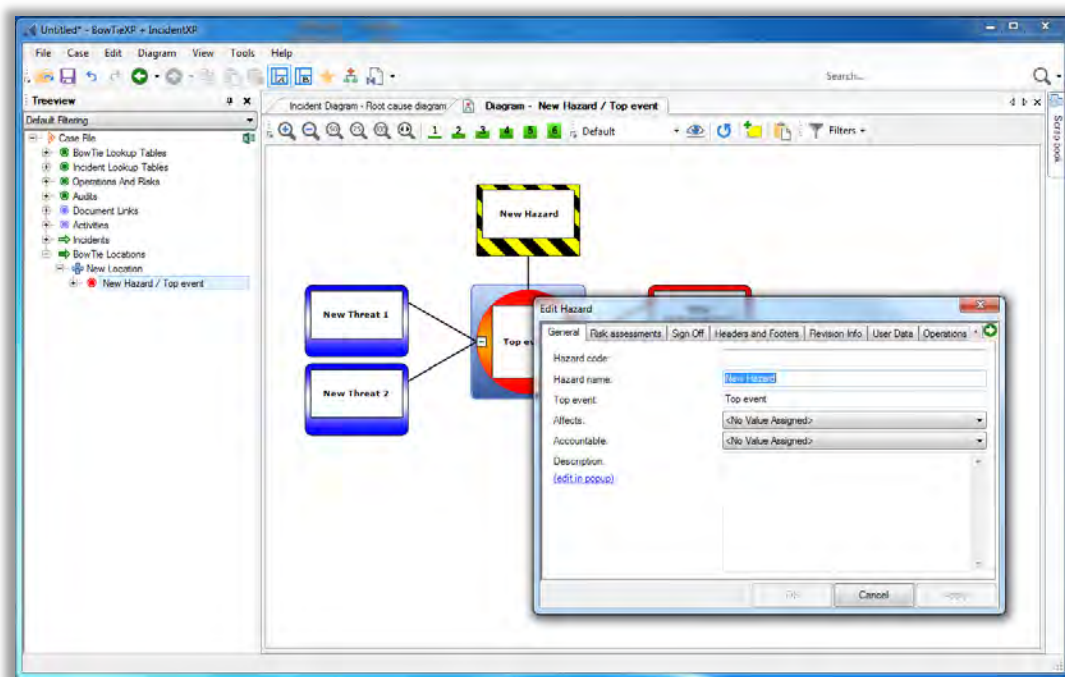
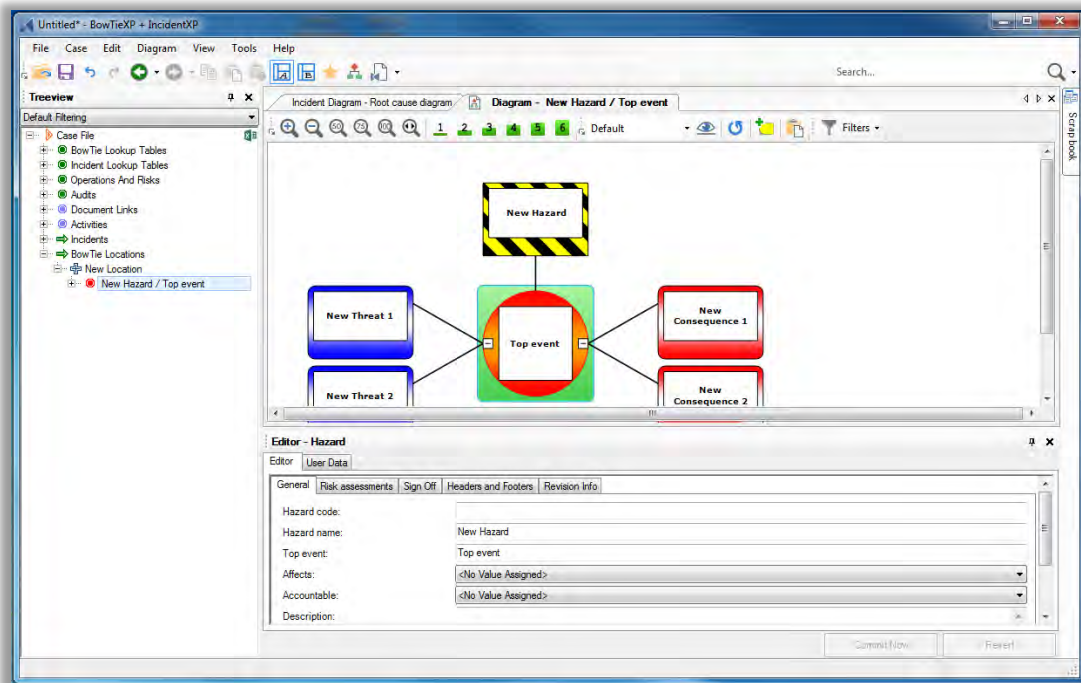


Figure 63 - The popup editor



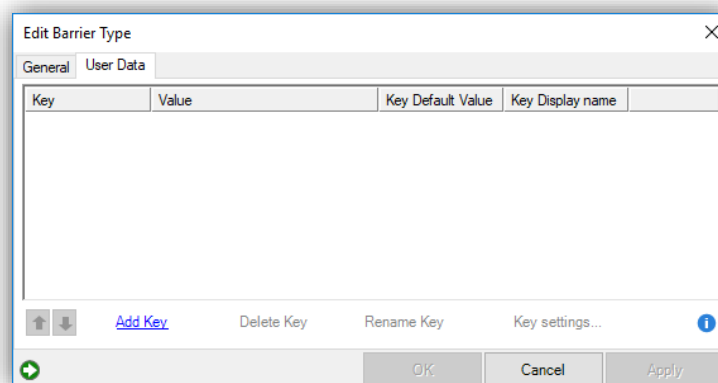
**Figure 64 - the docked editor**

The popup editor is preferred as it only takes up screen space when needed and allows you to modify links at the same time.

### 7.4.1. User data

You might have noticed the editor has a tab page called user data. The user data editor allows you define and edit your own custom data on each selected item. For example, we can add numerical frequency fields to barrier effectiveness.

Custom data is defined per object type. If we define a field called 'Frequency' on any effectiveness value, that field is immediately available on all effectiveness values.



**Figure 65 - User data editor**

The "Add Key" button allows us to define an extra field on a type. Once we define a new key name on a type, e.g. barriers, each barrier will now have this field.

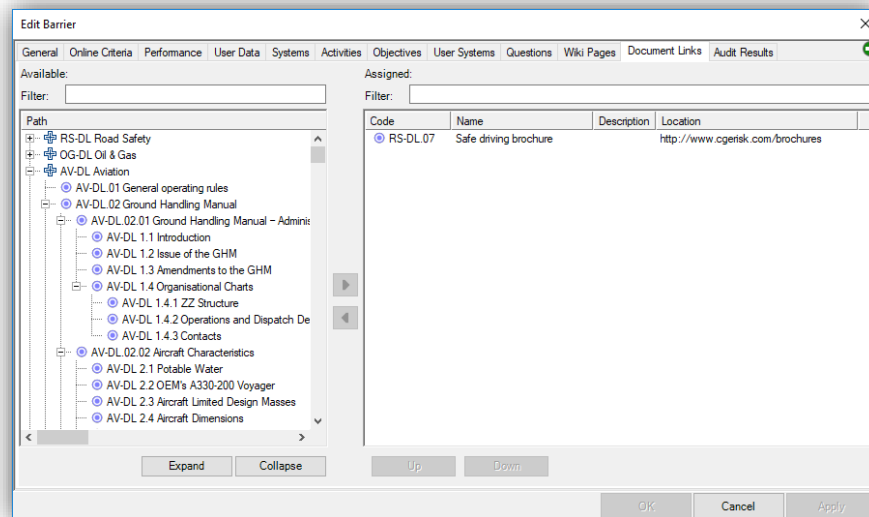
The delete key removes a field. Note that this will remove whatever is filled in on any object of the same type.

The rename key allows you to change a key name.

The key settings link allows you to set a default value for this key. This default value is then used in BowTieXL calculations for all items where a value has not been set.

### 7.4.2. Links

Apart from the tabs called “Editor” and “User Data”, there are several other tabs as well, depending on your selection. These tabs are to edit the items linked / assigned such as document links.



**Figure 66 - Link assignment tab in the popup editor**

The left-hand side shows all the items which can be linked to the barrier. The right-hand side shows all the entities already assigned. To move items between the two sides, you can select them and press the relevant arrow icon between the two halves of the screen. You can also drag and drop items between the two halves.

Items that are drawn in gray have already been assigned / moved to the right-hand side.

You can filter the items shown by typing information into the filters. You can also sort on each column by clicking the headers.

## 7.5. The diagram

The diagram window is where you create your bowtie diagram. When you select a hazard or one of its sub items in the Tree view window, the diagram associated with that hazard will appear in the diagram window. The item you clicked in the Tree view will be selected in the diagram.

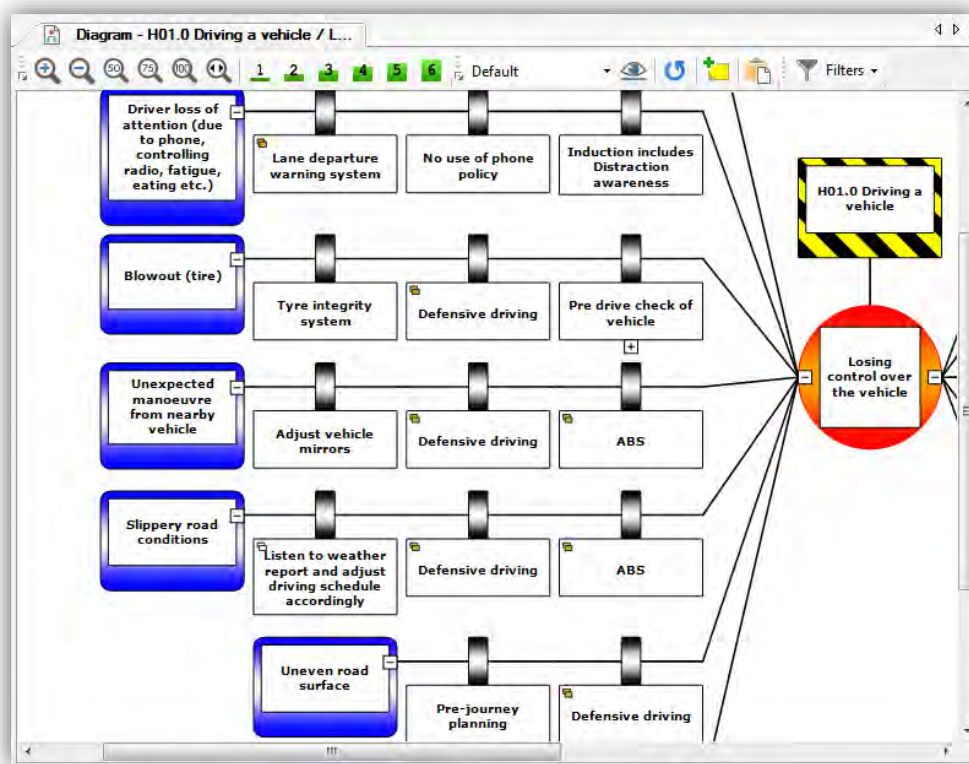
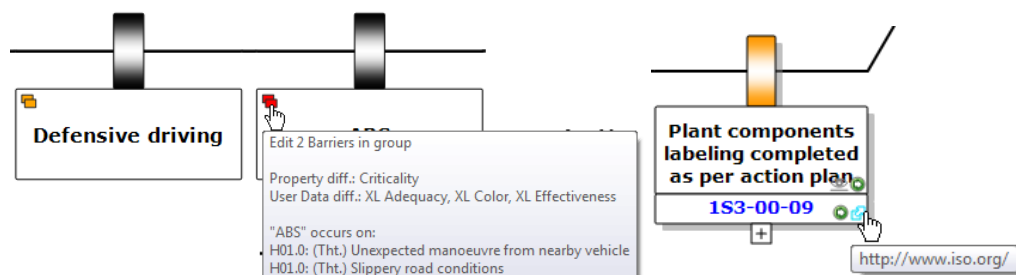


Figure 67 - The diagram window

When you move the mouse over the various shapes, some icons will appear and disappear:

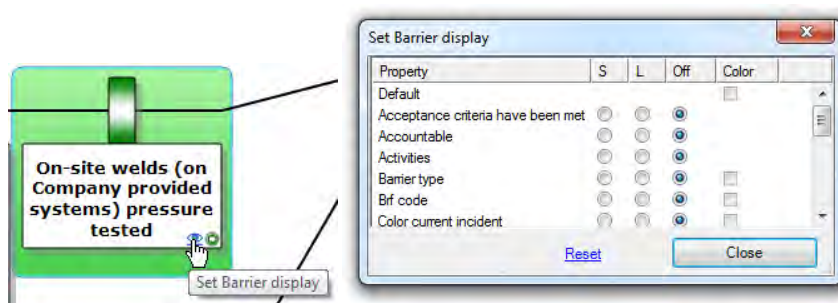


The button allows you to add new items such as threats, consequences, barriers and escalation factors.



The deck of items icon (left screenshot above) allows you to edit all barriers with the same name – same barrier group (Advanced only). This icon has an orange color when barriers in the same group have differences in property values. In case the elements are 100% identical, the icon will be transparent. The link icon on document links (right screenshot above) will open the link in the appropriate program. This could be a web-browser or a program like MS Word or Excel.

The eye icon will allow you to adjust display options relating to the item:



Along the top of the diagram window is a button bar with shortcut options. Certain options on the button bar are enabled depending on which part of the diagram you have selected. Some infrequently used buttons are hidden by default. They can be added as described in section 6.9.2.



**Figure 68 - The diagram window toolbars**

Icon	Description
	Zoom In
	Zoom Out
	Zoom 50%
	Zoom 75%
	Zoom 100%
	Zoom To Fit Page
	Use animations while collapse/expand bowtie elements
	Enable/disable tooltips on shapes
	Visually bundle barriers by a similar characteristic, i.e. barrier families (Advanced only)
	Select diagram display profiles (Advanced only)
	Configure profiles (Advanced only)
	Configure display settings
	Refresh/update diagram
	Create a new bowtie diagram
	Add action



Copy diagram to clipboard



Save diagram as...

Note: there are several mouse and keyboard shortcuts to help you navigate and work with the Diagram Window – see the table:

Shortcuts	Function
Scroll wheel	Scroll vertically through the diagram.
SHIFT + scroll wheel	Allows you to scroll horizontally through the diagram.
CTRL + scroll wheel	Changes the zoom level.
Arrow keys	Scroll through the diagram.
CTRL + arrow keys	Scroll through the diagram per page.
Press scroll wheel / middle button	Brings up a scrolling caret similar to the one in Internet Explorer.
Drag a rectangle with the right mouse button	Zooms to that region.
Drag on the diagram with the left mouse button	Scrolls the display.

### 7.5.1. Expand and collapse

All shapes on the diagram which have children have a small + or – symbol on the connection point where the links to the children meet. This is similar to the + and – symbols in the Tree view, allowing you to collapse parts which you do not want to see now.

A faster way to quickly reduce the diagram in size is to use the expand and collapse level buttons, on the expand and collapse levels toolbar:



Figure 69 - Expand and collapse levels toolbar

Icon	Description
	Level 1: Show only the top event and hazard
	Level 2: Show the top event, the hazard, threats and consequences
	Level 3: Show the top event, the hazard, threats, consequences and barriers
	The same as level 3 but also show the escalation factors
	The same as level 4 but show escalation factor barriers too
	Show all, including escalation factors on escalation factor barriers

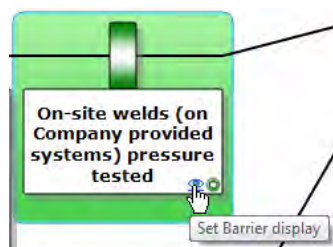
When clicking on these buttons, by default only the bowtie diagram that is currently in view will show the desired expansion state. To apply the desired expansion state to all the bowties in the casefile you can hold down the SHIFT key while clicking on a particular expand level button.

## 7.5.2. Displaying more information

It is possible to present more details about the shapes on the diagram in a visual manner, leveraging the power of this representation in various means:

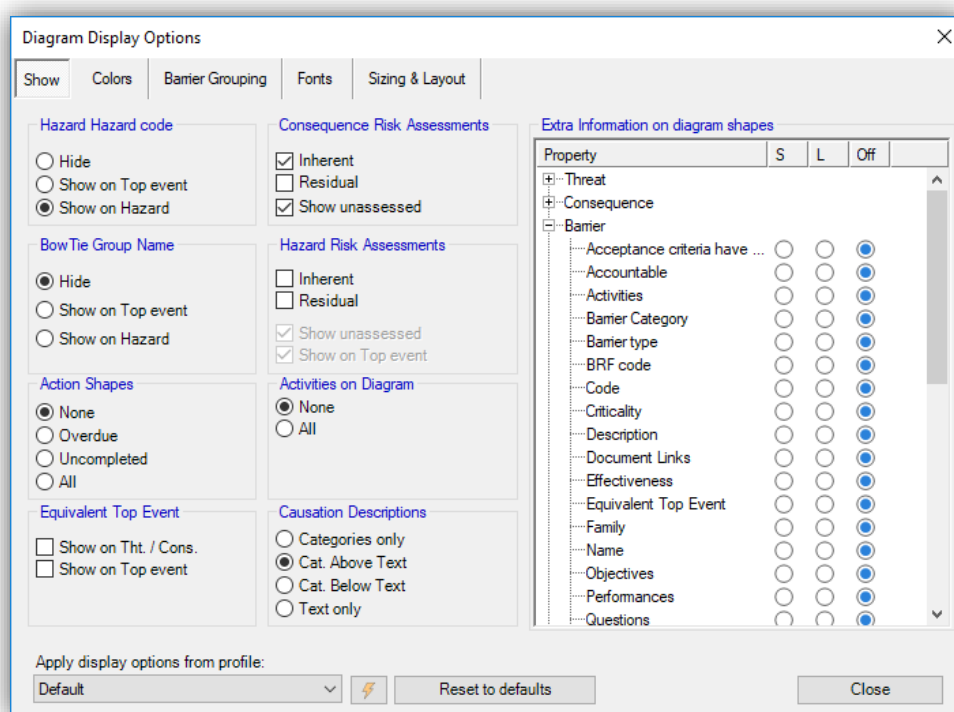
1. By showing extra information in each shape, such as activities, document links, BRF codes.
2. By coloring shapes with the colors and patterns defined on various properties such as effectiveness, barrier type, criticality, BRF code.
3. By showing the risk assessments of top events and consequences visually on the consequence and top event shapes.
4. Many more.

If you want to adjust the display of a specific item, you can click the eye icon on the shape:



This will bring up a dialog that allows you to adjust the coloring and display of extra information.

All these settings are also available in the diagram display options dialog, along with some extra options. You can bring this dialog up by selecting Diagram → Display Options:



**Figure 70 - Diagram extra info options**

In this dialog, you can customize all aspects of how your diagram is rendered. All options are explained in detail in chapter 8, Configuring the diagram on page 82.



### 7.5.3. Fonts

It is also possible to change the typeface of the different shapes, either by modifying the default font settings for all shapes, or by changing the fonts on specific shapes.

Use this to make important parts of your diagram stand out.

### 7.5.4. Filtering the diagram

In order to navigate around the diagram easier, and to tailor the display to your needs, there are several different filters available for you to use.



**Figure 71 - Diagram filter selection toolbar**

Selection of the filter is done via the filter toolbar. Each filter is discussed below.

#### 7.5.4.1. Selective visibility filter

You can use this feature to simplify your bowtie diagram temporarily. This is useful when for example you are preparing a report and want to include subsets of diagrams in it.

With selective visibility, you can make single items (e.g. a barrier) or items and their children (e.g. a threat and its associated barriers and escalation factors) invisible. There are three settings, accessible via the toolbar and the menu:

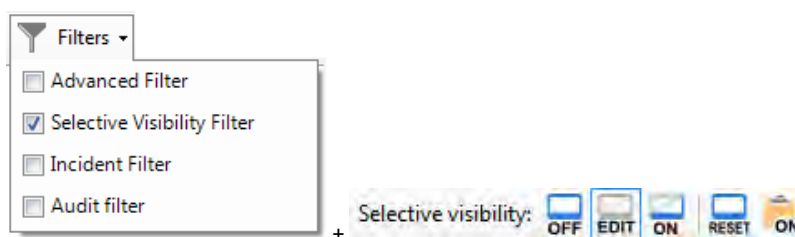
**Off** – When you select this setting, all items become visible, but the selective visibility selection will be saved.

**Edit** - When you select this setting, the items you marked as invisible will be shown in gray in the bowtie diagram.





**On** - When you select this setting, all items marked as invisible will be removed from the diagram. A warning will be displayed in the diagram window.

**Reset** – Reset your filter settings.

You can make items invisible by choosing the item, right clicking and selecting Selective Visibility → Mark as Hidden. You can also make items invisible by clicking the item while holding down the ctrl key.



**Figure 72 - Selective visibility filter toolbar**

Icon	Description
	Selective visibility off
	Edit / show selective visibility
	Selective visibility on
	Reset (all visible)





Make a snapshot to the clipboard with selective visibility switched on.

#### 7.5.4.2. Advanced filter – in BowTieXP standard

The advanced filter shows only shapes on the diagram that have a reference of any form to the entities you have selected. This is best explained by example:

Select the advanced filter as your filter. The entire diagram will disappear except for the top event and hazard.

Now, right click an activity in the Tree view, and choose “Add to Filter”: All the barriers that have links to the chosen activity will now be displayed. This works not only for activities, but also for document links, job descriptions, effectiveness values, for everything that can have any relation with a shape on the diagram.

You can also select items that do not have a value set, by adding the so-called 'null value' to the filter. In order to do so, right click the lookup table instead of an entry, and select "Add to Diagram Filter".

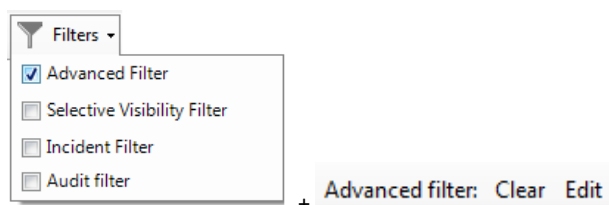


Figure 73 - Advanced filter toolbar

Icon	Description
Clear	Clear the list of selected entities
Edit	Edit/show the list of selected entities

#### 7.5.4.3. Advanced filter – In BowTieXP Advanced

The advanced filter, when running BowTieXP Advanced, is expanded with more options. It is a configurable filter, allowing you to specify multiple criteria to which a shape must conform to remain visible.

For this example, open up the test Case File and select the advanced filter from the filter drop down. After selecting it, this toolbar will appear:

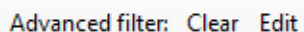


Figure 74 - Toolbar Advanced filter

The clear button clears all criteria and the edit button allows us to change criteria. We will examine an example later that makes this distinction clearer.

Let us press the edit button. The criteria edit dialog is popped up. You must select 'Add row':

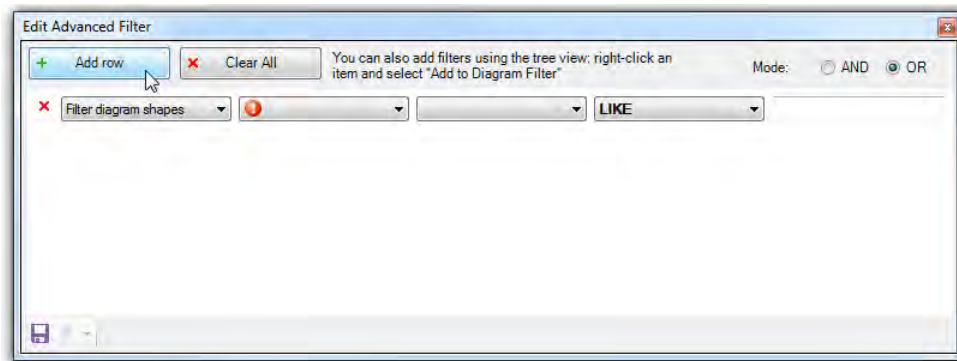


Figure 75 - Edit Advanced filter

The first drop down allows us to choose to filter on diagram shapes or linked elements. The second drop down list allows us to pick the type of object we are looking for. Choose “critical”. The third drop down chooses on which (text) part of the object we want to filter. Choose “Name”. The last drop down is how we want to compare this field. Choose the “like” operator and this will allow us to search for a substring. Next, enter the search text – enter “High Critical”.

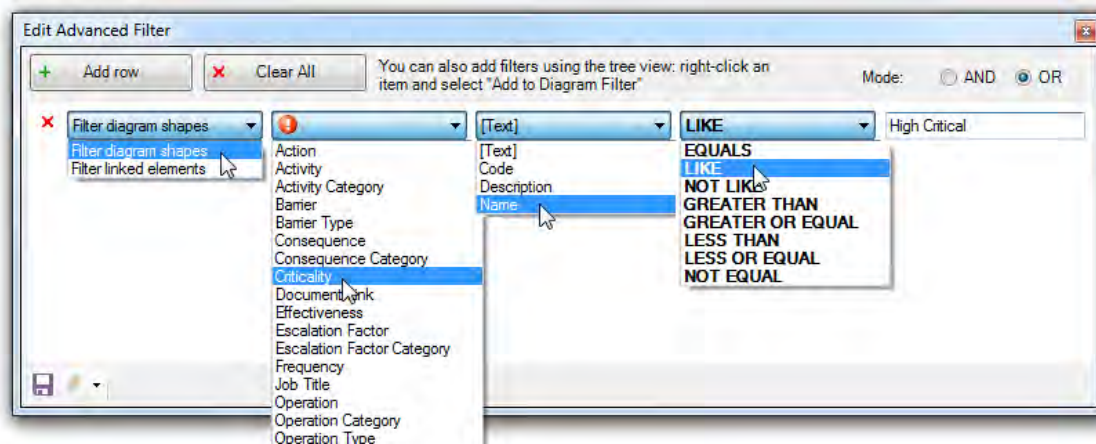


Figure 76 - Edit Advanced filter

Press “x”. The diagram will be filtered to show only the barriers with a “High Critical” value assigned:

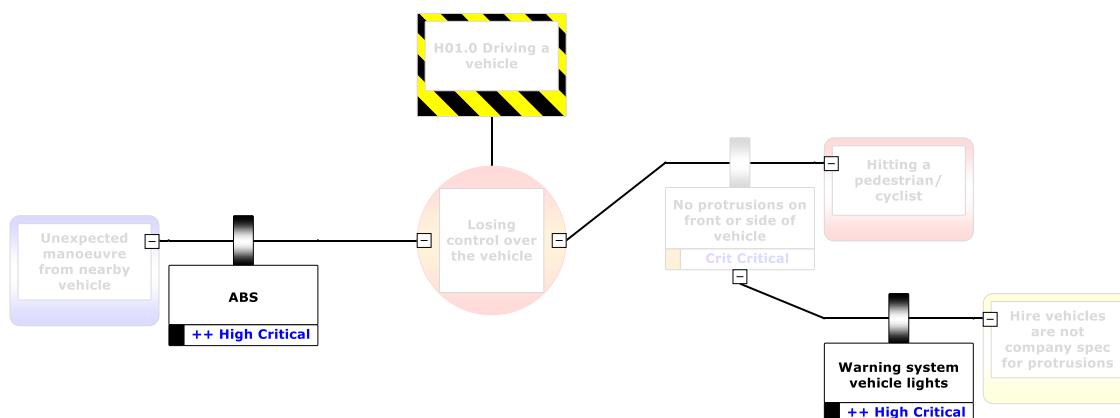
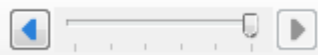


Figure 77 - Applied Advanced filter

As you can see, some shapes are grayed out – this is because they do not actually match the filter, but an item below it does. In this case, we must show the left-hand side barrier as otherwise we could not see the barrier on the escalation factor below it.

We can adjust the filter strength by clicking the arrows in this toolbar button:



**Figure 78 - Advanced filter strength**

You can add as many criteria as needed. You can also specify how to join them – should items agree with all criteria? Or is it good enough if an item agrees with a single criterion? This is the AND mode and OR mode radio button at the top.

#### 7.5.4.4. Incident filter

The incident filter allows you to filter the diagram down to all shapes that have relations with incidents. Including the status counts of the barriers that have been used in incidents.

---

**Note:** This is only available if you have both BowTieXP and IncidentXP. See chapter 29, IncidentXP and BowTieXP together on page 253 & the IncidentXP Software Manual for more information.

---

#### 7.5.5. Audit filter

The audit filter will display audit information directly on the barriers in the bowtie. See chapter 24, AuditXP add-on on page 192 for more detail.



---

**Note:** This is only available if you have both BowTieXP and AuditXP.

---

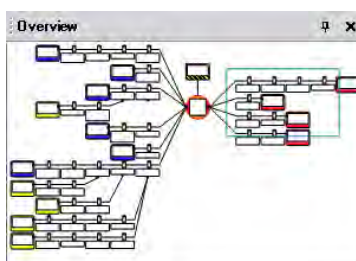
#### 7.5.6. Exporting the diagram

The created diagrams can be exported by three means:

1. By saving them to disk as a picture  and by
2. Copying them to the clipboard  and pasting them into the destination application and by
3. Saving them as a picture via the menu bar in Diagram → Save Diagram As...

### 7.6. Overview window

In the overview window, your entire bowtie diagram is displayed in miniature.



**Figure 79 - The diagram overview window**

As some diagrams can be very complex and large in scope, the overview window allows you to quickly navigate to a particular section of your diagram.

Left clicking and holding in this screen enables you to drag the green box around a part of the bowtie diagram. When the mouse button is released, your selection is displayed in the diagram window.

### 7.7. The scrap book

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**Note:** The Scrap book is advanced only functionality

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BowTieXP advanced also offers the Scrap book. It is a bit like a clipboard on steroids, but much more. A dockable window that allows you to:

- Copy entities there to keep them around for a while, and later drag them back into any Case File (might be a different one).
- Exporting entities from Scrap book to Excel.
- Drop data files (Excel, BowTieXP) and read the info on them into BowTieXP.
- Convert items from one type to another.
- Items that cannot be given a place within the current Case File yet can be temporarily stored.
- Store frequently used items - e.g. make a short list of frequently assigned activities.
- Build a reference library of elements.

For details, please see chapter 18, Advanced functionality: the Scrap Book on page 142.

## 7.8. Copy, cut, paste and paste special

BowTieXP of course offers copy and paste clipboard functionality that works as you would expect. BowTieXP however, offers one extra clipboard feature not commonly seen – the paste special.

Paste special allows you to paste not an entire element, but a subset of their properties. After copying an item onto the clipboard, you can right-click an item of the same type and select “Paste Special”:

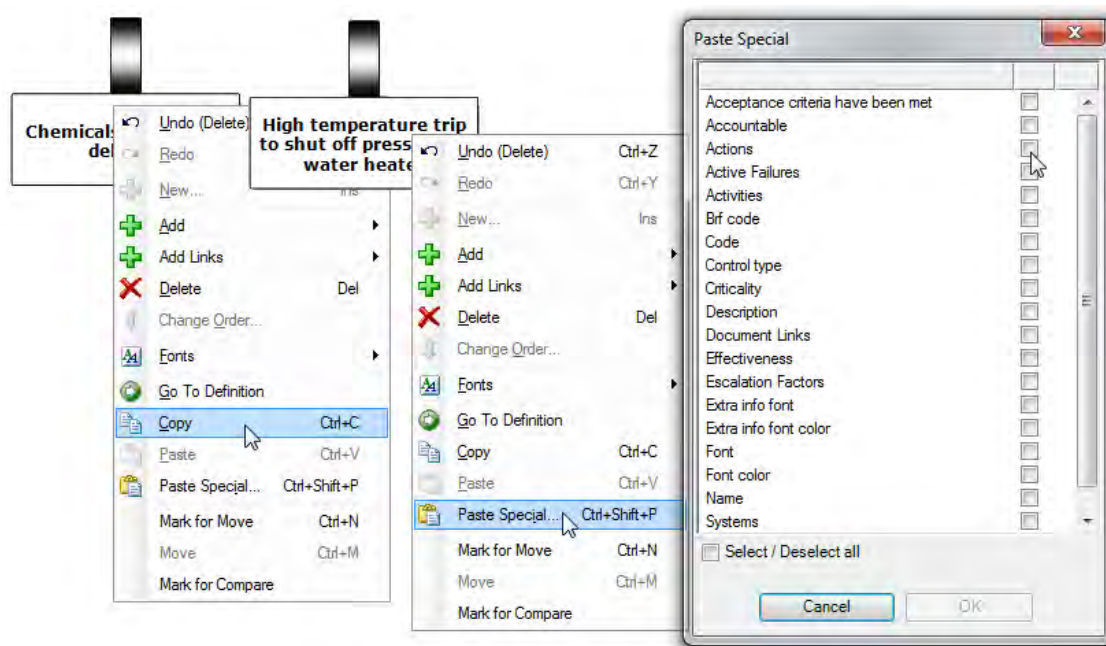
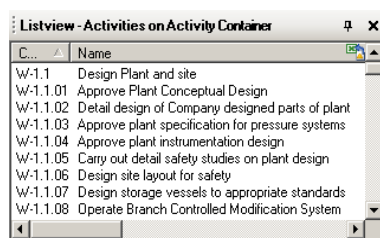


Figure 80 - Paste special

In the example you can see you can selectively paste items over the selected barrier, ranging from text fields (such as the description) to drop down items (such as effectiveness) to linked items (such as activities or document links).

## 7.9. Listview window

The Listview window sums up underlying nodes of the selection you made in the Tree view window.



**Figure 81 - The Listview**

For example, when you click on activities, the Listview will display a list of all activities.

The Listview is useful for working with multiple items at the same time. For example, you could select multiple activities all at once and drag and drop them onto a barrier in your diagram.

There are multiple ways to select multiple items:

- Click the first item you want to select. Then hold down the ctrl key and click other items you also want to select. This allows you to select items one by one.
- Click the first item you want to select. Then hold the shift key and click the last item in the group that you want to select. This will select all items from the first to the last.

### 7.9.1. Exporting to Excel

In the upper right-hand corner of the Listview, you may have noticed a small Excel icon. Click this and the contents of the Listview will be exported to Microsoft Excel.

### 7.9.2. Usage references / backlinks

The Listview is also used for another important function: the display of backlinks.

When an activity is referenced on say, a barrier, there's a virtual arrow pointing from the barrier to the location in the Tree view where the activity is defined. This arrow is called the link. We can also follow this arrow in the reverse direction, from the activity to all the barriers where it is used. These are called the backlinks. The backlinks are all the places where the item is used.

A similar concept applies to lookup table values. For each item, we can find out where they are used by showing us their backlinks.

This is done by right clicking the item of which you want to see where it is referenced and selecting the option in the context menu called "Show usage references". The Listview will show the usage references and indicate that it is doing so.

## 7.10. Drag and drop

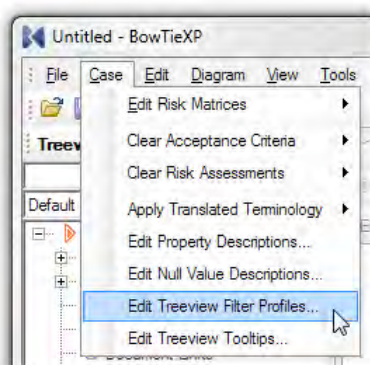
Throughout the application, you can use drag and drop to assign links to objects. Almost every barrier that lists linkable entities supports grabbing one of those and dragging it towards where you want to link it.

Drag and drop can also be used for creating and assigning document links. See section 3.11.3.1, Drag and drop on page 29 for more details.

## 7.11. Tree view filtering

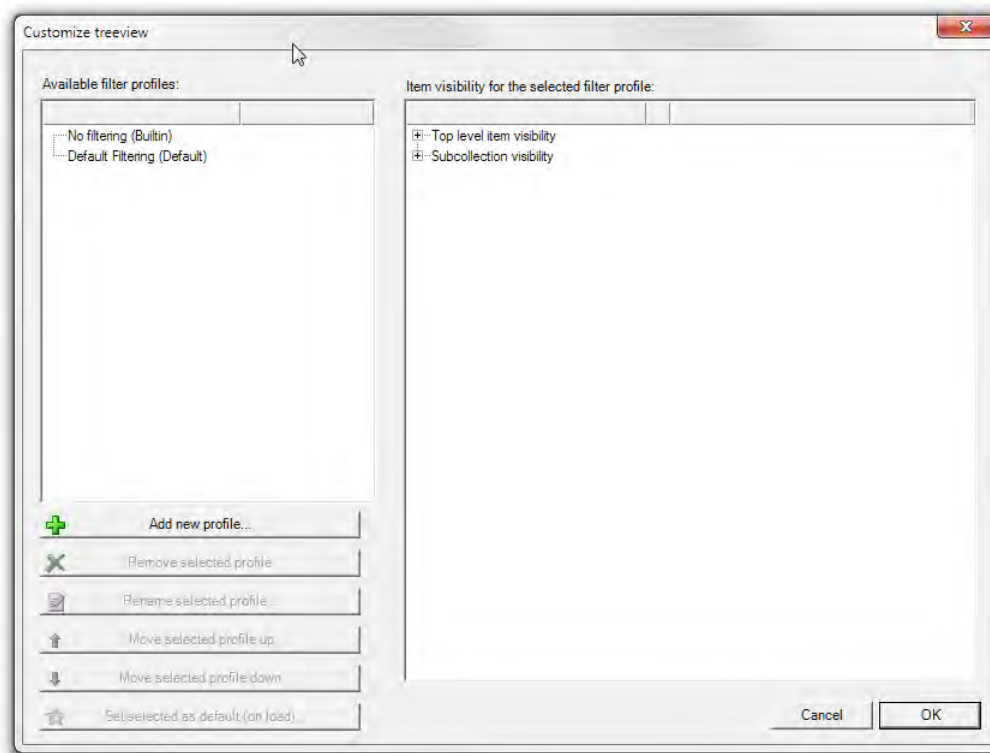
This feature allows you to remove seldom used or unused elements from the Tree view. You can define multiple filters, allowing you to hide and show elements based on the task you are currently working on.

To create or modify Tree view filter profiles, you open the "Customize Tree view" dialog box under Case → Edit Tree view Filter Profiles.



**Figure 82 - Edit Tree view filter profiles menu option**

The “Customize Tree view” dialog is shown.



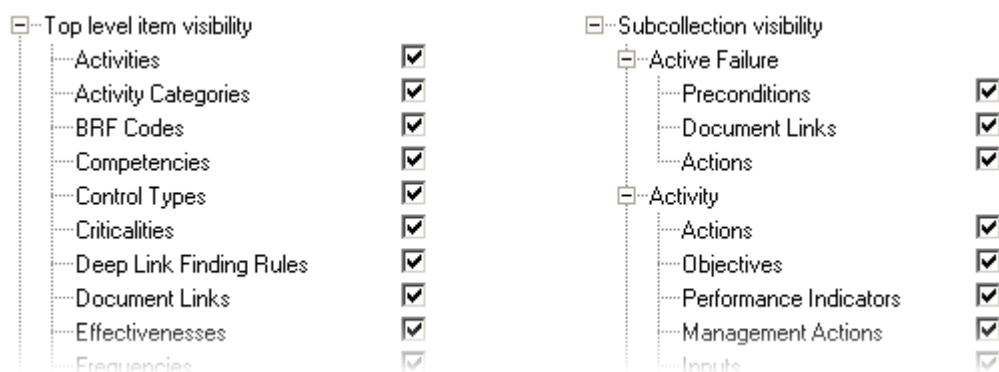
**Figure 83 - Customize Tree view dialog**

On the left-hand side, the available profiles are shown and there are buttons to modify the list.

There is always one built-in profile present, which shows everything. This one cannot be modified.

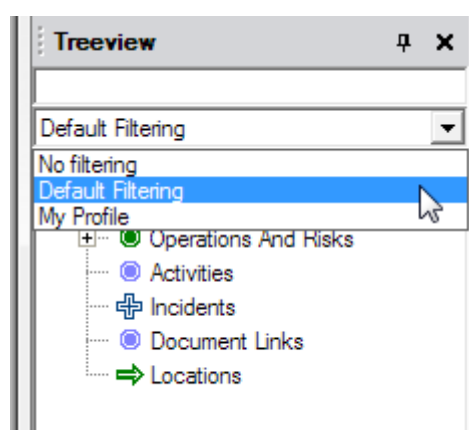
After creating a new profile, you can expand the items on the right and deselect the items you do not want to see. For example, if you do not regularly use the lookup tables, you can deselect it. It is located under the “Top level item visibility”.

You can also deselect collections under items, using the nodes under the “Sub-collection visibility” item. If you never use objectives on your activities, you can simply hide them.



**Figure 84 - Tree view elements available for hiding**

After clicking okay, your changes are saved. After defining a profile, you will now get a new drop-down box on the Tree view that allows you to select your filter profile.

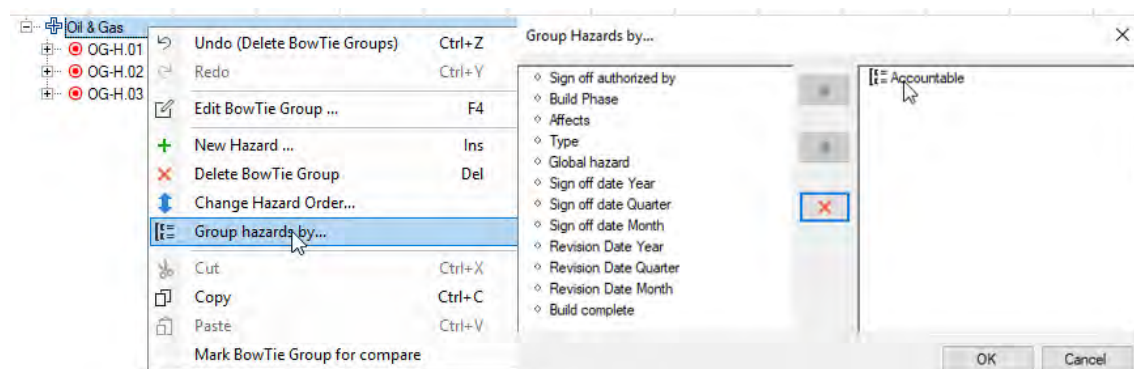


**Figure 85 - Tree view filter profile selection**

After selecting your modified changes, they are immediately applied.

### 7.11.1. Tree view filters, grouping by hazard

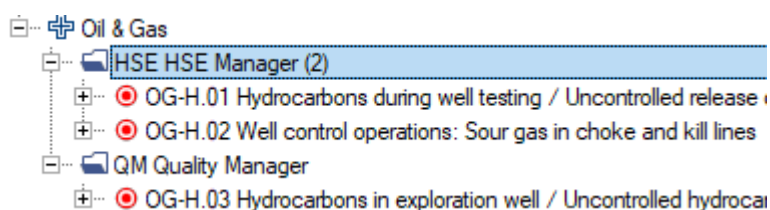
By default, the bowties in the Tree view are grouped by BowTie Groups. Additionally, users can group hazards in other ways by going to the Tree view and right clicking on a bowtie group (e.g. Oil & Gas) and selecting 'Group hazards by ...'.



**Figure 86 - Group hazards by Accountable**

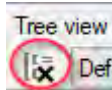
After pressing OK, the Tree view will look like this.





**Figure 87 - Hazards grouped by Accountable**

Any combination of values is possible, e.g. Accountable + Type. Grouping by multiple values creates nested folders to subdivide the bowties as configured. If you want to remove the grouping you can either press the red X in or click on



this icon located in the top left of the Tree view once a grouping has been selected.

It is also possible to group on bowtie groups level, please see section 23.2.1.

## 7.12. Risk matrices

Consequences (and top events) are assessed for their potential for harm in a given category and the chance of their occurrence using risk matrices. Each Case File contains up to eight risk matrices for this purpose, and they are fully configurable.

Each matrix is used twice on each hazard: once for the inherent risk assessment, once for the residual risk assessment.

Top events (Hazards) can also be assigned risk assessments.

When adding or editing a consequence or a top event, the risk matrices can be brought up to assess the consequence by clicking on the appropriate button for each assessment.

Configuring of the risk matrices is done via the Case → Edit Risk Matrices menu option. When you select one of the risk matrices out of the list, the risk matrix editor dialog box will appear.

**Note:** You can clear all risk assessments in the Case File using the Case → Clear Risk Assessment options.

		A	B	C	D	E	
		Never Heard of Incident in Industry	Incident has Occurred in Industry	Incident has Occurred in Our Company	Happens Several Times per Year in Our Company	Happens Several Times per Year in Location	
0	No Injury	A0	B0	C0	D0	E0	No impact
1	Slight Injury	A1	B1	C1	D1	E1	Incorporate Risk Reduction Measures
2	Minor Injury	A2	B2	C2	D2	E2	Manage for Continuous Improvement
3	Major Injury	A3	B3	C3	D3	E3	Intolerable
4	Single Fatality	A4	B4	C4	D4	E4	
5	Multiple Fatalities	A5	B5	C5	D5	E5	

**Figure 88 - Risk matrix editor**

How to change the dimensions of the risk matrix: Right-click on the severity tables (vertical axis) or the frequency labels (horizontal axis) and select the appropriate option.



How to edit the categories: You can edit, add or delete categories anywhere on the risk matrix by right clicking them.

**Note:** The risk matrix category order should be from low impact at the top to high impact on the bottom, i.e. from green to red. The order is used to compare and sort items by risk score. See section 7.12.1 Risk matrix category order for more information.

How to edit a cell label: right click the item and select the “Edit” option.

Changing the risk assessment of a matrix position:

1. Select the risk category you wish to use in making changes to the diagram.
2. Then, select the position within the graphic representation that you wish to change.

For example, we want to change A1 from yellow – Incorporate Risk Reduction Measures – to green – No Impact. In the graphic below, notice that the green risk category has been selected.



**Figure 89 - Risk matrix editor with selected category**

3. Now select A1, the position you wish to change.
4. Once you select it, the category color will change.
5. Notice how in the graphic on the next page, the color of A1 changed from yellow to green once the new risk category was selected.



**Figure 90 - Risk matrix editor with changed cell**

By default, coordinates will first list the X value (horizontal, frequency) first followed by the Y value (vertical, impact). In the screenshot above, we see the coordinate of the selection is listed as A1. You can customize this by clicking the XY button behind the “Display assessment code as”, and the order will be reversed.

You can also use custom labels for the coordinates.

**Note:** if you are not using some matrices, clear their name. This will make them disappear from the UI and on reports.

### 7.12.1. Risk matrix category order

The order of the risk matrix categories is important; they must be listed from low impact (green) to high impact (red). The order is used to compare and sort items by risk score.

This is used in various reports and overviews, but it is most important when using BowTieServer – because BowTieServer uses the order to determine if things are improving or not.

The risk matrix can still have completely custom zones, as illustrated in Figure 91 below, as long as the categories are ordered from low impact to high impact.



**Figure 91 - Risk matrix example**

### 7.12.2. Automatic Hazard risk assessment

Hazards risk assessment values can be configured to automatically set and follow the most severe values of the hazard's consequences.

By default, the hazard risk assessment for inherent and residual risk must be manually selected. However, when checking the box as indicated in Figure 92, the Hazard risk is automatically populated based on the worst case of the consequence risk assessments of that bowtie. For example: the worst-case residual risk for People coming from one of the consequences is D5. This populates the residual risk for People on the Hazard as D5.

	Inherent	Residual
People	[E5]	D5
Assets	[C4]	C4
Environment	[C0]	C0
Reputation	[C2]	C2

☒ Set risk assessments from consequence values

Figure 92 - Automatic Hazard risk assessment

### 7.13. Acceptance Criteria

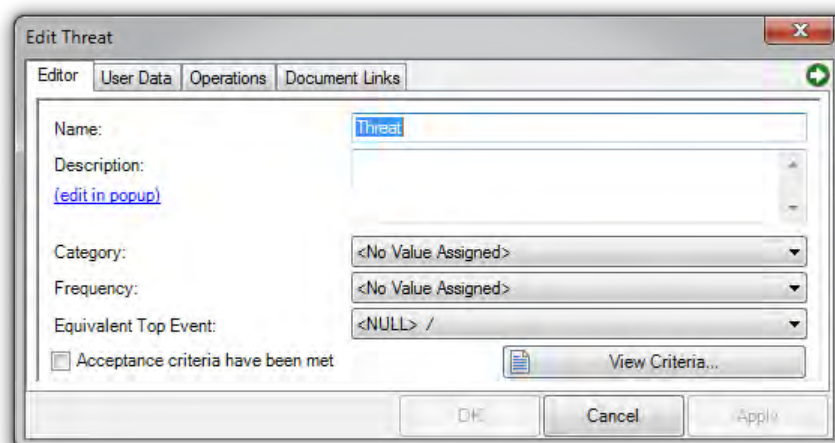
It is possible to define general acceptance criteria for threat barriers, escalation factor barriers, consequence barriers and barriers in general. These criteria can be accepted on each element. To give an example: acceptance criteria for a barrier could say that there should at least be someone accountable for the barrier, and it should have at least one activity. Threat criteria might say that a particular category of threats requires two different types of barriers before it is acceptable whereas another category might only require one type.

To define acceptance criteria, edit a Bowtie Group and click the tabs next to Bowtie Group Name. The criteria are described as free text.

Acceptance criteria for threat barriers:

DK Cancel Apply

To use the criteria, edit for instance a threat, at the bottom you will see two things. First, a "View Criteria" button, which will give you a popup with the acceptance criteria text. Second, an "Acceptance criteria have been met" tick box. This will be ticked once the threat adheres to the criteria.



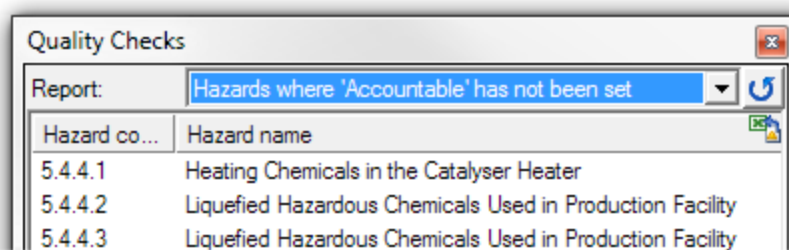
In the quality checks (see section 7.15, Quality checks window on page 80), there are also several reports that will list all the elements that do not yet meet the acceptance criteria.

## 7.14. Text find and replace

See chapter 9.4.1 Text find and replace on page 97.

## 7.15. Quality checks window

You can find the quality checks hidden on the right side of the diagram in the default layout.



**Figure 93 - The quality checks window**

The quality checks can display a number of different reports pertaining to the quality and completeness of the bowtie case you are building.

From the drop-down box at the top of the window, select the report you want from the list. Once you have selected a report, the window is populated with the results.

To refresh the list of items, click the button with the blue circular arrow.

If you select, for example, “Hazards where accountable has not been set” as shown in Figure 93, a list of all the hazards where no responsible party has been assigned is displayed.

The quality checks are extremely helpful in identifying holes in your analysis.

## 7.16. Revision info

Each hazard has a revision info tab that can be used to display revision information on the bowtie diagram. Double click a hazard and go to the tab called revision info. As soon as you pick something from the “Revision Information Box Alignment” dropdown, the revision info will be displayed on the diagram.

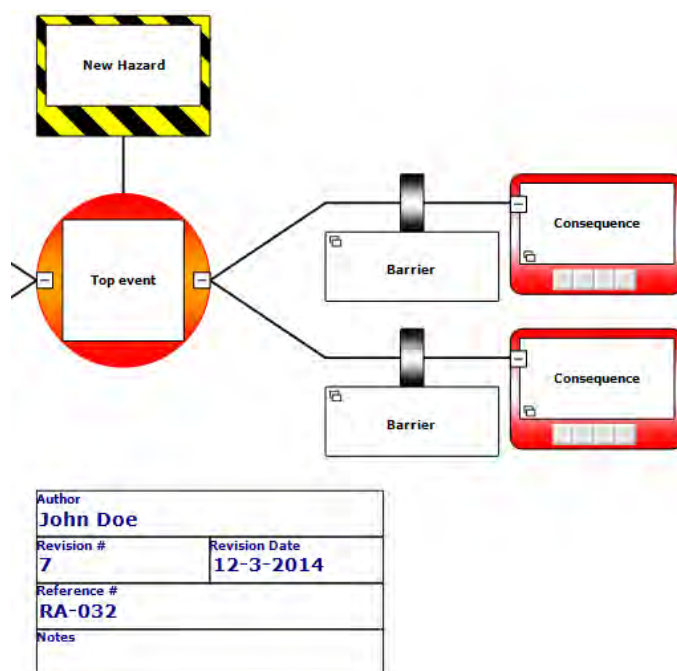
The 'Edit Hazard' dialog box has several tabs: General, Risk assessments, Sign Off, Headers and Footers, Revision Info (selected), User Data, and Operations. The 'Revision Info' tab contains the following fields:

- Revision Information Box Alignment: Top event
- Author: John Doe
- Revision #: 7
- Revision Date: 12-3-2014 (with a calendar icon)
- Reference #: RA-032
- Notes: (with a link to 'edit in popup')

Buttons at the bottom: OK, Cancel, Apply.

**Figure 94 - Revision info**

The revision info will also be added to the diagram when exporting it as a picture.

**Figure 95 - Revision info text box**

# 8

## Configuring the diagram

In this chapter, we explore how to configure the diagram appearance.

BowTieXP has a diagram that is configurable in many ways – there are loads of options to tailor the display to your needs. You can apply various colors and show all kinds of extra information. This chapter will explain all the various settings.

Due to the large amount of settings, you can also configure those into profiles, allowing you to quickly switch between predefined settings.

### 8.1. Changing settings for a single type of item

In the diagram, if your mouse is near or above an item, an eye-shaped icon will appear:



Figure 96 - Eye-shaped icon

If you click it, a dialog box will appear which allows you to customize the display of the item:

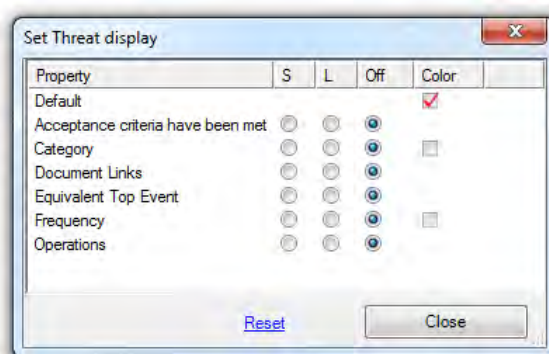


Figure 97 - Set element display dialog box

It lists all the fields that can be shown on the diagram as extra information boxes. This is done by selecting the button on the S or L column. S stands for **S**hort format and L stands for **L**ong format.


You can also select which property is to be used to color the item – this is done by selecting the check box in the color column. For example, if we select to show the acceptance criteria have been met, the threat looks as follows:

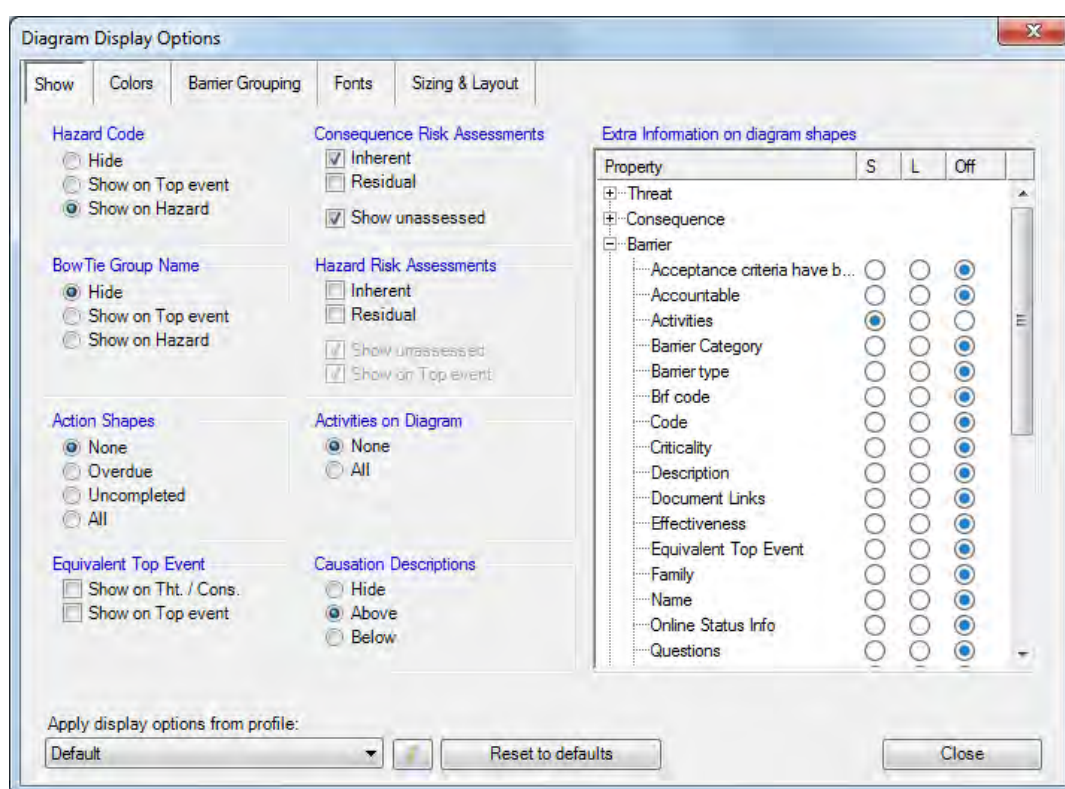


**Figure 98 - Acceptance criteria value shown on a threat**

You can adjust the display for all items on the diagram. If you need to configure more than one item, you can also use the large diagram display options dialog, discussed in the next section.

## 8.2. Changing all the settings

Modification of the current settings is done by clicking the eye-icon in the toolbar icon (  ). This brings up the current display settings. Modifying these does not change any of the profiles.



**Figure 99 - Diagram display options – “Show”**

This dialog consists of several tabs that allow you to change the appearance of the diagram.

### 8.2.1. Information to show / the “Show” tab

The first tab is about what texts to display, whether to display actions and risk assessments, and what extra information to display.

The left-hand side of this dialog contains various settings:



**Hazard Code**

☐ Hide  
☐ Show on Top event  
☒ Show on Hazard

**BowTie Group Name**

☒ Hide  
☐ Show on Top event  
☐ Show on Hazard

**Action Shapes**

☒ None  
☐ Overdue  
☐ Uncompleted  
☐ All

**Equivalent Top Event**

☐ Show on Tht. / Cons.  
☐ Show on Top event

**Consequence Risk Assessments**

☒ Inherent  
☐ Residual  
☒ Show unassessed

**Hazard Risk Assessments**

☐ Inherent  
☐ Residual  
☒ Show unassessed  
☒ Show on Top event

**Activities on Diagram**

☒ None  
☐ All

**Causation Descriptions**

☐ Hide  
☒ Above  
☐ Below

**Figure 100 - Diagram display options – left-hand side of "Show" tab**

- If and where to show the hazard code.
- If and where to show the BowTie Group name.
- Whether or not to show actions, and if so which ones – only the uncompleted or overdue ones?
- If the risk assessments on consequences and hazards should be shown – if so, which ones? Or both?
- If activities should be shown as separate boxes in the diagram.
- Causation Descriptions refers to IncidentXP.

The right-hand side barriers which extra information to show on the diagram shapes:

Property	S	L	Off
Threat			
Consequence			
Barrier			
Acceptance criteria have b...			<input checked="" type="radio"/>
Accountable			<input checked="" type="radio"/>
Activities	<input checked="" type="radio"/>		
Barrier Category			<input checked="" type="radio"/>
Barrier type			<input checked="" type="radio"/>
Brf code			<input checked="" type="radio"/>
Code			<input checked="" type="radio"/>
Criticality			<input checked="" type="radio"/>
Description			<input checked="" type="radio"/>
Document Links			<input checked="" type="radio"/>
Effectiveness			<input checked="" type="radio"/>
Equivalent Top Event			<input checked="" type="radio"/>
Family			<input checked="" type="radio"/>
Name			<input checked="" type="radio"/>
Online Status Info			<input checked="" type="radio"/>
Questions			<input checked="" type="radio"/>
Systems			<input checked="" type="radio"/>
User Systems			<input checked="" type="radio"/>
Wiki Pages			<input checked="" type="radio"/>
Escalation Factor			
Hazard			
Activity			

**Figure 101 - Diagram display options – right-hand side of "Show" tab**

For each bit of information present on an item there are three options:

- S for Short format
- L for Long format
- Off to not display the information



Here is an example of short format used on threats:

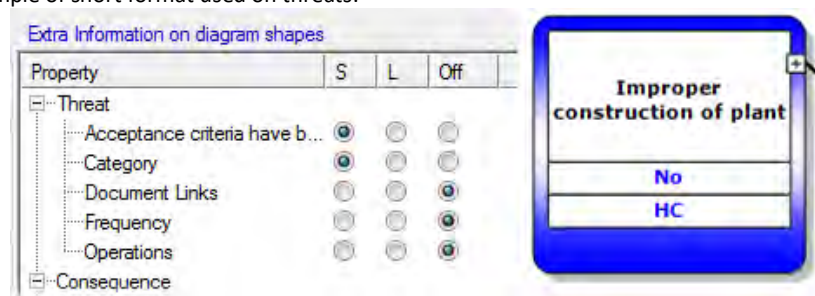


Figure 102 - Short format example

Here is an example of long format used on threats:

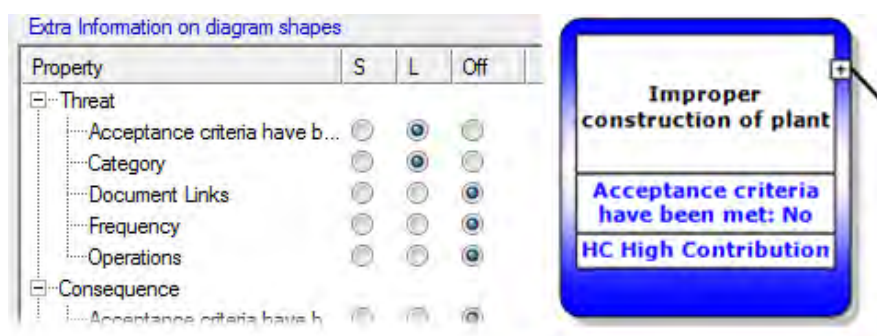


Figure 103 - Long format example

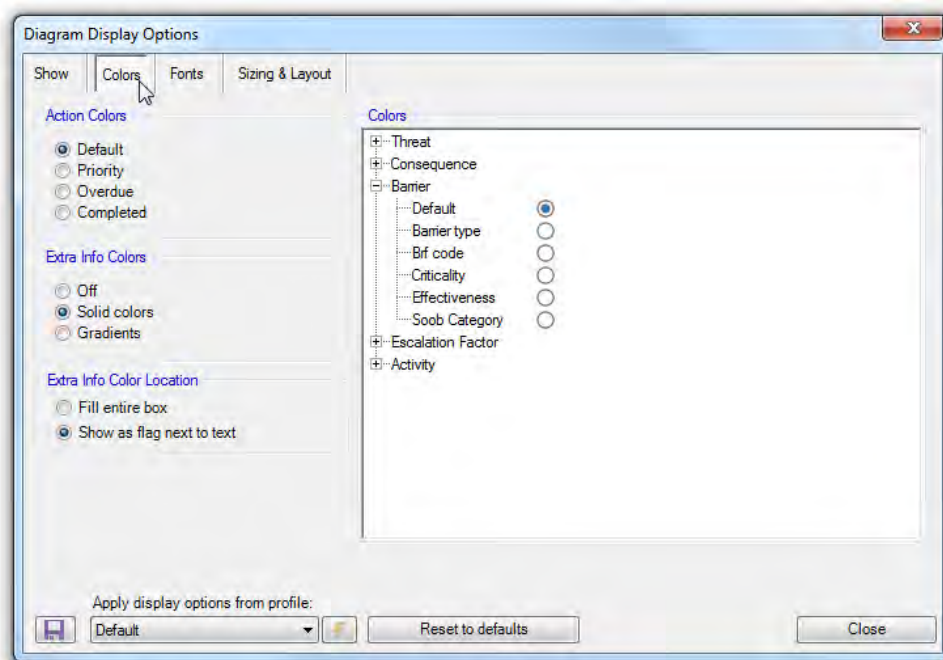
---

Note: Properties will always have a box on the shape, but it might be empty if no value has been assigned. Links (such as activities on barriers) will have one box per item – no extra boxes will appear if no items are linked.

---

### 8.2.2. Colors to use / the “Colors” tab

The next tab is about how to color the shapes.

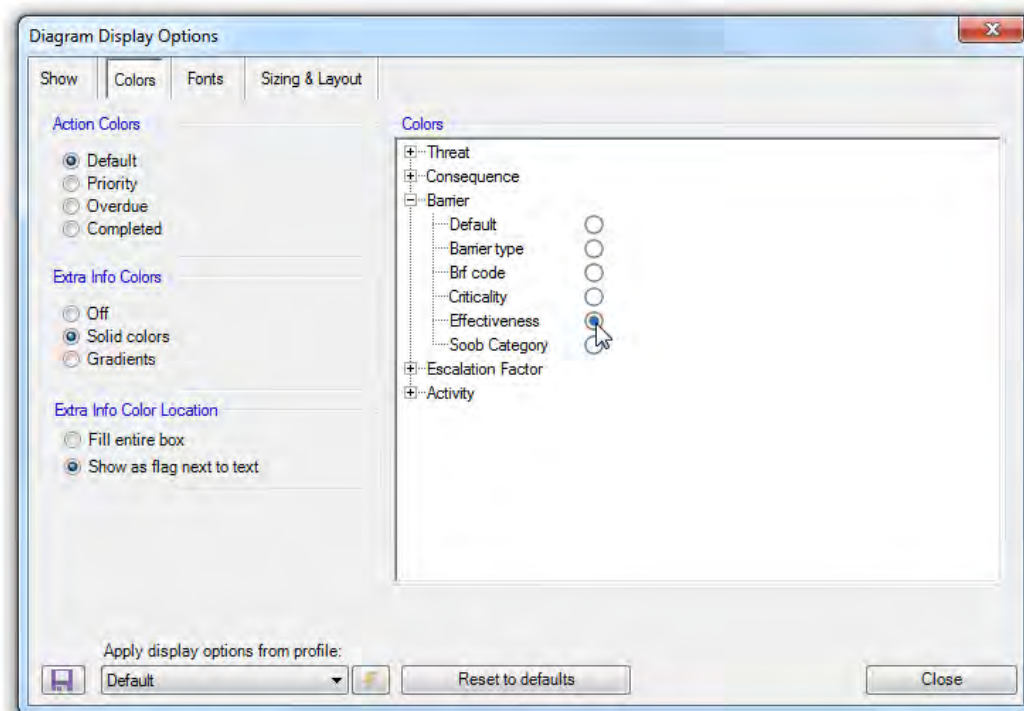


**Figure 104 - Diagram display options – “Colors”**

In the left-hand side of this page, we can configure which color to give actions, and if we want colors to appear in the extra info boxes (configured on the previous tab page).

In the right-hand side of this page, we can select which property to use to color the main shapes.

Here is an example - select to color barriers by their effectiveness:



**Figure 105 - Diagram display options - color barriers by effectiveness**

In addition, the shapes will change color:

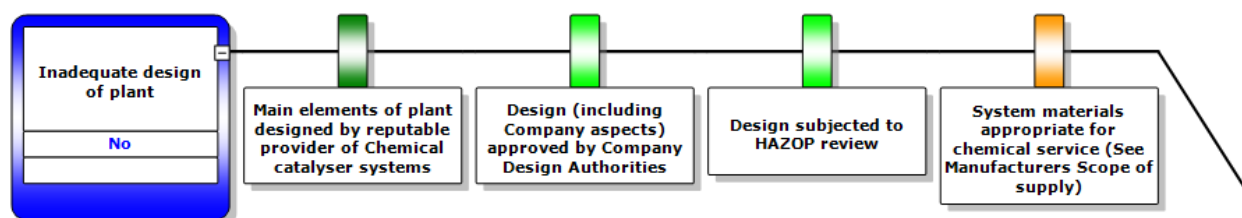


Figure 106 - Example of using barrier effectiveness for coloring

We can also show the effectiveness in an extra info box (select this on the first tab called “Show”).

Then we can enable colors on the extra info boxes and get this result:

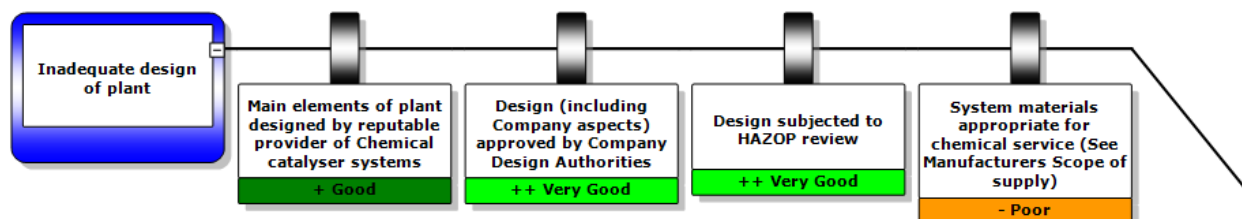


Figure 107 - Example of showing barrier effectiveness as extra information (colored)

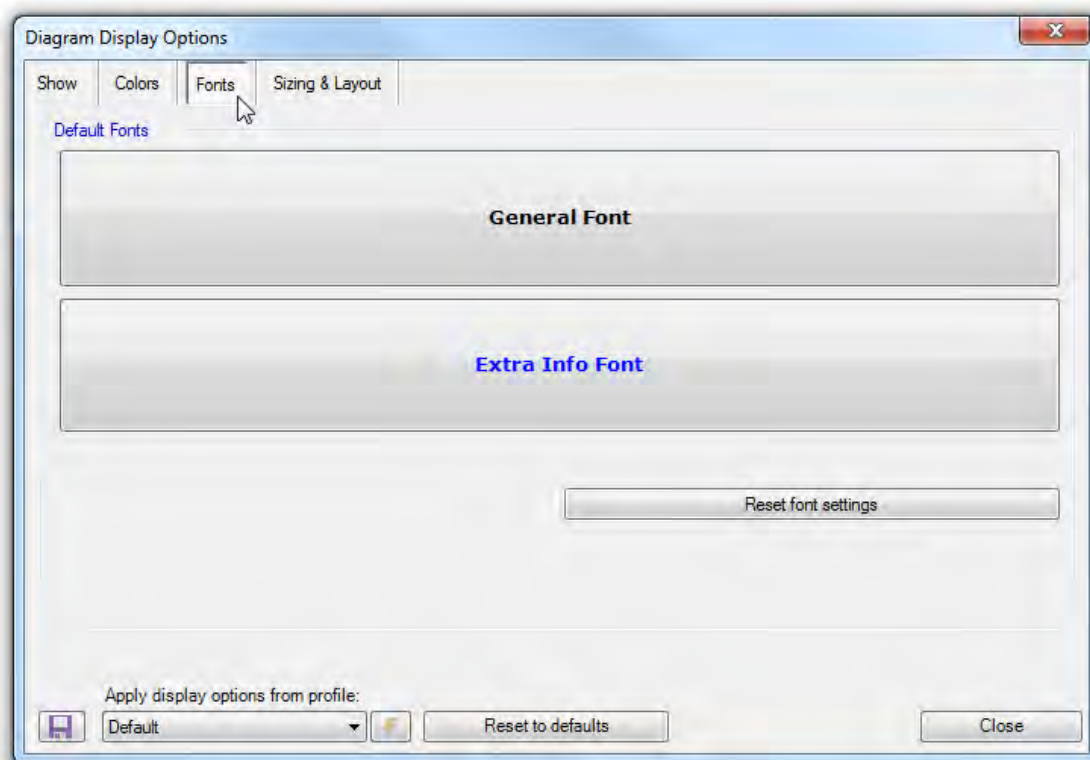
If some colors lead to bad readability, we can also choose to display the color only in the little box on the left-hand side. This can be done in the ‘extra info color location’, under the “colors” tab:



Figure 108 - Example of showing barrier effectiveness as extra information (colored as flag)

### 8.2.3. Fonts to use – the “Fonts” tab

The next tab allows us to set default fonts.

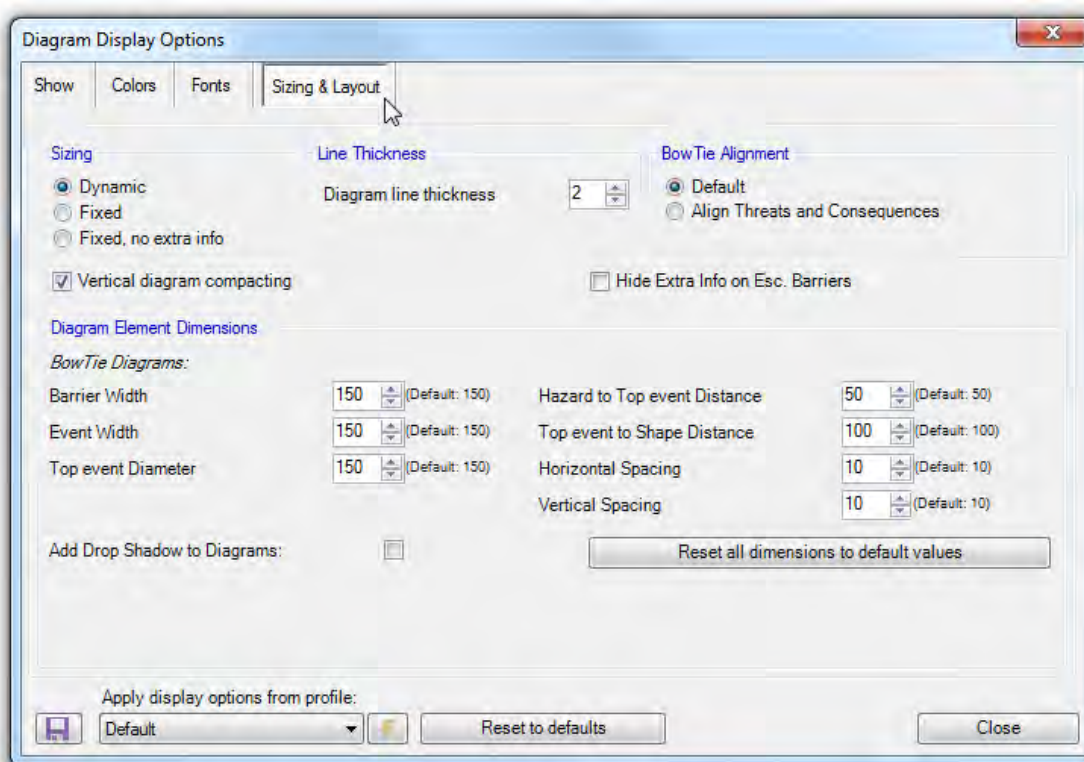


**Figure 109 - Diagram display options – “Fonts”**

Click the button to bring up a font dialog. An example of the current font will be showed in the box.

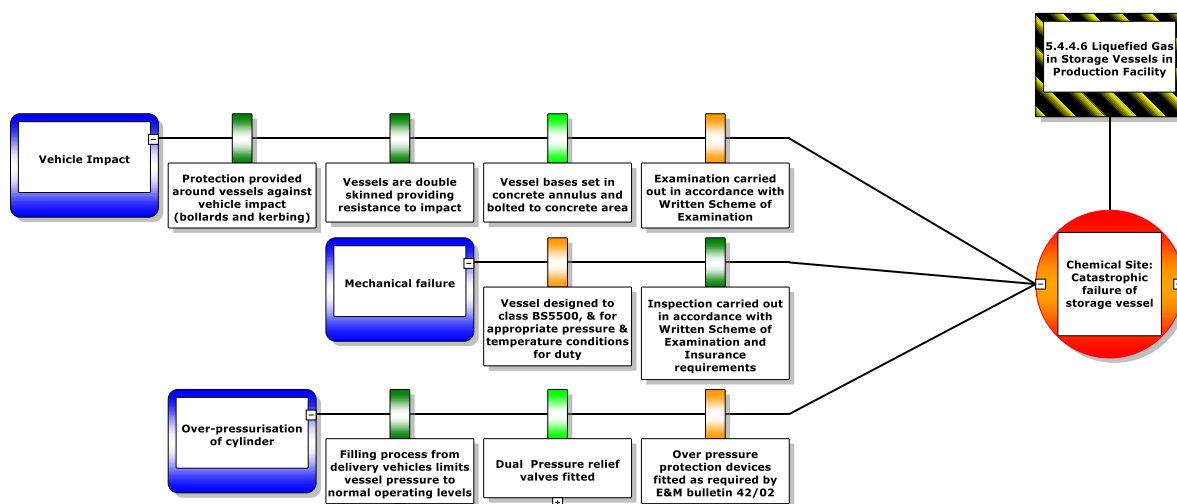
#### **8.2.4. Sizing and layout – the last tab**

The final tab contains various options related to sizing and layout:



**Figure 110 - Diagram display options – “Sizing & Layout”**

Dynamic sizing is the default but can sometimes look slightly messy due to the height difference from box to box. In this case, fixed sizing might look better.



**Figure 111 - Default dynamic sizing**

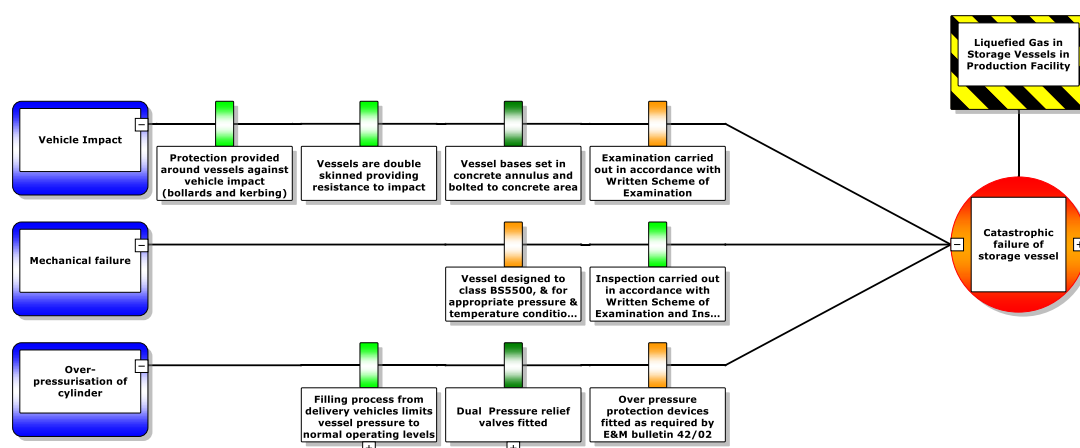


Figure 112 - Fixed sizing with outside alignment

The connector line thickness can be adjusted.

If wanted, the threats and consequences can be aligned against the outside of the diagram.

Vertical diagram compaction can be switched off if it is causing problems.

The barrier color legend can be scaled down if needed.

All diagram element sizes and distances are editable under "Diagram Element Dimensions".

It is possible to change the curved lines into straight lines. In the figure below the differences in the lines are shown.

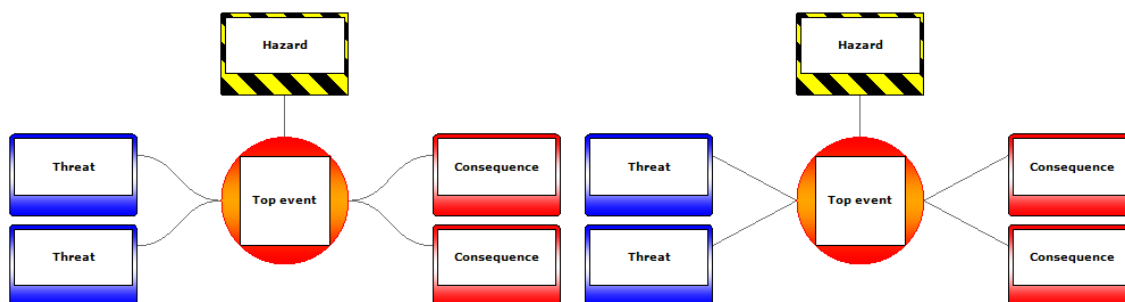
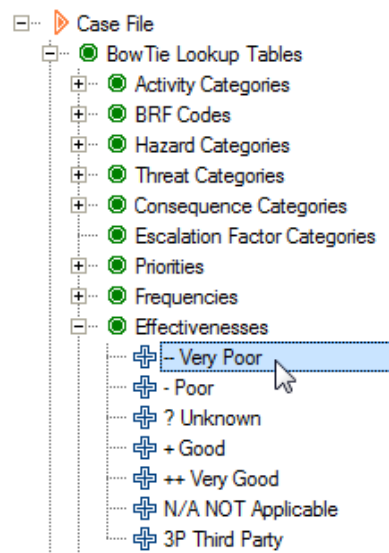


Figure 113 - Curved vs straight lines in the bowtie

This setting is called 'Draw bowtie edges as bezier curves'.

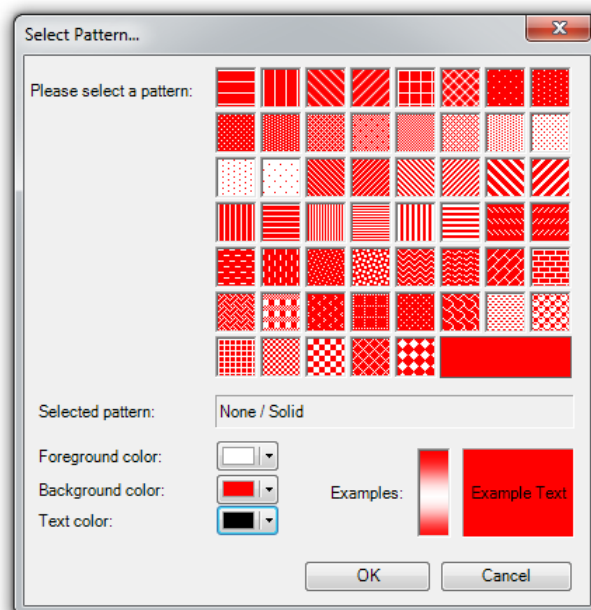
### 8.3. Adjusting lookup colors

The colors used on the diagram are fully adjustable. They can be set using the editor in the Tree view. For example, to adjust effectiveness colors, we go into the Tree view into the lookup tables node, into the effectiveness node, where we double click the item we want to modify:



**Figure 114 – Changing the effectiveness colors**

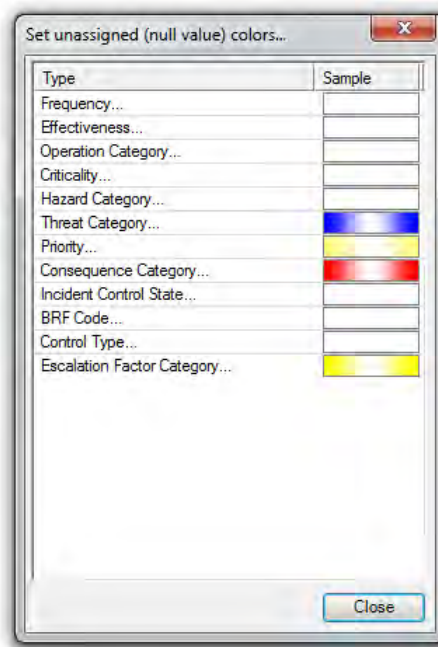
In the editor, we click on the “Choose” button to bring up the color picker dialog:



**Figure 115 - Color picker dialog**

## 8.4. Adjusting lookup colors for unassigned values

The color used when no value has been assigned to a property can also be adjusted – Select Case -> Edit null value colors in the menu. This will bring up the following dialog:



**Figure 116 - Null value colors**

Clicking an item will bring up the color picker dialog.



# 9

## Case File analysis

In this chapter, we take a look at the different methods for analyzing your Case File.

### 9.1. Introduction

The end purpose of building a Case File is of course to be able to analyze all the data and relations you have created in order to gain better understanding and insight. This chapter focuses on all the different methods BowTieXP offers for doing so.

We will discuss the case overview, searching information and relationship diagrams.

### 9.2. Case overview

You can find the case overview in the main menu: View → Windows → Case Overview.

The Case File overview presents many views onto the data in the Case File from different perspectives (“overview”), allowing visualization of relationships, which might otherwise be less evident, and allowing you also to quickly finding related data.

	[People]	People	[Assets]	Assets	[Environment]	Environment
<b>Haz. H01-0 Driving a vehicle / Losing control over the vehicle</b>						
Threat: Intoxicated driving						
Threat: Driver loss of attention (due to phone, controlling radio, fatigue, eating etc.)						
Threat: Blowout (tire)						
Threat: Unexpected manoeuvre from nearby vehicle						
Threat: Slippery road conditions						
Threat: Uneven road surface						
Threat: Poor visibility (external)						
Consequence: Crash into other vehicle or motionless object	[D-4]		[D-2]		[D-3]	
Consequence: Driver impacts internal of vehicle	[D-4]		[D-1]		[D-3]	
Consequence: Hitting a pedestrian/ cyclist	[D-4]		[D-1]		[D-3]	
Consequence: Crash into deep water resulting in entrapment	[D-4]		[D-2]		[D-3]	
Consequence: Vehicle roll-over	[D-4]		[D-2]		[D-3]	
<b>Haz. H01-1 Driving a vehicle / Driver loss of attention</b>						
<b>Haz. H01-1 Driving a vehicle / Impact on person</b>						

Figure 117 - The case overview

All output from each overview can be exported to Excel by means of the “Export to Excel” button.

The output is searchable by means of the “Expand by keywords” textbox along with the next and previous hit buttons.

In addition, present are expand/collapse all buttons to reduce or increase the amount of on-screen information, as well as a button to navigate to the definition of the selected node in the main Tree view.










When information in the Case File changes, the Case File overview will update automatically. If, for some reason, you want to rebuild the output you can do so with the “reset/reload” button.

Using the drop-down menu on the toolbar, labeled Overview Perspectives, you can change the perspective.

The other two case overview toolbars are shown below.



**Figure 118 - The case overview toolbars**

Icon	Description
	Execute expand by keyword operation by means of the keywords entered into the text box
	Go to previous keyword match
	Go to next keyword match
	Expand all
	Collapse all
	Go to definition in the Tree view
	Show relationship model of selected entity
	Reset/reload
	Export to Excel

### 9.2.1. Classic perspective

The classic perspective lists all bowtie groups, hazards, threats and consequences present in the current file along with each consequence's risk assessments. This overview is similar to a classic hazard register.

### 9.2.2. Management system perspective

**Note:** This perspective is available in BowTieXP advanced only.

The management system perspective lists all defined activities, similar to the Tree view, but with some extra deduced information.

For each activity, the associated barriers are listed, and for each barrier, you can drill down to see the threat, consequence, or escalation factor to which it belongs and you can keep drilling down all the way up to the hazard/top event.

As each hazard has a hazard category, activities are associated with hazard categories via the barriers on which they are linked. All the hazard categories that an activity is associated with in this manner will have an "x" cross-mark in the hazard category column.

The responsible persons are also listed.

Activities that do not have any relation with barriers are shown in a gray font.

### 9.2.3. Systems and user systems perspective

**Note:** This perspective is available in BowTieXP advanced only.

The systems and user systems perspective is similar to the management system perspective and lists where each system is used.

#### 9.2.4. Job titles perspective

This perspective lists all job titles present in the Case File and finds all activities and barriers where they are referenced.

All barriers where an activity is referenced are also listed so you are able to drill down to all barriers which are related to a given job title, starting from that job title.

Exporting this perspective yields a power overview of all barrier responsibilities per job title, which reveals accountability for barriers and activities that support barriers.

#### 9.2.5. Operations perspective

---

**Note:** This perspective is available in BowTieXP advanced only.

---

The operations perspective lists all the operations defined in the file and which hazards, threats and consequences they are associated with. When a hazard is not directly associated with an operation but via one of its threats or consequences, it will be printed in a gray font.

#### 9.2.6. Incidents perspective

---

**Note:** This perspective is available only if you have IncidentXP and BowTieXP both.

---

The incidents perspective shows all the incidents in the file, finds, and aggregates information pertaining to those. It is a very powerful tool to analyze incidents individually, but also to analyze multiple incidents together.

#### 9.2.7. Document links perspective

This perspective lists all document links defined in your Case File and where they are used.

#### 9.2.8. Barrier register perspective

This perspective finds all barriers defined within your Case File and then counts the number of times each one appears.

Barriers are matched by using the code and description fields. If these fields are identical on two different barriers, BowTieXP will list them as the same barrier. You can then expand each node to display where these barriers exist in your Case File.

#### 9.2.9. Threats register perspective

The threats register lists and aggregates all threats in the Case File, shows the number of times they occur, and where they are located.

#### 9.2.10. Escalation factors register perspective

The escalation factor register lists and aggregates all escalation factors in the Case File, shows the number of times they occur, and where they are located.

#### 9.2.11. Consequences register perspective

The consequences register lists and aggregates all consequences in the Case File, shows the number of times they occur, and where they are located.

## 9.2.12. Actions perspective

This perspective finds all actions present in the Case File and displays them in two groups: completed actions and uncompleted actions.

## 9.3. Quality checks

The quality checks are also a valuable source of information about your Case File. The quality checks window can display a number of different reports pertaining to the quality and completeness of the bowtie case you are building.

The quality checks window is extremely helpful in identifying holes in your analysis and finding locations where more attention is needed.

For more details about the quality checks, please refer to section 7.15, Quality checks window on page 80.

## 9.4. Search box

In the top right of BowTieXP there is a search box to search for words or elements within the Case File. It finds the exact location of a term or string of text within your Case File.

After entering your search term or search string, BowTieXP gives you exact details of where each match was found in the results window, along with its name and the name of the field in which it was found.

In the results window there is multi-edit (with BowTieXP Advanced) and drag and drop support.

If you click on a result, BowTieXP will:

1. Navigate to the location in the Tree view.
2. Navigate to the location in the diagram, if it is an element in a diagram.

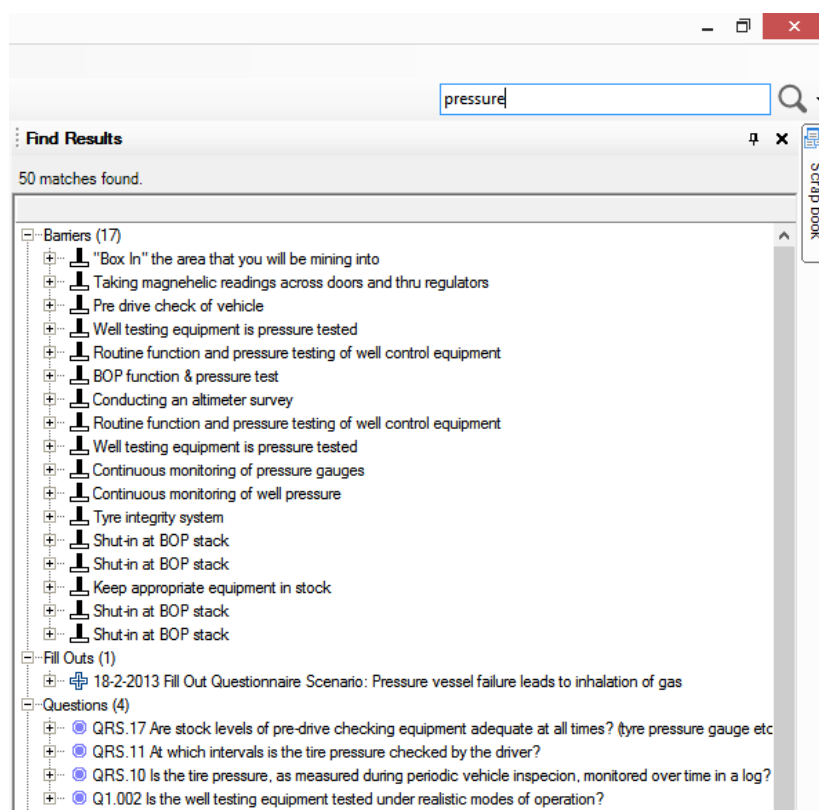


Figure 119 - The text find window

It is possible to search for elements with a specific value. You can search either an 'equal' value or a 'like' value of a bowtie element by using these formulas:

- 'Equal' searching → `=(bowtie element, "value")`
- 'Like' searching → `~(bowtie element, "value")`
- 'Is not' searching → `<>(bowtie element, "value")`

For example: You want to see every barrier that has 'passive hardware' as barrier type. When you enter `=(barrier type, "passive hardware")`, all barriers with the barrier type 'passive hardware' appear in the search box.

It is also possible to search for empty values within an element by only typing two quotation marks without a word in it. For example, you can use `=(code, "")` when you want to search for every bowtie element with an empty code field. This is useful for when you want to check if every entity has been filled in or when you want to see how many bowtie elements you have with a specific value.

### 9.4.1. Text find and replace

You can also replace found values, either one at a time or all at once. To do this, click the arrow next to the search icon (see Figure 120), and click the Text replace button at the bottom. Alternatively, go to Tools > Text Replace.

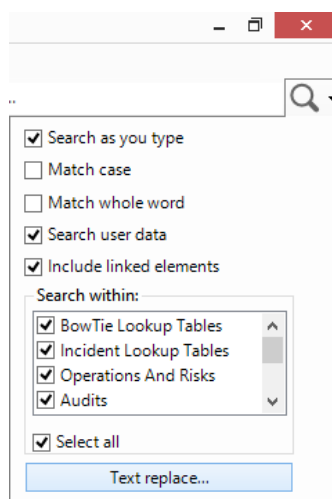


Figure 120: The Text replace button

Specify what to find, what to replace it with, and click Find. The search results will list all matches, and you can replace values one at a time or all at once.

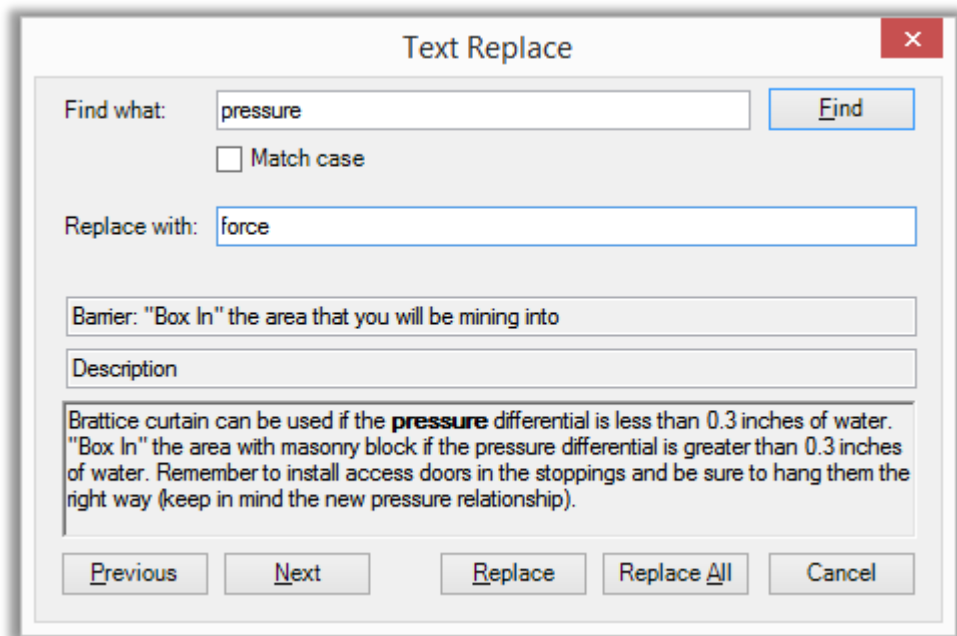


Figure 121: The Text replace dialog

Before doing a replace all operation it is prudent to at least do a cursory check of all the found items, although you can of course always undo the operation.

## 9.5. Advanced functionality: relationship models

After building a complete Case File, and adding all the relations, the relationship models allow you to analyze and navigate these relations visually, offering greater insight into your data.

Accessing relationship diagrams is done via the context menu in the diagram or the Tree view. When right clicking an entity for which a relationship diagram can be drawn, you will see the menu entry for the relationship diagrams similar to the one shown below.

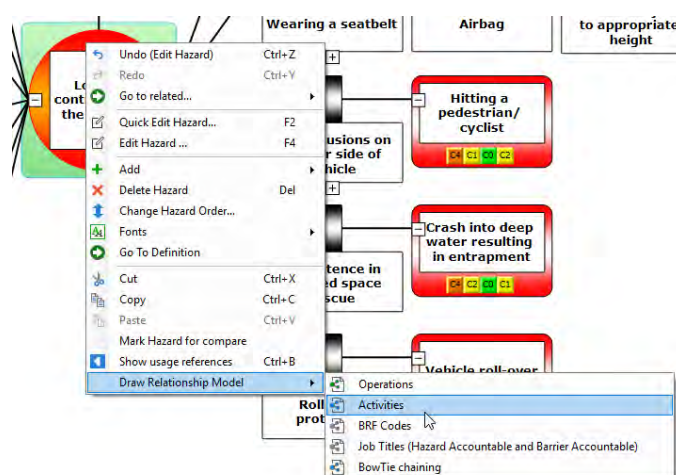
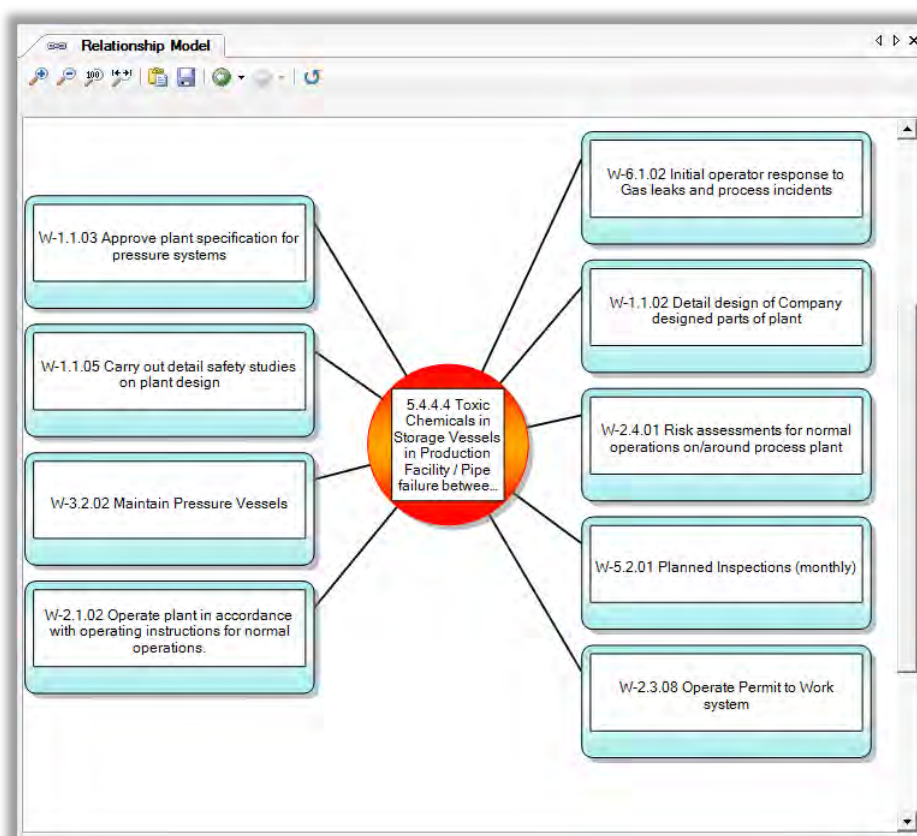


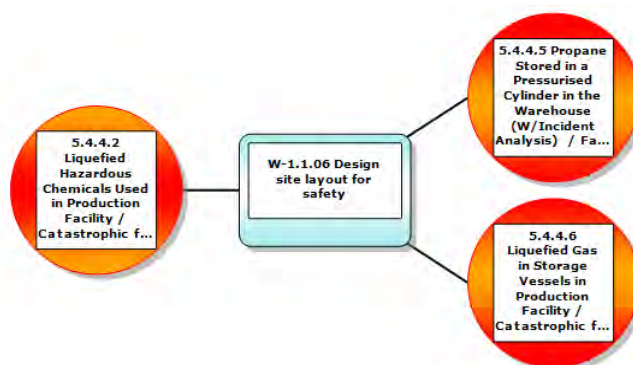
Figure 122 - Relationship diagram menu

After selecting the desired relationship diagram, it will be shown as in the figure below.



**Figure 123 - Example relationship diagram**

In the relationship diagram, you can navigate to another relation by clicking any shape with the left mouse button. A menu will pop up allowing you to choose the relation to follow. For example, following the option highlighted in the screenshot above, we will go to the diagram pictured below.



**Figure 124 - Example relationship diagram**

Right clicking any shape allows you to go to the item's definition in the Tree view, go to another diagram, or to remove the clicked item from the diagram for presentation purposes.

Toolbar buttons allow you to save the picture, copy it to the clipboard, and navigate between previously drawn relationship diagrams.

The tables below list all the available relationship diagrams, grouped by the type on which they are available.

The following relationship diagrams are available when an activity has been selected:

Name	Description
Activity: Hazards.	All the hazards associated to the activity, via barriers, threats, consequences and escalation Factors.
Activity: Hazards, including child Activities	Same as above, but also including the child activities.

The following relationship diagrams are available when a Hazard has been selected:

Name	Description
Hazard: Operations.	Collects all the operations linked on the hazard and its threats and consequences and shows them with the hazard.
Hazard: Activities	All the activities associated to the hazard, via barriers, threats, consequences and escalation factors.
Hazard: BRF Codes.	This gathers all used BRF codes on all barriers beneath a hazard (via the threats, consequences etc.) and shows them.
Hazard: Job Titles (Hazard Accountable and Barrier Accountable).	Collects all the job titles used as barrier accountable persons and as hazard accountable persons and shows them together with the hazard.

The following relationship diagrams are available when a threat has been selected:

Name	Description
Threat: Operations	All the operations associated with the threat.

The following relationship diagrams are available when a consequence has been selected:

Name	Description
Consequence: Operations	All the operations associated with the consequence.

The following relationship diagrams are available when a job title has been selected:

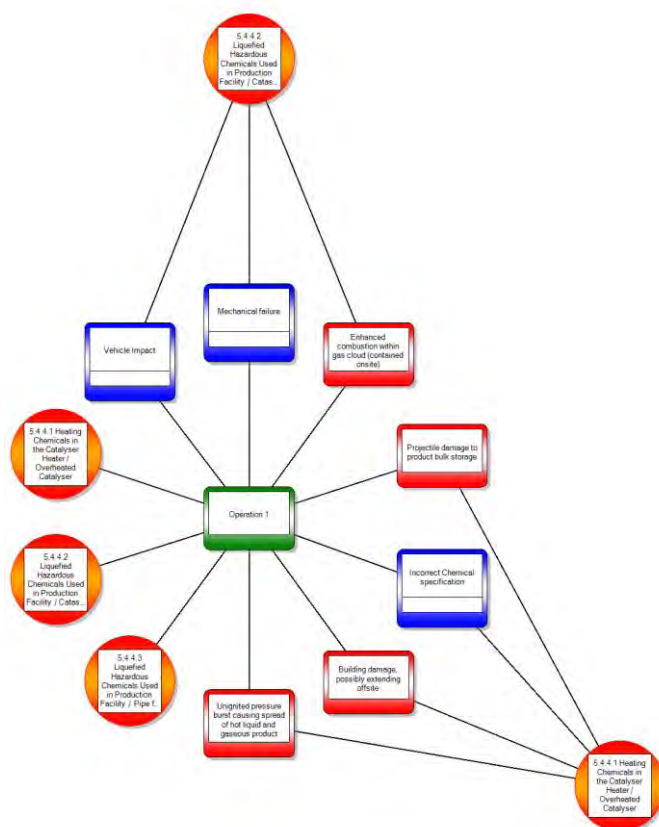
Name	Description
Job Titles: Activities.	Finds all the activities where the given job title is used.
Job Titles: Barriers, Activities, Operations and Hazards.	Collects all the activities, operations and hazards that are related to the selected job title and draws a diagram.
Job Titles: Barriers.	Finds all the barriers where the given job title is used.
Job Titles: Operations.	Finds all the operations where the given job title is used.
Job Titles: Hazards, Operations.	Finds all the hazards and operations where the given job title is used.

The following relationship diagrams are available when an operation has been selected:

Name	Description
------	-------------



Operation: Hazards	Shows all the hazards the given operation is related to.
Operation: Hazards, Threats and Consequences	Shows all the hazards, threats and consequences the given operation is related to.  See Figure 125 - Operation: hazards, threats and consequences for an example.
Operation: Job Titles	Shows how the given operation is associated via hazards to job titles.  See Figure 126 - Operation: job titles for an example.
Operation: Job Titles (Simple)	The same diagram as above but in a different format.  See Figure 127 - Operation: job titles (simple) for an example.
Operation: Soob Matrix	Shows how the operation relates to a different one in a Soob matrix.



**Figure 125 - Operation: hazards, threats and consequences**

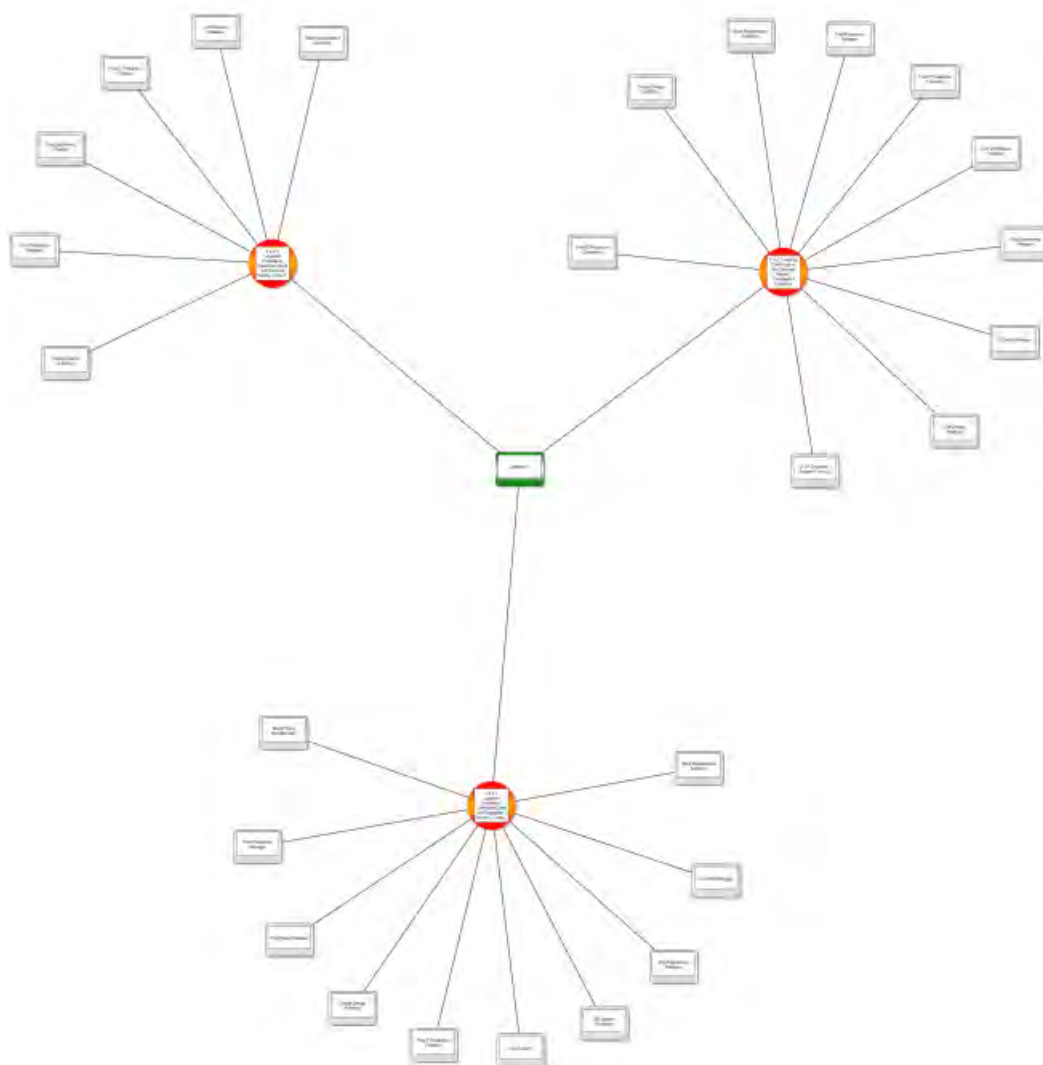


Figure 126 - Operation: job titles

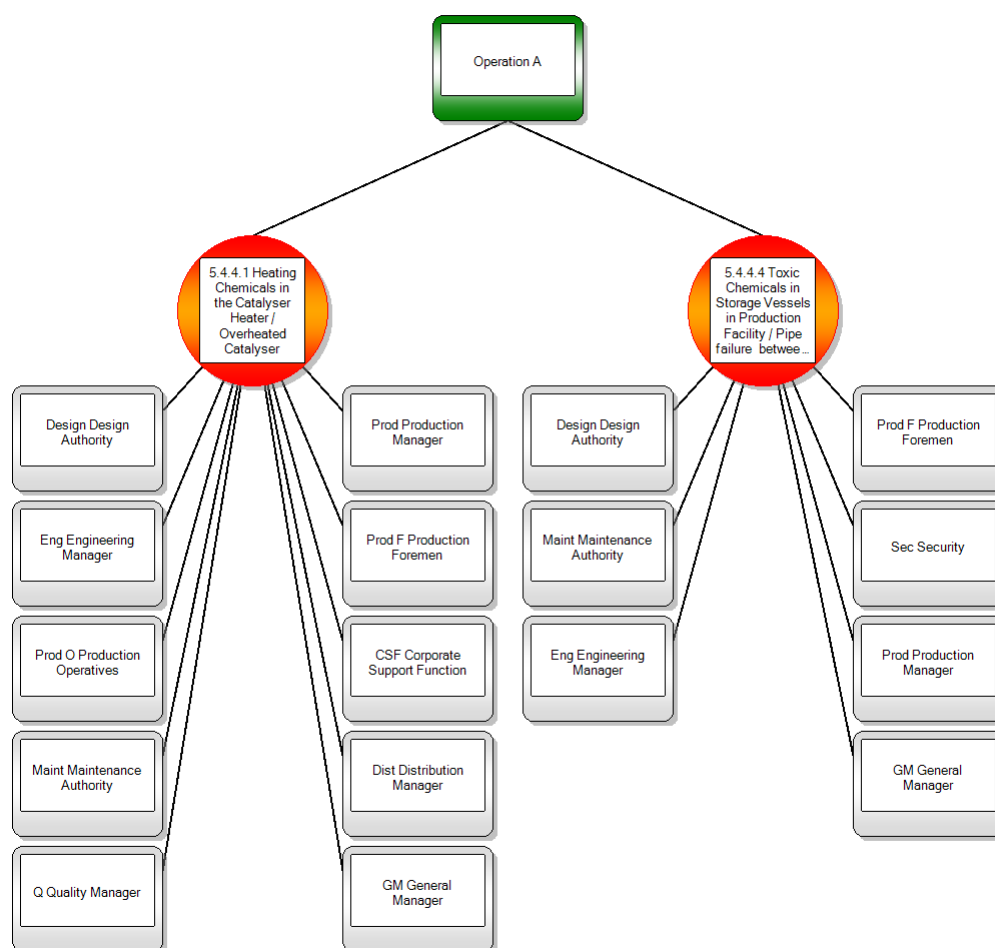


Figure 127 - Operation: job titles (simple)

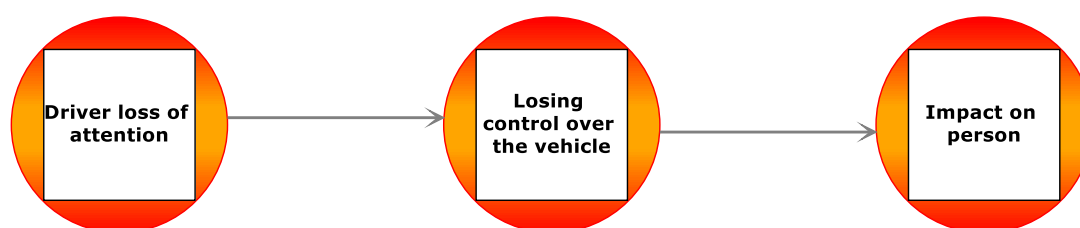


Figure 128 - Bowtie Chaining



# 10

## Linking to documentation

A lot of the information in a BowTieXP Case File has close relationship with documents already in existence. This chapter shows how to refer to it from BowTieXP.

### 10.1. Introduction

A lot of information present in a BowTieXP Case File is about matters that have already been documented elsewhere, and in a lot of instances within a Case File you will want to refer to that external information. For example, when assigning an effectiveness value to a barrier, you may want to refer to a specific analysis performed on that barrier.

To solve this need, BowTieXP has included a Document Links section. Document links are pointers to external documentation that can be linked onto various elements within your Case File. In this chapter, we will explain how to make efficient use of them.

Document links are defined in Document link groups as a hierarchy, and thereafter linked onto relevant items in your Case File. To create a document link you can navigate to the document link groups node in the Tree view, right-click it and select New Document Link Group.

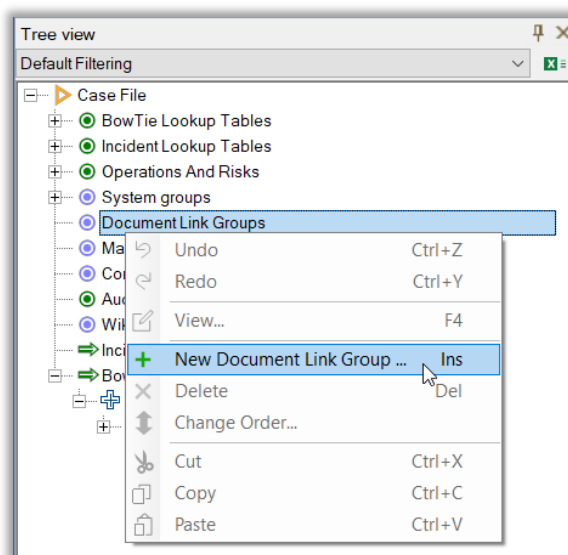
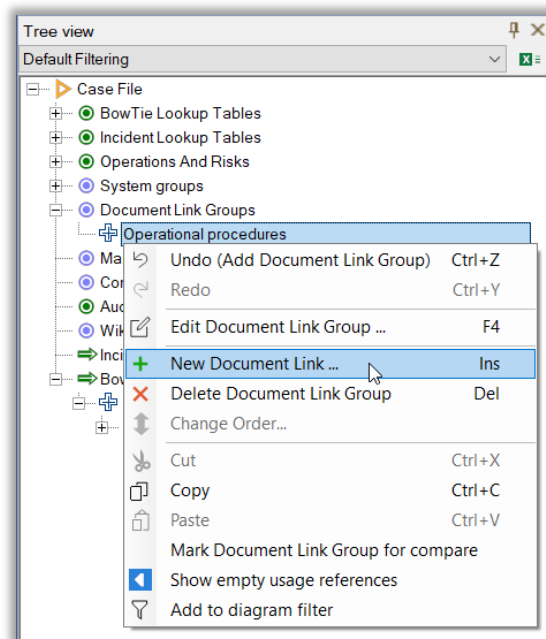


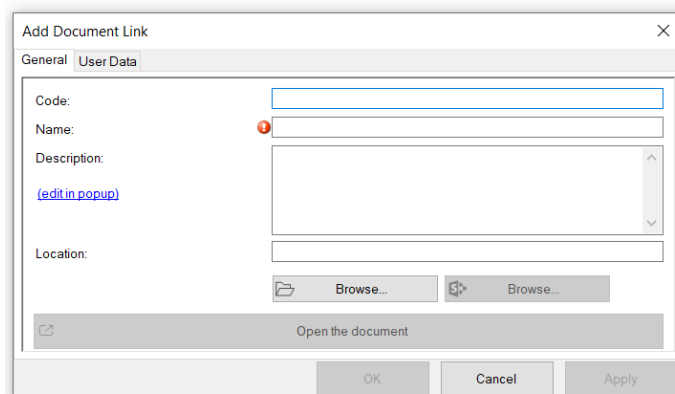
Figure 129 - Add New Document Link Group

Give the group a name, for instance 'Operational procedures'. Then right-click the group in the Tree view and select New Document Link., like in Figure 130.



**Figure 130 - Add New Document Link**

A document link consists of a code, a name, a description and a location, like in Figure 131. The location defines where the actual document resides. This can either be a URL or a file path.



**Figure 131 - Document link editor**

If you click on the left Browse button, you can choose a document from your computer. The right Browse button guides you to a Sharepoint environment (if your organization makes use of Sharepoint, note that Sharepoint is no longer actively supported).

After defining your document links, they can be linked onto bowtie elements by dragging and dropping from the Tree view or by using the editor screen as shown in Figure 132.

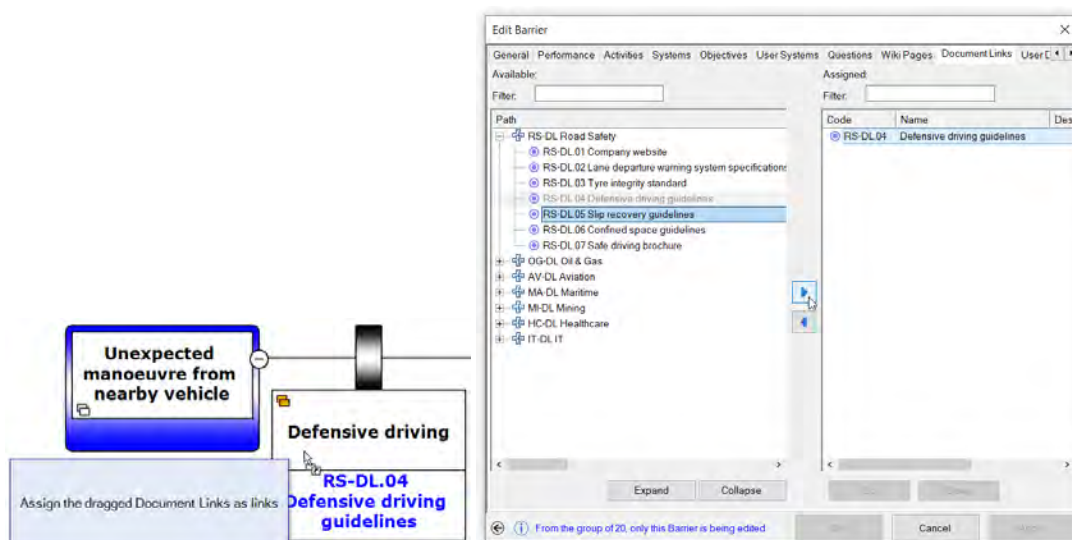


Figure 132 - Linking document links

When assigned they can be shown on the diagram, and quickly accessed by means of the "Open" button:

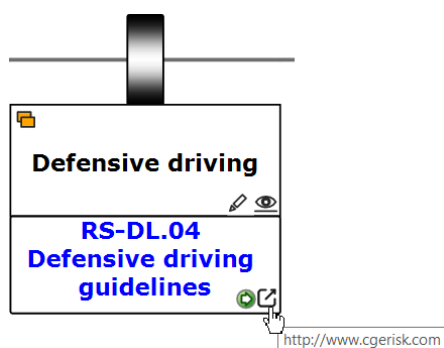


Figure 133 - Barrier showing documents links along with "open" button

## 10.2. Using drag and drop from a web browser or a file explorer to create and assign document links

You can directly drop a URL or a file onto a bowtie element. BowTieXP will search through all document links to see if the file or URL is already known. If it is already known, the link is connected.

If you drop an unknown file or URL onto a bowtie item, BowTieXP will pop up the editor and ask you to fill out some details. When you press ok, the new document link is added to the list of document links and the link is created.

## 10.3. Using relative paths for document links

If you locate the documents you will be linking to next to the .btf file, BowTieXP will create document links with relative paths. If you copy all the documents along with your .btf file, you will be able to open them anywhere.

# 11

## Bowtie chaining

At times you need be able to analyze the consequences of consequences within a bowtie frame, or the threats of threats. This is made possible with Bowtie chaining.

### 11.1. Chaining threats/consequences with top events

The software allows you to chain two or more bowties together. Chaining is the process of connecting bowties to create a sequence in which the top events logically follow each other. Chaining is done by connecting threats/consequences to top events. By doing so, a consequence in diagram X will be a top event in diagram Y, which can be a threat in diagram Z.

Before you chain the bowtie diagrams, you must create all the bowties that you want to chain. On a threat or consequence (diagram X), there is an Equivalent Top Event dropdown in the threat editor. Select the top event that is the same as that threat/consequence (diagram Y):

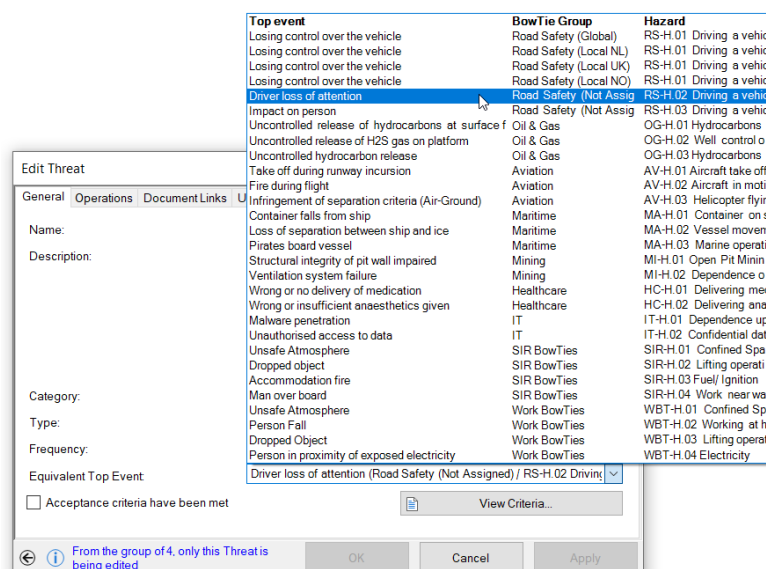

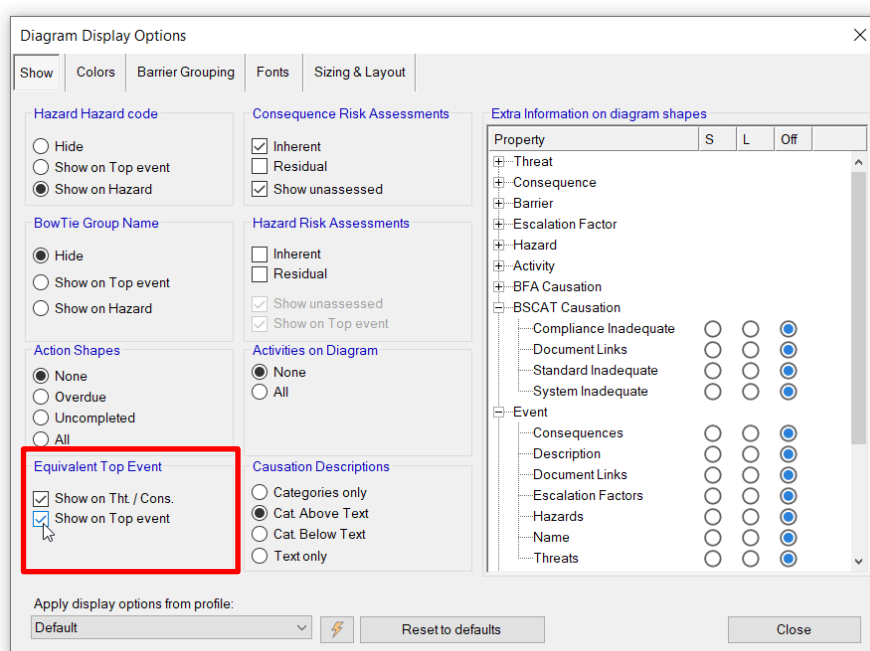


Figure 134 - Equivalent top event drop down

### 11.2. Displaying and navigating chained bowties

In the display options, on the 'Show' tab of the large eye icon , tick the bottom left two boxes under Equivalent Top Event:





**Figure 135 - Diagram display options - Equivalent top event**

On the bowtie diagram, small shaped top events will appear next to the chained threat or consequence. Hover over one of the new top event shapes and you will see a little green button appearing in the bottom right corner. Click it to switch to that chained bowtie diagram.



**Figure 136 - Chained bowtie "Go to-button"**

### 11.2.1. Bowtie chaining relationship model

**Note:** Relationship models are only available in BowTieXP advanced.

It is also possible to show the relation between the chained bowtie diagrams in a relationship model. Right click on the chained top event and chose 'Draw relationship model → BowTie chaining'. For an extensive explanation about relationship models, see Chapter 9.5 Advanced functionality: relationship models.

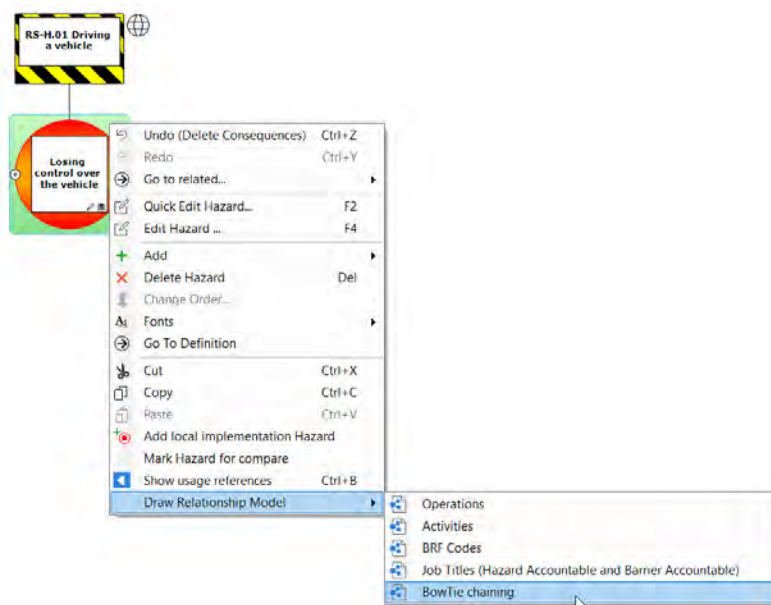


Figure 137 - Draw relationship model - Bowtie Chaining



Figure 138 - Relationship model - Bowtie chaining

### 11.3. Chaining barriers to other bowtie diagrams

Barriers can also have an equivalent top event. Conceptually speaking, chaining barriers to top events is especially useful when the barrier has many escalation factors linked to it. In such a scenario it could be better to change the escalation factors to threats in the chained bowtie diagram. Please note that chained barrier will not appear in the relationship model diagram and is also not visualized on the bowtie except as an extra info box under the barrier, like in Figure 137 - Barrier linked to Top Event.

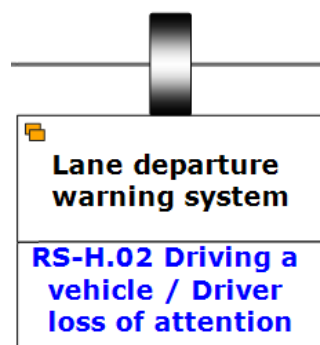


Figure 139 - Barrier linked to Top Event

# 12

## Getting data into BowTieXP

In this chapter, we examine various ways to get data into the BowTieXP application.

### 12.1. Importing entities from other BowTieXP Case Files

It is possible to import entire diagrams from other BowTieXP Case Files using the File → Import Entities option. After choosing the file you want to import, the entity selection screen is brought up. The import functionalities you have access to depend on the type of license you have; BowTieXP standard or Advanced. To find out which license you have, go to Help → About in the upper tool bar. See at Enabled Features if you have BowTieXP (which is the Standard version of BowTieXP) or Advanced BowTieXP.

#### 12.1.1. Importing entities with BowTieXP Standard

If you have the BowTieXP Standard software version, the entity selection screen will look as pictured below:

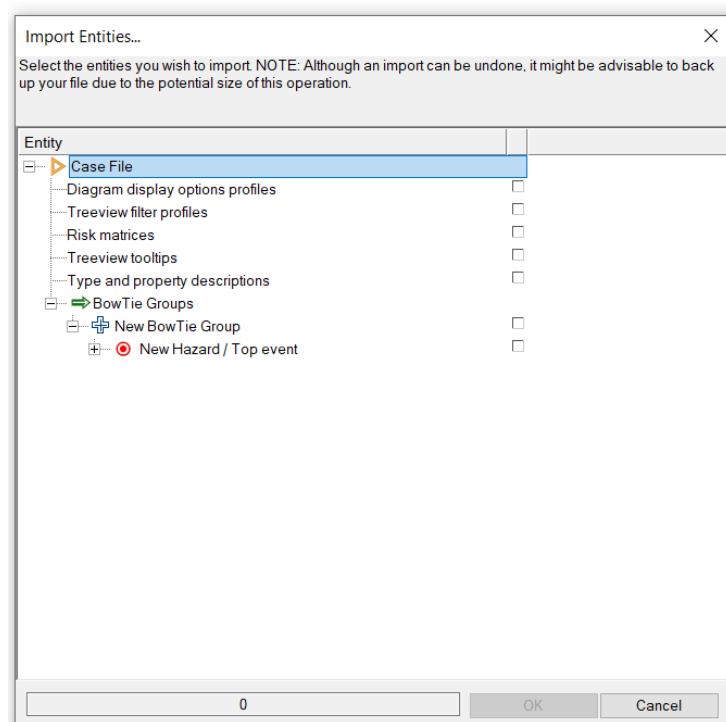


Figure 140 - Import entities window BowTieXP Standard

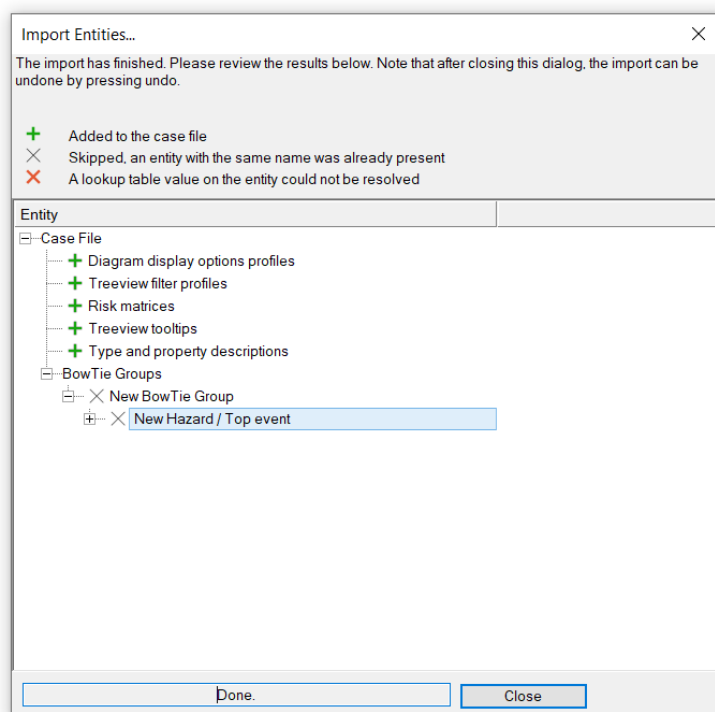
By checking the boxes to the right of the listed entities, they are selected for importing.

Note: You can right click items and choose to select the item and all its children. This is useful if e.g. you want to import all entities.

You can also import:

- Diagram Display options profiles: Chapter 17 Advanced functionality: diagram display profiles
- Tree view filter profiles: Chapter 7.11 Tree view filtering
- Risk matrices: Chapter 7.12 Risk matrices
- Tree view tooltips: Chapter 7.11 Tree view filtering
- Type and property descriptions: Chapter 20 Advanced functionality: type and property descriptions

Once your selection is complete, you can press OK to start the import. After completion, the screen will change and the results of the import operation will be shown, together with a legend at the top:



**Figure 141 - Import entities results**

Review all these results to ensure the import operation was done as you intended. Note that if the results are not as wanted, you can undo the entire import operation by pressing undo.

Note: Referenced information (e.g. information linked to barriers such as effectiveness values, activities, etc.) is not imported .

### 12.1.2. Importing entities with BowTieXP advanced

This is similar to the import as described above, except for three important differences:

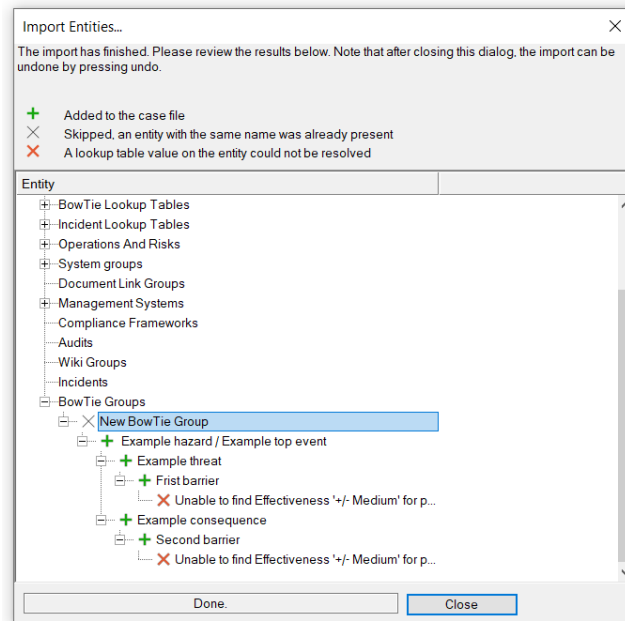
- Reference information can also be selected to import.
- Lookup table inconsistencies are resolved/will be assigned on the imported data.
- Linked entities such as activities will be resolved / the links will also be imported.

Let us clarify with an example – you want to import a hazard with some threats and barriers, and on those barriers, there are linked activities and assigned effectiveness values. Using BowTieXP Standard, it would only be possible to import the bare hazard, threats and barriers. Barriers would not have any activities assigned to them and the effectiveness values would all be set to “No Value Assigned”.

With BowTieXP Advanced, BowTieXP will try to resolve those items using data that is already present in your target file. This is done by looking for entities with the same name within the Tree view – to resolve an effectiveness value “Good”, BowTieXP looks through all effectiveness values in the target file for one named “Good”. If it is found, it will be used. If it is not found, it cannot be linked to the existing values.

For the activities the same process is performed – all activities in the target file will be searched for ones with the exact same name within the Tree view. If one is found, that one will be aligned.

The results of this search will be displayed after the import is completed. See below for an example.



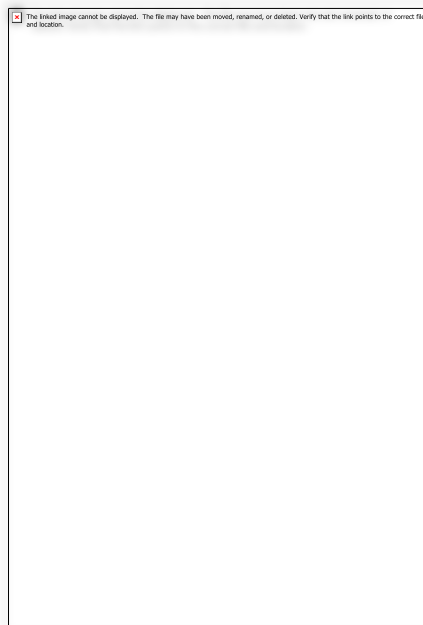
**Figure 142 - Import errors**

As you can see, some barrier types and activities were not found in the target file. You can prevent this by first importing the reference data from the Tree view. Once that is successfully done, you can import the bowties with all its content.

### 12.1.3. Copying entities from one file to another using the clipboard

In BowTieXP advanced, you can also copy information from one file to another.

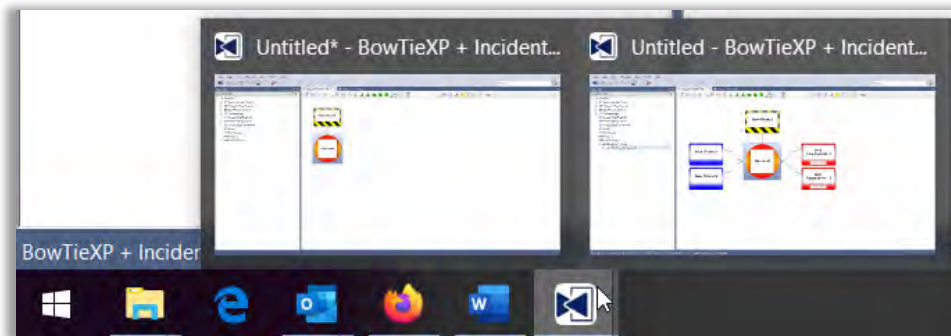
Note that resolving linked information such as activities on barriers, or effectiveness values on barriers, is done in the same manner as in the entity importer described in the previous section. BowTieXP gives you a warning of the unresolved errors.



**Figure 143 - Clipboard link resolve errors**

Let's clarify this with a small example:

1. Start BowTieXP and open the test Case File (File → Open Test File).
2. Start BowTieXP again and create a new file.
3. Notice that there are two BowTieXP windows in your taskbar.



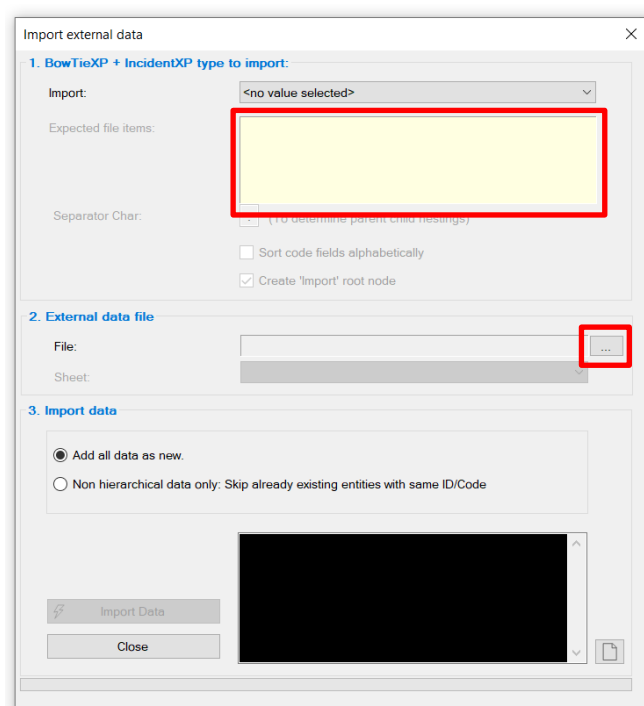
**Figure 144 - Two BowTieXP windows in the taskbar**

4. Switch to the test Case File and copy a barrier with an activity to the clipboard.
5. Switch to the blank Case File and paste the barrier on a threat or consequence.  
**A screen, like**
6. Figure 143 - Clipboard link resolve errors, pops up that shows the copy errors.

## 12.2. Importing data from Excel

It is likely that you already have a lot of reference data structures that you would like to import into the Case File you are working on. Importing between BowTieXP Case Files is possible with all editions of BowTieXP, but for importing from external software such as Excel, you need the 'Import external data' function offered in BowTieXP Advanced.

Data can be imported from Microsoft Excel, comma separated formats, tab-delimited formats and .xml files. To start the import, select File → Import External Data. The import external data dialog box is displayed.



**Figure 145 - Import external data dialog**

You first need to select the type of data you want to import. The expected layout of the file is shown in the yellow text area. For example, if you want to import effectiveness levels, the description would read:

“Records/rows with 3 fields/columns named: ‘Code’, ‘Description’, ‘LongDescription’”.

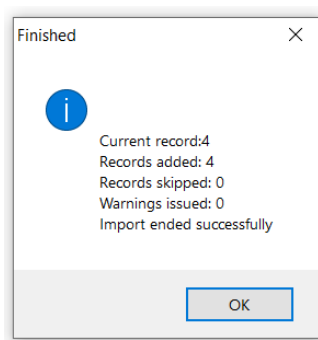
Our Excel sheet would have to look like this (note that formatting is ignored with the import):

	Code	Description	LongDescription
1			
2	--	Very poor	
3	-	Poor	
4	+	Good	
5	++	Very good	
6			

**Figure 146 - Sample Excel file for importing**

After selecting the type of data to import and reviewing if our input data is in the correct format, we can select the file we want to import. Click on the “...” button under 2. ‘External data file’ to open a file selection dialog box. After selecting the file, we can optionally choose the worksheet we want to import.

**Next, we are offered the choice if we want to skip existing entities, or add them all as new. When ready to import click the “Import data” button. The import will begin and progress will be shown in the black status area. We need to review this to see if any errors occurred. After the import is completed, a dialog will appear to tell you if the import went successfully., like in Figure 147 - Finished import external data dialog.**



**Figure 147 - Finished import external data dialog**

When importing hierarchical data, BowTieXP automatically recreates the multi-level structure based on the code field. When adding e.g. the following activities:

A1, A2, A1.1, A1.2, A1.3 and A2.1

BowTieXP will detect and create, based on the separator characters, the following structure:

- A1
  - A1.1
  - A1.2
  - A1.3
- A2
  - A2.1

If you detect any errors you want to correct after importing, you can press the undo button to undo the entire import.

## 12.3. Importing data using the Scrap book

The Scrap book also offers many options for bringing information into your Case File, either from an Excel file or from other Case Files. The Scrap book is the ideal solution if you need to import parts of a Case File which you will use to build diagrams or add in the hierarchical information – you import all the elements and then quickly start building using drag and drop.

For full details, please refer to chapter 18, Advanced functionality: the Scrap Book..



# 13

## Getting data out of BowTieXP

In this chapter, we take a look at the myriad of methods to generate information for creating reports.

### 13.1. Introduction

Putting information into Case Files is useful, but it is even better to also have the opportunity to get all the information out of the Case Files in various perspectives and formats, in order to share them with your desired audience.

In this chapter, the different methods for outputting information are discussed:




- Which reports can be generated;
- How to export information through Excel;
- How to export information using the Clipboard function;
- And how to print information from BowtieXP.
- 

### 13.2. Reporting

You can report information from a Case File in various ways using BowTieXP's built-in reporting engine. Depending on the chosen report, the format will be either in Microsoft Word (rtf) or Microsoft Excel.

#### 13.2.1. Generating a report

Follow these steps to generate a report:

1. Select Tools → Reports from the drop-down menu or use the report button  from the toolbar.
2. Click on the desired report.
3. When you select and run a report, it is automatically opened in Word  or Excel .

You can then save the report under a name and location of your choosing.

Some reports are also available from the context within the bowtie file. These include a) the barrier overview report, which can be accessed by right clicking a barrier, b) the job title overview report through clicking on a job title and c) the document links overview through clicking on a document link (Figure 148 - Overview report from barrier).

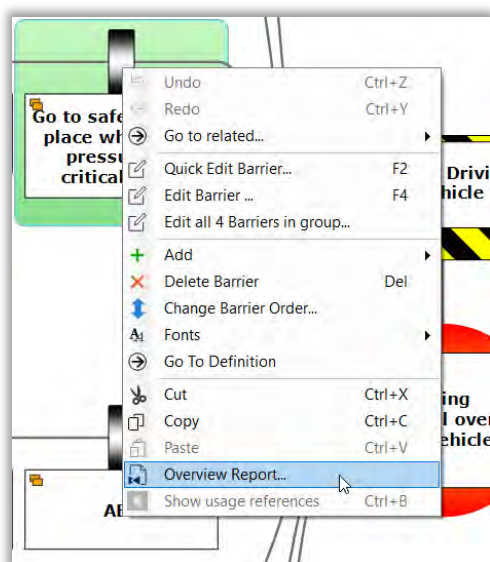


Figure 148 - Overview report from barrier

### 13.2.2. BowTieXP reports

In this section, we present an overview of all the reports that are available to you. Depending on the report you choose, you may be asked to provide additional information before the report can be generated (such as which hazards/bowties or columns to use).

#### Actions

- Actions in XL
- Actions in BowTie context
- Actions in BowTie context, condensed version
- Actions of a selection of Hazards
- All Actions
- Actions by Action party
- Actions by Priority and Action party
- Actions of a specific Action party

#### Activities

- (Advanced Only) Activities usage references by Hazard
- List of Activities with Barrier context
- Activities grouped by Activity Responsible
- Activities grouped by Activities.Responsible of a single Hazard (Alt Format)
- Activities grouped by Activities.Responsible of a single Hazard
- Activities grouped by Hazard and Activities.Responsible (Alt Format)
- Activities grouped by Hazard and Activities.Responsible
- Activities by single Activity Responsible
- All Activities
- (Advanced Only) Activities linked to Barriers as hierarchical list
- (Advanced Only) Activities linked to Barriers as hierarchical list - Filtered
- Activities linked to Barriers ordered by Activity tree order.
- (Advanced Only) Activities of a specific Operation grouped by Activity.Responsible (Short version)
- (Advanced Only) Activities of a specific Operation grouped by Activity.Responsible (Long version)
- Activities Responsible context overview

#### Audits

- (AuditXP Only) Survey results shown on BowTie diagrams, using active filtering
- (AuditXP only) Survey results in XL
- (AuditXP Only) Survey results as follow up, quantitative version
- (AuditXP Only) Questions linked to specific Hazards
- (AuditXP Only) Question Overview

- (AuditXP Only) Survey results shown on Barriers
- (AuditXP Only) Survey results
- (AuditXP Only) Individual Fill Outs
- (AuditXP Only) Create empty Survey fill out form

#### Barrier Types

- Barrier Type count of a Bowtie Group

#### Barriers

- Barrier Organizational Unit Performance
- Barrier overview report
- Flat Barrier register with customizable columns
- Barriers register with Activities
- Barriers by Hazard summary sheets
- Barrier register
- Barrier Accountable context overview
- Barrier Accountable context overview of a specific Hazard

#### Competencies

- (Advanced Only) Required Competencies for a specific Operation, grouped by Activity.Responsible

#### Document Links

- List of Document Links with Barrier context

#### Escalation Factors

- Escalation Factors sorted by Barrier Type
- Escalation Factors with Barriers of type...
- Escalation Factors without Barriers

#### Hazards

- Detailed Hazard report with optional report sections
- Flat Hazard list with customizable columns
- BowTie Chaining
- BowTie Diagrams
- Register
- Report of all Hazards – Work sheet
- Cut-out Diagrams
- Register with Activities, Document Links and Systems
- Traditional Hazard register
- Report of a specific Hazard, long version
- Report of all Hazards
- Short summary list of Hazards

#### IADC HSE Case Guidelines

- (Advanced Only) Hazard register complete
- (Advanced Only) Hazard register without Activities

#### Incident Diagram

- (IncidentXP Only) Graphical timeline breakdown
- (IncidentXP Only) Incident Timeline Event grid
- (IncidentXP Only) Timeline Events
- (IncidentXP Only) Report on all Incident Barriers

#### Incident Diagrams Bfa

- (IncidentXP BFA combined with BowtieXP Only) Barriers linked to Incidents

#### Incident Diagrams BSCAT

- (IncidentXP BSCAT combined with BowtieXP Only) Barriers linked to Incidents

#### Incident Diagrams RCA

- (IncidentXP RCA combined with BowtieXP Only) Barrier count per RCA Event Category

- (IncidentXP RCA combined with BowtieXP Only) Barrier count per RCA Event kind
- (IncidentXP RCA Only) RCA Event Category profile

#### Incident Diagrams Tripod

- (IncidentXP Tripod Beta combined with BowtieXP Only) Barriers linked to Incidents
- (IncidentXP Tripod Beta Only) Tripod breakdown
- (IncidentXP Tripod Beta Only) Tripod Overview
- (IncidentXP Tripod Beta Only) BRF Code profile

#### Incidents

- (IncidentXP combined with BowtieXP Only) Incident Barrier State counts

#### Job Titles

- Job Title count per Hazard
- Job Title Overview

#### Lists

- (IncidentXP RCA Only) RCA Event Categories
- (IncidentXP BFA Only) BFA lists
- (IncidentXP Tripod Beta Only) Tripod category lists
- (IncidentXP BSCAT Only) BSCAT lists
- (Advanced Only) BowTie register report for data export
- Barriers
- Document Links
- Activities
- Competencies
- Job Titles
- Systems
- Threats and Consequences

#### LOPA

- (LOPA plugin Only) BowTie Method Overall
- (LOPA plugin Only) LOPA scenario overview and segments (BowTie method) per Hazard
- (LOPA plugin Only) LOPA Classic Scenario Analysis
- (LOPA plugin Only) LOPA classic summary with related open Actions
- (LOPA plugin Only) LOPA Risk assessment summary sheet, opens in XL

#### Operations

- (Advanced Only) Operations overview

#### Other

- Lookup references
- (Advanced Only) BowTie report from template
- Color Legends
- Report on Barrier BRF Codes
- Contents of Case File overview

#### Risk Assessment

- Report Risk Assessment Matrix Definitions
- Report Risk Assessment matrices (Top event)
- Aggregated Top event Risk Assessments
- Aggregated Risk Assessments
- Aggregated Consequence Risk Assessments
- Consequences ordered by Risk Assessment
- Report Risk Assessment Matrices

#### SOOB Matrices

- (Advanced Only) Soob Matrix report

#### Systems

- (Advanced Only) Systems linked to Barriers

- Systems linked to Barriers Ordered by System lookup table order

### 13.2.3. Report from template

It is possible to define a company template report, complete with logos, fonts and other styling and fill that with information from a bowtie file, using tags that are inserted into the template.

To create a custom template, follow these steps:

- Open Word (for this example, we will use Word 2016).
- Go to File > Options > Customize Ribbon.
- Make sure the “Developer” option is ticked in the Main Tabs section.

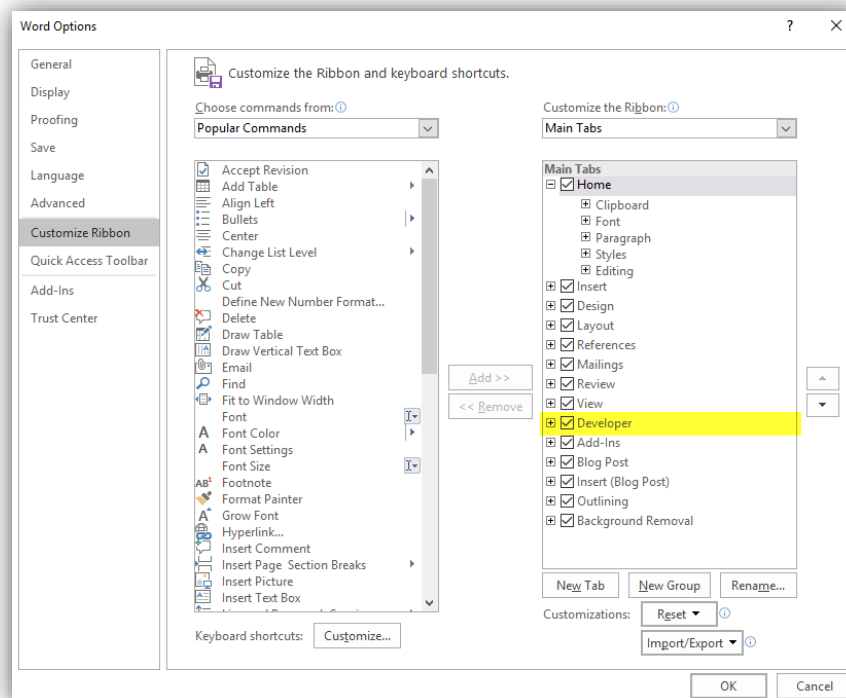


Figure 149 - Microsoft Word - Customize Ribbon

- Open the Developer tab. You can add fields with the “Aa” icon. The tooltip describes it as a “Plain Text Content Control”.

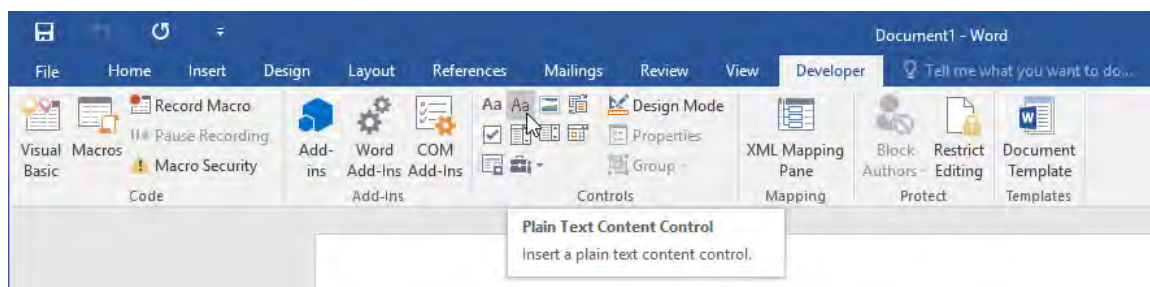


Figure 150 - Microsoft Word - Plain Text Content Control

- The field will look like this:

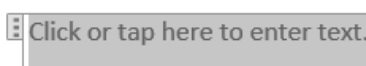
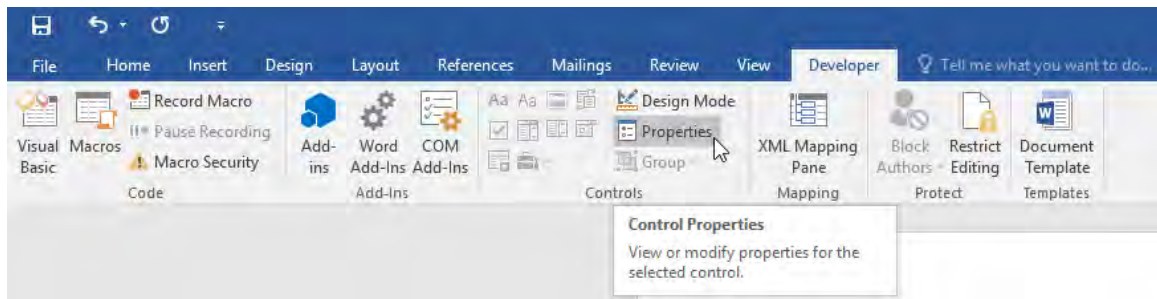


Figure 151 - Microsoft Word - Plain Text Content Control (2)

- To make sure the field is filled with the right data, select the field and click “Properties” in the ribbon.



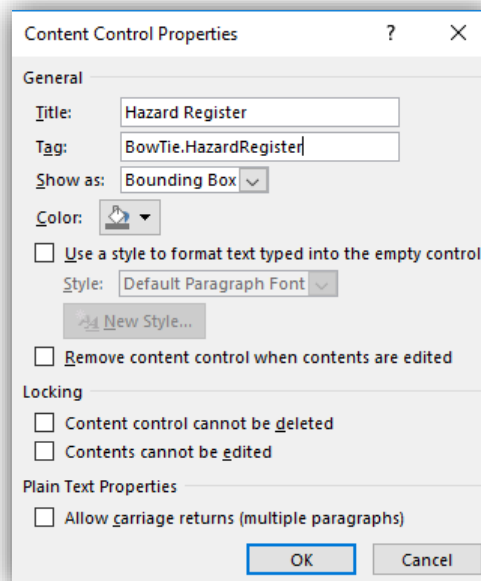
**Figure 152 - Microsoft Word – Content Control Properties**

- After naming the tag, you can insert one of the tags that are available (see Table below) in the Tag field. If you want to see these tags in the document, switch on the “Design Mode”.

Available tags:

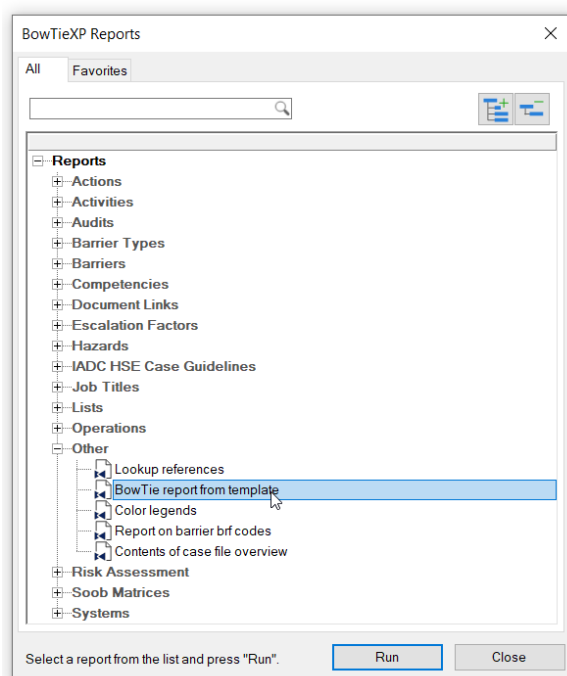
1. BowTie.HazardRegister
2. BowTie.BarrierRegister
3. BowTie.AllDiagrams
4. BowTie.Actions
5. BowTie.JobTitles
6. BowTie.Activities
7. BowTie.DocumentLinks
8. BowTie.Systems
9. BowTie.ThreatsAndConsequences
10. BowTie.ActivitySummaries
11. BowTie.BarrierSummaries

Add the tags to the Content Control Properties:



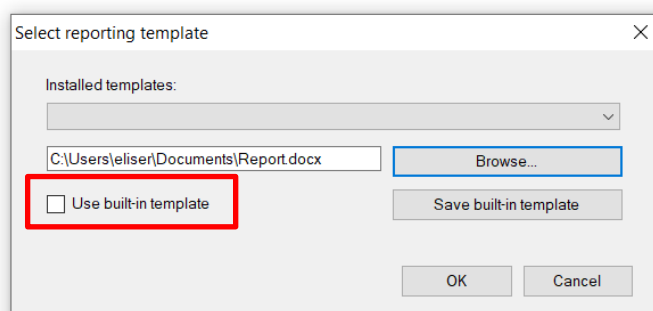
**Figure 153 - Microsoft Word – Content Control Properties (2)**

- Save your template and close Word. You cannot run the report while it is opened in Word.
- In BowTieXP, go to Tools → Reports → Other → BowTie report from template.



**Figure 154 - BowTie report from template**

- Choose the bowtie(s) you want to include in your report. After you have selected them, a dialog appears.



**Figure 155 - Selecting reporting template**

- Make sure "Use built-in template" is deselected and click "Browse" to select your template.
- Click OK to run the report.

You can edit and change the report, then update the tags by selecting the same word file again. All fields will then be updated, without changing any other information.

### 13.3. Export to Excel button

In various places within the software, an Excel button is offered to export that particular information to excel. This is an overview of all possible options.

#### 13.3.1. Exporting the Tree view

The Tree view can be exported listwise to Excel - by clicking the small Excel icon in the top right corner of the Tree view, all content is exported to Excel.

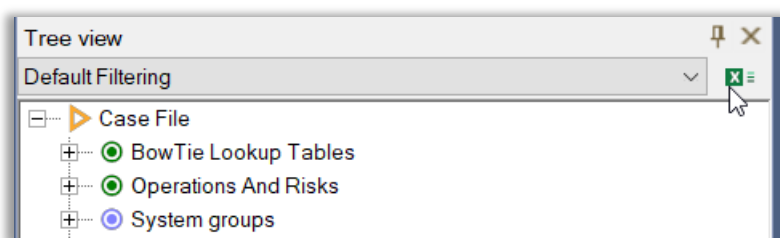


Figure 156 - Tree view export to Excel

### 13.3.2. Exporting a Case File overview

The Case File overview, discussed in section 9.2, Case overview, offers many views on the different relations throughout your data. These views can serve as material to base external reports on, by exporting its content to Excel.

You can open the Case Overview by clicking on View → Windows → Case Overview. Select the Overview you want to see and export this one to Excel.

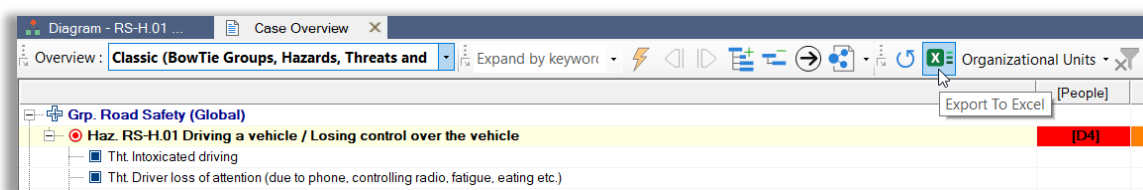


Figure 157 - Caseoverview export to Excel

### 13.3.3. Exporting a quality check list

Similar to the Case File overview, the quality checks (discussed in section 9.3, Quality checks) also offer various lists which can be exported to Excel and serve as a basis for reports.

You can open Quality checks by clicking on View → Windows → Quality checks. Select the desired overview and export this to Excel.

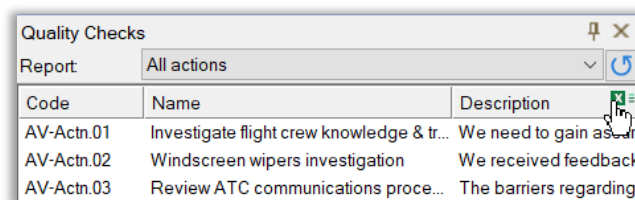


Figure 158 - Quality checks export to Excel

### 13.3.4. Exporting the listview

The listview can be used to export lists of variables to Excel as well – for example, to create a list of all job titles, you can select the job titles container in the Tree view: the listview will show all the job titles contained in it. This list can be exported to Excel by clicking the Excel button. Please refer to section 7.9.1, Exporting to Excel for more details.



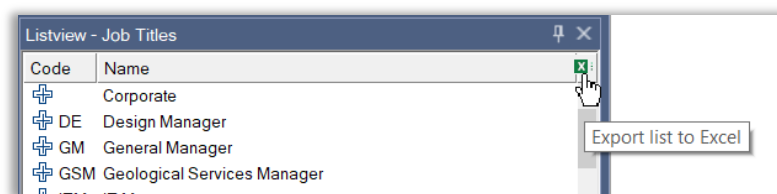



Figure 159 - Listview export to Excel

### 13.3.5. Exporting Case File comparison

A Case File compare can be exported by using the export to Excel button in the center of the results window. Go to Files → Compare Case Files and run a comparison to find the button to export the compare results to Excel. Results can also be exported as a list format by going to the Script view tab and clicking the export button  there and choose which export to run (as there are multiple options).

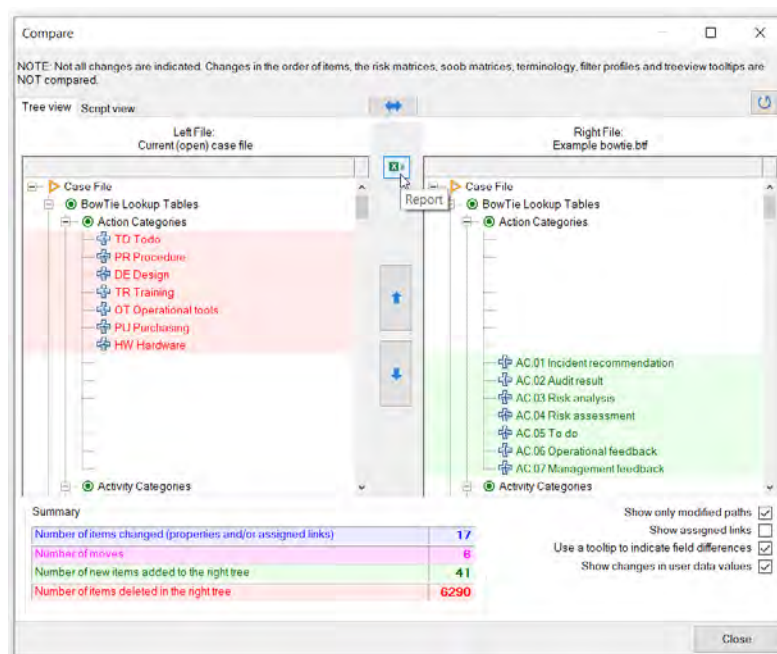




Figure 160 - Compare Case Files export to Excel


## 13.4. Exporting the diagrams

The main diagram as well as the relationship diagrams can be exported through various applications. There are three exports to choose from:

- Save diagram as: this will export the diagram as a bitmap, such as .png or .jpg. (Diagram → Save Diagram As.. or use the  button)
- Copy diagram to clipboard: this will copy the diagram to the clipboard as an .emf ()
- Export to Visio: this will output the bowtie diagram as a .vsd Visio drawing (Diagram → Export to Visio). Note that this export will only export the basic diagram picture and does not include any additional information such as reference data. Also, not every shape is supported. A valid Visio 2002 or higher is required to make use of this export functionality, since BowTieXP uses a Visio 2002 stencil to export the diagram towards. Make sure that your [Microsoft Office Trust Center](#) settings allow accepting and opening Visio 2002 stencil types.

Note that you can customize the view of the diagram for exporting by means of the selective visibility filter. See section 7.5.4.1, Selective visibility filter for details.

## 13.5. Exporting the color legend

If you are using colors on the diagram shapes, you can also copy the diagram color legend to the clipboard. Make sure you can see the legend by clicking on View → Windows → Color Legend and choose a variable to depict. Click on the copy to clipboard button  to export.

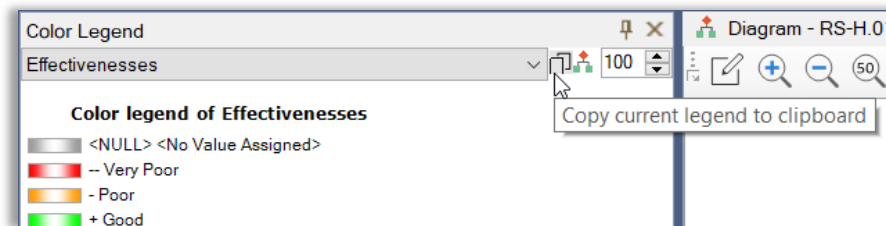


Figure 161 – Exporting the color legend

## 13.6. Printing

There are two main ways of printing a bowtie diagram using BowTieXP. In this chapter, we will discuss both methods, along with their respective advantages and disadvantages.

The standard printing functionality for BowTieXP can be found in the File menu. It is sufficient to use for quickly printing a diagram. For more printing options, see Chapter 13.6.2, Printing with Copy to clipboard. Copy to clipboard has several advantages over the basic printing functionality.

### 13.6.1. Printing from File menu

To print a bowtie diagram, go to File → Print. The diagram you have currently selected will be printed.

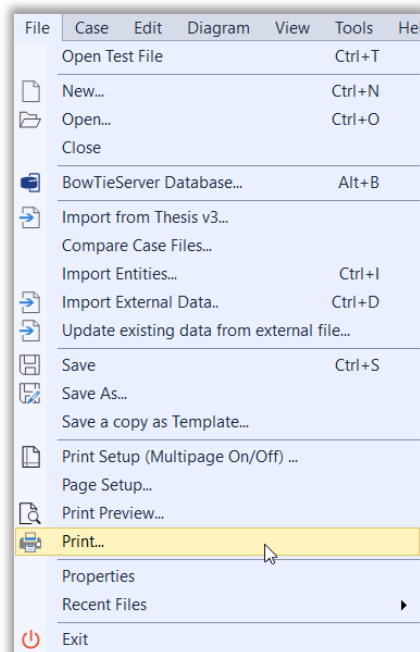


Figure 162- Print in the File menu

The print dialog is basic and should look familiar to other applications. It allows you to select a printer, the print range, the number of copies and printer specific properties before clicking OK to print.

### 13.6.1.1. Print setup

There are several options in printing the diagrams in Print Setup. It is possible to shrink the diagrams to a single page, center the diagrams and set a zoom level. Go to File → Print Setup (Multipage On/Off...) to customize this.

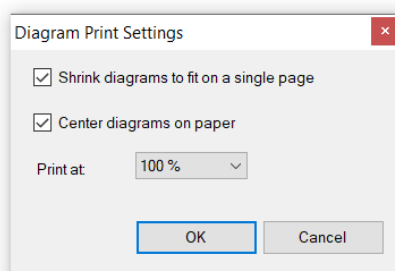


Figure 163 - Print setup

### 13.6.1.2. Page setup

It can be convenient to control the size and orientation of the paper to print on, so BowTieXP can optimize the size of the bowties. This can be controlled in the Page setup window (File → Page Setup).

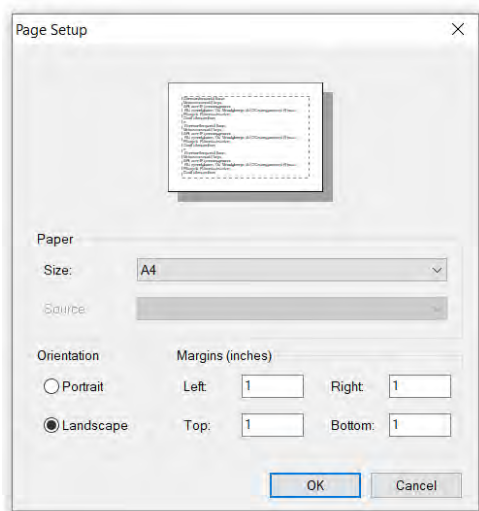


Figure 164 - Page setup

### 13.6.1.3. Print preview

The print preview allows you to see what and how it will be printed. If the option 'Shrink diagrams to fit on a single page' in Print Setup (Multipage On/Off...) is not selected, you can click on 1, 2, 4, 6, 9 or 12 to choose the number of pages to print your bowtie on.

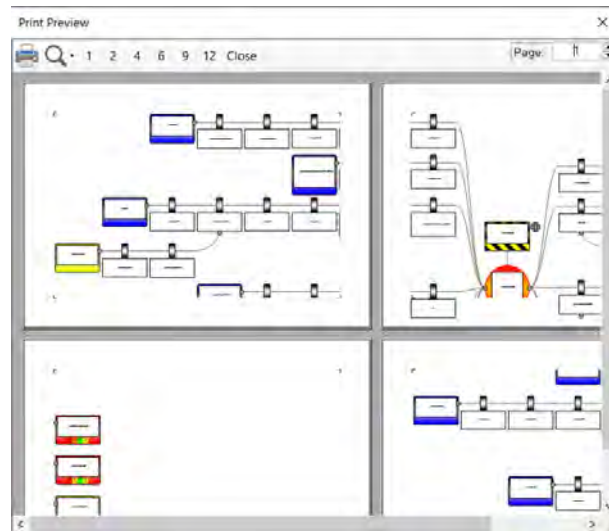


Figure 165 - Print preview

### 13.6.2. Printing with Copy to clipboard

You can find the Copy to clipboard button in the toolbar:

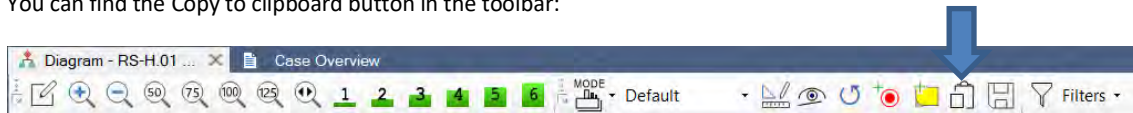


Figure 166 - Copy to clipboard button in toolbar

If higher quality export is required, it is possible to increase the resolution of the diagram that is copied to the clipboard. Go to Tools → Options → Reports. There is an option to increase the size of exported diagrams (see Figure 167 - Change size of diagram for copy to clipboard). The default value is 1, but it can be increased to a maximum of 4.

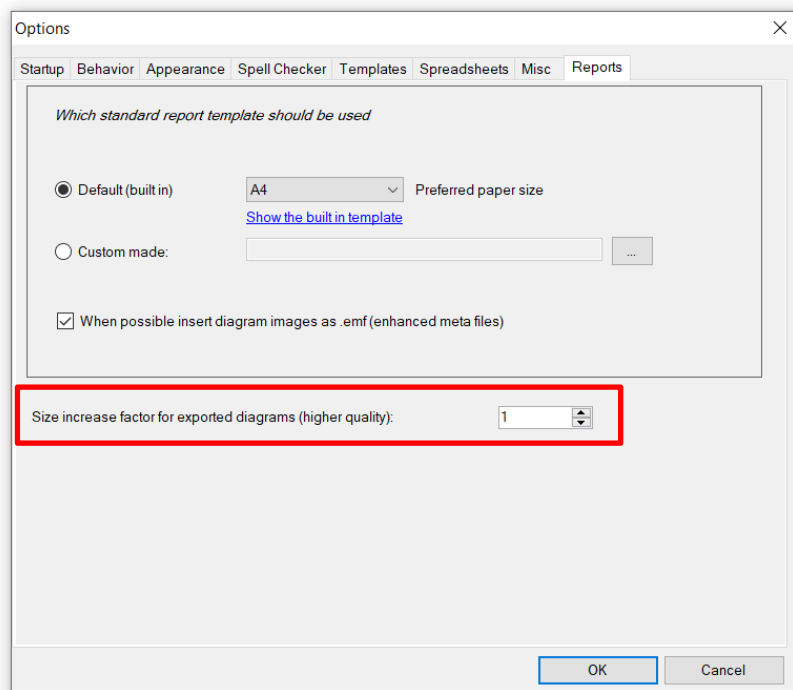


Figure 167 - Change size of diagram for copy to clipboard

Paste in PowerPoint, Word or any graphical program of your choice.

# 14

## Working with templates

BowTieXP contains a file template mechanism that allows you to distribute templates for new Case Files. This chapter explores this functionality.

### 14.1. Introduction

Every file you create using BowTieXP can be used as a template to create new files from. All that is needed is to place your template file in the right directory. The next time you want to create a new file, BowTieXP will ask you if you want to base it on any of the available templates.

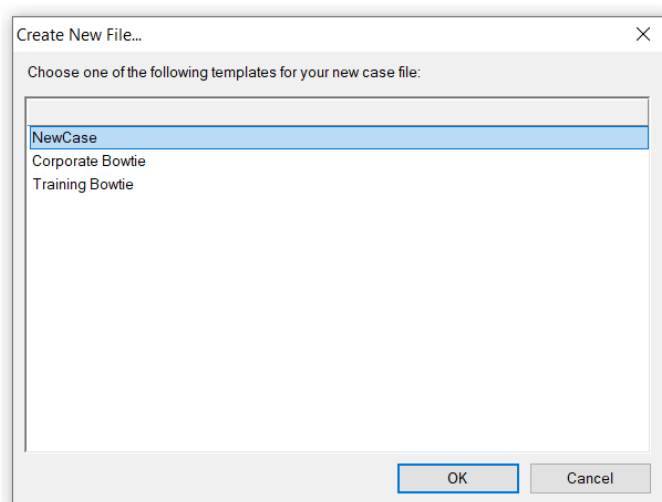


Figure 168 - Selecting a template

In the example above, we see that we can create a new file either based on the built-in “NewCase” template, or based on our own “Corporate Template” or “Training Template”.

### 14.2. Creating a template

In order to create a template, we first have to create a Case File containing all relevant information. The most important things are:

- Lookup table values, notably the effectiveness values, barrier types
- The activities hierarchy as defined within your organization, including other important related info such as job titles and activity categories
- The (customized) risk matrices
- Tree view filter profiles
- Display profiles
- Custom terminology

If you plan to use Soob, you will want to set up the operations and related tables located under the “Operations and Risks” node. If you plan to use document links, setting those up in the right hierarchy is important.

Some organizations also work with reference bowties or have dedicated lists of hazards and top events. Such reference information is best put into a separate bowtie group, named e.g. "Reference Hazards".

### 14.3. Installing a template

After creation of the file is complete, you will need to get it into the templates directory. The easiest way to do this is to select File → Save a Copy as Template. You can also place files in the template directory manually: Click the Help→Go to Templates directory to open the directory in Windows Explorer.

Place your file in the templates directory and it will be available next time you create a new Case File.

### 14.4. Deploying templates along with the exe

You can also place the .btf files in a directory called "Templates" located in the same folder as the executable. They will be automatically picked up and built-in templates will be hidden.

This is handy for system administrators who want to deploy a template along with the software.

### 14.5. Downloading templates from a central location/repository

Apart from manually placing files in the template directory, you can also configure BowTieXP to automatically download them from a central location and relocate them for you.

BowTieXP can handle the following location types:

- Normal file paths (drive letter, path and filename like Z:\path\to\file.btf)
- UNC paths (network paths like \\servername\sharename\path\to\file.btf)
- http or https URLs (www locations)

---

**Note:** BowTieXP supports username and password embedded in the URL.

**Example:** <http://user:password@site.com/>

**Please be aware that these will be stored unencrypted on disk.**

---

Adding and modifying the entries is done by opening the template configuration by going to Tools → Options → Templates. Click on Configure automatic template downloading.. and choose the appropriate option such as add, edit, remove, etc. The interval between checking for updated templates is customizable. Granularity is in days.

### 14.6. Hiding built-in templates

Normally the built-in Case File is displayed too. Some companies may want to hide this to ensure the corporate template is used and the built-in template is not accidentally chosen. This can be accomplished by means of unchecking the "Use built in new Case Files templates too" checkmark under Tools → Options → Templates.

### 14.7. Filtering on language

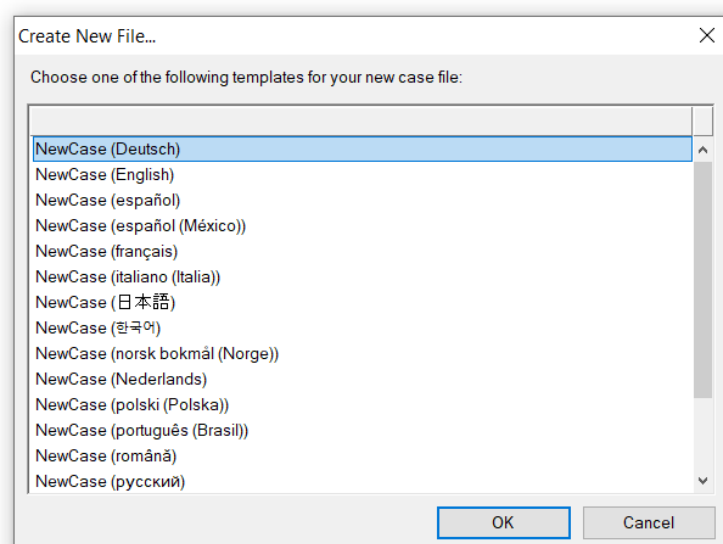
BowTieXP supports multiple languages and because of this, there's a new Case File template built into BowTieXP for each supported language. Normally you will only see the one for the language that you are currently using. If you would like to see them all, you can uncheck the "Filter out known languages" checkbox under Tools → Options → Templates. This will show all the available templates when you restart BowTieXP.

This mechanism also works for your template files. If you want to work with templates in multiple languages, you can use this mechanism to do so. BowTieXP detects in which language a template file is supposed to emerge by means of the filename. If you format your filename correctly, BowTieXP will execute this accordingly.

The format for the filename is: Filename.LanguageCode.btf

The language code is separated from the filename by a period ('.'). Language codes supported in BowTieXP at the current time are:

Language Code	Language
De	German
En	English
Es	Spanish
es-MX	Spanish (Mexico)
Fr	French
It-it	Italian
Ja	Japanese
Ko	Korean
nb-NO	Norwegian (Bokmal)
Nl	Dutch
pt-BR	Portuguese (Brazilian)
Ro	Romanian
Ru	Russian
zh-CHS	Chinese (simplified)



**Figure 169 - Localized templates**

# 15

## Overview of fields and purposes

This chapter highlights some of the commonly used data fields and their purposes.

### 15.1. Introduction

BowTieXP contains a large range of functionality and therefore has a large range of fields. Although most data fields can be renamed and customized to fit any need, the fields come with default names and are there with an intended purpose. In this chapter, some of the more commonly used fields are listed and their intended purpose is described.

The **grey background** indicates that this field is mainly used or best used with BowTieServer. More information about those fields can therefore be found in the BowTieServer manual.

### 15.2. Fields on bowtie groups

Name of field	Intended purpose	Examples and references
BowTie Group Name	Main information about the bowtie group.	-
Threat A.C.	Define company criteria on how to correctly define a threat. If the element complies with the criteria, a box can be ticked.	"A threat must not be a barrier failure. A Threat must lead directly to the Top Event."
Escalation Factor A.C.	Define company criteria on how to correctly define escalation factors. If the element complies with the criteria, a box can be ticked.	"Escalation factors must only be used to highlight exceptional circumstances."
Consequence A.C.	Define company criteria on how to correctly define consequences. If the element complies with the criteria, a box can be ticked.	"Consequences should be described as an occurrence rather than damage."
Barriers A.C.	Define company criteria on how to correctly define barriers. If the element complies with the criteria, a box can be ticked.	"A barrier should be individually capable to stop the incident."
Organizational Units	Identify a site or department for which these bowties are relevant.	Amsterdam, Paris, Drilling Rig A, Refinery, Maintenance Hangar 12 etc. Also, see Chapter 23.2.
User Data	Define keys and specific values that are do not exist in the lookup table.	-



Attachments	Used to upload files and pictures so they can be referred to in long description fields.	For more information about attachments in description fields, please refer to the BowTieServer manual.-
-------------	--	---

### 15.3. Fields on Hazards / Top-Events

Name of field	Intended purpose	Examples and references
General	Main information about the hazard/top event.	"Driving a car", "Losing control over the car", etc.
Risk assessments	Risk assessment for the hazard/top event.	See Chapter Risk matrices7.12 Risk matrices.
Sign off	Workflow to indicate that a Build Phase has been completed and approved.	Define Build Phases in Bowtie Lookup Tables
Headers and Footers	Display the header and footer when copying the diagram and paste it elsewhere.	-
Revision info	Track how often the Bowtie has been updated plus room for notes and display the author of the bowtie.	-
Other	Indicate for which modules and processes the Bowtie is used and to what global bowtie it is connected.	-
Lopa (LOPA plugin Only)	Set the LOPA settings for the hazard/top event	-
Operations	Indicate for which operations the Bowtie is relevant. Used in SOOB matrices functionality.	See Chapter 21 Advanced functionality: Soob matrices.
Document links	Link documentation to the hazard/top event.	-
User data	Define keys and specific values that is not in the lookup table.	-

### 15.4. Fields on Threats

Name of field	Intended purpose	Examples and references
General	Main information about the threat.	"Slippery road conditions", Category: Environmental, etc.
Lopa (LOPA plugin Only)	Set the LOPA settings for the threat.	-
Operations	Indicate for which operations this Threat can be expected. Used in SOOB matrices.	See section 21.
Document links	Link documentation to the threat.	-
User data	Define keys and specific values that is not in the lookup table.	-

## 15.5. Fields on Consequences

Name of field	Intended purpose	Examples and references
General	Main information about the consequence.	"Crash into water", Medium concern, etc.
Risk assessments	Risk assessment for the hazard/top event.	See Chapter Risk matrices7.12 Risk matrices.
Lopa (LOPA plugin Only)	Set the LOPA settings for the consequence.	-
Operations	Indicate for which operations the consequence may be expected. Used in SOOB matrices.	See section 21.
Document links	Link documentation to the consequence.	-
User data	Define keys and specific values that is not in the lookup table.	-

## 15.6. Fields on barriers

Name of field	Intended purpose	Examples and references
General	Main information about the barrier.	"Fire extinguisher", Effectiveness: good, etc.
Performance	Used to set actual effectiveness values per organizational unit.	London: very good, Amsterdam: good etc.
Lopa (LOPA plugin Only)	Set the PFD for the barrier.	-
Activities	More specific detailed tasks that need to be executed in order for a barrier to be fully functional.	Perform maintenance on valve, inspect valve, etc.
Systems	Link systems to indicate that barrier is part of a collection or rely on certain systems.	Fire suppression systems, evacuation plans, relies on electricity, relies on radio contact.
Objectives	Link objectives to indicate which barriers represent a part of a compliance framework.	See Chapter 25 Compliance frameworks.
User systems	Link systems to indicate that barrier is part of a collection or rely on certain systems.	See Chapter 22 Advanced functionality: Live on/offline system states.
Questions	Used for AuditXP.	See Chapter 24 AuditXP add-on.
Wiki pages	Link wiki pages to barriers.	See Chapter 23.8 Wiki pages.
Document links	Link documentation to the barrier.	-
User data	Define keys and specific values that is not in the lookup table.	-
Audit results	View all results that are related to the questions linked to this specific barrier.	-

## 15.7. Fields on Escalation Factors

Name of field	Intended purpose	Examples and references
General	Main information about the Escalation Factor.	"Forgetting to wear seatbelt", category: human factor, etc.
Document links	Link documentation to the escalation factor.	-
User data	Define keys and specific values that is not in the lookup table.	-

# 16


## Advanced Functionality: Visual Barrier Grouping

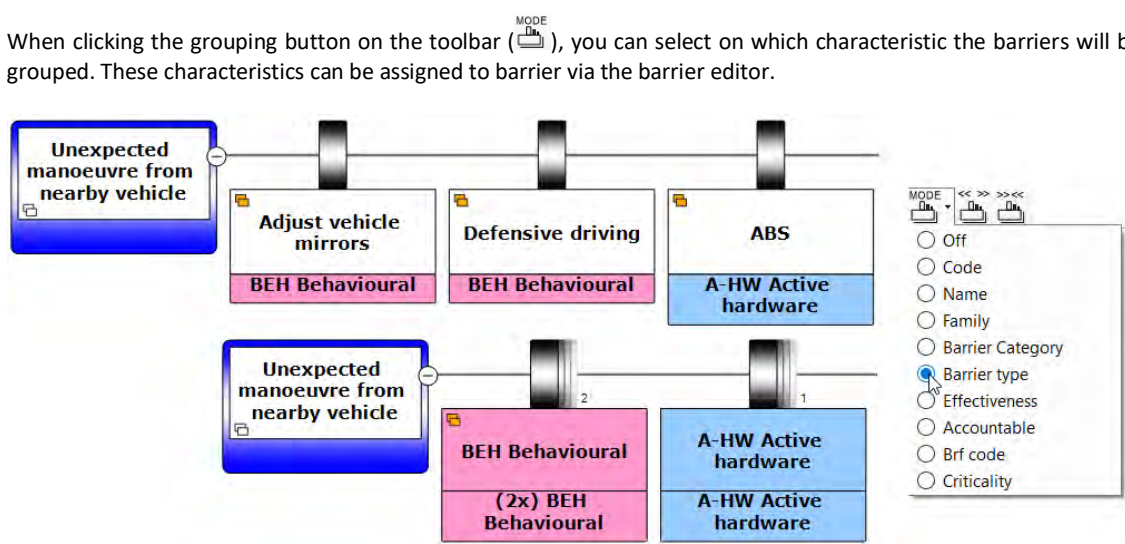
In this chapter, we will visually bundle together barriers that share a similar characteristic.

### 16.1. Introduction

When analyzing highly complex processes within an organization, the resulting bowties can become quite large and will have many different barriers on them. One way of keeping the overview is by using the Visual Barrier Grouping function, which visually bundles barriers together based on a common characteristic that those barriers have. This feature can be used to quickly get an overview of (amongst others) the distribution of barrier types and accountabilities throughout a bowtie.

### 16.2. Bundling characteristics

When clicking the grouping button on the toolbar (MODE ) , you can select on which characteristic the barriers will be grouped. These characteristics can be assigned to barrier via the barrier editor.



**Figure 170 - Barriers bundled by the Barrier Type characteristic using the barrier families button.**

Most of these characteristics are the dropdown fields. However, the Family field is a free text field within the barrier editor that has been added for these bundling purposes. Barriers can be bundled by family name if those barriers share the exact same family name.

You can enter the family name through the barrier editor. Double click on barrier top or use the pencil icon to open the barrier editor. Fill in the family name in the field highlighted in the picture below.

**Edit Barrier**

General Performance Lopa Activities Systems Objectives User Systems Questions Wiki Page

Code:

Name:

Description:

[\(edit in popup\)](#)

**Family:**

Barrier Category:

Barrier type:

Effectiveness:

Accountable:

Brf code:

Criticality:

Equivalent Top Event:

Global barrier:

Verification:

[\(edit in popup\)](#)

☐ Acceptance criteria have been met [View Criteria...](#)

Figure 171 - Barrier editor family name

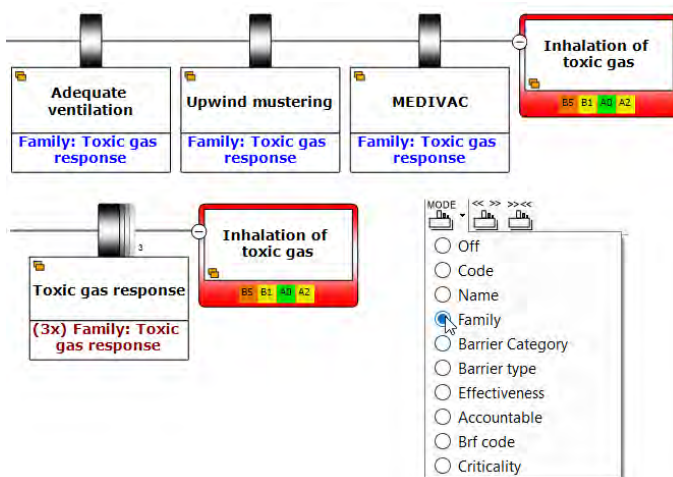


Figure 172 - Family name bundling

### 16.3. Display options on groups

Once barriers are bundled, each individual bundle can be expanded by using the plus button that appears on top of the group when you hover over it. Collapsing them can be done via the minus button that appears when hovering over one of the expanded shapes. The small number next to the bundle shape represents the number of barriers contained in that bundle.

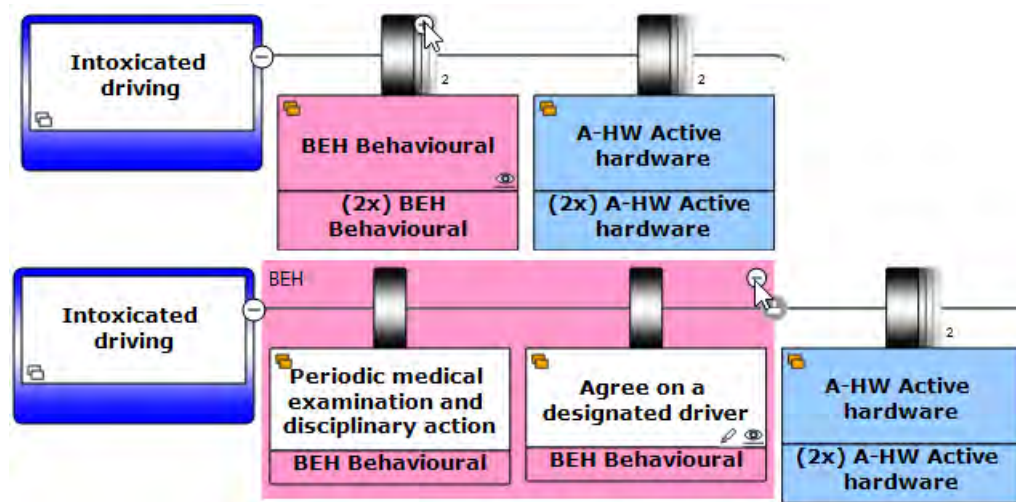


Figure 173 - Splitting out barrier bundles

All bundles together can be expanded or collapsed using the buttons on the toolbar that appear as soon as a bundling characteristic is selected:



Figure 174 - Expand and collapse all bundles

A bundle shape does not contain any information on itself; it only displays the information of underlying shapes. For example, when displaying effectiveness values under a barrier bundle, the effectiveness's of all the underlying barriers will be listed underneath.

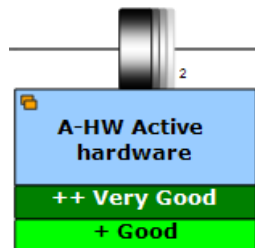


Figure 175 - Barrier bundle showing the effectiveness values of its barriers.

Note: For consistency's sake, barriers that are alone in a group will also be displayed as bundle with the name of the barriers' characteristic. By pressing the plus symbol, its original name will be shown.

# 17

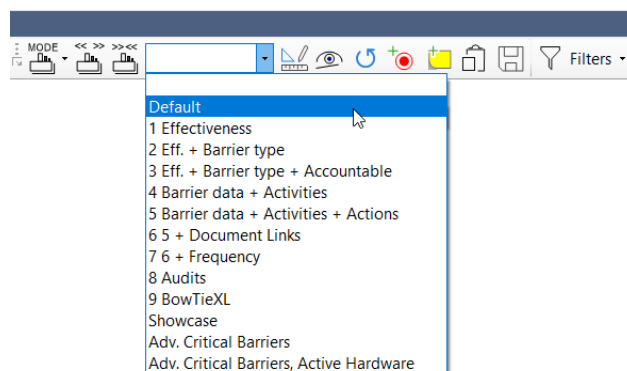
## Advanced functionality: diagram display profiles

In this chapter, you'll learn how to set up diagram display profiles to quickly switch between modes.

### 17.1. Introduction

As the number of configurable display options has grown very large over time and setting up the exact desired display over again takes up quite some time, diagram display profiles were introduced.

Each Case File can hold a list of diagram display profiles, enabling you to easily switch between them using the profile drop down box in the diagram toolbar:




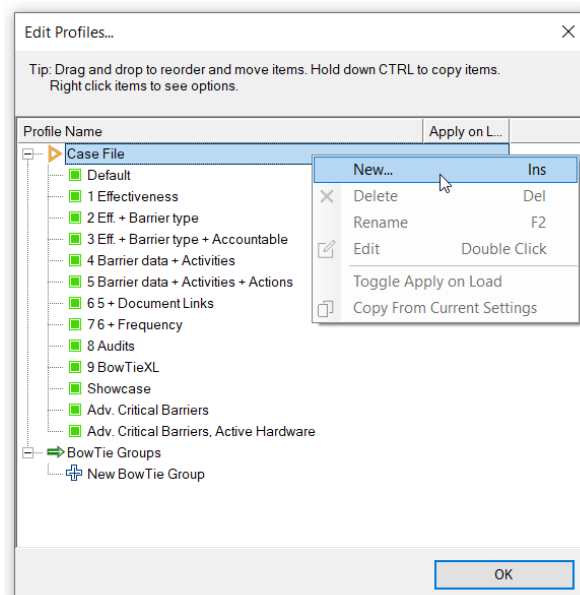
**Figure 176 - The diagram display profiles drop-down box**

Note: it can be very handy to set up a profile per task – this allows you to progress with your work quickly.

### 17.2. Creating a profile

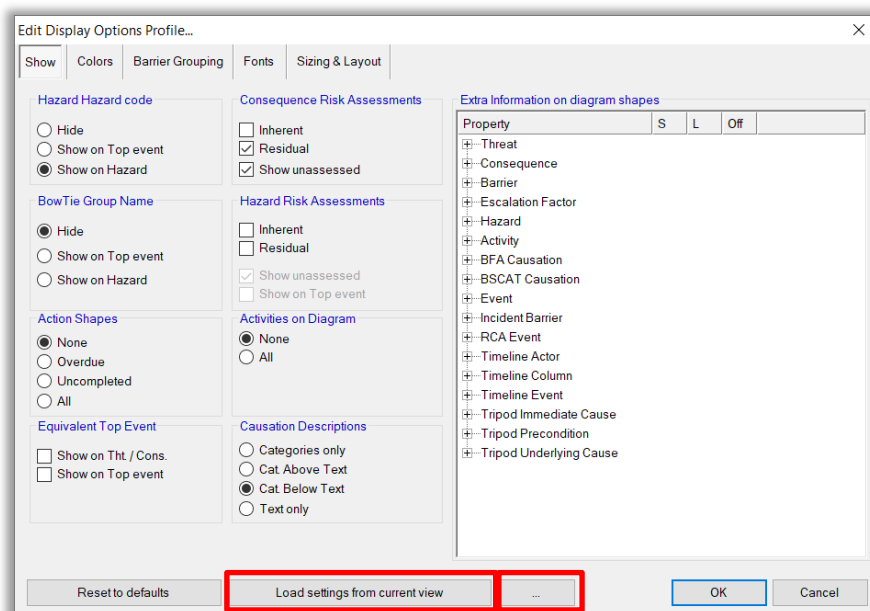
Due to the large number of settings, bundling these up into profiles saves a lot of time. To create a profile based on the current configuration, take the following steps:

1. Press the profile button (  ) to bring up the profiles dialog box:



**Figure 177 - Diagram display profiles window**

2. Right-click on Case File, select New and type in a name to add a profile that will be available for all bowties in that particular Case File.
3. Double click the new profile that was added to the list. This will bring up the actual profile:



**Figure 178 – Edit display profile**

4. Press the “Load settings from current view” button to load the current configuration into the profile. **You can further customize the profile, or optionally add an advanced filter through the “...” button (see**
5. **Figure 178 – Edit display profile).** To know more about how the filters work, see Chapter 7.5.4 - Filtering the diagram.
6. Click OK to close the dialog.

The new profile is now available in the drop down to quickly switch to, and will be saved in your Case File.



An additional feature is to create profiles that are only accessible within a specific bowtie group. To add these, instead of right clicking the Case File, right-click a bowtie group name to add a new profile. These profiles will only be available for the bowties within that group. To move profiles around, you can simply use drag and drop.

It is also possible to select a profile that should be loaded automatically when the file is opened. This can be convenient to make sure people the data you want them to see. To select the profile that should be loaded on start-up, right-click a profile and select "Toggle Apply on load". The second column will indicate with a small asterisk sign which profile is currently set to auto-load.

### 17.3. Importing profiles from a different Case File

Display profiles can also be imported from other Case Files using File → Import entities.

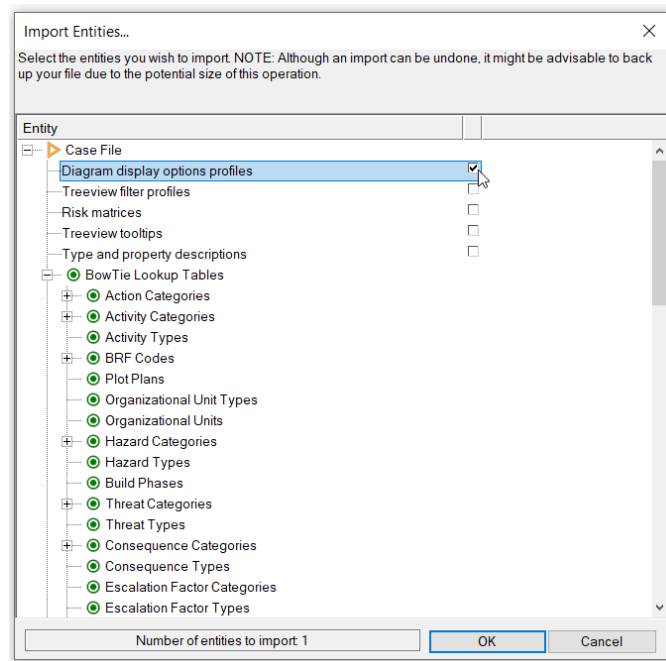


Figure 179 - Importing diagram display profiles

# 18

## Advanced functionality: the Scrap Book

In this chapter, the different Scrap book functionalities will be explained

### 18.1. Introduction

BowTieXP advanced also offers a functionality called the Scrap book. A dockable window that allows you to:

- Copy entities there to keep them around for a while, and later drag them back into any Case File (might even be a different one).
- Drop data files (Excel, BowTieXP) and read the info from them into BowTieXP.
- Convert items from one type to another.
- Items that cannot be given a place within the current Case File yet can be temporarily stored.
- Store frequently used items - e.g. make a short list of frequently assigned activities.

Items on the Scrap book such as Bowtie Groups, Hazards and Consequences can serve as templates. When you drag an item from the Scrap book onto a bowtie diagram, a copy is made which is placed in the Case File. Because the content of the Scrap book is independent from your Case Files, you can use it to build a library of often-used templates. You can also place reference information in the Scrap book, such as activities or document links. When you drag these items onto a shape in the diagram, you add a link to the corresponding reference item in the Case File.

---

**Note:** Changes in the Scrap book do not support undo-redo.

---

### 18.2. Displaying the scrap book

To view the Scrap book, select View → Windows → Scrap book (or ctrl + shift + s):

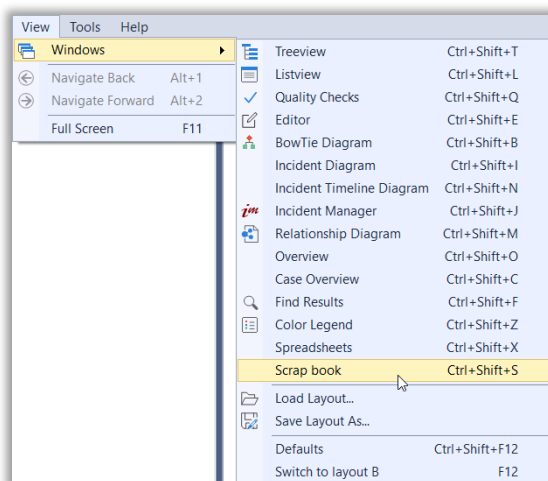


Figure 180 - Displaying the Scrap book

The Scrap book will thereafter appear on the right-hand side of the screen:

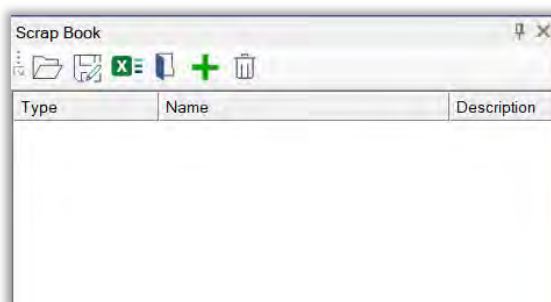


Figure 181 - The Scrap book

## 18.3. Basic Scrap book operations

First, open the test Case File to have some data examples provided. Select File → Open Test Case File. Ensure you can see the barriers on the diagram (zoom level 3 or higher).

### 18.3.1. Dragging a regular item onto the Scrap book

Select a barrier on the diagram by clicking it. Dragging is done as follows: press ALT on the keyboard, move the mouse over the item, press and hold down the mouse button, move the mouse until it is over the Scrap book. Now release the mouse button and the ALT button. As a result you have a copy of the barrier in the Scrap book. It is also possible to drag and drop from the Tree view to the scrap book. In that case holding ALT while dragging is not needed.

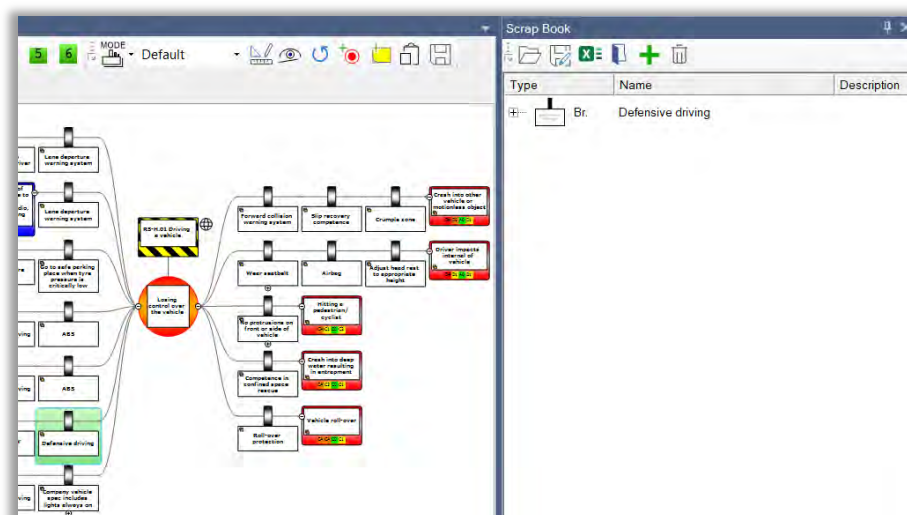
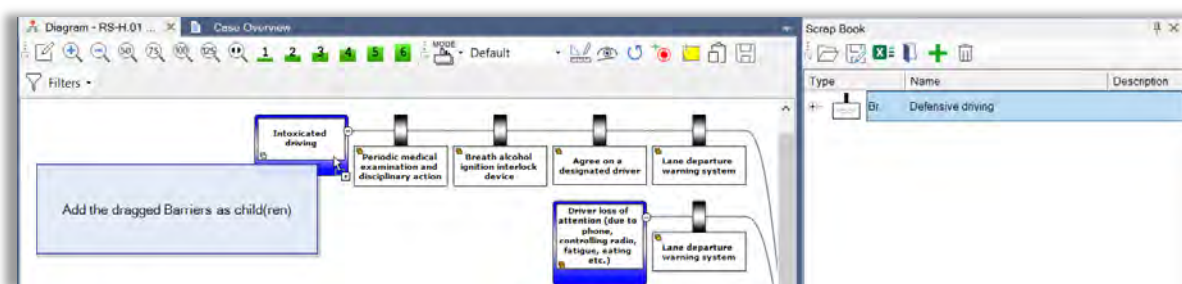


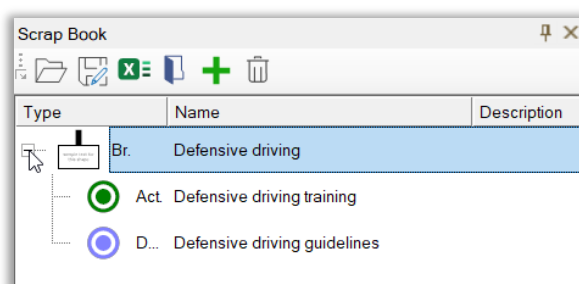
Figure 182 - The Scrap book containing a single barrier

We can now drag the barrier back into the Case File. For example, drag it back onto the diagram but drop it on top the first threat in the file labeled “Intoxicated driving”. The barrier is added to the threat. Note that you have to drop the item onto a ‘parent’ within the bowtie file to add it as a ‘child’ of that parent.



**Figure 183 - Duplicated barrier**

You could say the Scrap book is similar to the clipboard, except it remembers also the additional reference data you copied onto it. In this example, the barrier has been copied in its entirety – all properties, children and attached links have been copied. We can see what extra information the barrier held on the Scrap book if we click the little plus sign next to it:



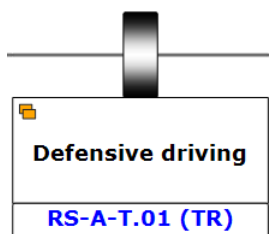
**Figure 184 - Barrier on the Scrap book showing children**

We see that an activity is linked to the barrier, as well as a document link.

### 18.3.2. Dragging a reference item onto the Scrap book

We cannot only drag complete diagram elements onto the Scrap book, but also separate reference information (linkable items from the Tree view).

For this example, first ensure to see the assigned activities on the diagram. Click on the small eye icon (👁) on a barrier and check the activities box for (S) Short description. Now we can see all the activities assigned to the barriers, like the picture below:



**Figure 185 - Displaying barriers with activities (Short description)**

Open up the activities' container in the Tree view and drag an activity onto the Scrap book. Now the Scrap book looks as follows:

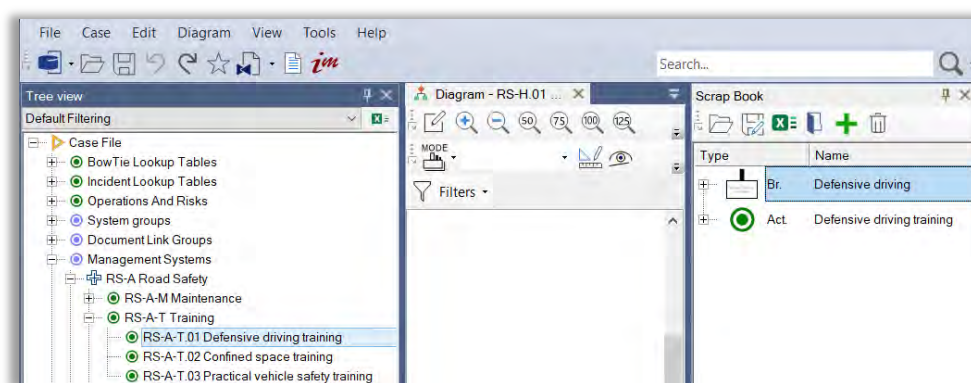



Figure 186 - Scrap book with a reference item on it

If we drag this item onto a barrier, we will assign the selected activity, just as if we dragged it from the Tree view, or used the activities' assignment tab within the barrier editor.

## 18.4. Organizing data in the Scrap book

Data in the Scrap book can be reordered by dragging it around. You can drop an item onto another item so it becomes a child / sub item.

You can also create groups to hold several items – press the new group toolbar button (  ) and enter a name. You can then drop items into it. Note that nested groups are not supported.

### 18.4.1. Illegal combinations

When dragging items around you will see, the Scrap book does not limit what you can place underneath what – all kinds of illegal combinations are possible such as barriers under barriers.

The Scrap book will let you know if a combination is illegal by means of overlaying a red exclamation point on the offending item, and a yellow exclamation point for all the higher levels – so at the top level you can also see something is not in order:

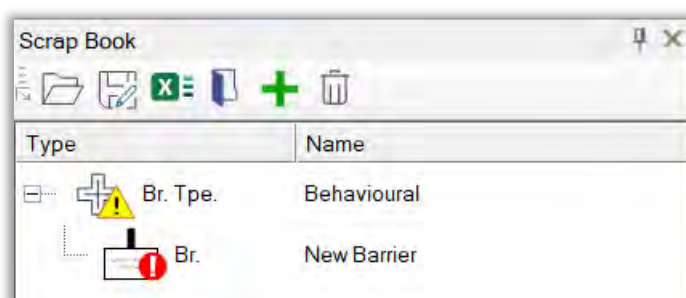
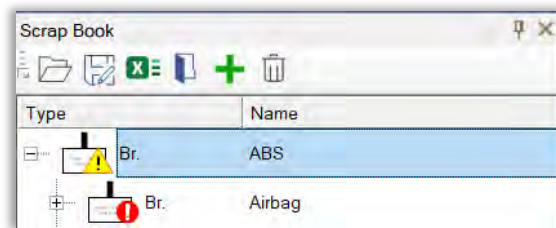


Figure 187 - Scrap book with illegal combination

If an item is in error, you cannot drop it anywhere. You must resolve the error first, by either removing or converting the offending item.

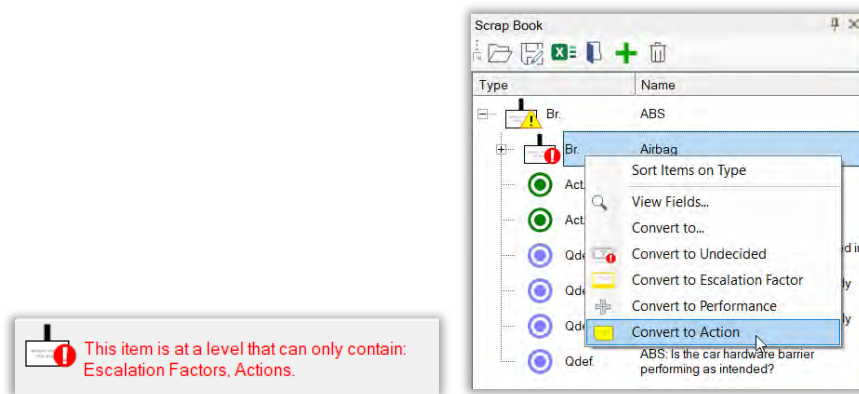
## 18.5. Converting items

Let us say we have made the following illegal combination:



**Figure 188 - Scrap book with illegal combination**

The software provides you with a logical structure hint at the bottom of the Scrap book screen. We can resolve this error by means of conversion –right click an item to bring up the conversion menu and pick an option:



**Figure 189 - Scrap book hint and convert menu**

During conversion, all matching properties are kept and assigned, and everything else is placed in user data – nothing is lost. If we want to see all fields available, and whether they have been matched successfully, we can right click an item and choose view fields. All the matched items are depicted in bold; the rest will be placed in user data.

Field	Value
Code	
Name	Airbag
Description	
Verification	
Family	
AcceptanceCriteriaMet	false
Accountable	VM Vehicle Manager
Effectiveness	++ Very Good
Type	A+HW Active hardware
Criticality	HC Highly Critical
LP_CurBarrierPFD	0
LP_FutBarrierPFD	0
LP_Comments	
XL Adequacy	4
XL Reliability	2
XL Color	=OFFSET(Report\$B\$2, INDIRECT(ADDRESS/DOW/18,TRUE,TRUE),0)

**Figure 190 - Scrap book view fields per item**

## 18.6. Scrap book file management

When you exit BowTieXP, the contents of the Scrap book are saved and will be available the next time you start BowTieXP. However, not all Scrap books are equally valuable – for instance if you are building a library of elements, you probably want to make backups regularly.

You can save contents of the Scrap book using the save (📁) button and load them using the open button (📁). You can also load files by dragging them onto the Scrap book.

## 18.7. Using the Scrap book to import data

You cannot only open bts (BowTieXP Scrap Book) files, you can also get items from Excel files. They must have the following format:

- The first row contains the column headings
- Each row after that represents an item to import
- The first column must be the item type and its heading must be “Entity”

Here is an example:

Entity	Id	ParentId	Code	Name	Description	TopEvent
Hazard		1	RS-H.01	Driving a vehicle		Losing control over the vehicle
Threat	T1	1		Intoxicated driving	Alcohol level > 1.3	
BowTieControl	C1	T1		Periodic medical examination and disciplinary action	Monthly check	
Question	Q1	C1	RS-Q.04	Are the medical examiners properly certified?		
	E1	C1		Good	Level of effectiveness	

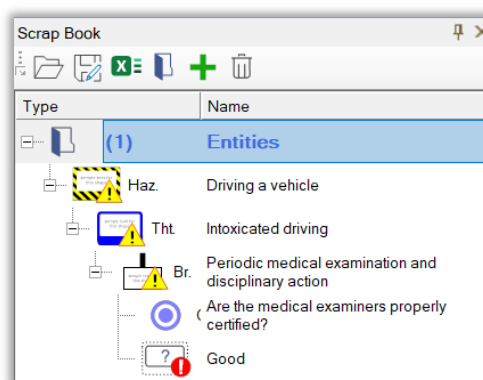
**Figure 191 - Sample Excel sheet for importing into the Scrap book**

The first row (row 1) contains the column headings / property names. The first column is called “Entity” and describes the type of each row.

The second and third column describe any hierarchical relationships. Any entity with an Id can be referenced as a ‘parent’ by another entity in the ParentId column. For instance, a hazard with an Id of H1 can be referenced by a threat by putting H1 in the ParentId column of the threat. This means that the threat belongs to that hazard. The same can be done with barriers that belong to a threat.

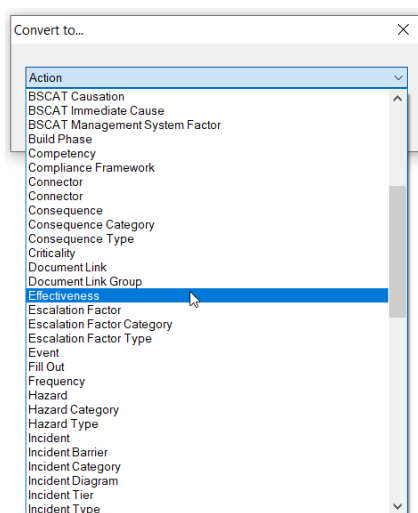
The other columns are the fields/properties we want to fill. If a column is not applicable for a certain type just leave it empty – for example, there is no field called “Top Event” on barriers so we leave it empty.

Lookups such as effectiveness are resolved in the current Case File. Therefore, here is what happens after we drop it onto the Scrap book:



**Figure 192 - Scrap book after Excel import**

Looks like we forgot to set the entity for the fifth row – we can fix this easily, just right click the item and convert it to the correct entity. BowtieXP offers an alphabetic drop down list of all possible options.



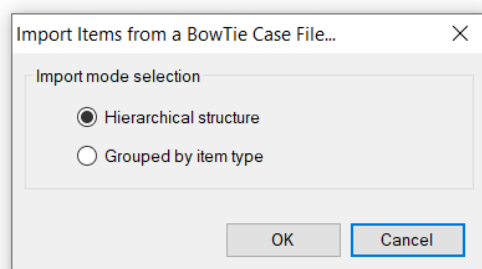
**Figure 193 - Converting items in Scrap book**

You can drag the items onto a diagram (make sure to use the ALT-key) to verify if all columns have been imported successfully.

The Scrap book enables easy graphically oriented import of various data – it is for example a good method to import data from LOPA analyses and reconstruct that information onto bowties.

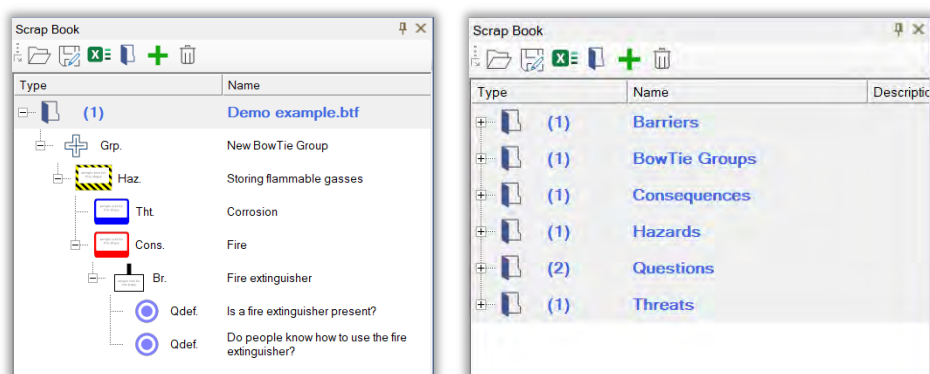
## 18.8. Dropping a BowTieXP Case File (.btf) onto the scrap book

To facilitate library building, you can also drop an entire BowTieXP Case File onto the Scrap book. When you do so you will be asked how you want the file to be handled, maintaining its hierarchical structure or group the file by item type:



**Figure 194 - Scrap book btf file handling question**

Depending on your choice, respectively the result will look either like the left or the right picture shown below:






**Figure 195 - Scrap book after hierarchical vs grouped import**



## 18.9. Exporting the Scrap book to Excel

The Scrap book can be exported to Excel. This can be useful for various purposes, for example, if you want to adjust or modify multiple items simultaneously.

To do this, make sure you have placed all relevant items in the Scrap book. Select the export to Excel icon . If you do not have the export to Excel button on your toolbar, it might need to be added via the 'add or remove buttons' icon  in the Scrap book window (see Figure 196).

After making certain adjustments in Excel, you can import the data back into the Scrap book by using the import/open file icon again .

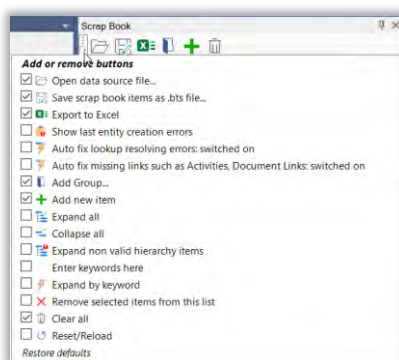











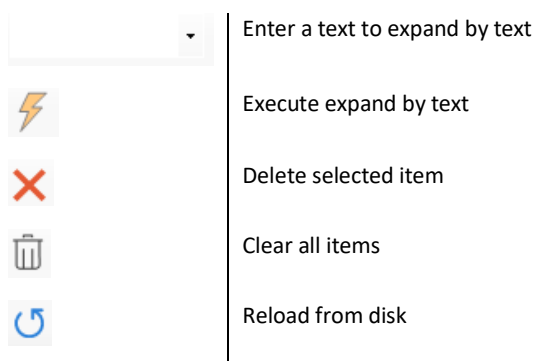





Figure 196 - Add or remove Scrap book buttons

## 18.10. Toolbar button reference

Icon	Description
	Open a Scrap book file, Excel file, CSV file or BowTieXP Case File
	Save the current Scrap book contents as .btf file
	Export the entities in Scrap book to Excel
	Show last entity creation errors
	Toggle auto-creation of lookups (e.g. effectiveness)
	Toggle auto-creation of linkable items (e.g. activities)
	Add a new group folder
	Add a new item
	Expand all
	Collapse all
	Expand to show illegal items



## 18.11. Icon reference

Overlay	Title	Meaning	Drag and drop behavior
	Red exclamation	Item is not allowed in its current location or it is a linkable item that conflicts with another item on that level.	Drag and drop is only allowed within the Scrap book pane internally or externally with the right mouse button (single item drag).
	Yellow exclamation	Item contains one or more items that are invalid, in conflict or are non-matched links.	Drag and drop is only allowed within the Scrap book pane internally or externally with the right mouse button (single item drag).
	Link sign	Item represents a valid link to a linkable item within the current Case File.	Drag and drop works as expected.

# 19

## Advanced functionality: comparing files and parts of files

In this chapter, we take a detailed look at the comparison functionality.

### 19.1. Introduction

BowTieXP Advanced allows you to compare parts of Case Files or entire Case Files and analyze the differences between them. This very powerful tool is often used in change tracking and compliance checking.

For example, some companies have centrally defined how reference information in Case Files should look, and keep template files containing this information. Using the file comparison function, it is trivially easy to figure out if a Case File complies with the template. The same applies to reference bowties.

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**Note:** Please refer to Chapter 23.6 - Global – local linking in BowTieXP for an alternative way to compare bowties and keep corporate oversight.

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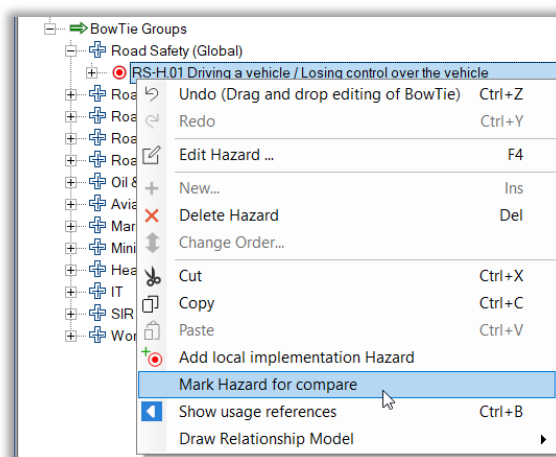
Change tracking is done in a similar fashion. If your company has a document management system, and the Case Files are checked in on a regular interval, you can easily track the development of the Case Files by means of the Case File compare.

### 19.2. Starting a comparison

There are two different methods of comparing data. The first method is comparing using the context menu, which means you can compare bowties within one Case File. The other method is comparing using the file menu. This allows you to compare data between two different bowtie Case Files.

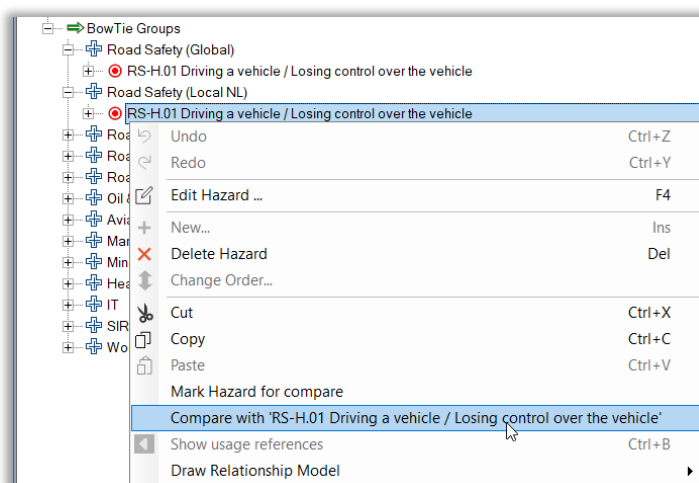
#### 19.2.1. Comparing using the context menu

The first method of comparing is by selecting parts of the currently open Case File for comparison by right clicking in the Tree view. This allows you to only compare data from the current Case File.



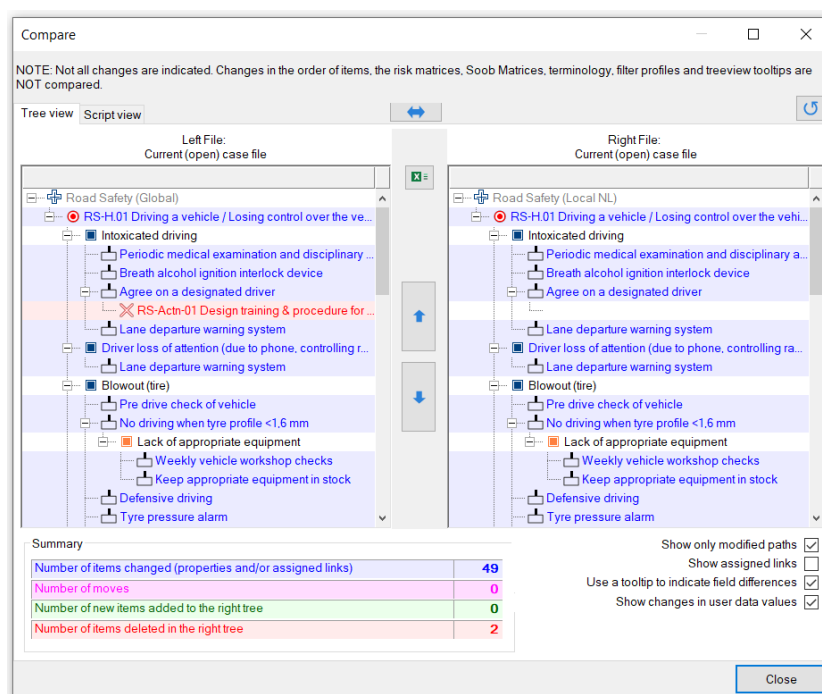
**Figure 197 - Marking part of a tree for comparison**

After selecting a branch for comparison, if we right click another place in the tree and a comparison makes sense (is possible), you have the option of comparing it:



**Figure 198 - Comparing parts of a tree**

After clicking, the comparison results are shown:

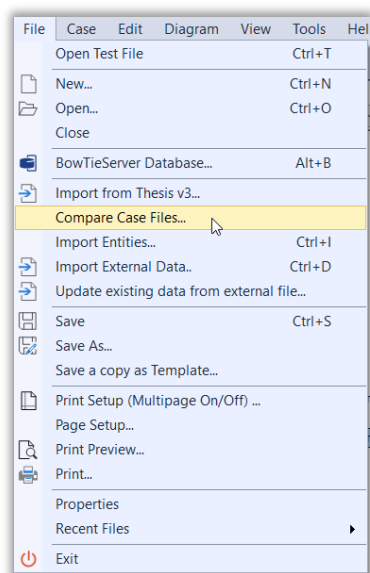


**Figure 199 - Comparison results**

More on interpreting these comparison results will follow in the next sections.

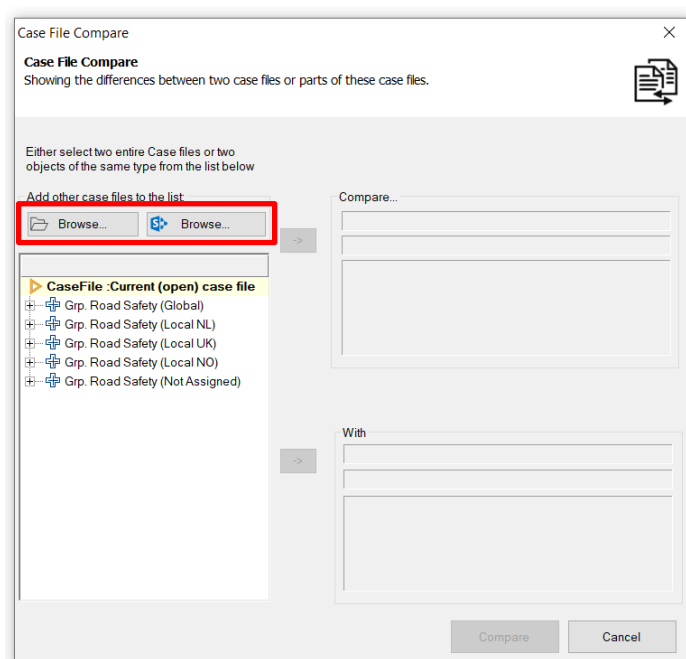
### 19.2.2. Comparing from the file menu

The second method of comparing is by means of the File → Compare Case Files menu entry. This allows you to compare data in different Case Files. This menu option will bring up the comparison wizard.



**Figure 200 - Comparing Case Files menu option**

It is not necessary to have a specific Case File already open – the comparison allows you to choose two files that are not your current Case File. Additionally, you can also compare different parts of the current file against that of other files.

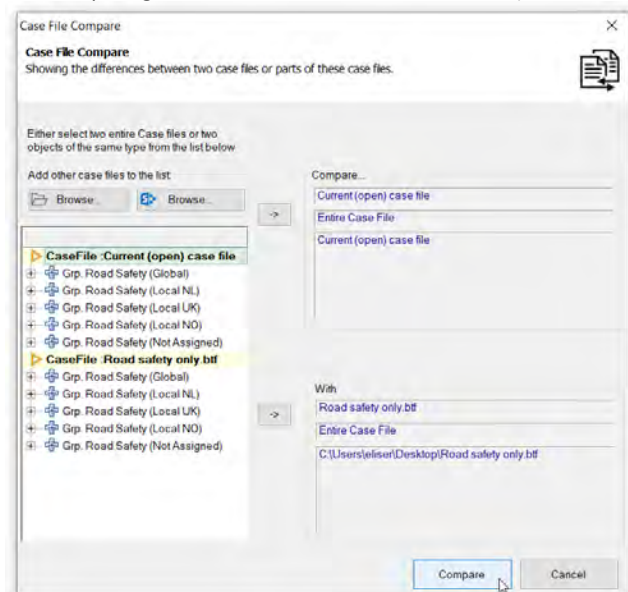


**Figure 201 - Choosing what to compare**

The Tree view on the left lists all the bowtie groups and hazards in the currently open Case File. You can add files to this tree by one of the two browse buttons. The first button browses your computer and network; the second button allows you to browse SharePoint sites.

After you have loaded the files you want to compare, you have the choice of either comparing the entire files, or just two bowtie groups or hazards. Select the first item to compare and click the upper “->” arrow button. It will be listed on the right in the box titled 'Compare...'. Select the item to compare it with and click the lower “->” arrow button. It will be listed on the right in the box titled 'With'.

In the example below, we are comparing two revisions of the same Case Files (stored locally):



**Figure 202 - Two entire files marked for comparison**

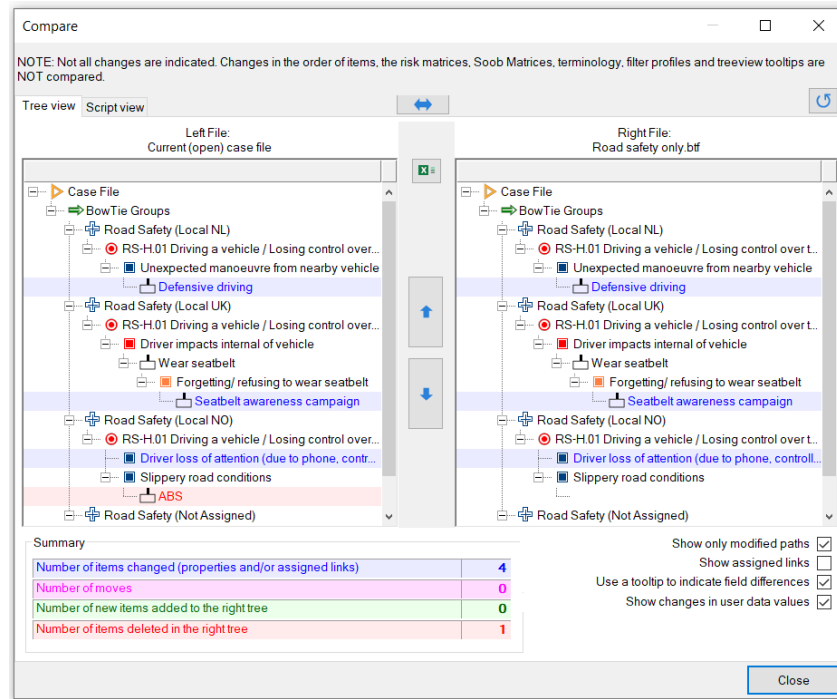
Note the following:

- "Current (open) case file" is selected in the tree and listed on the right.
- "Road safety only.btf" is selected and listed on the right as well.


The Compare button is enabled, signaling we can start the comparison.

### 19.3. Analyzing the comparison

Here are the results of comparing the forenamed examples.



**Figure 203- File compare results**

Items that differ between the two files are color-coded. You can switch the compared information from left to right by using the two-sided arrow button in the top middle of the comparison screen (  ).

In the example of the figure above, some elements have been changed (of which we can see three out of four pictures) and the barrier 'ABS' has been removed on the local Norwegian bowtie group.

We can also report all the changes in a textual format - see the second tab page called 'Script view'.

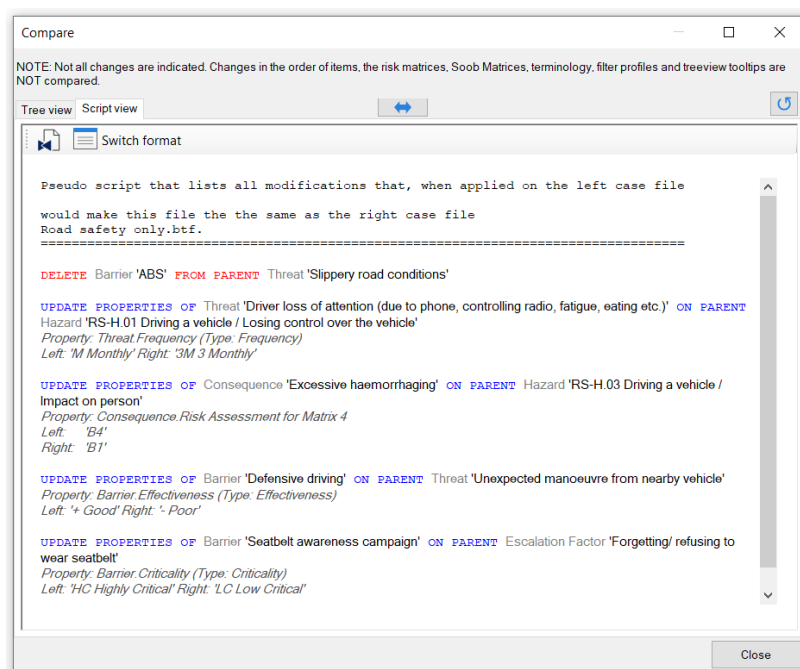


Figure 204 - Compare Case Files Script view



# 20

## Advanced functionality: type and property descriptions

In this chapter, type and property descriptions are discussed: how to customize your Case File terminology.

### 20.1. Introduction

Each Case File contains a large table with names of all object types and their properties present within BowTieXP. This feature allows customers to make slight adjustments to various names and tailor-fit the software to their company.

For example: In a bowtie diagram, you have *barriers* in place to prevent *threats* from causing the *top event* to occur. In some companies and industries, barriers are referred to as *controls* instead.

Another example is that controls have a property, called a *responsible* person. This determines which person is responsible for managing the barrier's functioning. However, in some industries or companies, the term *responsible* might not cover its exact legal meaning, and the property might be rather renamed to *accountable*.

---

**Note & Warning:** Because editing these descriptions can lead to unwanted consequences due to the semantics of the terms that BowTieXP assumes, it is advisable to discuss your intended changes with CGE – in this way, you can be sure that your changes will not have undesired impacts.

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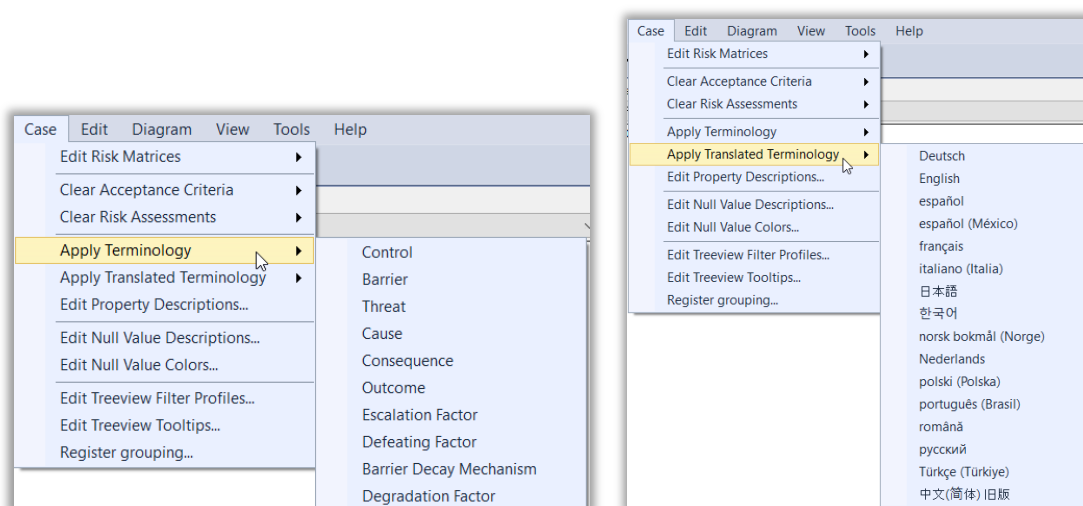
### 20.2. Use in translated Case Files

It is also possible to have these customized terminology translated in a different language than the English default. If you create a new Case File in BowTieXP in a different language than English, the customized terminology will be offered in that language. If, for example, you run BowTieXP in Brazilian Portuguese, terms such as Barrier/Control and Top Event will be in Brazilian Portuguese ("Controle" and "Evento Principal" respectively).

When you open this Brazilian Portuguese Case File in BowTieXP using the English user interface, translated terminology will still be Brazilian Portuguese. The content of the Case File will also be unaffected, regardless of the user interface language you choose.

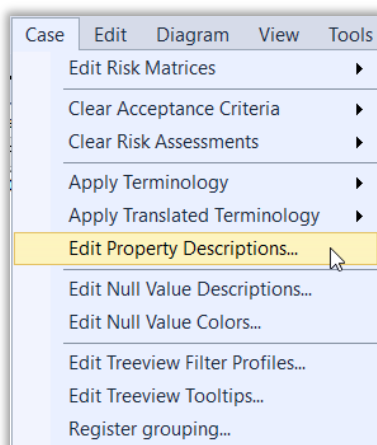
### 20.3. Modifying type and property descriptions

For the most prominent terminology used in BowtieXP, a few common variants are used by the majority of companies. We have adopted these as presets, which can be found under Case > Apply Terminology. They can be translated via Case > Apply Translated Terminology.



**Figure 205 - Presets for commonly used terminology and translating them**

Full control over all terminology is given through the property descriptions screen, go to Case → Edit Property Descriptions.... With this menu, you can rename any terminology in the software to your own fit. The full editor can be found under Case → Edit Property Descriptions....



**Figure 206 - The case menu**

This takes you to the following screen:

Edit Property Descriptions

WARNING: Editing of property descriptions is complex functionality. DO NOT USE THIS FUNCTIONALITY WITHOUT PROPER TRAINING AND INSTRUCTION.

Object/Property	Custom Description	Custom Plural Description	Custom Abbreviation
[-] Action	Action	Actions	Actn.
[-] Action Category	Action Category	Action Categories	Cat.
[-] Action Category Container	Action Category Container	Action Category Containers	Action cat. cont.
[-] Activity	Activity	Activities	Act.
[-] Activity Category	Activity Category	Activity Categories	Act. Cat.
[-] Activity Category Container	Activity Category Container	Activity Category Containers	Act. Cat. cont.
[-] Activity Type	Activity Type	Activity Types	Tht. Tpe.
[-] Activity Type Container	Activity Type Container	Activity Type Containers	Actv. Tpe. cont.
[-] Answer	Answer	Answers	Answ.
[-] Attachment	Attachment	Attachments	Att.
[-] Audit	Audit	Audits	Aud.
[-] Audits	Audits	Audits	Aud. Cont.
[-] Barrier	Barrier	Barriers	Br.
[-] Barrier Category	Barrier Category	Barrier Categories	Br. Cat.
[-] Barrier Category Container	Barrier Category Container	Barrier Category Containers	Br. Cat. cont.
[-] Barrier Type	Barrier Type	Barrier Types	Br. Tpe.
[-] Barrier Type Container	Barrier Type Container	Barrier Type Containers	Br. Tpe. cont.
[-] BFA Causation	BFA Causation	BFA Causations	Assmnt.
[-] BFA Primary Cause	BFA Primary Cause	BFA Primary Causes	BFA 1C
[-] BFA Primary Causes	BFA Primary Causes	BFA Primary Cause Containers	BFA 1C Cont.
[-] BFA Secondary Cause	BFA Secondary Cause	BFA Secondary Causes	BFA 2C
[-] BFA Secondary Causes	BFA Secondary Causes	BFA Secondary Cause Containers	BFA 2C Cont.
[-] BFA Tertiary Cause	BFA Tertiary Cause	BFA Tertiary Causes	BFA 3C
[-] BFA Tertiary Causes	BFA Tertiary Causes	BFA Tertiary Cause Containers	BFA 3C Cont.
[-] BowTie Group	BowTie Group	BowTie Groups	Grp.
[-] BowTie Group Container	BowTie Group Container	BowTie Group Containers	Grp. cont.
[-] BowTie Lookup Tables	BowTie Lookup Tables	BowTie Lookup Tables	BT. Lkup. tbls.
[-] BRF Code	BRF Code	BRF Codes	BRF
[-] BRF Codes Container	BRF Codes Container	BRF Codes Containers	BRF cont.

Export to Excel... Import from Excel... OK Cancel

**Figure 207 - Property descriptions screen**

In this screen, you can change all descriptions, plural descriptions, abbreviations. The first column cannot be changed since this is what BowtieXP is programmed with.

Note: Changing linked values, e.g. Effectiveness, need to be changed under its own Object/Property, but also under the elements it is linked with (e.g. barriers). Use the + buttons to see what values are specifically linked to an object/property.

The text used to denote when no value has been assigned can also be changed using Case → Edit Null Value Descriptions. This provides you with the following dialog box, in which you can determine what code and text to use to represent empty value fields:

Edit Descriptions for Null Values

No Value Assigned Code: <NULL>

No Value Assigned Description: <No Value Assigned>

OK Cancel

**Figure 208 - The null value descriptions screen**

# 21

## Advanced functionality: Soob matrices

This chapter describes how to get up and running with  
Summary of operation boundaries matrices.

### 21.1. Introduction

This chapter is to help you get started with the Summary of operation boundaries (Soob) functionality in BowTieXP Advanced. BowTieXP Advanced is designed to make it easy to quickly set up a Summary of operation boundaries matrix and to manage large Soob matrices.

### 21.2. What are Soob matrices?

The Summary of operation boundaries is a record of operations used to determine under which circumstances extra caution should be taken or work should no longer be allowed to proceed.

This is to support the decision process of whether to proceed with operations when encountering suboptimal conditions. Suboptimal conditions can be many things, such as:

- Doing several operations at the same time;
- Some critical barriers are unavailable due to maintenance or disruption;
- Barriers have compromised effectiveness;
- Critical equipment is unavailable;
- Weather conditions are becoming more extreme and closer to tolerable limits.

When working close to tolerable limits, due to insights into the extra risk exposure, decisions can be made to supplement the operation with extra barriers or perhaps stop the operations all together.

The Soob consists of three parts, which examine different aspects of operations:

1. Operations versus Operations. This part of the Soob tells us which combinations of operations are within tolerability limits or technical limitations, and whether and how they can be combined.
2. Operations versus Barriers under reduced effectiveness. This examines which operations are either allowed or aren't when certain barriers have been defeated or function under reduced effectiveness.
3. Operations versus Operational Risk Factors. Here we examine if operations are safe to proceed under different circumstances that influence the risk of doing these operations, such as weather conditions, missing out on critical equipment, etc.

The Summary of operation boundaries (Soob) is very similar to the Manual of Permitted Operations (MOPO). MOPOs can easily be made using the Soob functionality in BowTieXP. You will find that the thinking behind Soob is much more dynamic than the static concept of a manual.

The entire Soob can be divided across a number of different matrices, although they can also be listed within a single matrix. Because of this we refer to a Soob matrix in this manual and not to the whole Soob, which would be all these matrices combined.

Let us clarify the various parts of a Soob matrix with some examples.

### 21.2.1. Operations versus operations

In this section we will examine which combinations of operations are within tolerability limits or technical limitations, and whether and how they can be combined.

As a sample, marine operations on board a drilling rig are considered. Please note this description was not written by a drilling expert and should serve only as an example for explaining the different Soob matrix concepts.

Operation	Description
Anchoring	The anchoring of the rig is the operation where the rig's anchors are dropped to maintain the rig's position for a longer period of time. This is done by bringing the anchors out using e.g. a support vessel and dropping them a certain distance from the rig. After dropping the anchors, the anchor lines are tightened to fix the rig's position.
Ballasting (Change Draft)	Changing the draft of the platform by taking on ballast.
Bulk Transfer	The transfer of bulk products such as drilling mud and cement onto the rig from a support vessel.
Towing	Changing the location of the rig by means of towing it with tugboats.

Below is an example of the Operations versus Operations part of the sample Soob matrix we are examining.

	Anchoring	Ballasting (Draft Change)	Bulk Transfer	Towing
SM1 Soob Matrix 1				
Operations				
Op. Anchoring	ATP	ATP	ATP	ATP
Op. Ballasting (Draft Change)	ATP	ATP	ATP	ATP
Op. Bulk Transfer	ATP	ATP	DNP	DNP
Op. Towing	ATP	ATP	DNP	DNP

The names and colors are explained in the table below.

Name	Color
Do Not Proceed	Red
Proceed With Caution	Yellow or Orange
Authorized to Proceed	Green

We see that combining Bulk Transfer with Towing is not allowed, indicated by the red color and the code DNP (Do Not Proceed): Moving the rig whilst at the same time having a support vessel maintaining the same relative position to the rig is very dangerous and should not be attempted. We can also see that all other combinations of operations are authorized to proceed.

### 21.2.2. Operations versus barriers under reduced effectiveness

This part of the Soob matrix examines which operations are either allowed or aren't when certain barriers have been defeated or function under reduced effectiveness.

Below you see an example of this part of the matrix. In this sample, the hazards of having liquefied gas in a storage vessel near a road is considered, creating the possibility of an impact with a moving vehicle.

For the operations we use the abstract operations A through D to demonstrate the possibilities of the Soob.

	Operation A	Operation B	Operation C	Operation D
<b>SM1 Soob Matrix 1</b>				
<b>Barriers Under Reduced Effectiveness</b>				
<b>Loc. Hazardous Site</b>				
<b>Haz. 5.4.4.6 Liquefied Gas in Storage Vessels in Production Facility / Catastrophic failure of storage vessel</b>				
<b>Tht. Vehicle Impact</b>				
Ctrl. Protection provided around vessels against vehicle impact (bollards and kerbing)	PWC	NA	ATP	ATP
Ctrl. Vessels are double skinned providing resistance to impact	NA	NA	NA	NA
Ctrl. Vessel bases set in concrete annulus and bolted to concrete area	NA	NA	NA	NA
Ctrl. Examination carried out in accordance with Written Scheme of Examination	NA	NA	NA	NA

Operations A through D have all been deemed relevant to the Threat of Vehicle Impact in the bowtie for the catastrophic failure of a storage vessel containing liquefied gas. We see that most barriers are not relevant – they have been classified as NA / Not Applicable.

We also see that if the barrier called “Protection provided around vessels against vehicle impact (bollards and kerbing)” is not functioning or is missing, operation B, C and D can continue, but for different reasons: Operation B can continue because the barrier is deemed Not Applicable for this operation. Operation C and D can continue because missing this barrier is applicable, but not essential for the safety of these operations, so we are authorized to proceed.

Contrary to the other operations, we see that operation A can Proceed With Caution, in the situation where the road barriers are either missing, damaged or otherwise not up to par. For this operation, not having this barrier fully functioning apparently adds extra risk, but not so much to stop the operation altogether.

### 21.2.3. Operations versus operational risk factors

For the last section of the Soob matrix, we return to our drilling rig example. We have defined several operational risk factors having to do with environmental conditions, such as visibility and sea state. On the horizontal axis, we again have our marine operations.

	Anchoring	Ballasting (Draft Change)	Bulk Transfer	Towing
<b>SM1 Soob Matrix 1</b>				
<b>Operational Risk Factors</b>				
<b>Orf.: ENV Environmental Conditions</b>				

Orf. Night Time	ATP	ATP	PWC	ATP
Orf. Poor Visibility (Fog)	DNP	ATP	DNP	PWC
Orf. Sea State > 8 ft	PWC	ATP	PWC	ATP
Orf. Strong Current > 3 kts	ATP	ATP	ATP	ATP
Orf. Wind Speed > 30 kts	DNP	ATP	DNP	PWC

We see that anchoring, ballasting and towing can continue at night, but bulk transfer should Proceed With Caution.

When visibility is poor, we should stop anchoring operations and bulk transfer. Towing should Proceed With Caution and ballasting can continue unhindered. In fact, ballasting is not affected by any of these conditions. Notice as well that strong currents have no effect on these operations.

## 21.3. Overview of setting up a Soob matrix

To set up your Soob matrix, work through the following steps:

1. Creating Operations, this consists of the following steps:
  1. Defining Operation Categories (optional)
  2. Defining Operation Types (optional)
  3. Defining Operations
  4. Linking Operations to Hazards, Threats and Consequences (optional)
2. Creating and Linking Operational Risk Factors (optional)
3. Creating Soob matrices, which consists of the following steps:
  1. Defining Soob categories
  2. Creating Soob matrices
  3. Linking operations to Soob matrices
4. Populating / filling in the Soob matrices.

All of these aspect can be found under the Operations and Risks node in the Tree view.

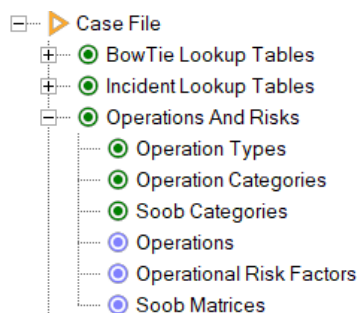


Figure 209 - Tree view showing operations and risks node

## 21.4. Creating operations

The first step in creating a Soob matrix is defining which operations can be part of the Soob matrix. In order to do so, we first need to define the reference information we might be using on the operations themselves. Thereafter we can define the operations. It is of course possible to modify all the reference information at any time.

### 21.4.1. Defining operation types (optional)

Operation types can be used to categorize your operations. When you add or edit an operation, you can set to which operation type the operation belongs. Assigning operation types to operations is an optional step.

Some operation types that we can derive from our example are:

- Drilling
- Marine
- General
- Administration
- Lifting

You can add operation types by right-clicking the Operation Types container underneath the Operations and Risks node in the Tree view. Choose New operation type. A screen like the figure below appears. Fill in the code, name, description and a color if needed and click on OK.

**Figure 210 - Adding operation types**

### 21.4.2. Defining operation categories (optional)

Operations cannot only have been assigned a type; it is also possible to assign a category. These can be created in the Operation Category container and works exactly the same as creating Operation Types. The previous section explains how to add an Operation Category or Type.

### 21.4.3. Defining operations

Before being able to create a Soob matrix, we need to define what operations will be part of our Soob matrix. Operations are defined centrally in the Operations container in the Tree view, and can be assigned to multiple matrices.

Defining operations is done by adding them to the Operations container in the Tree view. It is located beneath the Operations and Risks node as well.

**Figure 211 - The add operation dialog box**

The operations are initially organized in the order in which you add them, but you can reorder them if you needed by right clicking the container and selecting 'Change Order...' from the menu.



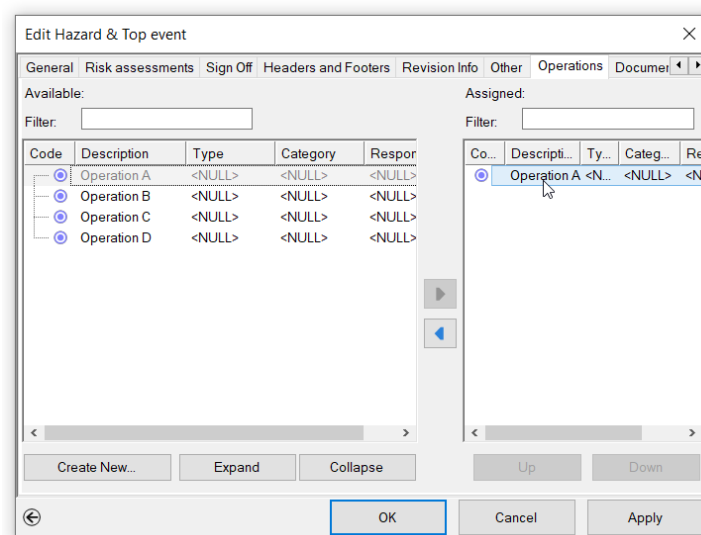
Operations can be defined hierarchical. This allows you to link only the top-level operation, through which all sub-operations will be available automatically. Note that only the sub-operations can be filled in.

#### 21.4.4. Linking operations to hazards, threats and consequences (optional)

If we want to examine the impact of missing or ineffective barriers for our operations, we will need to associate hazards, threats and consequences with those operations. By creating a link between an operation and a hazard and top event, we are indicating that the operation is potentially exposed to that specific hazard and subject to one or more consequences of a top event.

Link operations to entire bowties by linking them at the hazard level, or link an operation to only a part of a bowtie by linking them at the threat and/or consequence level. Only the relevant parts of the bowtie will be visible and editable in our Soob matrix.

This linking is done in the same manner as all linking in BowTieXP. Go to the hazard, threat or consequence editor, and find the operations tab, in which you drag the operations to the right column.



**Figure 212 - Assigning operations to threats/consequence/hazard**

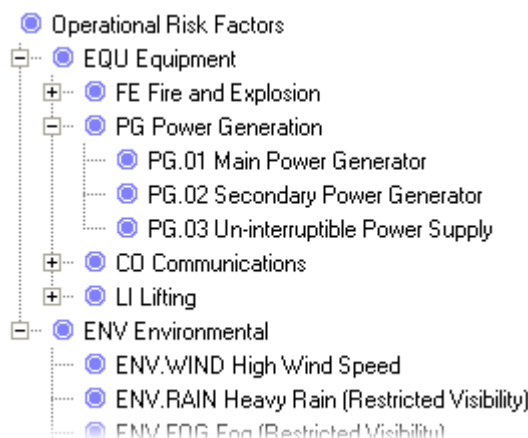
You can also link operations using drag and drop from the Tree view immediately; simply drag the operation from the Tree view onto the hazard, threat or consequence in the diagram and drop the value.

#### 21.5. Creating and linking operational risk factors (optional)

If you want to analyze what kind of impact other operational risk factors have on your operations, you should define those factors. Operational Risk Factors are created by adding them into the Operational Risk Factors container in the Tree view, beneath the Operations and Risks node. Right-click on Operational Risk Factor and choose New Operational Risk Factor. A dialogue like the figure below will appear. Fill in the details and click on OK.

**Figure 213 - Creating Operational Risk Factors**

Note that operational risk factors can be nested so you can create groups. Some common values include:

**Figure 214 - Example operational risk factors**

After creating the operational risk factors we want to include in our Soob matrix, we need to associate them to their relevant operations. This is done similar to all linking within BowTieXP. The easiest way is to go to the operation in the Tree view, open up an editor screen, go to the Operational Risk Factors tab, and drag and drop the relevant Operational Risk Factors.

The operational risk factors are often used for listing HSE-critical equipment. If it is used for HSE-critical equipment, the criticality of the equipment can be categorized by populating the criticalities under the lookup tables in the Tree view. When adding new HSE-critical equipment as Operational Risk Factors, you can assign the criticality rating in the editor.

An example of an equipment criticality rating scale:

- SCE - Safety Critical Equipment/System
- HEE - HSE Essential Equipment/System
- OEE - Operations Essential Equipment/System
- NEE - Non Essential Equipment/System

## 21.6. Defining Soob categories

The Soob categories are the values that can be used in your Soob matrices, that indicate whether you can perform certain operations simultaneously or not. They can be customized in the Tree view under Case → Operations and Risks → Soob Categories. A Soob category consists of a code, a description and a color.

**Figure 215 - The add Soob category dialog box**

Often a categorization similar to this example is used:

Code	Name	Color
DNP	Do Not Proceed	Red
PWC	Proceed With Caution	Yellow or Orange
ATP	Authorized to Proceed	Green
NA	Not Applicable	White or Gray

What is also commonly seen is that several 'Proceed with Caution' categories are defined, for instance:

Code	Name	Color
PWC1	Proceed with Caution #1 (clarification #1)	Yellow
PWC2	Proceed with Caution #2 (clarification #2)	Yellow
PWC3	Proceed with Caution #3 (clarification #3)	Yellow

In this latter case, each PWC category has specific notes on how to proceed.

It can certainly be done this way, but it is not necessary to add clarifications to the 'Proceed With Caution' category in this manner: each cell within the matrix can have its own comments, instructions and document links with more detailed information. However, if you have many cells in which you want to place the same comments, adding a specific Soob category might be efficient.

## 21.7. Creating Soob matrices

After defining the Soob categories, you are ready to create a Soob matrix. You can do so by adding a Soob matrix to the Soob matrices container in the Tree view.

**Figure 216 - The add Soob matrix dialog box**

The code and name fields are mandatory, and you should think about which of the tree different types of Soob data you want to enter into this matrix:

- Operations versus Operations
- Operations versus Barriers Under Reduced Effectiveness
- Operations versus Operational Risk Factors

After clicking OK, the Soob matrix editor is opened, displaying an empty matrix: There are no operations assigned to the matrix yet.

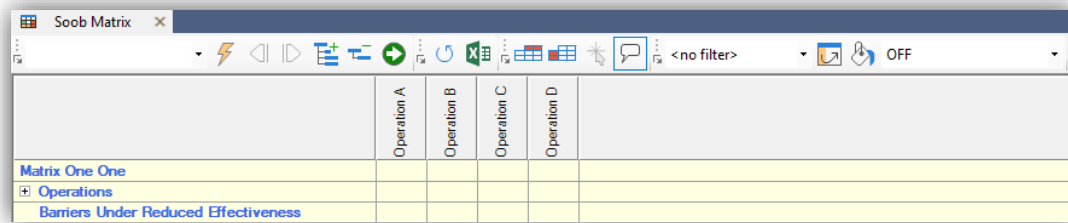


Figure 217 - Soob matrix editor with empty matrix

## 21.8. Linking operations to Soob matrices

Assigning operations to the matrix is done by expanding the matrix in the Tree view, and right clicking the operations container. Select "Assign linked Operations" from the context menu.

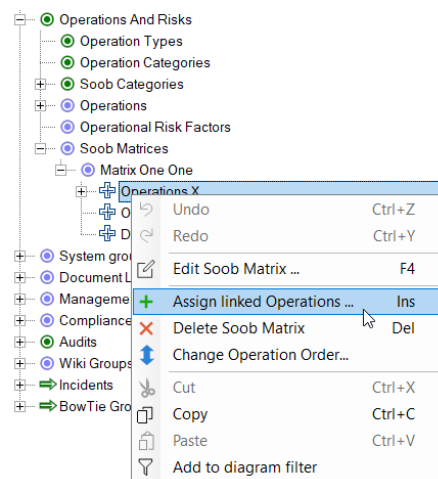


Figure 218 - Selecting to assign links

After assigning operations to the Soob matrix, we get a logical matrix as a result:

	Operation A	Operation B	Operation C	Operation D
Matrix One One				
Operations				
Op. Operation A		Careful		Go
Op. Operation B	Careful			Go
Op. Operation C	Go		Stop	
Op. Operation D	Go	Go		
Barriers Under Reduced Effectiveness				

Figure 219 - Soob matrix showing operations versus operations

Filling in the Soob matrix is explained in the next section. Note that the order in which the operations appear is determined by the order in which the operations have been defined in the Tree view. When changing the order in the Tree view, the matrix will update to reflect your changes.

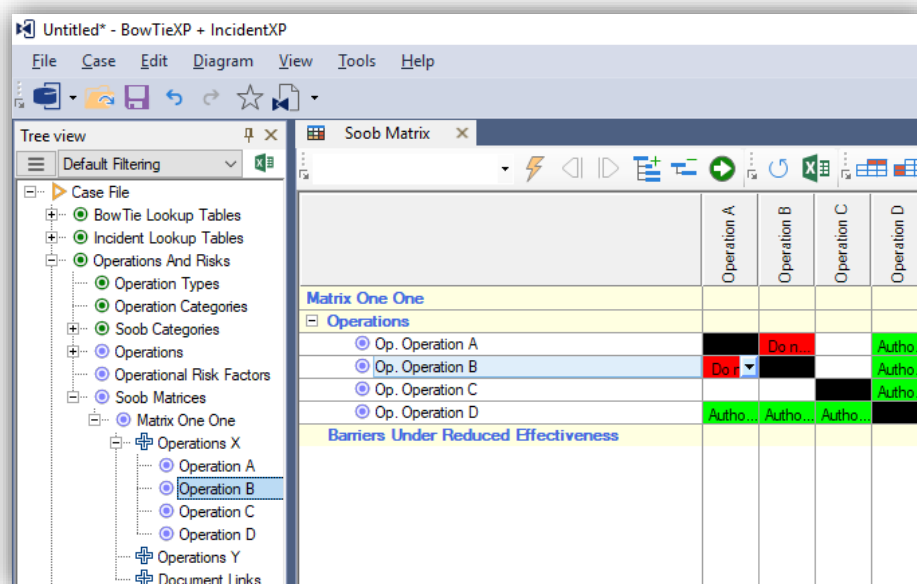


Figure 220 - Order of operations

## 21.9. Populating a Soob matrix

After opening the Soob matrix, we can populate the matrix with the values (Soob categories) that we have set up. As mentioned before, the Soob matrix consists of three parts. Let us quickly review:

- **Operations versus operations.** This part of the Soob matrix allows you to define whether operations can run simultaneously.
- **Operations versus barriers under reduced effectiveness.** In this part of the matrix, you can define whether certain barriers are critical to an operation and must be available and fully functional before the operation can begin.
- **Operations versus operational risk factors.** The operational risk factors part of the matrix is a part of the matrix that you can configure yourself with any risk factor that you find to be of crucial influence on your operations. Operational risk factors are used for e.g. weather restrictions and conditions and/or critical equipment.

First, we will show how to proceed with the operations versus operations part of the matrix and show you how to edit the Soob matrix. The other sections of the matrix are edited in a similar manner, all of which will be discussed below.

### 21.9.1. Basic Soob matrix editing

First, we need to select the cell of the combination of operations we are to consider. Let us start by considering operation A and operation C by clicking on that cell, as seen in the screenshot below.

	Operation A	Operation B	Operation C	Operation D	
SM1 Soob Matrix 1					
Operations					
Op. Operation A					
Op. Operation B					
Op. Operation C					
Op. Operation D					
Controls Under Reduced Effectiveness					
Operational Risk Factors					

Figure 221 - Soob matrix with selected empty cell

A drop-down arrow will appear in the right-hand side of the cell. If we click this arrow, we get a drop down menu, where we can select the appropriate Soob category. This is the reason to define those beforehand.

	Operation A	Operation B	Operation C	Operation D
<b>SM1 Soob Matrix 1</b>				
<b>Operations</b>				
Op. Operation A				
Op. Operation B				
Op. Operation C				
Op. Operation D				
<b>Controls Under Reduced Effectiveness</b>				
<b>Operational Risk Factors</b>				

**Figure 222 - Choosing a Soob category for a cell**

After selecting the appropriate value, it is applied to both cells that refer to the combination of operation A and operation C. The chosen category is displayed by means of its code and color.

**Note:** The combination of an operation with itself is not possible – it makes no sense and therefore the cells on the diagonal cannot be selected.

If you need to define whether the same operation can be combined with itself, the operation is probably not specified in enough detail. For example, crane-lifting operations could be split out into crane lifting operations for crane A and for crane B, and their combined operation can then be specified.

	Operation A	Operation B	Operation C	Operation D
<b>SM1 Soob Matrix 1</b>				
<b>Operations</b>				
Op. Operation A				
Op. Operation B				
Op. Operation C				
Op. Operation D				
<b>Controls Under Reduced Effectiveness</b>				
<b>Operational Risk Factors</b>				

**Figure 223 - Soob category has been applied**

Notice that after applying a Soob category to the cell, the editor still allows us to add a description. For instance, when a cell describes that combining operations A and B should 'proceed with caution', you probably want to add additional information about how exactly to proceed.

**Note:** When a combination of operations has a Soob category assigned to it, we also refer to this combination of operations as a "Soob value", a filled space in the matrix.

After completely filling in the matrix, it may look like this:

	Operation A	Operation B	Operation C	Operation D
<b>Matrix One One</b>				
<b>Operations</b>				
Op. Operation A		Proce	Do n	Do n
Op. Operation B	Proce		Do n	Autho
Op. Operation C	Do n	Do n		Do n
Op. Operation D	Do n	Autho	Do n	

**Figure 224 - Filled Soob matrix**

### 21.9.2. Editing the operations versus barriers under reduced effectiveness section

If you have linked an operation to a hazard/top event, and enabled the operations versus barriers section in your Soob matrix, you will see that this section of the Soob matrix is now expanded with the hazard/top event and all the threats, consequences, escalation factors and barriers below them.

If a cell is grayed out, that means that the barrier in question is part of a hazard/top event that is linked to at least one operation but not to the operation for which the cell is grayed out.

	Operation A	Operation B	Operation C	Operation D
<b>Matrix One One</b>				
<b>Operations</b>				
Op. Operation A		Careful	Stop	Go
Op. Operation B	Careful			Go
Op. Operation C	Str			Stop
Op. Operation D	Go	Go	Stop	
<b>Barriers Under Reduced Effectiveness</b>				
Grp. Road Safety (Global)				
Haz. RS-H.01 Driving a vehicle ...				
Tht. Intoxicated driving				
Br. Periodic medical examination and di...				
Br. Breath alcohol ignition interlock devi...				
Br. Agree on a designated driver				
Br. Lane departure warning system				
Tht. Driver loss of attention (...)				
Br. Lane departure warning system				
Tht. Blowout (tire)				
Br. Pre drive check of vehicle				
Br. No driving when tyre profile <1,6 mm				

Figure 225 - Enabled and disabled cells

#### In the screenshot shown in

Figure 225 - Enabled and disabled cells, we see that:

- Operations B and C are linked at the threat level – all cells are enabled for one threat.
- Operation A is probably linked to the entire hazard.
- Operation D is not linked to this hazard or any of its threats.

Tip: There could be some or even many barriers in your risk model that may not be critical or even relevant for an operation. Using a Soob category called 'Not Applicable' (or any similar value) helps you to identify those barriers as 'Not Applicable' to this operation. It is important to think it through though, because your operation is or could be exposed to the hazard and subject to one or more consequences of a top event. Using a Soob category called 'Not Directly Applicable' might be a good way to deal with those barriers that the operation indirectly relies on for the prevention of a release of the hazard, but that are not considered a direct part of the operational activities.


If you unlink operations from hazard/top events, the structure of your Soob matrices will be automatically updated to reflect this change. Any values that you have assigned to cells (operations vs. barrier) that are no longer linked are then lost. If a barrier is part of a bowtie of a hazard/top event that has been unlinked, those values are lost because they were a part of that link.

BowTieXP will not provide you with a warning when you unlink operations. It does however allow you to recover from your mistake by undoing your change with the Undo button (↶). This will also recover all linked information that you lost by unlinking.

### 21.9.3. Editing the operations versus operational risk factors section

The operations versus operational risk factors section is edited in the same manner as the previous two sections.

### 21.9.4. Exporting to Microsoft Excel

Although it is recommended to provide Soob matrices in BowTieXP format the matrix can also be exported to Microsoft Excel. Press the Export to Excel button (  ) to do so.

It is recommended to provide matrices to consumers because BowTieXP has special features for navigating and searching through the matrices, and is capable of referencing all linked information easily. The matrices are less accessible from Excel. Remember that the navigator version of BowTieXP also supports all features for navigating the matrices.

Microsoft Excel provides you with many formatting options, if you want to know more please contact [support@cgerisk.com](mailto:support@cgerisk.com) and we will provide you with some useful Microsoft Excel formatting tips.

### 21.9.5. Relationship models of operations

Another useful feature of Soob in BowTieXP is that once the matrix has been populated with values, you can right-click on an operation in the Tree view and select to see its relationship diagram as shown in the screenshot below:

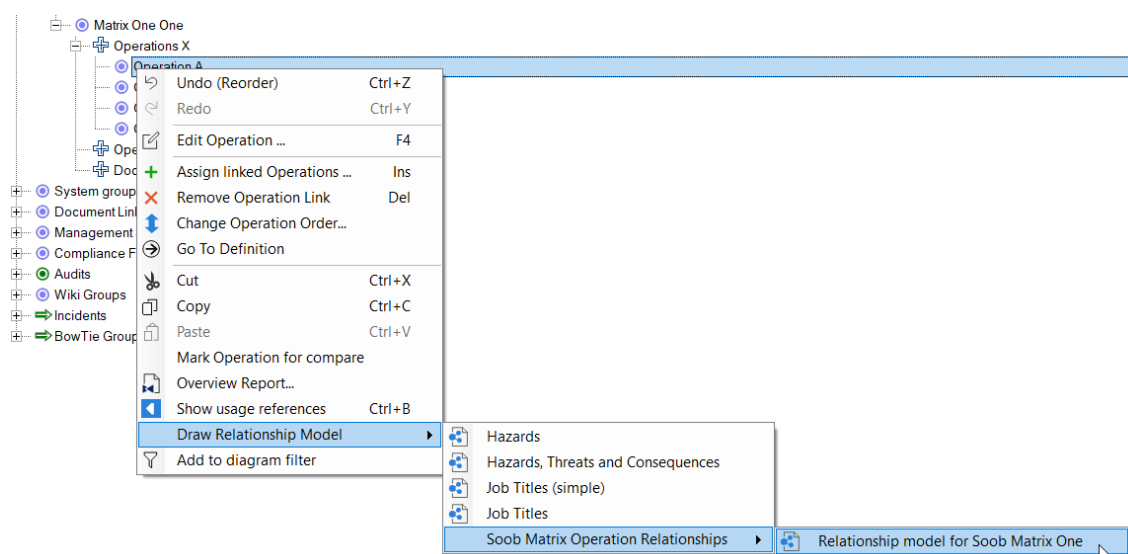


Figure 226 - Relationship model menu

You will see a mind map showing the Soob relationship that has been defined between this operation and the other operations.

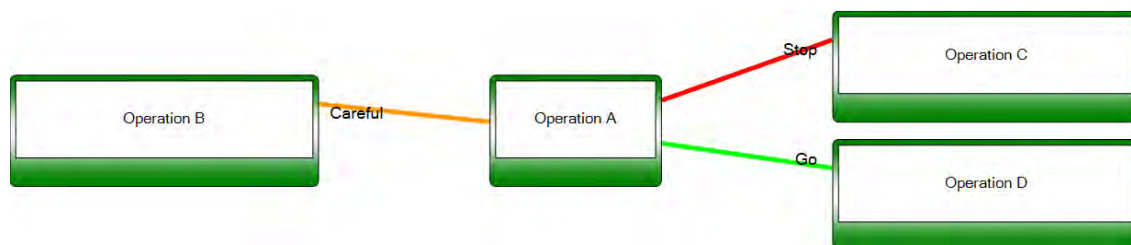



Figure 227 - Example Soob relationship diagram

Note: For more details on relationship models, see chapter 9.5, Advanced functionality: relationship models.



### 21.9.6. Soob matrix editor toolbar reference

This section explains all icon functionalities. If you miss any of the icons in the tool bar, use  to find the icon.

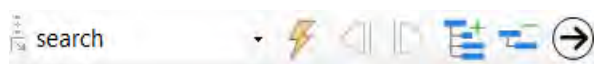


Figure 228 - Expand / collapse toolbar







Icon	Description
Keywords	Enter the keywords to expand by here
	Execute expand by keyword operation by means of the keywords entered into the text box
	Go to previous keyword match
	Go to next keyword match
	Expand All
	Collapse All
	Go to definition in the Tree view



Figure 229 - General toolbar





Icon	Description
	Reset/reload
	Export to Excel



Figure 230 - Column filter and fill/paint toolbar

Icon	Description
	<p>Select either the column to display or the named selection of columns to display here:</p> <p>With the column filter, you can show only one operation vertically to allow you to focus on that one operation versus the other operations. By selecting &lt;no filter&gt;, you can show all operations on the columns again.</p> <p>You can also create sets of operations to work with. They are called Soob filtered views and are defined in the Tree view underneath the matrix.</p>
	Copies one column to another.



OFF

Replace one Soob category with another/fill.

Select the Soob category to paint with here to enable this feature. After selecting a category, each cell you click will be assigned the selected Soob category.

Icon	Description
	Enable the display of the row of the currently selected/hovered cell.
	Enable the display of the column of the currently selected/hovered cell.
	Enable hot tracking: when this option is enabled, the row and column display will show the values for the cell currently under the mouse pointer. When it is disabled, they will display the information for the currently selected cell.
	Enable tooltips showing extra information for the cell under the mouse.

# 22

## Advanced functionality: Live on/offline system states

This chapter describes how to automatically determine whether a hardware barrier is on- or offline based on the barriers' individual parts

### 22.1. Introduction

Many barriers found on modern industrial installations have hardware components in them. These hardware parts are often managed by maintenance management systems, which keep track of the states of these parts. If parts are taken out of commission or isolated for the time being, their status can go from 'online' to 'offline'. If some parts are considered offline or the status is unknown, this can have an impact on the availability of a barrier function of which they are a part.

With the live on/offline system states functionality, the effects of individual parts going on- or offline can be shown on the bowtie. For example, when a part's status is updated to an offline status, a barrier can automatically turn red depending on a configurable logic model. If these parts states are updated regularly, the bowtie can show near real-time current state of the barriers.

### 22.2. Overview of the model

In order to automatically determine whether a barrier should be considered online or offline, a decision tree can be constructed using a hierarchy of systems relying on a list of parts.

In Figure 231 on the far right we see the individual parts. Parts are the lowest level of hardware components on which the organization can retrieve an online/offline/unknown state. They are defined in the parts table and have a code, name and on/offline or unknown status. They do not contain any decision logic.

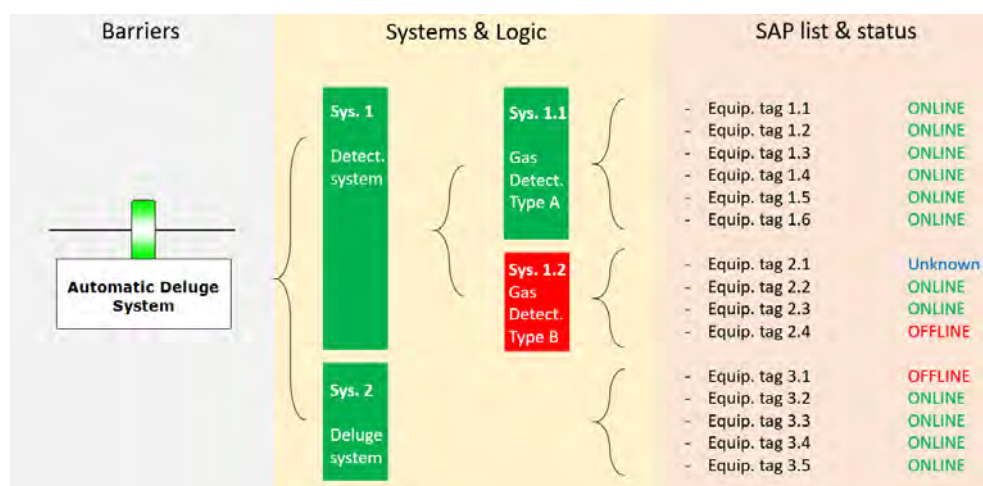


Figure 231 - Example model of parts, systems and barriers

Parts can be linked directly to systems and sub-systems. It is on the level of the systems where the decision logic is defined. On- or offline criteria can be defined with simple rules such as:

- If more than x Equip. tags are online: online
- If less than x Equip. tags are online: offline
- If a percentage if online: online

Using this logic, a hierarchy of systems can be created to determine the on/offline status of the main system, or barrier.

See for example, Figure 231. The online criteria for System 1.2 (Gas detection type B) may be defined so that only one part may be offline at any time. In the figure, we see however that two of its parts are considered offline or unknown; therefore, the whole system is now considered offline. Furthermore, the online criteria for System 1 (Detection system) may prescribe that at least one of the subsequent systems should be operational. We can see that although system 1.2 is offline, system 1.1 is still online which is enough to consider system 1 online.

The following sections will describe how to set up the entire system.

## 22.3. Create a system group

In the Tree view you find the node System groups. Add a new system group by right clicking on systems group and fill in the code, name and description. It automatically creates two sub tabs; one for parts and one for systems.

## 22.4. Adding system parts

You can add parts by right clicking on the parts container and click on New part. The editor like the figure below will appear. You can fill in a code, name and select what its online status is.

Figure 232 - Parts editor

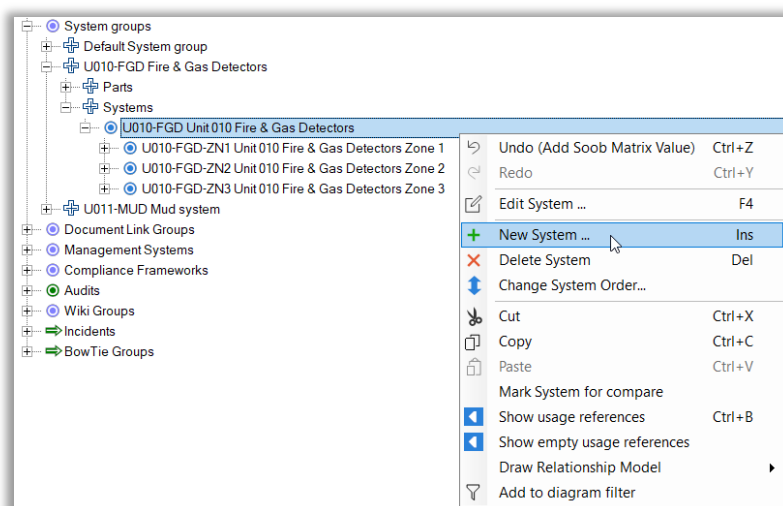
---

Note: Creating parts manually will take a lot of work. It is much more efficient to use the Scrap book to import a list of parts that you might already have created in Microsoft Excel. Please refer to Chapter 18 Advanced functionality: the Scrap Book.

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## 22.5. Adding a hierarchy of systems and linking their parts

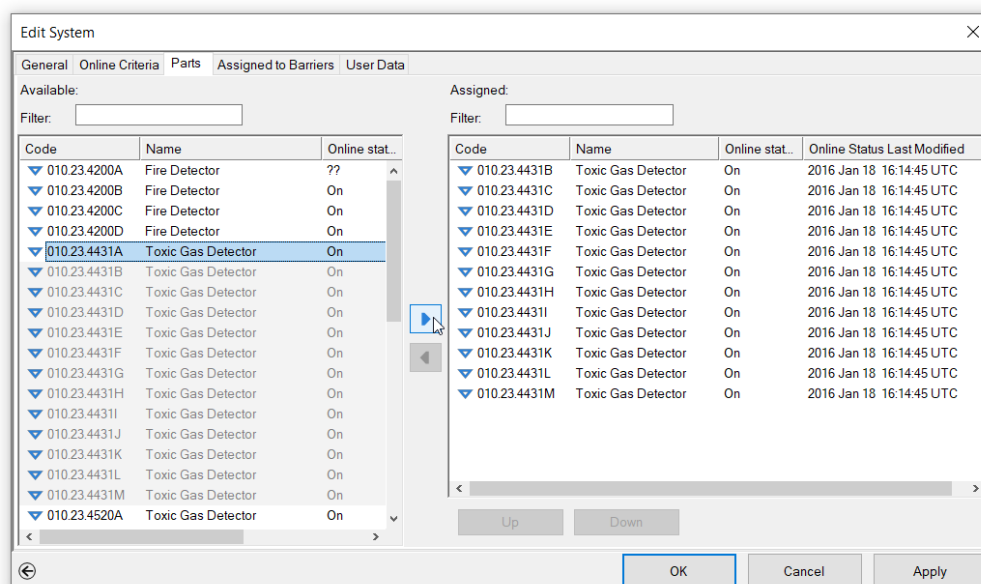
Once you have created a list of parts, you can add a hierarchical structure of systems. Right click on systems to add a new system. You can make a sub system by adding a system to the system that you have just created. The figure below shows a hierarchical structure and how to add a new sub-system.



**Figure 233 - Creating a hierarchy of systems**

To link parts to systems, double click a system and go to the “parts” tab. The parts in the left column are all parts defined in the software, but that are not yet linked to the system. To link parts, you first need to select the parts you want to link. Use the arrows in the middle of the diagram or drag the parts from the left column to the right column. All parts in the right column are linked to this specific system.

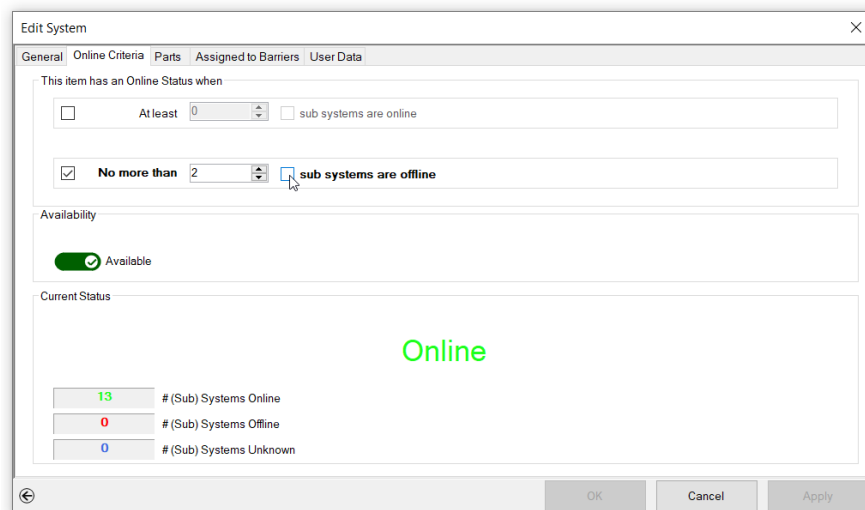
One part can be linked to multiple systems, allowing for re-use and maximum flexibility in the online calculations.



**Figure 234 - Linking parts to systems**

## 22.6. Defining online status criteria for systems

After double clicking a system, you can go to the “online criteria” tab to define the on/offline criteria for the system based on the direct ‘child’ elements (i.e. parts and/or systems) linked beneath the system. The configuration is done as follows:



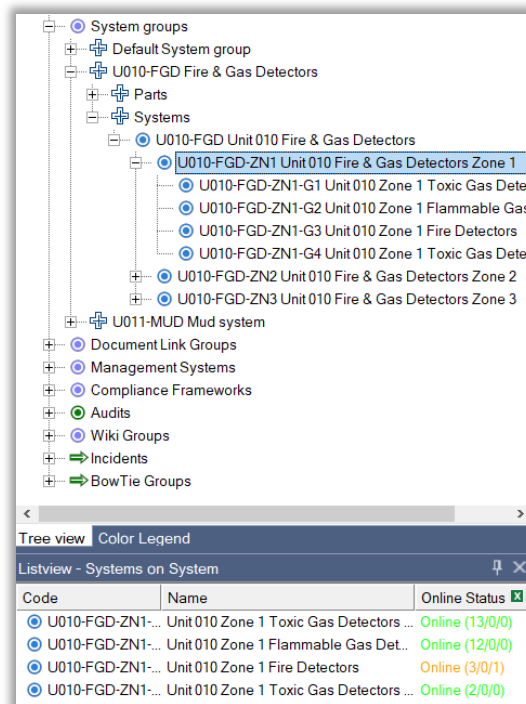
**Figure 235 - Define on / offline criteria**

On each system, there are two potential rules that can be enabled:

- A minimum availability rule – at least N parts or subsystems must be online for the system to be online
- A maximum unavailability rule – no more than N parts or subsystems may be offline if this system is to be considered online.

Both rules can be configured in absolute numbers or in percentages. To toggle to percentages, use the tick box on the right of the numerical selector. Both rules can be active at the same time. You will get a choice whether the two criteria are both to be met or only one is to be met (AND/OR logic). If no rules are active, the part will be in the offline status by default.

These rules will run from leaves to root in the systems hierarchy, calculating the status of each element by means of the part online/offline status. The online status for the following systems hierarchy can be made visible if we select the system group in the Tree view and look below that screen in the listview:



**Figure 236 - Systems status from Tree view depicted in listview**

The listview (View → Windows → Listview) is useful to view the status of the system you selected in the Tree view. In the right-hand column, we see the status of the system itself. Green means the system is fully online, red means it is considered offline and amber means that the system has met the online criteria, but not all sub-systems are online. The notation behind the on/offline indicator shows how many of its directly linked systems and/or parts are online (left), offline (middle), or unknown (right).

In the quality checks (View → Windows → Quality checks) (see section 7.15, Quality checks window), you can do several checks based on the online criteria. These checks are:

- Systems that do not have any online criteria set
- Systems with offline, unknown or amber status
- Systems with online criteria set

## 22.7. Linking systems to barriers

When a hierarchy of systems has been defined, the systems can be linked to barriers in the same way as any other link collection in the software. Make sure all online criteria are set for all (sub-)systems, to see the online status of the barrier.

Linking a system to a barrier can be done in the systems editor or barrier editor. The figure below shows how to do this from the system editor. Go to the tab: 'Assigned to Barriers'. Use the arrow or drag and drop the appropriate barrier from the left box to the right box.

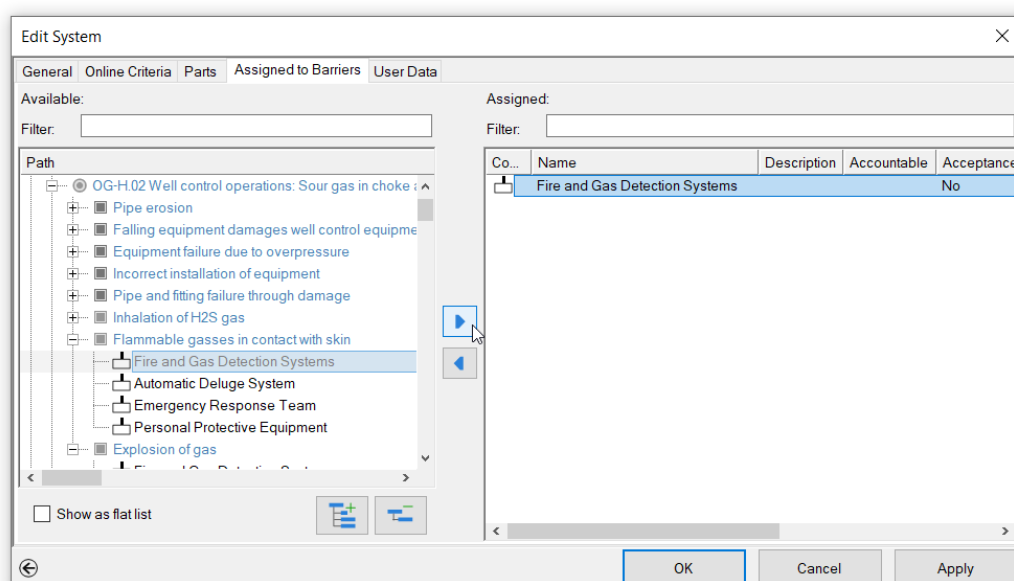


Figure 237 - Linking systems to barriers

## 22.8. Displaying online/offline status on the diagram

All this results in a visualization beneath each barrier, showing the actual barrier status as well as the make-up – how many associated systems are online or offline. This display is configured via the display options by clicking the small eye icon (👁) in the bottom right-hand corner of the barrier:

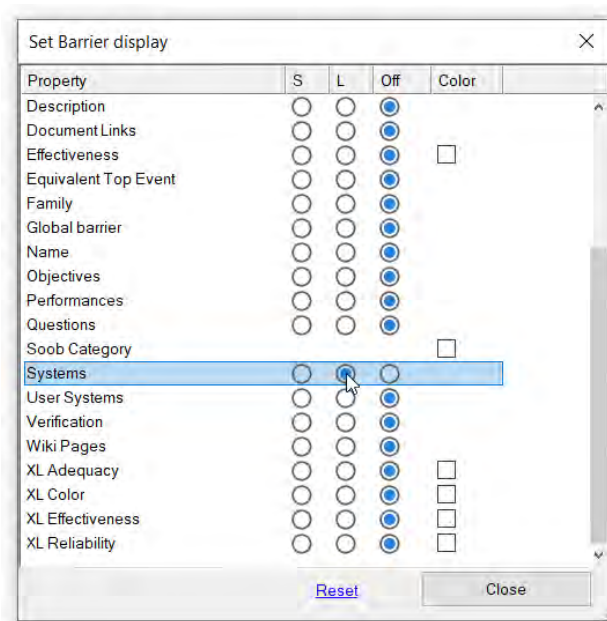


Figure 238 - Set online status info via the barrier's 'eye' icon menu

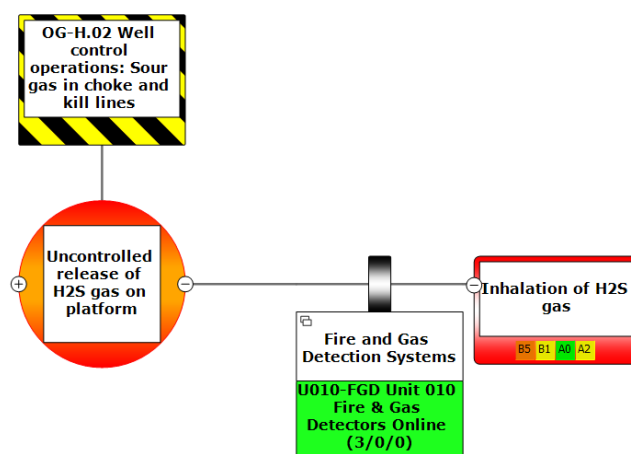


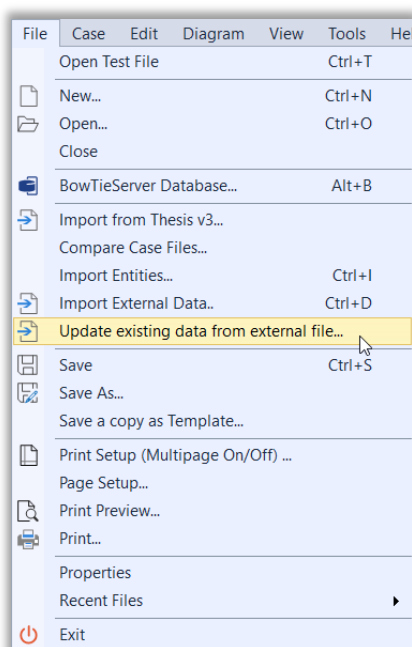
Figure 239 - Visualization of system status on barriers

Only one system is linked on the barrier, in this case the automatic deluge system. The barrier is online, as that system has 2 sub-systems online, 0 unknown, and 0 offline. This can be deduced from the (2/0/0) context under the system display. The order is (Online/Unknown/Offline).

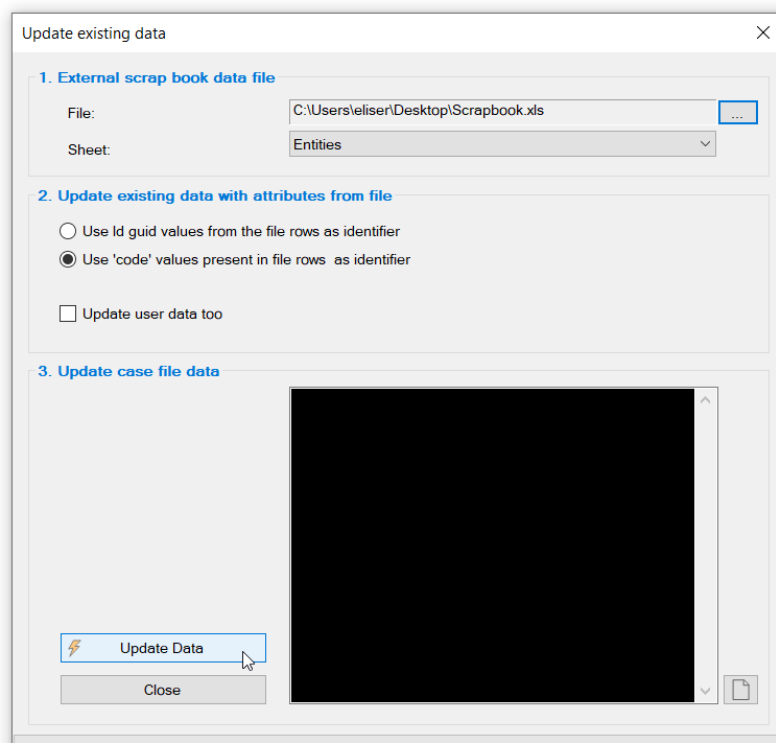
## 22.9. Updating parts' states

In order to do bulk updates of the parts' status, you can use the functionality: Update existing data from external file (File → Update existing data from external file).





**Figure 240 - Updating existing data from external file**



**Figure 241 - Update existing data**

It shows the screen like the figure above. In the first section, you need to add the external data (Microsoft Excel) file you want to update and choose the correct sheet. The second section asks you if you want to update by ID values or Code values.

- ID values are created by BowTieXP for each element.
- Code values are created by the users when you fill in the code of the part.

The imported Excel file could look like the figure below (This file is retrieved from Scrap book (View → Windows → Scrap book)):

	A	B	C	D	E	F
1	Entity Id	Code	Name	Description	Status	
2	Part	4151567d-c	Eq 1.1	Equipment Tag 1.1		Offline
3	Part	4e77215a-b	Eq 1.2	Equipment Tag 1.2		Offline
4	Part	25602b29-8	Eq 1.3	Equipment Tag 1.3		Online
5	Part	46c1ec65-6	Eq 1.4	Equipment Tag 1.4		Online
6	Part	f1b868a5-b	Eq 1.5	Equipment Tag 1.5		Online
7	Part	f21d2b25-6	Eq 1.6	Equipment Tag 1.6		Online
8	Part	353821fd-3	Eq 2.1	Equipment Tag 2.1		Unknown

Figure 242 - Import Excel file for updating

## 22.10. Displaying online states in the Case Overview

For an overview other than the bowtie's graphical representation, a list-wise representation can be provided via the Case Overview. The states are part of the 'Systems-User Systems' overview (for details on the Case Overview, see section 9.2).

Systems	Online Status	Criteria- Is Online when:
<b>Systems</b>		
Sys. GSYS Generic Systems	No criteria set	No criteria set - unknown
Sys. Instrumented air	No criteria set	No criteria set - unknown
Sys. General power	No criteria set	No criteria set - unknown
Sys. Emergency power	No criteria set	No criteria set - unknown
Sys. IT network	No criteria set	No criteria set - unknown
Sys. DCS (Distributed control system)	No criteria set	No criteria set - unknown
Sys. P Procedure	No criteria set	No criteria set - unknown
Sys. U010-FGD Unit 010 Fire & Gas Detectors	Online (3/0/0)	No more than 0 sub systems/parts are offline
Br. Fire and Gas Detection Systems		
Br. Fire and Gas Detection Systems		
Br. Fire and Gas Detection Systems		
Br. Fire and Gas Detection Systems		
Sys. U010-FGD-ZN1 Unit 010 Fire & Gas Detectors Zone 1	Online (4/0/0)	No more than 0 sub systems/parts are offline
Sys. U010-FGD-ZN1-G1 Unit 010 Zone 1 Toxic Gas Detectors Ty...	Online (13/0/0)	No more than 2 sub systems/parts are offline
Prt. 010.23.4431A Toxic Gas Detector	Online	2016 Jan 18 16:14:45 UTC
Prt. 010.23.4431B Toxic Gas Detector	Online	2016 Jan 18 16:14:45 UTC
Prt. 010.23.4431C Toxic Gas Detector	Online	2016 Jan 18 16:14:45 UTC
Prt. 010.23.4431D Toxic Gas Detector	Online	2016 Jan 18 16:14:45 UTC
Prt. 010.23.4431E Toxic Gas Detector	Online	2016 Jan 18 16:14:45 UTC
Prt. 010.23.4431F Toxic Gas Detector	Online	2016 Jan 18 16:14:45 UTC
Prt. 010.23.4431G Toxic Gas Detector	Online	2016 Jan 18 16:14:45 UTC
Prt. 010.23.4431H Toxic Gas Detector	Online	2016 Jan 18 16:14:45 UTC

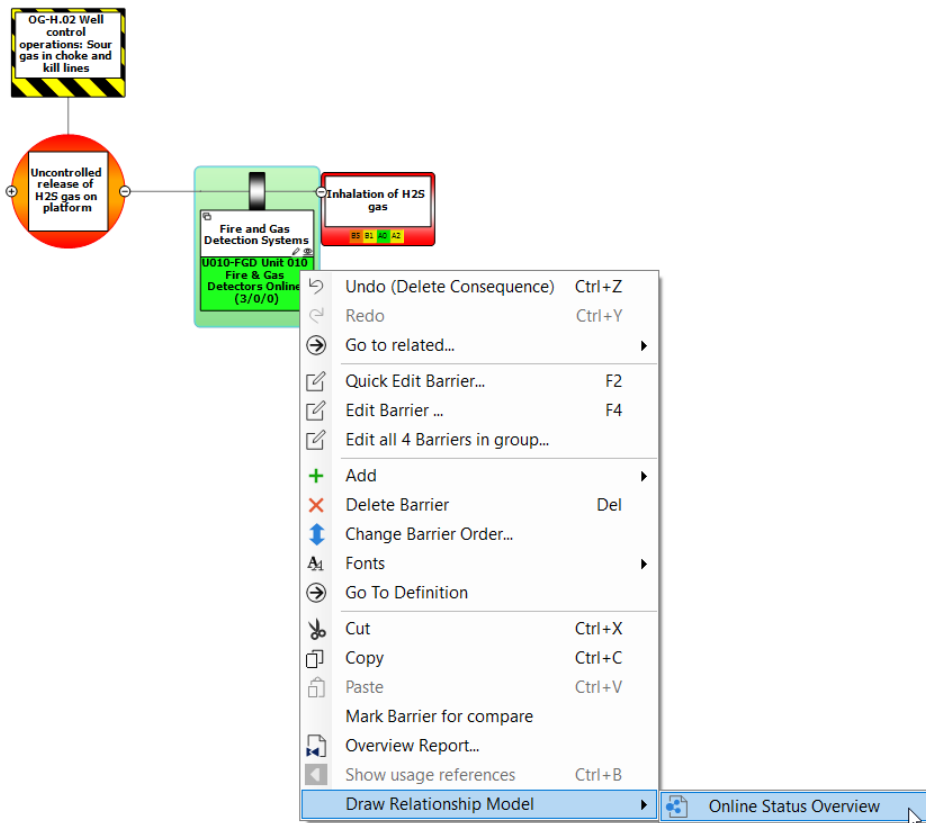
Figure 243 - Case Overview for Systems that shows online/offline states

The Case Overview can be used to drill down and analyze why systems are considered online/offline. The Case Overview is interactive, so it is possible to directly edit the barriers, systems and parts from this structure if required. In addition to its calculated online state, it also shows at what date/time the status has been updated and what the criteria are per system/barrier.

## 22.11. Display online status in relationship diagram

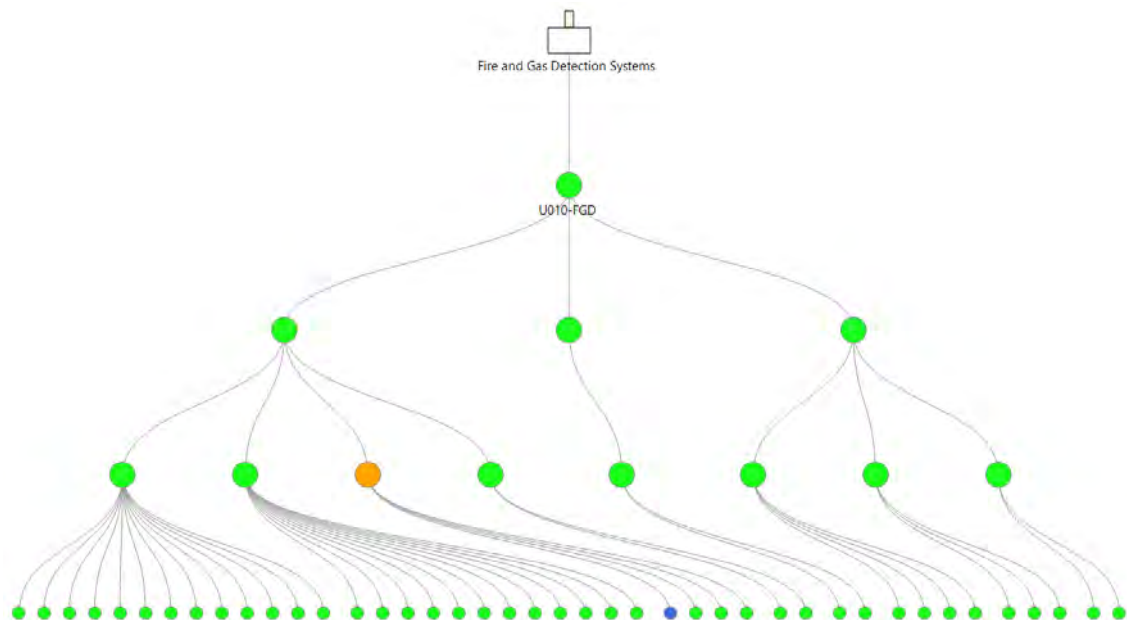
For more complex barriers, the subsequent hierarchy of systems and parts can become very complex. To facilitate the analysis of why a barrier is considered online or offline, it is possible to draw a relationship tree that shows all sub systems and their children plus it highlights whether they are red, green or amber. The online status relationship tree can be displayed on any level within the hierarchy as long as a system has child elements.

You can show the relationship diagram by right clicking on the system on a barrier or from the system in the Tree view. Choose Draw relationship diagram → 'Online status overview' as in the figure below.





**Figure 244 - Online status overview for a barrier and a system**

The diagram that is produced will take the following form:



**Figure 245 - System relationship diagram**

Interacting with the model is possible by using the right click menu. The diagram can be copied using the copy-to-clipboard functionality in the top left corner (  ). The Filter button (  ) allows the relationship model to show the offline and their connected shapes.

# 23

## BowTieServer oriented features

This chapter lists some of the features in BowTieXP that work best in combination with BowTieServer.

### 23.1. Introduction

Some features in BowTieXP are especially powerful when used in combination with BowTieServer. Some can also be used when using BowTieXP stand-alone but may not always be practical.

---

This chapter will only briefly describe the features, but for a more detailed description, please refer to the BowTieServer manual.

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### 23.2. Organizational units

Most large international organizations have operations on multiple sites, spread out over the globe. All of these sites may want to make bowties or in some cases even share bowties if they are dealing with similar risks. To keep track of which data is relevant for which location, organizational units can be created and assigned to various forms of data.

In BowTieXP, these organizational structures are often tied to a geographical location, although it is also possible to define departments that are more abstract. The organizational units can be defined in the Tree view under the bowtie lookup tables similar to any other taxonomy. They are hierarchical in nature, so the following structures could be possible:

North Sea

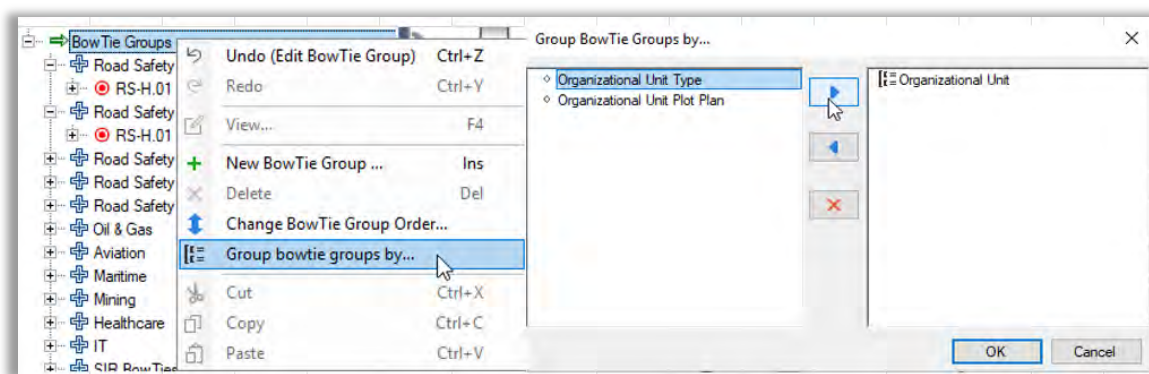
- Drilling platform A
  - Drilling floor
  - Crew Quarters
  - Helideck
- Drilling platform B
  - Drilling floor
  - Crew Quarters
  - Helideck

Various features in BowTieXP and BowTieServer make use of the organizational units:

- Barrier performance: Define the actual effectiveness of a barrier per organizational unit
- Organizations can have in addition to a geographical location also a more detailed Plot plan
- Link organizational units to bowtie groups to track which bowties are relevant for them
- Link organizational units to Incidents to track which are relevant for them
- Use them as filtering parameters in the AuditXP's audit filter and IncidentXP's incident filter
- Use them as filtering parameters in various BowTieServer overviews

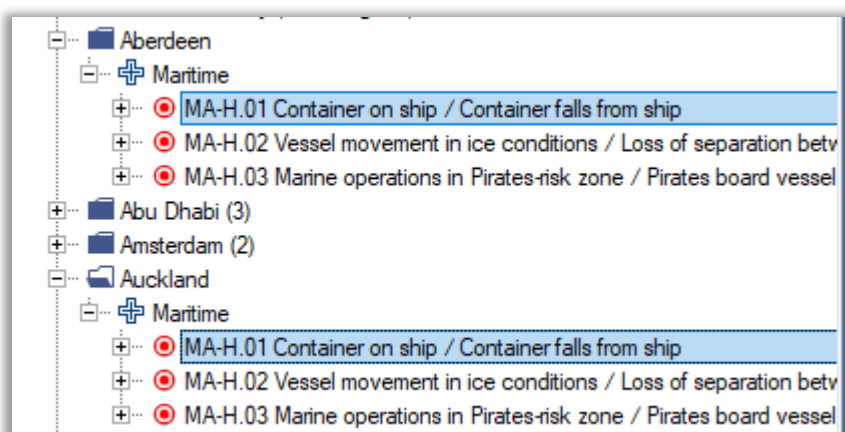
#### 23.2.1. Organizational units grouping

Users can group by organizational units in the Tree view by right-clicking and selecting 'Group bowtie groups by...'.



**Figure 246 - Grouping bowtie groups by organizational unit**

Pressing OK gives you the below view. The bowtie group 'Maritime' contains 3 bowties. Those bowties will be displayed for each organizational unit they apply to. Note that this does not mean that the bowtie gets duplicated, there are still only 3 maritime bowties. The bowtie MA-H.01 Container on ship / Container falls from ship for the organizational unit Aberdeen is the same bowtie as the one for Auckland. The view simply gets duplicated, so it is easier for you to go down the list of bowties per organizational unit.



**Figure 247 Grouping on organizational unit**

To check how many links to an organizational unit a bowtie has you can right-click on the hazard and select 'Go to definition'.

It is also possible to group on hazards, please see section 7.11.1 Tree view filters, grouping by hazard.

### 23.3. Plot plans

Because industrial installations can be quite large, merely a geographical location is not always practical. To get a higher level of detail, the image of a plot plan can be uploaded to achieve a higher level of detail. Even though the functionality is called "plot plans", it can also be used to upload another picture such as an aerial photograph or any other schematic representation of the site.

Another use of plot plans is to have a stable mapping for locations that themselves are mobile. For example, a maritime vessel may not always be in the same geographical location, but its plot plan will be the same no matter which geographical location.

Plot plans can be added in the Tree view, under bowtie Lookup tables. They are then used by various features:

- Incident reporting: Pinpoint the location where the incident occurred.
- Link organizational units to specific points on a plot plan

## 23.4. Change history logs

When a user has permission to view change histories, a clock symbol will appear on all bowtie elements. Pressing this button will show the change log for that element, listing all changes that have been made in the past to this element. The same log is also accessible in the web UI of BowTieServer.

## 23.5. Barrier Performance data

In organizations that have operations in multiple locations, it is possible that they are dealing with similar risks regardless of the geographical location. It could therefore be possible that these locations share a bowtie on the same risk or require having the same barriers in place. However, even though the barriers must be the same, the effectiveness of the barriers may vary per location. To assess the actual effectiveness of the barriers per organizational unit, the barrier performance feature can be used.

**In this tab in the barrier editor, the effectiveness of the barrier can be determined for every organizational unit that has been linked to the bowtie group in which the bowtie diagram resides. The barrier performance per organizational unit can be displayed into the bowtie diagram, like in Figure 248. This can be done by checking the 'Performances' box in the display option (small or big eye icon). In addition, the diagram can be filtered down to only show barriers with performance values, by selecting the Performance Filter.**

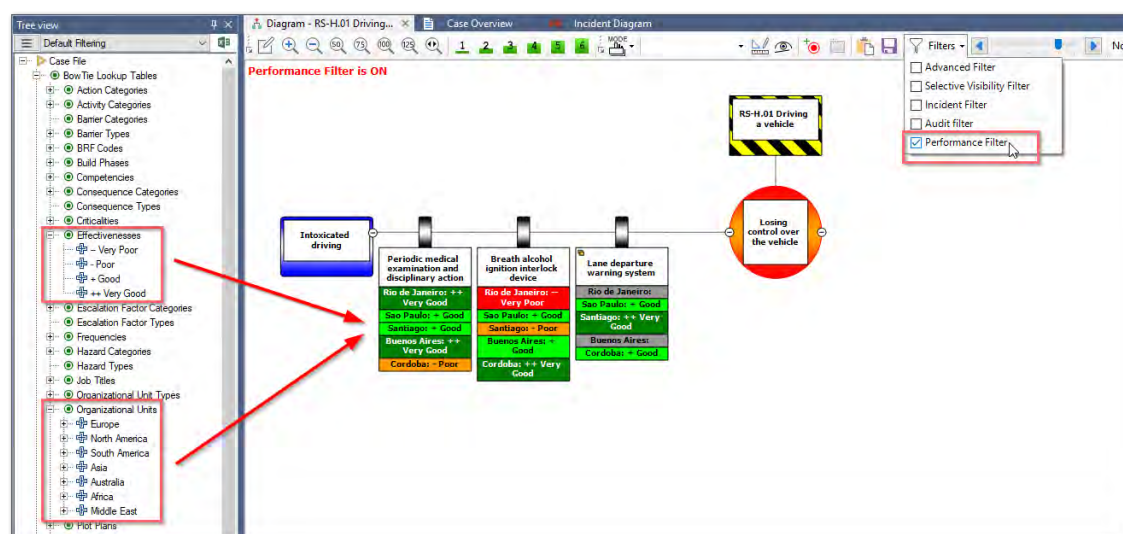


Figure 248 Barrier performance per organizational

When applying the performance filter, it is also possible to select the 'organizational units' dropdown. This dropdown allows you to modify the filter on performances per organizational unit.

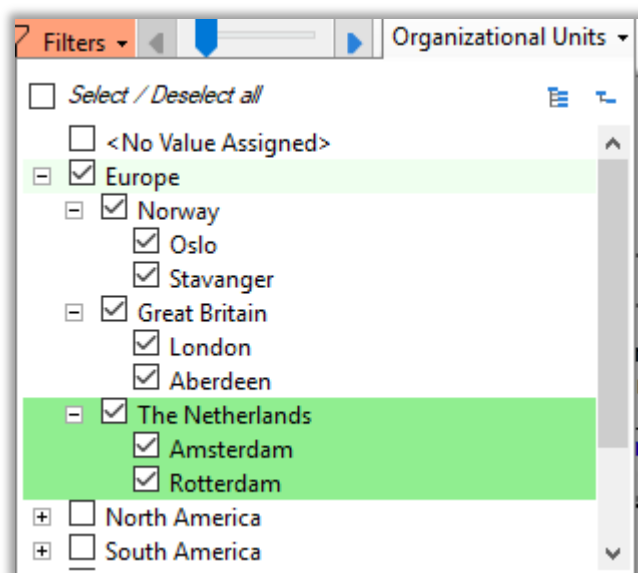


Figure 249 - Organizational unit dropdown

The dropdown uses color to highlight which organizational units are connected to the currently selected bowtie, as defined in the bowtie group to which that bowtie belongs.

**White background color:** The currently selected bowtie does not have any organizational units connected to the bowtie, toggling these items therefore has no impact on the display of the bowtie.

**Dark green background color:** These organizational units are linked to the currently selected bowtie. Toggling these will for instance reduce the number of performance items under a barrier (see Figure 250 - Performance on barrier).

**Light green background color:** This color shows that this colored organizational unit has a link to one of the organizational units below it. In

Figure 250 - Performance on barrier' this is the organizational unit 'Europe'.

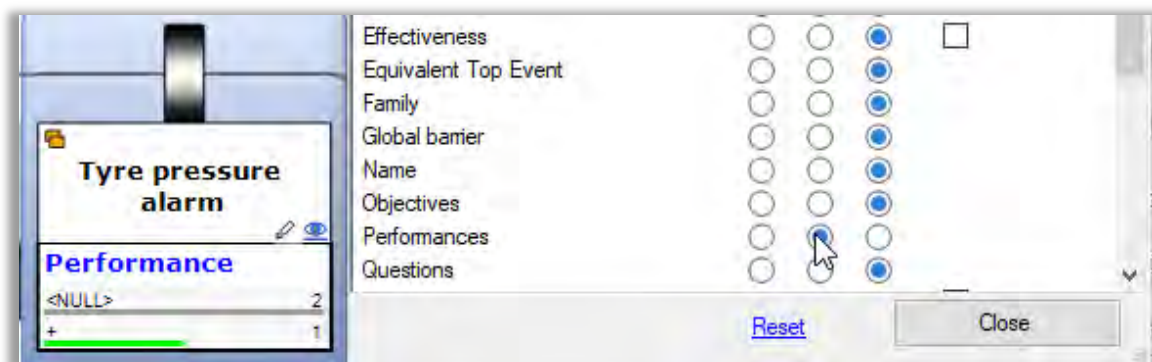


Figure 250 - Performance on barrier

In the example shown above, the barrier 'Tyre pressure alarm' has one performance item defined as 'Good (+)' and 2 undefined effectiveness values (<NULL>), in this case for the organizational unit The Netherlands and its sublevels: Rotterdam and Amsterdam.

It is possible to change what is being displayed by un-toggling either The Netherlands, Rotterdam or Amsterdam, or all of them. Clicking The Netherlands once, will instantly deselect both the parent as well as its children. The barrier will not show any performance data anymore (despite it's 'on' status in the small eye icon).

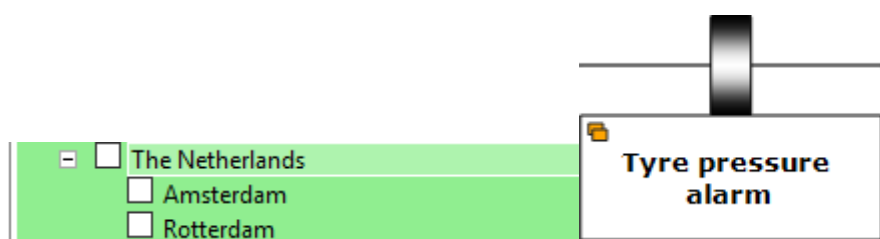


Figure 251a – (Un)Toggling performance data on barrier

Deselecting Rotterdam will automatically deselect The Netherlands and only show the barrier's performance value for Amsterdam. Note that the icon of the 'parent' organizational unit (The Netherlands in this example) becomes black to indicate items related to it are not displayed on the diagram anymore, despite its link.

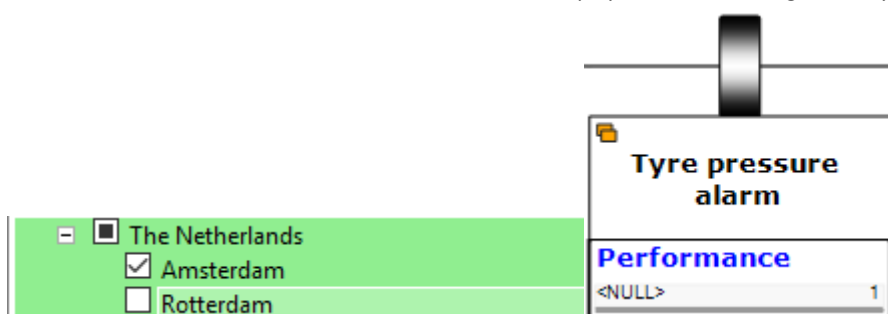


Figure 252b – (Un)Toggling performance data on barrier

To select just The Netherlands (or both Amsterdam or Rotterdam), users have to hold the **“Ctrl”** button on their keyboard and then select the organizational unit. The barrier's performance value will show only The Netherlands.

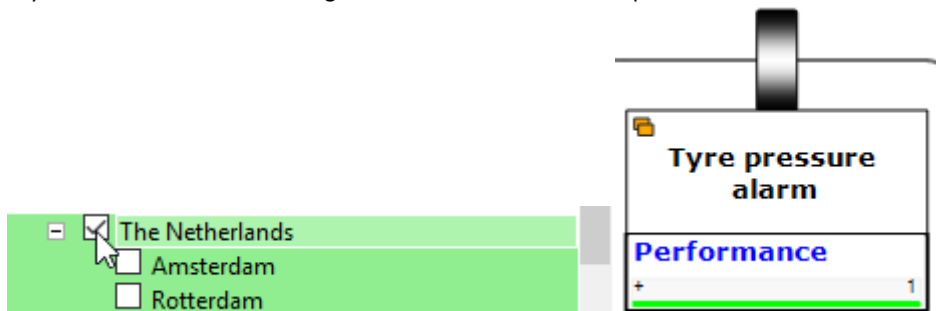


Figure 253c – (Un)Toggling performance data on barrier

## 23.6. Global – local linking in BowTieXP

Similar to the barrier performance feature, global - local linking can also be utilized to demonstrate local performance on a global level.

A set of (local) bowties can be linked to a parent (often on global level) bowtie, after which all linked element values will be aggregated and displayed on the global bowtie. This will allow for autonomous management of local bowties while at the same time the global bowties can be utilized to compare all local values. This feature can be used and applied in the standalone version of BowTieXP as well as in combination with BowTieServer. The initial concept of global local was designed and created with the idea that it will be used with BowTieServer.

Both BowTieServer and BowTieXP will allow the user to make a copy of an already existing bowtie and use it as a local version. As the local bowtie will be automatically linked to the global bowtie, this will save a significant amount of time. BowTieServer related functionality of this global-local feature can be found in the BowTieServer software manual.



Both barrier performance and global local linking can be used to visualize local performance on a global level. Choosing between both features depends on the needs of the organization.

If local performance is only used to differentiate performance (effectiveness) on local level, the barrier performance feature can be sufficient. Assurance of the performance can be done by using AuditXP. Bear in mind that the same bowtie will be used as the basis for all organizational units.

If the local bowties are used for more autonomous way of managing locations, for instance if every organization unit manages their own version of the bowtie, then global – local feature might be a better fit. All local reference and meta data can be shown on the linked global bowtie. Often in these situations the performance assurance is already covered on local level and effectiveness of barriers is determined on local level as well. This effectiveness value will also be displayed on the global bowtie.

### 23.6.1. Linking elements between global and local bowties

Regardless whether a global copy from BowTieServer/BowTieXP is used as the starting point of the local bowtie or the local bowtie is designed and linked from scratch, BowTieXP can be used to identify the link between elements. Links between elements can be established on following element types:

- Barrier
- Hazard / Top event

To create a link between a global and local element, a full repository check-out should be performed. This will prevent multi-level linking between elements and will also prevent circular linking between diagrams. After the full repository has been checked out a new local bowtie diagram can be created, or an already existing local bowtie can be edited.

In order to create or edit this link between diagram elements, the local element should be opened for editing in BowTieXP. After this either the Hazard / Top Event combination can be linked to its global equivalent, this can be performed from the “other” tab within the editing popup.

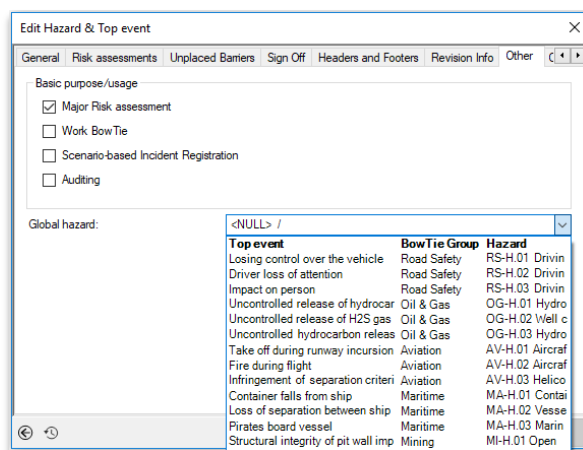


Figure 254 - Linking a new, local hazard

The barrier element can be linked to its global equivalent, this can be achieved from the general tab within the editing screen. Bear in mind that a global – local link between a hazard / top event should be established first. Based on this information BowTieXP will display a hierarchy of possibly linkable elements. To select the relevant element, the highlighted icon should be clicked. The search box above the list view can also be used to quickly locate the desired element.

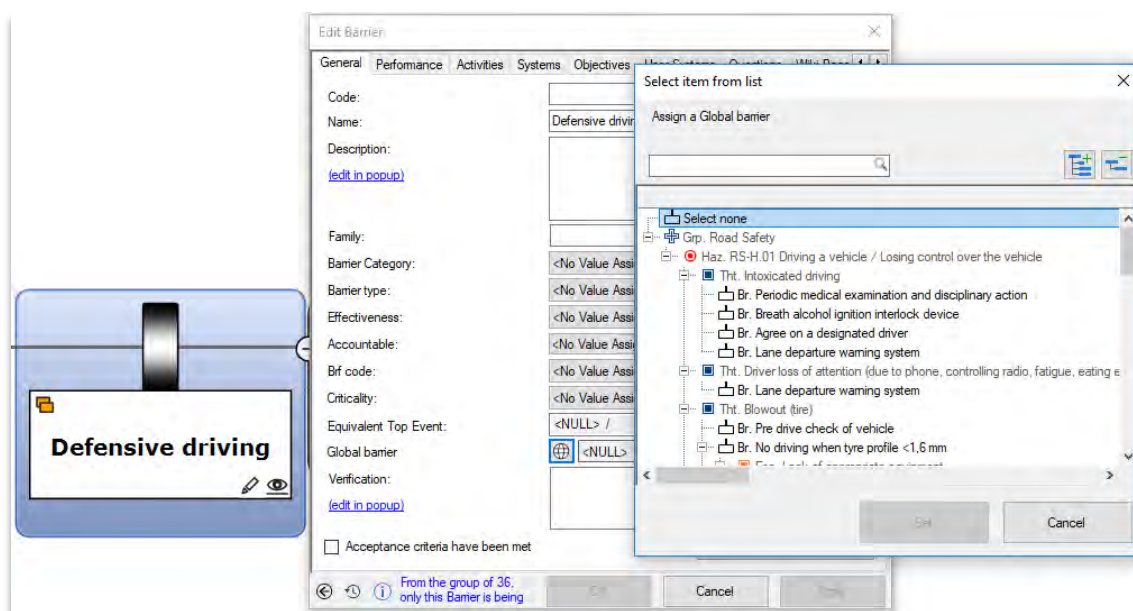


Figure 255 - Selecting the related global barrier

If a local copy was created in order to use this as a local variant before the database has been checked out, the links are already present and can be edited. This is applicable to both the hazard / top event as well as the barriers. On hazard level (both global and local) an icon will indicate that these are used either as global or as local hazard / top event.

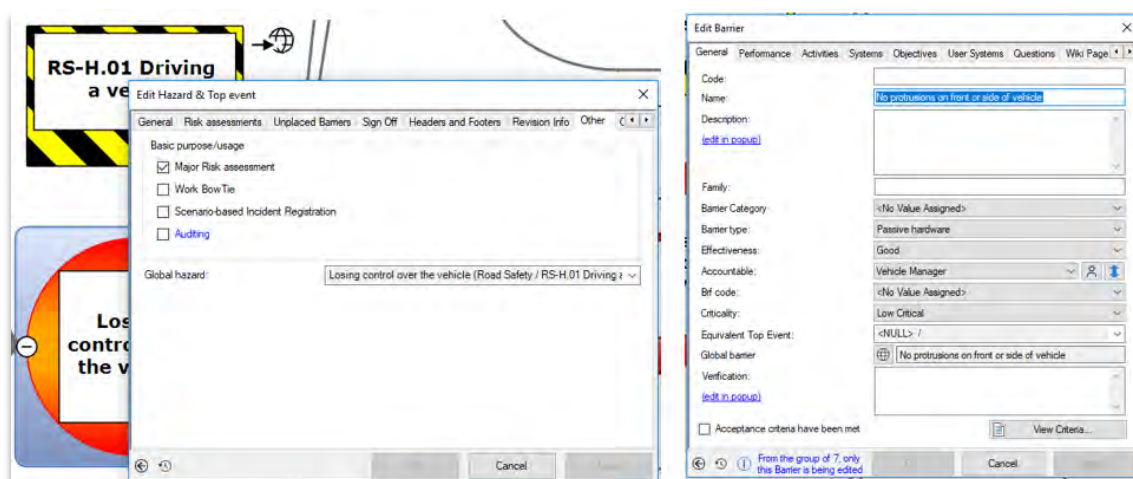


Figure 256 - Existing link between global local hazard / top event combinations (left) or barriers (right)

Using display settings, certain local information can be displayed on the global bowtie diagram. (e.g. Showing effectiveness as extra info underneath a global barrier will also display local values of the linked barriers.)

If a local copy needs to be created after the database has been checked out, this can be performed within BowTieXP. To do so, after checking out, in the tree view, right click on the hazard which will serve as the global bowtie and choose "Add local implementation Hazard". After this, a pop-up will show allowing for selection of information which needs to be copied to the local version of the bowtie. Confirming this process by clicking on "OK" will lead to a new bowtie diagram being created. As the full bowtie is copied, all elements in the local diagram are also linked to their counterparts in the global diagram. This diagram will have a "LOCAL" prefix and will be placed in the same bowtie group as the parent. The local copy can now be moved to the correct location.

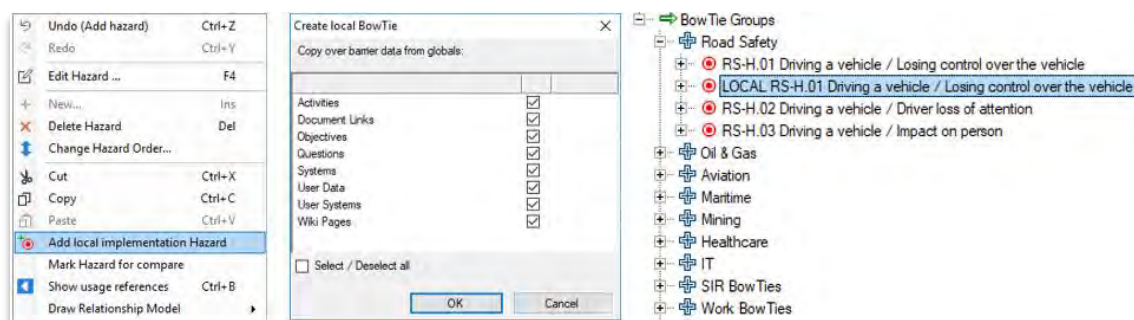


Figure 257 - Creating a local copy of a global bowtie

## 23.7. Markdown formatting

Long description fields support a simple markdown formatting. This means that with simple code, the text in description boxes can be formatted and clarified with headers, bold text, italics, simple tables, hyperlinks and even images.

For example, typing a word between “/” symbols will make the word appear in the BowTieServer web UI appear in *italics*. To create a header, the “#” symbol with a space can be placed before a line of text. It will then be interpreted as a level 1 header.

While working in the description boxes in BowTieXP, you will only see the code form of the formatting. Currently, the only way to see the formatted version of the code is to run the Barrier Overview report, which can be found in the right-click menu on barriers.

## 23.8. Wiki pages

There may be a lot of documentation available that is related to BowTie elements, in particular to barriers. Documents such as procedures, more elaborate descriptions and explanations, legal / audit standards could be relevant to consult. With the wiki pages, this information can be stored in wiki form and uploaded onto BowTieServer. The information can then be chunked into sections, chapters, paragraphs etc. and these can then be linked to individual barriers. This way, very specific parts of information can be linked to individual barriers. Therefore, when information is required, the right bit of information is easily accessible, and it is no longer necessary to leave through a large document.

The wiki pages support the before mentioned markdown formatting, so can include images, tables and other forms of simple formatting.

## 23.9. Actions and to-do items

The sticky notes in BowTieXP are called Actions when BowTieXP is used as a standalone. However, with the introduction of BowTieServer the differences between Actions from BowTieXP and Actions from BowTieServer becomes difficult to differentiate. Therefore, Actions in BowTieXP are called ‘To-do items’ and ‘Actions’ from BowTieServer remain Actions. This can be changed at all times in the BowTieServer ‘Language’ section under Admin.

# 24

## AuditXP add-on

### 24.1. What is the AuditXP add-on?

AuditXP is an add-on for the BowTieXP software package. It is used to generate barrier related audit questionnaires or surveys. The add-on allows you to easily generate questions concerning barriers and management systems. These single questions can then be compiled into surveys (a selection of questions), which can be exported to Excel as a fill-out form. After importing the audit findings, the results can be visualized in the bowtie diagrams.



Figure 258 - PDCA cycle

Auditing is a valuable way of gaining insight into barrier quality/effectiveness, to get early warnings before incidents occur. With the audit add-on, we provide a tool to close the Deming circle (PDCA cycle). After defining the barriers in your safety management system (i.e. the plan stage) and implementing them (i.e. the do stage), a check is required to ensure the quality of the barriers. Relying on barriers that are in reality inadequate can be dangerous. In addition, a thorough examination of the barriers during the check stage facilitates the generation of relevant recommendations later on (i.e. act stage).

### 24.2. Three advantages of the audit add-on

Three main advantages of using AuditXP are:

1. **Risk based auditing.** Create an audit scope by looking at the risk scenario, and report on results from a risk based perspective.
2. **Analyze dependency effects.** Visualize how a poorly performing management system can have large effects throughout the bowtie.
3. **Visualize results.** Audit results are directly plotted on the bowtie using intuitive graphs, instantly highlighting problem areas. The visual representation facilitates expert judgments on overall barrier quality. It also provides an up-to-date feedback on the current barrier quality status.

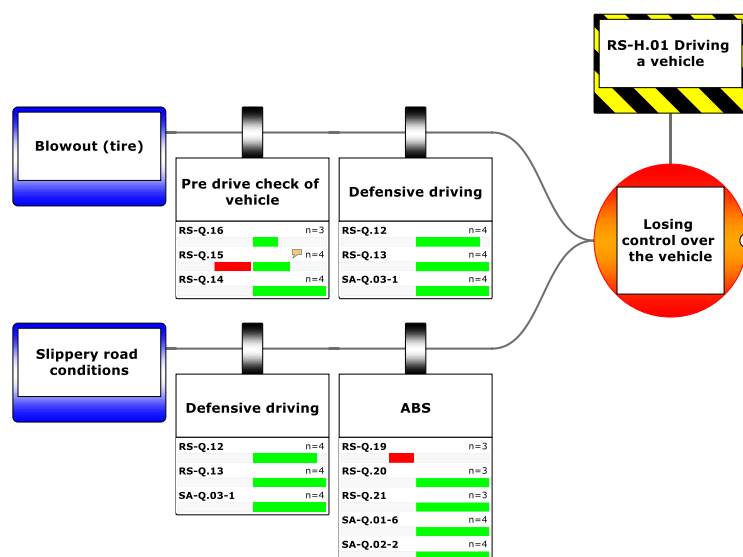


Figure 259: Visualize audit results on barriers

### 24.3. Create questions on different 'bowtie levels'

With AuditXP, you can generate surveys that directly relate with elements that are defined on the bowtie diagram. The surveys can be directed at three levels of elements:

1. Barrier level
2. Management system level (activities and documents)
3. General questions (e.g. on organizational structure)

On the barrier level, the auditor is questioning whether the integrity of barrier meets the predefined requirements (e.g. is it in place? Is it working?).

On management system level, the underlying management system can be assessed. This level covers activities such as training and maintenance, but also whether documentation is up to par (e.g. manuals, procedure documents).

The third level covers questions that cannot be linked to any specific element in the bowtie, but cover more high-level structural or general questions. Questions typically cover the existence of complete systems (e.g. if there is a housekeeping system defined) or general subjects (e.g. the way personnel communicate or the state of housekeeping).

### 24.4. The general workflow

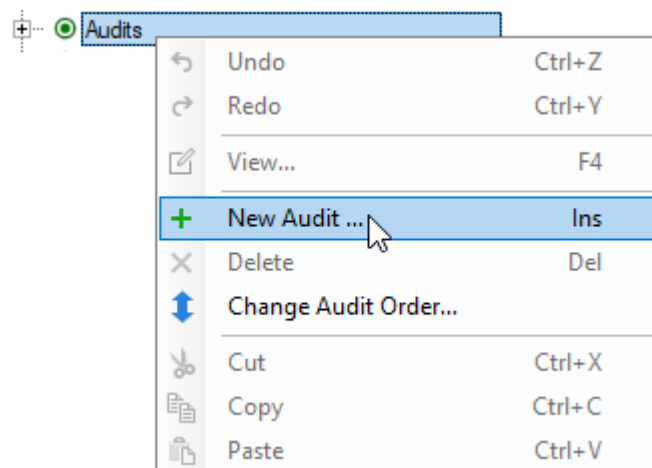
The general workflow of AuditXP is as follows:

1. Define or import questions.
2. Associate the defined questions with barriers and/or activities.
3. Create a survey, a selection of questions.
4. Create fill out forms for respondents.
5. Feed the filled out forms (the answers) back into BowTieXP.
6. View and interpret the results.

All the audit data is stored within the bowtie Case File.

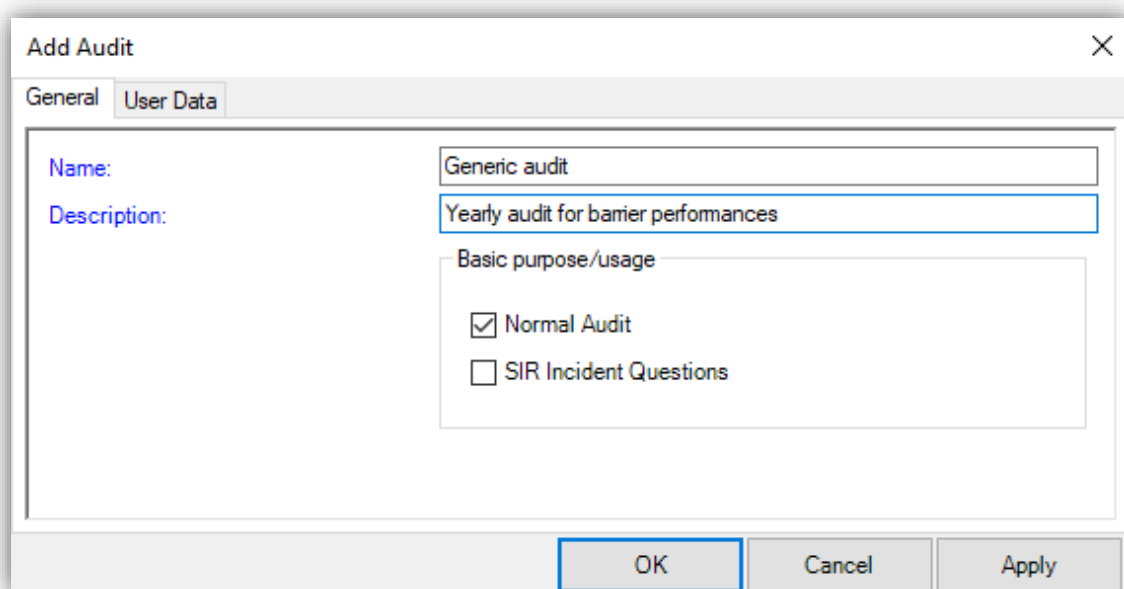
### 24.5. The audits Tree view node

All audit data is stored under the audits node in the BowTieXP Tree view. There can be multiple audits within the audit module. An audit is a collection of questions and a collection of surveys (questionnaires, consisting of a subset of questions from that audit). To create a new audit, right click the audit node and select new audit. Like in the figure below.



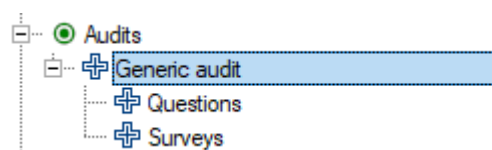
**Figure 260 - The audits node**

When you select a new audit, the add audit window appears. In this window, indicate a name and basic purpose/usage for the audit. In case you are using AuditXP for risk-based auditing, please select Normal Audit as a basic purpose/usage. The option SIR Incident Questions is for setting up the Incidents module in BowTieServer, please refer to the BowTieServer Manual.



**Figure 261 - The add audit window**

Once you created the new audit, two containers are automatically added: One for the questions and one for the surveys of that audit.



**Figure 262 - The add audit window**

## 24.6. Defining questions

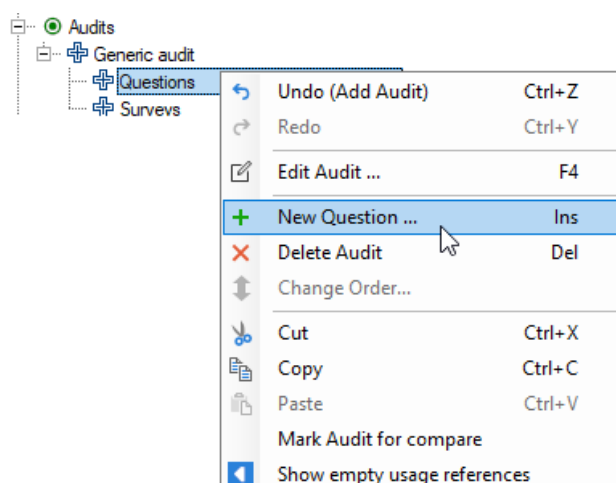


Figure 263 - Creating questions

Defining questions within BowTieXP is done by right clicking on the questions node of audits container and selecting New Question. The editor will then pop-up:

A screenshot of the 'Add Question' dialog box in BowTieXP. The dialog has a title bar 'Add Question' and a close button. It contains several tabs: General, Document Links, Assigned to Barriers, Assigned to Activities, User Data, and Work Instructions. The 'General' tab is active. The fields are: Code: Q001; Question: Is the ABS installed in all company cars?; Description: (with a link to 'edit in popup'); Ordinal answer values list: Yes, No (with a link to 'edit in popup'); Answer Keying: Positive answer appears first in ordinal list (selected), Negative answer appears first in ordinal list; Criteria: (with a link to 'edit in popup'); and an 'Advanced' section with a checkbox 'Most negative answer given will determine overall result'. At the bottom are buttons for OK, Cancel, and Apply.

Figure 264 - Editing a question

*Questions should be choice questions.*

The questions created in AuditXP should be choice questions. This means that only a limited set of answers can be defined. The possible answers should be in a logically keyed order – from most positive to most negative or vice versa. This means that a question like “Which country are you from?” cannot be asked in a question, because the answers do not range from positive to negative. A list of countries is a nominal scale, whereas AuditXP only deals with ordinal scales. From the set of possible answers, the respondent can select only one answer.

*Questions can be defined hierarchically.*

Just like activities and document links, questions can be defined hierarchically (nested). This has been added for convenience and grouping purposes only. The surveys themselves will only consist of a flat list of selected questions.

### 24.6.1. Defining answers

*Use the ENTER key to go to a new line in the answers field.*

The possible answers are each defined on a separate line in the “ordinal answer values list” field. To accomplish this ENTER must be used to go to a new line in this edit field.

*Positive, neutral and negative answers*

AuditXP assumes that the top half of the answers is positive and the bottom half is negative. It is possible to alter the negative or positive value in the ordinal answer value list, for instance by having negative answers first, by selecting ‘negative answer appears first in ordinal list’ under ‘Answering Key’. Ensure that the answer options you add to a question are in line with this interpretation. See the table in 24.10.3, How to read the positive/negative bar charts on page 207 for examples.

*Use @ to change the center of the answer scale*

By default, AuditXP will take the exact middle of all the answers and use that to determine what is positive and negative. This middle point can be biased by including an @ sign as the first character on a line. Make sure it is the first character. Placing an @ anywhere else will result in unexpected results.

For example:

Poor		Totally disagree
@		Disagree
Acceptable		Somewhat disagree
Good		@Neutral
Very good		Agree

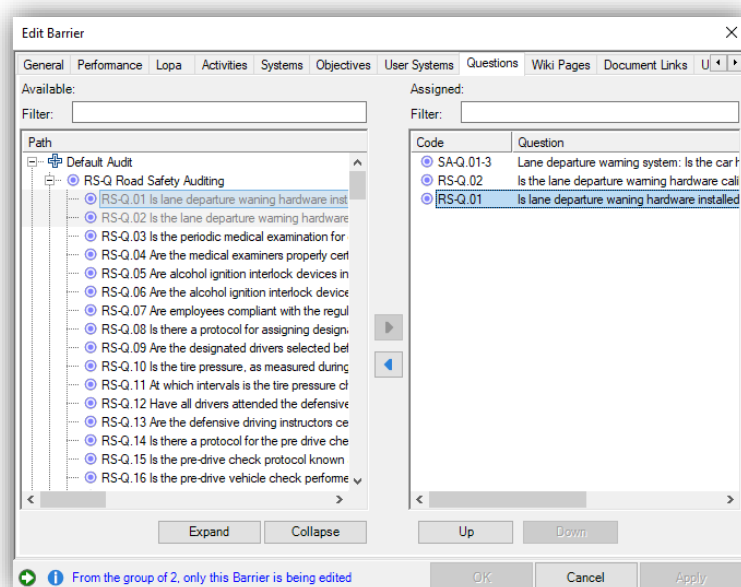
In the example above, the middle will be between Poor and Acceptable. In the second example, Neutral will be the middle.

In the advanced section for each question, there is one additional option: Most negative answer will determine overall result. This option will make sure that if there are multiple answers, the most negative answer will be used as the overall result. This can be convenient if one is not interested in the average result, but only in the outliers.

## 24.7. Associating questions with barriers and activities

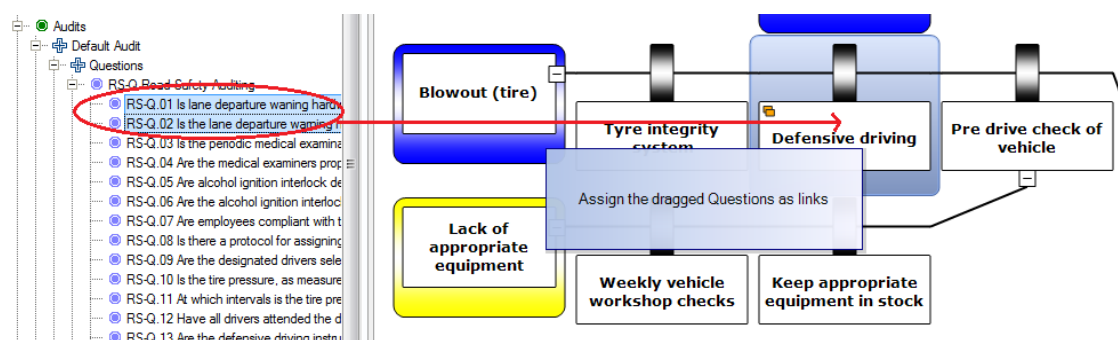
Now that the questions have been defined, you can associate the questions with existing bowtie barriers and/or activities. This can be done by dragging the question to the target barrier or activity, or by adding the question to the barrier or activity in the questions tab in the barrier editor. To help you make a selection in the ‘Questions’ tab, there is a filter box to type text to filter the questions on.





**Figure 265 - Assigning questions to a barrier with the editor**

Note that this works the same way as linking other items such as document links to bowtie elements.



**Figure 266 - Assigning questions using drag and drop**

The assigned questions can be displayed beneath the barrier shape as extra information, by using the eye-icon (👁) and selecting questions. See chapter 8, Configuring the diagram on page 82 for more details on how to configure the diagram.

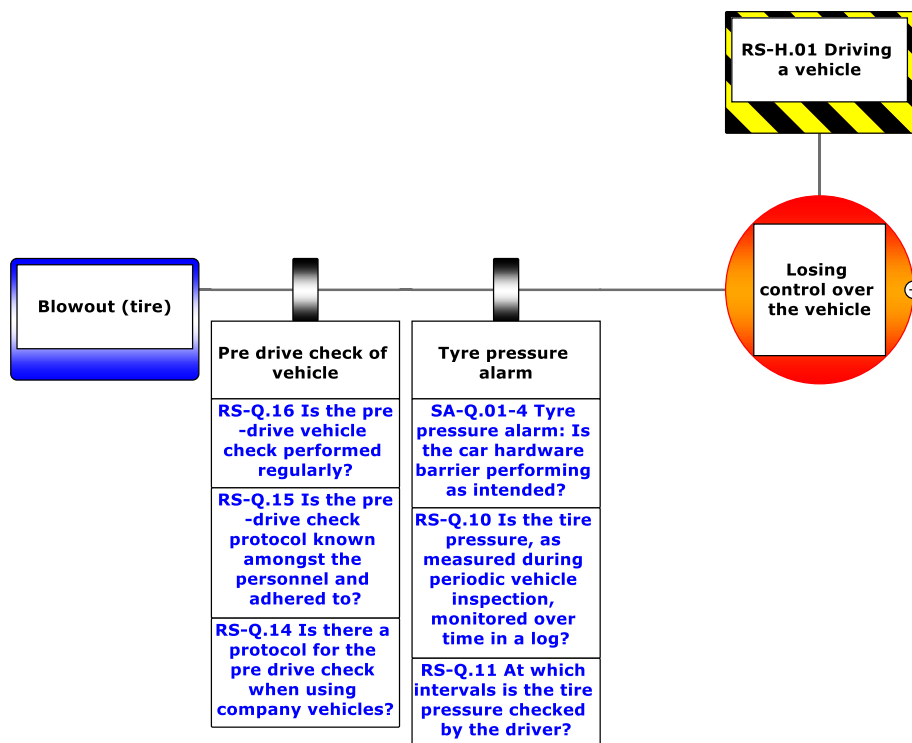


Figure 267 - Showing questions as extra info on barriers

## 24.8. Creating surveys

The set of questions can quickly become very large, and in most instances, you will not be seeking answers to every defined question – the time needed to gather all the answers will become prohibitive. In addition, some questions you will probably want answered at a different frequency than others.

For this reason, you will select a subset of all available questions, and this subset will be answered. Such a subset is known as a survey.

To create a new survey, you go over to the audits node in the Tree view, right click the surveys node and choose “New Survey”. The editor is popped up:

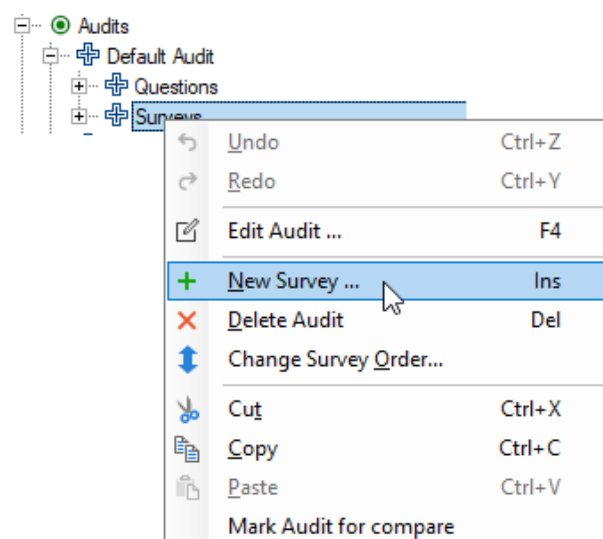


Figure 268 - Adding a new survey

Figure 269 - The survey editor

You will need to supply a code and name and can supply an optional description. The view results part will initially show nothing because no respondents have contributed yet to this survey. The questions in this survey can be assigned on the questions tab page.

Figure 270 - Assigning questions to a survey

To help you make a selection, there is a filter box to type text to filter the questions on. There are also three dropdowns, which will allow you to use the bowtie as the selection mechanism for the questions. For example, in

Figure 270 you see the first column says 'Assigned to Barrier', the second says with 'Accountable' and the third has 'Driver'. This means that the list of questions is currently filtered to only display questions that are linked to barriers where the accountable is Driver. This filter can be used multiple times to make combinations of criteria.

After entering a code and name for the survey and the questions are assigned, you can press the apply button. Now the export and import buttons will be enabled. This is covered in the next sections.

When the survey form is saved, the survey will be added to the Tree view. It will be visible like this:

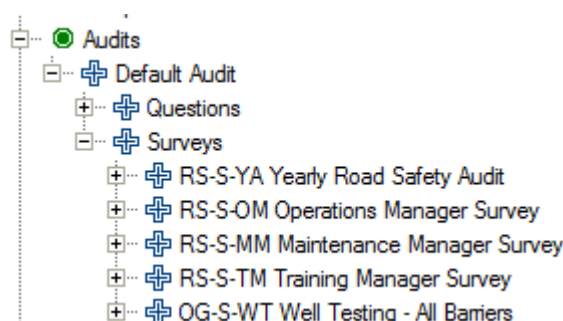


Figure 271 - Tree view with a new Survey

The questions linked to this survey are visible under the questions node.

## 24.9. Creating fill out forms for respondents

A set of answers from a respondent is known as a fill out in the software. It consists of a date, a respondent's name, and an organizational unit and of course a set of answers and answer remarks. For each question, there can be one answer and a remark.

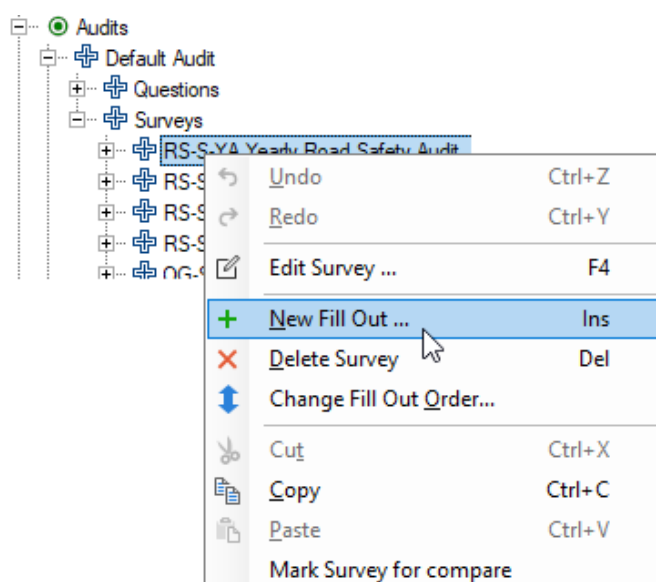


Figure 272 – Adding a new fill-out

**Figure 273 - Creating a new fill-out**

Adding a set of answers into the software is fine if you are the only respondent, but if you might not have your computer handy or would like to gather answers from many respondents, this will not work. That is why there are other ways of getting the data into BowTieXP.

The primary way is by means of Excel sheets – you might have noticed the import/export buttons on the survey editor. We will discuss those in the next section.

Another way is to couple the audits module to another external system. This can be done by means of the BowTieXP API, which allows programmers to manipulate btf files directly. This is beyond the scope of this manual, but contact us for details on options on how to integrate with your external audit system and use BowTieXP for visualization of the results.

### 24.9.1. Exporting and importing fill outs to and from Microsoft Excel

After the surveys have been composed by selecting relevant questions, an Excel sheet can be automatically generated. This sheet consists of all the questions, criteria and answer keys defined by the user and provides a quick dropdown menu.

The auditor can simply select the applicable answer key. After that, the sheet can be imported back into BowTieXP for quick analysis and visualization of the results.

To do this, on the survey editor there are two buttons for exporting to and importing from Excel. The export button will create a Microsoft Excel workbook in which you can enter answers and remarks to each question. Using the import button, you can then import the filled out sheet, and the results will be stored in a new fill-out in the Tree view.

This allows you to send the survey to potentially many people, and receive the answers back via e.g. email. You can then import them all at the press of a button.

To export and import an Excel sheet, double click a Survey or right-click a survey and select 'Edit Survey'. In the 'Edit Survey' window, it is possible to select 'Export Fill Out' or 'Import Fill Outs'

**Edit Survey**

General Questions User Data

Code: RS-S-YA

Name: Yearly Road Safety Audit

Type: Quick scan

Description: [\(edit in popup\)](#)

View Results: None

Export Fill Out

Import Fill Outs

Σ X Fill Outs Organizational Units No date filter

- RS-Q Road Safety Auditing
  - RS-Q.01 Is lane departure warning hardware i...
  - RS-Q.02 Is the lane departure warning hardw...
  - RS-Q.03 Is the periodic medical examination ...
  - RS-Q.04 Are the medical examiners properly ...
  - RS-Q.05 Are alcohol ignition interlock device...
  - RS-Q.06 Are the alcohol ignition interlock de...
  - RS-Q.07 Are employees compliant with the re...
  - RS-Q.08 Is there a protocol for assigning desi...
  - RS-Q.09 Are the designated drivers selected ...
  - RS-Q.10 Is the tire pressure, as measured du...

OK Cancel Apply

Figure 274 – Importing and exporting Excel fill outs

Note: you can also drag the filled out Excel sheet onto the Scrap book and into the Tree view from there.

#	Code	Question	Answer	Remarks
1	RS-Q.01	Is lane departure warning hardware installed on all company vehicles?		
2	RS-Q.02	Is the lane departure warning hardware calibrated correctly on all company vehicles?	Yes	
3	RS-Q.03	Is the periodic medical examination for drivers performed regularly?		
4	RS-Q.04	Are the medical examiners properly certified?		
5	RS-Q.05	Are alcohol ignition interlock devices installed in all vehicles?		
6	RS-Q.06	Are the alcohol ignition interlock device correctly calibrated in all vehicles?		
7	RS-Q.07	Are employees compliant with the regulations regarding the alcohol interlock device?		
8	RS-Q.08	Is the interlock device bypassed somehow?		

F.O. RS-S-YA Yearly Road Safety

Figure 275 - Fill out in Microsoft Excel

## 24.10. Viewing results

The relevant answers returned can be viewed graphically:

- On the survey editor form in the results pane.
- On the barrier editor form on the audit results tab page (only answers related to that barrier).
- On the activity editor form on the audit results tab page (only answers related to that activity).
- On the barrier shapes in the diagram (by using the Audit Filter).

On the editor, the results of a particular survey are displayed as positive/negative bar graphs, one bar per question. Right click on a single bar and select 'View details' to show the details of all answers given for that question. In addition, the number of fill outs received for the Survey is shown. It is also possible to filter on a specific survey, organizational unit, date, fill outs or the results (for instance to only show negative results).

**Note:** Throughout this document, the bar graphs use the green color on the right-hand side to indicate positively keyed answers, and red on the left-hand side to indicate negatively keyed answers. However, these colors are not optimal for people born with color blindness. That is why in the application the positive and negative colors can be configured in the BowTieXP options screen.

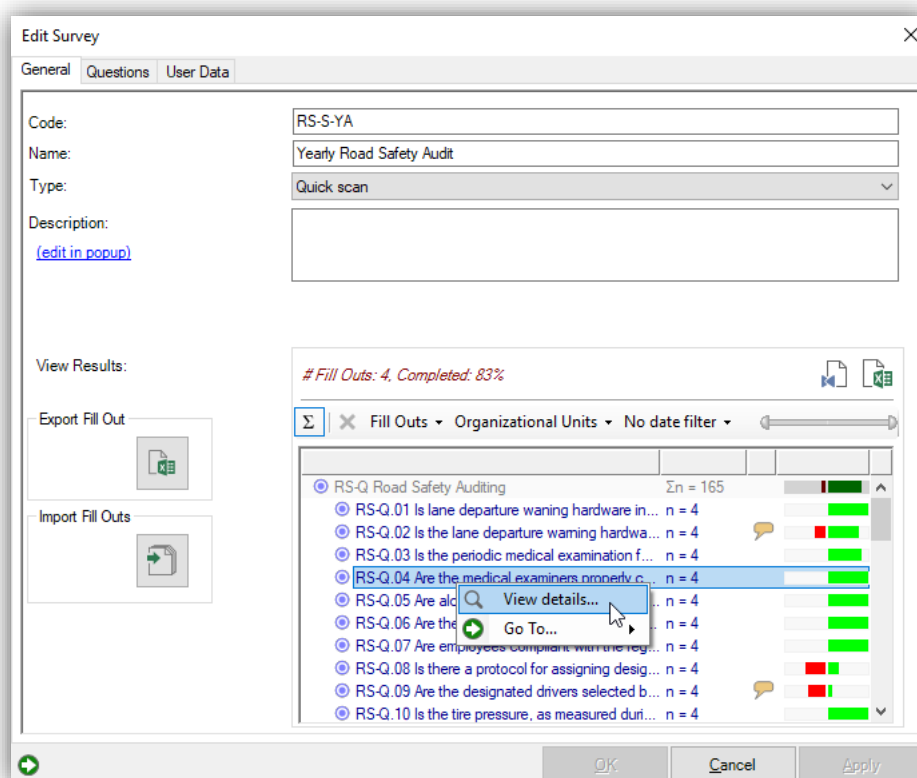


Figure 276 - Viewing survey results in the survey editor

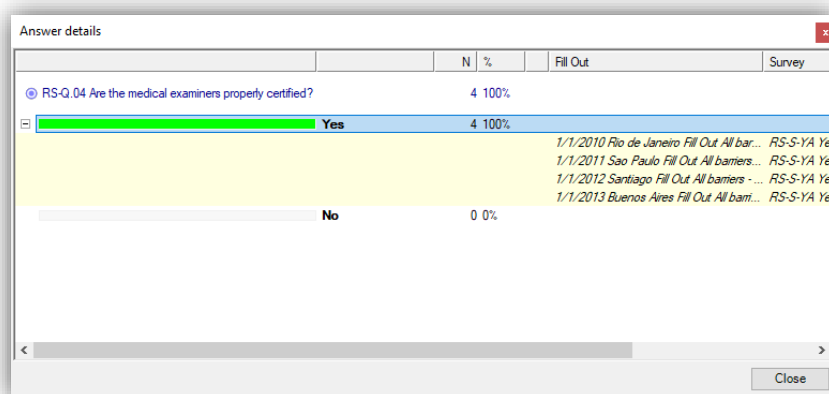
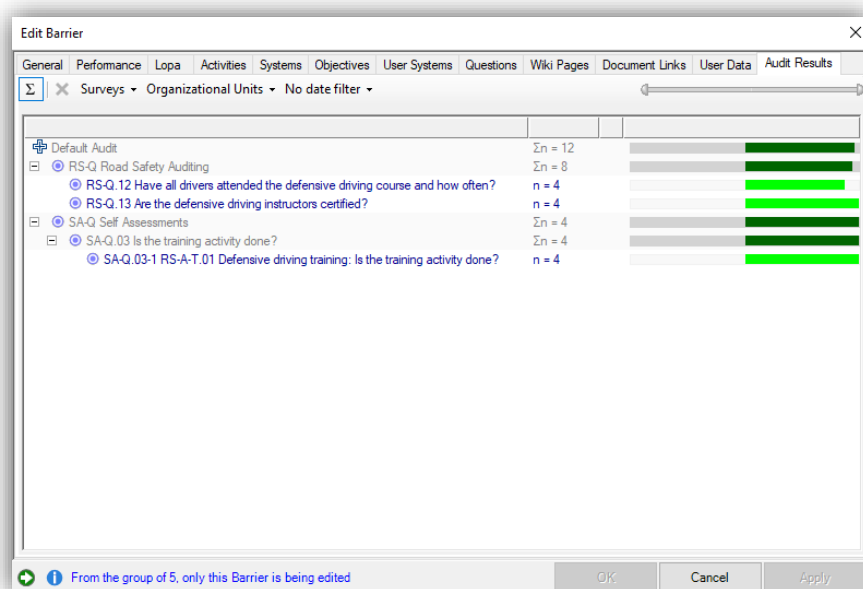
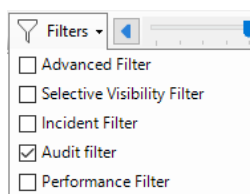


Figure 277 - Detailed overview of question results



**Figure 278 - Viewing audit results in the barrier editor**

To see results displayed on the bowtie. The Audit filter needs to be turned on. Go to Filters in the toolbar and select Audit filter (see Figure 279).



**Figure 279 - The audit filter on the bowtie**



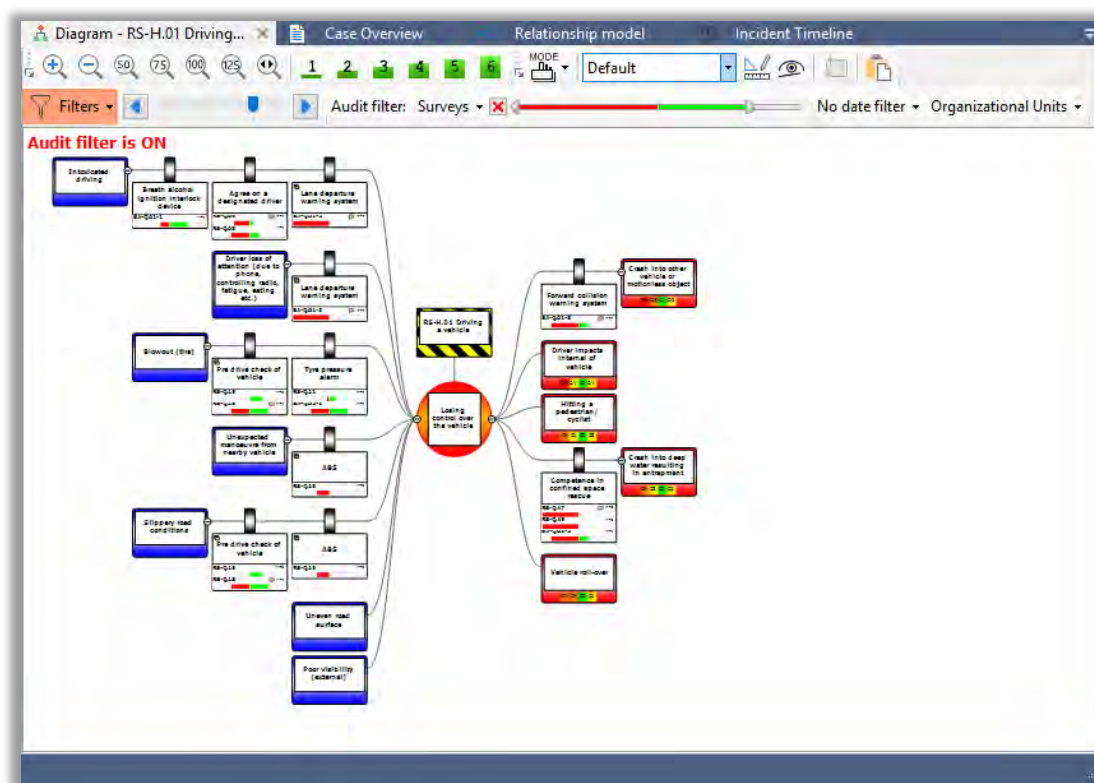


Figure 280 - Showing audit results on the diagram

Clicking on a bar of a graph will show the answers given in a separate dialog form. You can also configure the diagram to show only results from a specific survey and a specific respondent (fill out). There is also a date filter and a filter to show a specific section of results. It is also possible to filter the audit results for a specific organization unit.

**Note:** The organizational unit filter overrides the survey filter. If you have a survey of an organizational unit that is not in the bowtie group, it will not show those results on the bowtie.

### 24.10.1. Aggregation of audit results

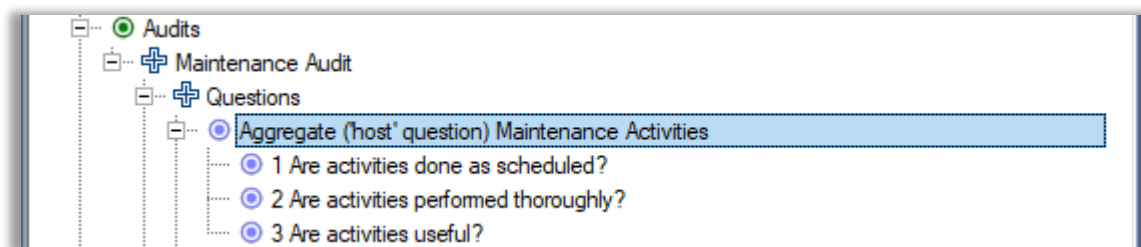
Aggregation of audit results allows you to show the sum of all the answers of your questions on a barrier. This can help reduce the amount of information shown on your barriers when the audit filter is selected.

To keep the aggregation of audit results manageable, we have to create multiple layers according to the parent-child structure of the Tree view. Some of these layers will not actually be real questions, but they will simply be there to 'host' the answers of the individual questions for us.

To make an aggregation of audit results, right click on Audits in the Tree view and select 'new question', this question will be a 'host question'. Note that this will not be a real question, the only reason we're doing this is because the software demands a parent-child structure. Fill in a name and code, but nothing else, and press OK.

On this new 'host question', right click and select 'new question' again to make the actual set of questions that you are interested in. In

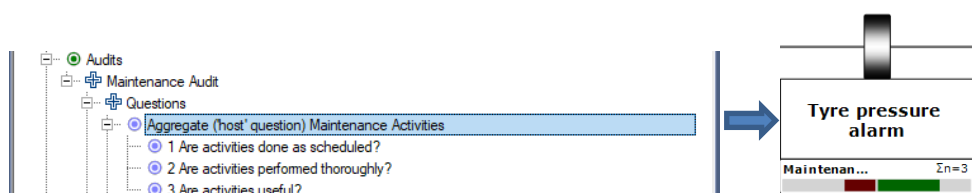
Figure 281 – An example of a parent-child structure for aggregation, as an example, we've created a 'host' question called 'Maintenance Activities'. Under that 'host question' we've assigned three individual questions.



**Figure 281 – An example of a parent-child structure for aggregation**

To get answers for these questions, walk through the survey steps described in chapter '24.8 Creating surveys'.

Note: in this example, the 3 individual questions are not assigned to a barrier. To show the aggregated answers, drag the 'host question' (e.g. 'Maintenance Activities') we made earlier to a barrier and turn the Audit filter on. The result should look something like this:



**Figure 282 – Assigning a group question to a barrier**

As illustrated by the Sigma sign  $\Sigma$  3, instead of having 3 different questions & answers on a barrier, which would take up more space, we now have only the sum or aggregation of the audit results on the barrier. Clicking on the answer will show another window, as seen in Figure 283 - Showing detailed aggregated audit results, displaying all the different answers the 'host question' consists of:

Question	Answer	Progress Bar
Aggregate (host' question) Maintenance Activities	$\Sigma n = 3$	[Progress Bar]
Q1 Are activities done as scheduled?	Yes	[Progress Bar]
Q2 Are activities performed thoroughly?	No	[Progress Bar]
Q3 Are activities useful?	Yes	[Progress Bar]








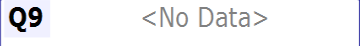
**Figure 283 - Showing detailed aggregated audit results**

It is of course also possible to show both the aggregation as well as the individual answers on a barrier. However, this would not make much sense. If you want to show aggregation of audit results on a barrier which already has individual questions linked, we suggest to temporarily remove all the individual questions. You can do this by right clicking, selecting edit barrier, going to the questions tab and remove any excess questions.

## 24.10.2. Interpretation

In essence, BowTieXP is a qualitative tool and so is the question framework. All the different answers are counted and displayed as clear as possible, but it is up to the BowTieXP user to draw any conclusions and take corrective measures where needed.

### 24.10.3. How to read the positive/negative bar charts

Example question and resulting graph:	description	meaning
<p><b>Q2 What did you think about lunch?</b></p> <p>Q2      Somewhat Ok...</p> 	<p>Single answer</p> <p>Somewhat positive answer</p>	Single answer
<p><b>Q10 How knowledgeable would you rate the trainer?</b></p> <p>Q10      Expert</p> 	<p>Single answer</p> <p>Most positive answer</p>	Single answer
<p><b>Q1 Was the room temperature ok?</b></p> <p>Q1      n=8</p> 	<p>8 answers (n=8)</p> <p>Even distribution between negative and positive answers</p>	Uncertainty
<p><b>Q3 Were there enough breaks?</b></p> <p>Q3      n=8</p> 	<p>Representing 8 answers (n=8)</p> <p>Mostly negative answers</p>	Negative tendency
<p><b>Q7 Was there a cohesive story that ran through the course?</b></p> <p>Q7      n=8</p> 	<p>Representing 8 answers (n=8)</p> <p>Answered all most positively</p>	Fully positive
<p><b>Q10 How knowledgeable would you rate the trainer?</b></p> <p>Q10      n=8</p> 	<p>Representing 8 answers (n=8)</p> <p>Mostly neutral answers</p>	Neutral tendency
<p><b>Q10 How knowledgeable would you rate the trainer?</b></p> <p>Q10      n=8</p> 	<p>Representing 8 answers (n=8)</p> <p>All answers are all centered / fully neutral</p>	Fully neutral
<p><b>Q9 Were the sheets informative?</b></p> <p>Q9      &lt;No Data&gt;</p> 	<p>No answer data available</p>	Not answered

## 24.11. AuditXP in combination with BowTieServer

### 24.11.1. Adding an audit (Audit module in BowTieServer only)

There are three different ways of adding a new audit when you are using the audit functionality in combination with BowTieServer:

1. Entire database check out
2. Add audit check out
3. Add new audit remotely

Note that option three is probably the easiest.

#### 24.11.1.1. Entire database check out

To do this, follow these steps and see Figure 284.

1. Connect with BowTieServer (please see the BowTieServer Software Manual on how to do this).
2. This brings up the server explorer, where we can select what we want to check out.
3. Select 'Open and checkout the entire contents as writeable' in the lower left bottom of the window
4. Select 'Open from database'
5. From this point, the process of creating an audit is the same as described in sections 24.5, The audits Tree view node, in sections 24.6, 24.7, 24.8.

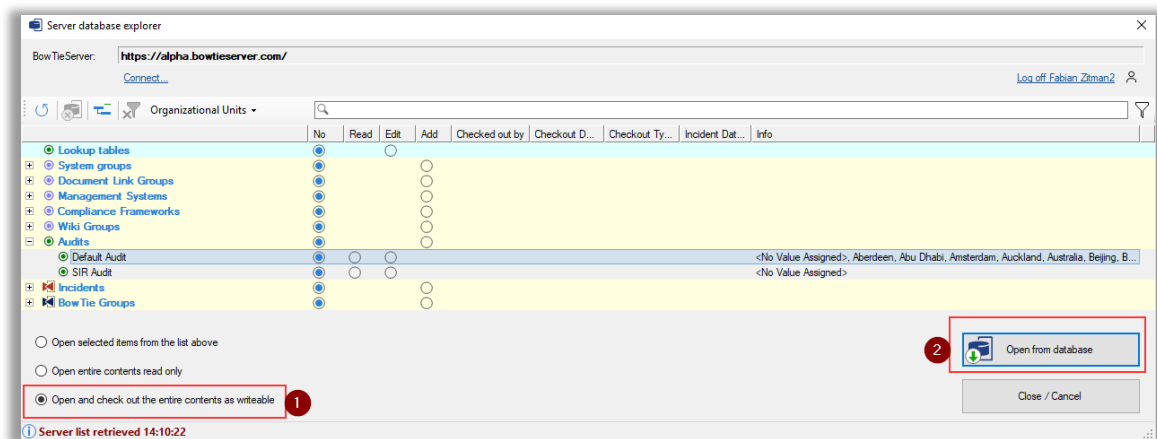



Figure 284 - Entire database check out


#### 24.11.1.2. Add audit check out

It is not always possible to check out the entire database, since other people might be or need to edit other entities of the database at the same time, for example someone is adjusting another audit or a group of bowties. The option of 'add audit check out' can be useful when an entire check out is not possible, and you intend to add multiple audit objects.

**To do this, follow these steps and see**

Figure 285. First, connect with BowTieServer using (  ) (please see the BowTieServer Software Manual on how to do this).

12. Select 'Open selected items from the list above' in the lower left bottom of the screen
13. Select the radio button in 'Add' column in the Audits node of the window.

**Note:** if the "Add" column is not visible, please click the menu icon (  , in the top right-hand corner, under your user name) and choose to display the "Add" column.

14. Select 'Open from database'
15. Now we can freely add new audits to the audits Tree view node. From this point, the process of creating an audit is the same as described in sections 24.5, The audits Tree view node, in sections 24.6, 24.7, 24.8.

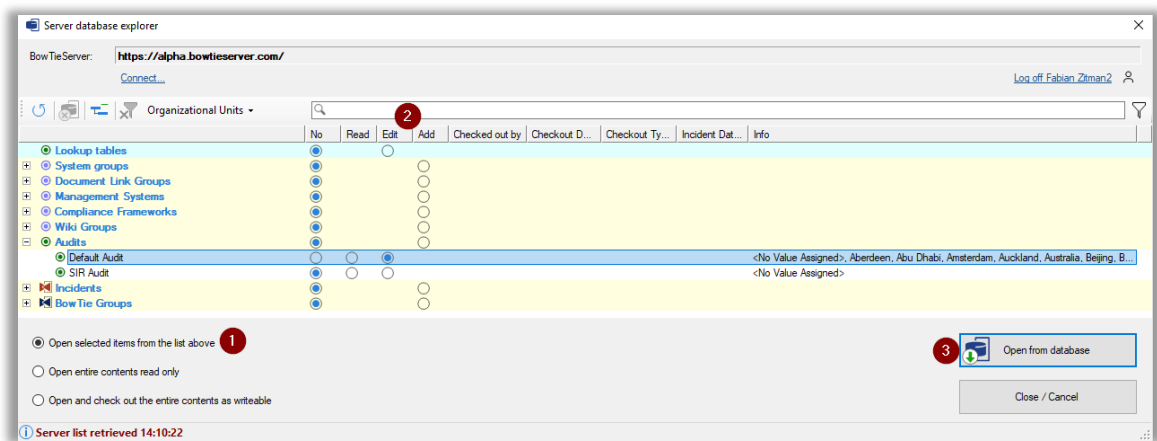



Figure 285 - Add audit check out

### 24.11.1.3. Add new audit remotely

It is not always possible to check out the entire database, since other people might be or need to edit other entities of the database at the same time, for example someone is adjusting another audit or a group of bowties. The option of 'add new audit remotely' can be useful when an entire check out is not possible.

To do this, follow these steps and also see Figure 286, Figure 287 & Figure 288 for reference. Connect with BowTieServer using (  ) (please see the BowTieServer Software Manual on how to do this).

1. Select 'Open selected items from the list above' in the lower left bottom of the screen (Figure 286)
2. Right-click the audits node and select 'Add new audit remotely'.
3. Enter a name for the new audit select 'OK' (Figure 287).
4. Select the edit radio button for the newly created audit (Figure 288).
5. Select 'Open from database'.
6. From this point, the process of creating an audit is the same as described in sections 24.5, The audits Tree view node, in sections 24.6, 24.7, 24.8.

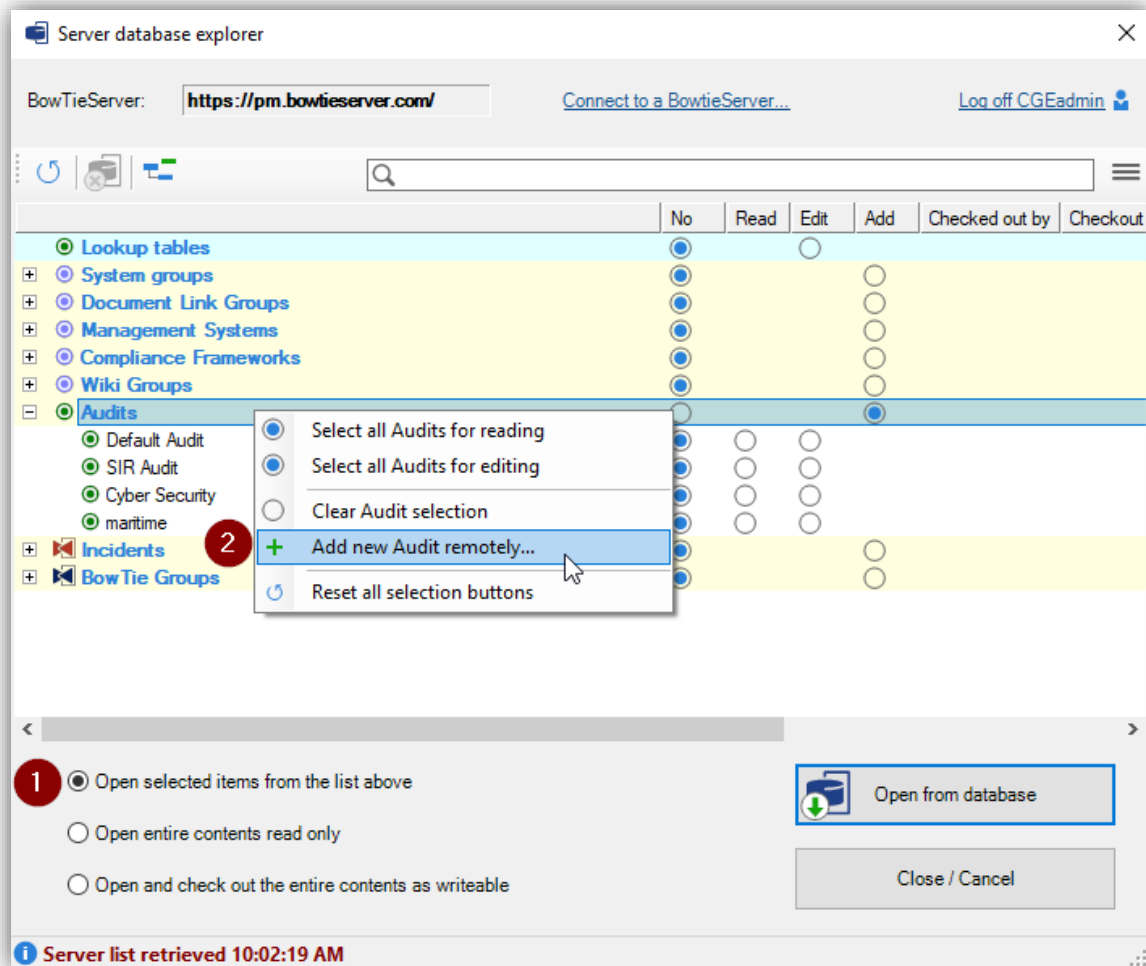


Figure 286 – Add new audit remotely (1/3)

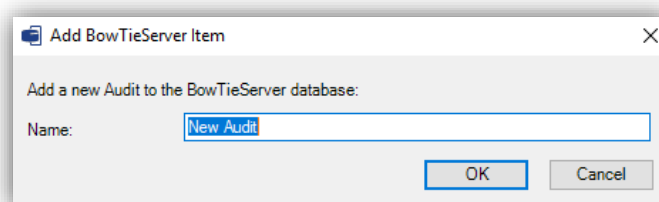


Figure 287 -Add new audit remotely (2/3)

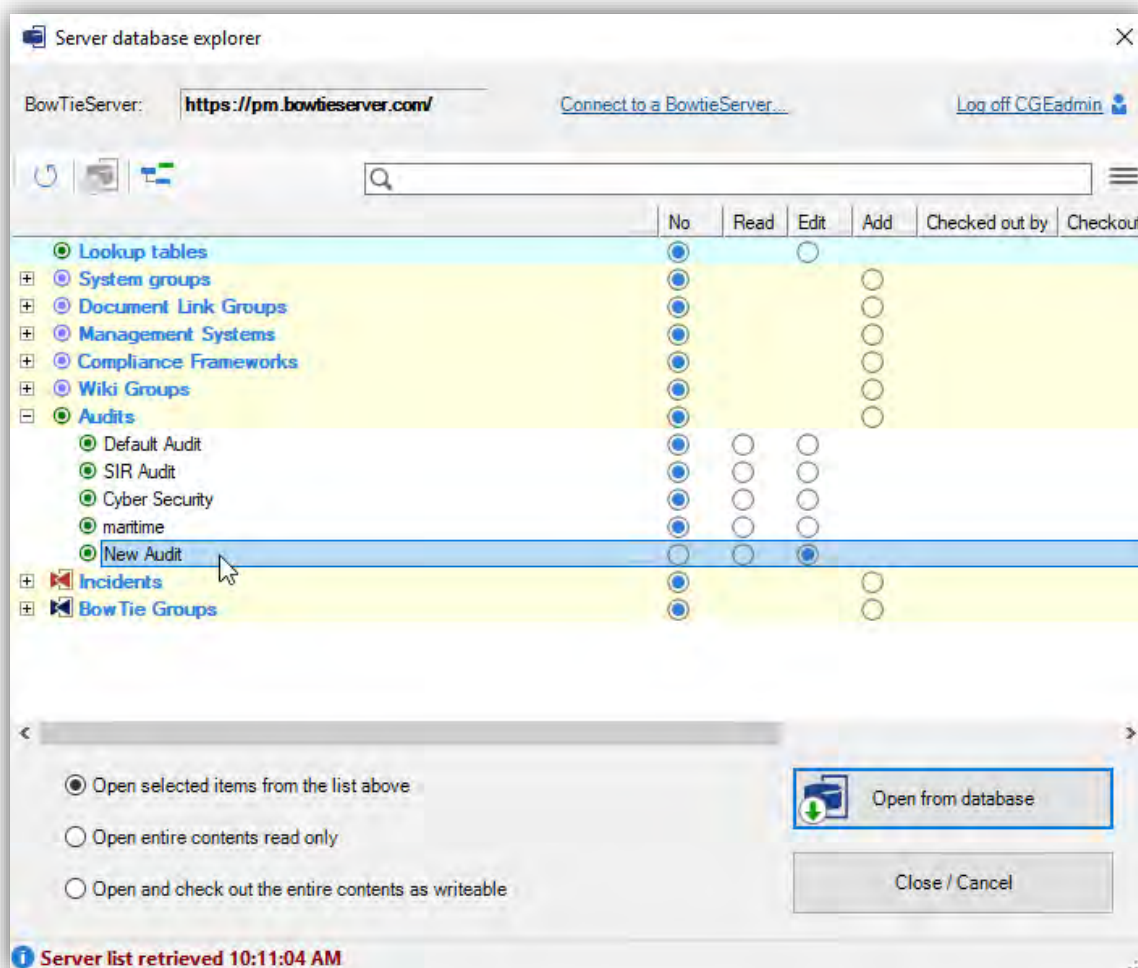


Figure 288 - Add new audit remotely (3/3)

### 24.11.2. Long format surveys (Audit module in BowTieServer only)

The audit module in BowTieServer has extended audit possibilities. Not only in the form of reports, but also by means of the long format surveys. This enables the user to extend an audit question with sub questions named 'work instructions'.

The questions created in AuditXP should be choice questions with an ordinal scale. With the long format surveys, it is possible to extend the audit questions with work instructions to also ask for instance open-ended questions and questions with a nominal answering scale.

For instance, an audit question might be "Is lane departure warning hardware installed on all company vehicles?" An ordinal choice based AuditXP audit answer possibilities could be 'Yes' and 'No'. From the set of possible answers only one answer can be selected by the respondent and remarks can be added.

With work instructions, we can add a set of sub questions that can have different answering inputs. The work instructions for this audit question might be:

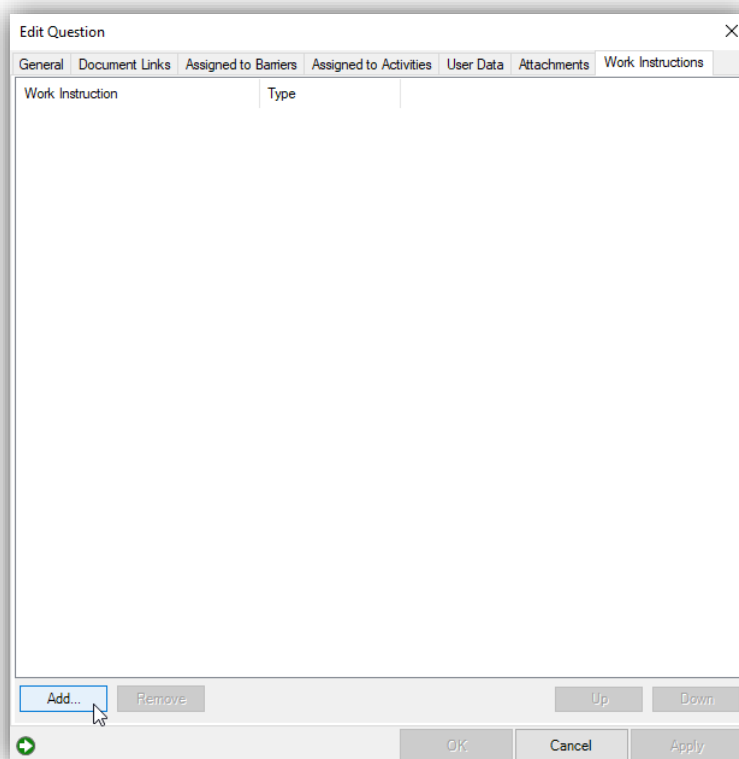
- "Which type of LDWS is installed?"
- "Is the LDWS calibrated?"
- "What is the certification type of the LDWS?"
- "What is the expiration date of the certification of the LDWS?"

In BowTieServer, the main audit question (in the example above: "Is lane departure warning hardware installed on all company vehicles?") will be posed first. After which the work instructions are presented. Once the work

instructions are filled in, a judgement can be given by the user on the main audit question. Attachments can be inserted as well, for instance to provide additional information or evidence.

### 24.11.2.1. Adding work instructions

To set up the long format survey with work instructions on an audit questions, double click the question to which you would like to add work instructions to. Subsequently select the tab 'Work instructions' and select the icon 'Add.' to extend the audit question with a work instruction.

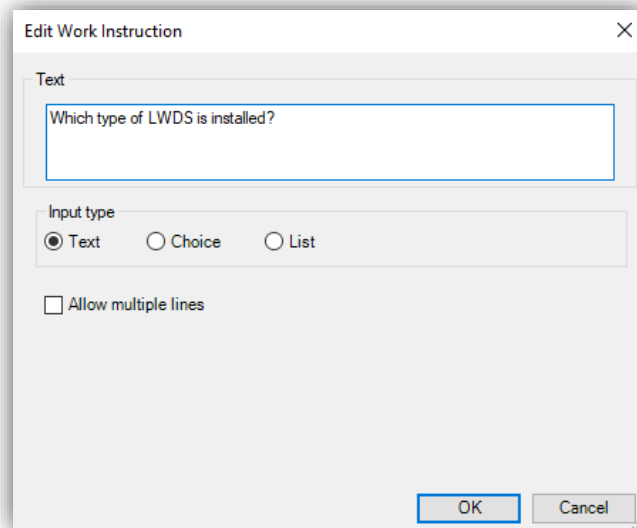


**Figure 289 - Adding a work instruction in the 'Work instructions' tab**

When 'Add' is selected, you will be prompted with an 'Edit work instruction' window. There are multiple ways of presenting work instructions answering inputs for an audit questions by selecting 'Input type'.

When input type 'Text' is selected, the respondent is able to insert text. Check the box 'Allow multiple lines' to provide the user with an opportunity to extend the text answer input in the box over multiple lines.

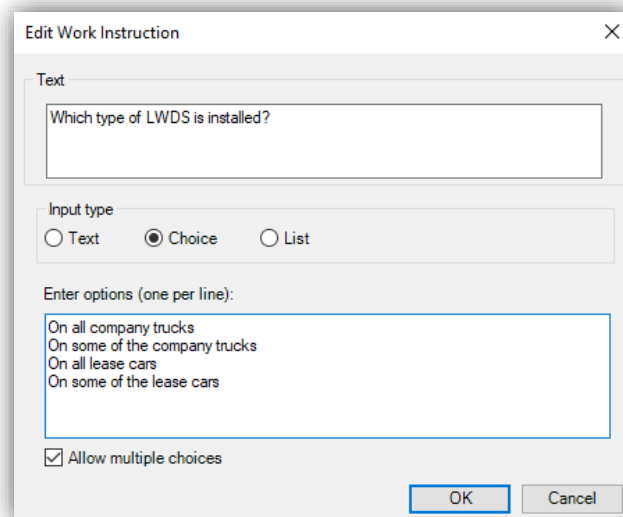




The screenshot shows a dialog box titled "Edit Work Instruction". It has a close button (X) in the top right corner. Inside the dialog, there is a section labeled "Text" with a text input field containing the text "Which type of LWDS is installed?". Below this, there is a section labeled "Input type" with three radio buttons: "Text" (which is selected), "Choice", and "List". Below the radio buttons, there is a checkbox labeled "Allow multiple lines" which is currently unchecked. At the bottom right of the dialog, there are two buttons: "OK" and "Cancel".

**Figure 290 - Input type 'Text'**

When input type 'Choice' is selected, the user can create choice based answer values. Check the box 'Allow multiple lines' to allow for checking multiple boxes. If the box is unchecked, the respondent can only insert one answer using a radio button.



The screenshot shows the same "Edit Work Instruction" dialog box, but with the "Choice" radio button selected under the "Input type" section. Below the "Input type" section, there is a new section labeled "Enter options (one per line):" with a text input field containing the following text:  
On all company trucks  
On some of the company trucks  
On all lease cars  
On some of the lease cars  
Below this text input field, there is a checkbox labeled "Allow multiple choices" which is now checked. The "OK" and "Cancel" buttons remain at the bottom right.

**Figure 291 - Input type 'Choice'**

When input type 'List' is selected, multiple work instruction columns can be added with a 'Text' or 'Choice' based input by selecting 'Add'.

Name	Type
Certification type	Text
Certification expiration date	Text

**Figure 292 - Input type 'List'**

When 'Add' is selected, you will be prompted with the 'Edit work instruction column' window. It is possible to add 'Text' or 'Choice' based answer values for the work instruction column in the 'Edit work instruction column' window.

Column
Certification type

**Figure 293 - Input type 'Text' for the work instruction column**

**Edit work instruction column**

Column  
Certification expiration date

Input type  
☐ Text    ☒ Choice

Enter options (one per line):  
 2016  
 2017  
 2018  
 >2019

☐ Allow multiple choices

OK Cancel

**Figure 294 - Input type 'Choice' for the work instruction column**

Select 'OK' to add the work instruction or work instruction column to the audit question.

#### 24.11.2.2. Enabling the long format survey

Once work instructions have been added to an audit question, and the audit questions have been added to a survey, the long format survey with the work instructions need to be enabled. To enable the long format survey, check the box 'Use long question format' in the 'Edit Survey' window. The 'Edit Survey' window can be opened by double clicking a survey.

**Edit Survey**

General Questions User Data

Code: RS-S-YA  
 Name: Yearly Road Safety Audit  
 Type: <No Value Assigned>  
 Description: [\(edit in popup\)](#)

☒ Use long question format

View Results: None

Export Fill Out

Import Fill Out

Σ × Fill Outs Organizational Units No date filter

- RS-Q Road Safety Auditing
  - RS-Q.01 Is lane departure warning hardware in...
  - RS-Q.02 Is the lane departure warning hardwa...
  - RS-Q.03 Is the periodic medical examination f...
  - RS-Q.04 Are the medical examiners properly c...
  - RS-Q.05 Are alcohol ignition interlock devices ...
  - RS-Q.06 Are the alcohol ignition interlock devi...
  - RS-Q.07 Are employees compliant with the reg...
  - RS-Q.08 Is there a protocol for assigning desig...
  - RS-Q.09 Are the designated drivers selected b...
  - RS-Q.10 Is the tire pressure, as measured duri...

OK Cancel Apply

**Figure 295 - Enabling the long format survey**

# 25

## Compliance frameworks

This section covers how to set up the compliance frameworks and how to link them to barriers.

The compliance frameworks are part of the audit module. BowTieServer also supports the compliance functionality with some additional dashboards.

### 25.1. Concept introduction

To use the compliance frameworks functionality effectively, it is important to understand the underlying idea and concept that was used during the design of this feature. This will be explained in the following section.

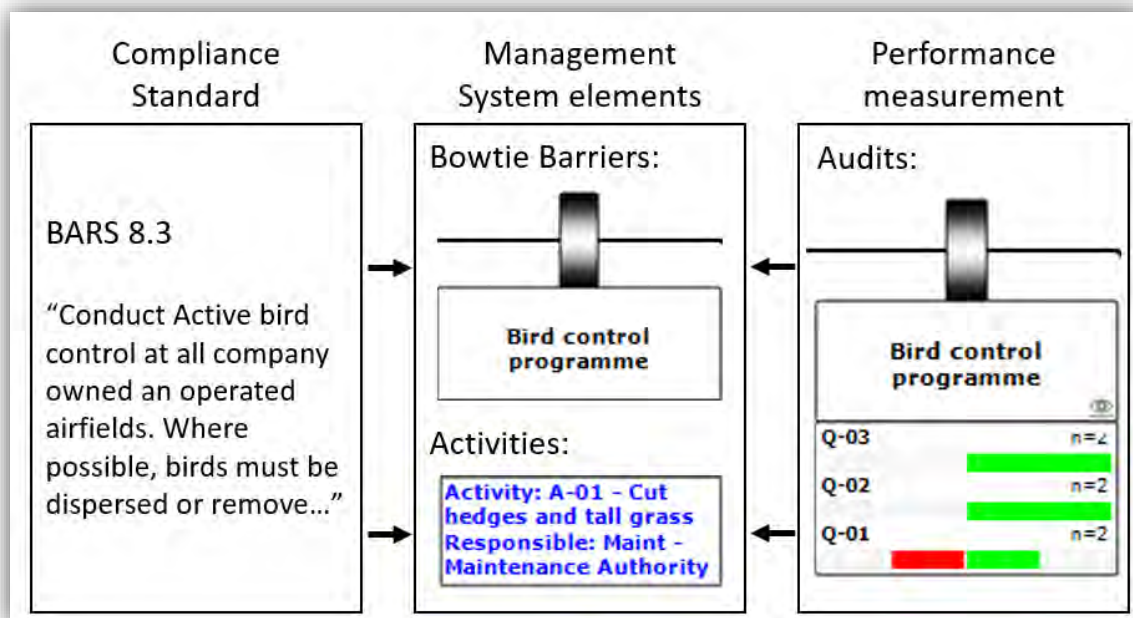


Figure 296 - Compliance framework concept with example

The feature was introduced to bridge the gap between bowties (i.e. barrier-based risk management) and the world of compliance assurance. There are many standards, covering wide subjects ranging from quality control to safety management. Some of these are considered best practices, where others even have legal implications. However, compliance standards are usually not foolproof plans for the implementation of a safety management system. A safety management system is typically designed to manage the current operation, the compliance frameworks are then used to check whether the designed system conforms to the standard.

In this module, we assume that most of standards (if not all) can in essence be broken down into a collection of 'control objectives'. These control objectives can be seen as statements that describe a requirement that the organization's management system needs to be capable of. To check whether the control objective is met by the company, it must first be determined which part of the management system takes care of this objective. Once it is

clear which part of the system is responsible, it must also be verified whether that system is effectively implemented and functional.

In the example shown in Figure 296, the aviation related BARS standard (<http://flightsafety.org/bars/>) has a control objective that describes the requirements for a bird control unit. This objective is realized in the barrier “bird control program” and perhaps in additional activities such as “cut hedges and tall grass” which can be associated with a different barrier. In turn, barrier-based audits can be linked to the barrier. This then shows us the performance of that barrier, which in turn helps us to make a decision on whether this objective has been effectively implemented or not.

So, by looking at which barriers and activities within the organization take care of a control objective, and by looking at the performance of those activities and barriers we can draw a conclusion on whether the objective has been effectively met.

This concept has various advantages. First, the feature visualizes how the control objectives of one (or multiple) compliance standards are intended to be realized through the barriers and related activities. If a control objective can be mapped on a BowTie, it demonstrates that a barrier system has been defined that takes care of that objective. If an objective cannot be mapped, this means that either no system has been defined that takes care of that objective or that this objective cannot be directly mapped onto the barrier-based model. This process can visualize how standards and legislative requirements map on bowtie diagrams and increase the understanding of why certain barriers are important.

Secondly, it can help to reduce the audit workload. In this model, it is possible to link multiple standards onto the same set of bowties. It is very likely that one barrier realizes requirements from multiple different standards. Traditionally, compliance with standards is checked with a specific audit for that standard. If a barrier represents multiple objectives from multiple standards, this often means that the barrier has to be audited for every standard in which it is mentioned. This can lead to repetitive audits that add little additional insight into the barrier yet create additional audit workload. Instead, with this model, multiple standards can be linked to a barrier, but the quality of the implementation of that barrier is done by a single set of questions. Therefore, by auditing the quality of the barrier, we can derive through the barrier whether the standard is complied with.

## 25.2. Setting up compliance frameworks

In general, compliance frameworks can be set up and used in the following two steps:

1. Create / import the control objectives
2. Link the control objectives to the barriers

These will be explained in the following sections.

### 25.2.1. Creating / importing control objectives

A new compliance framework can be added to the BowTieXP casefile under the “Compliance Frameworks” node. This can be done by right clicking the node and defining a new name for the framework.

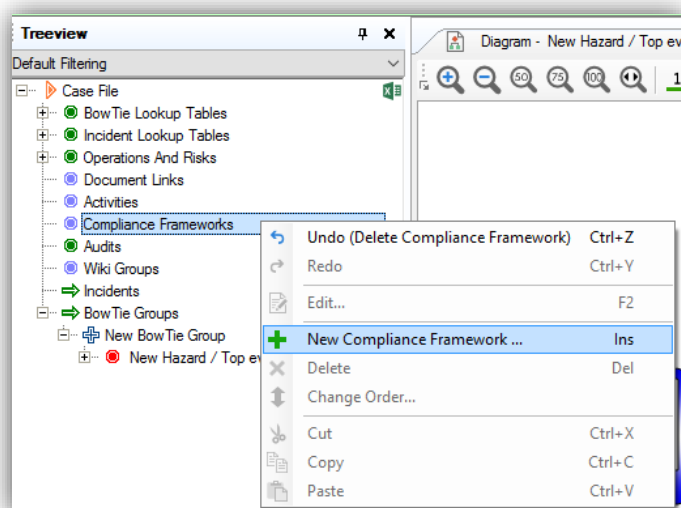


Figure 297 - Add compliance framework

A compliance framework contains two collections that can be defined as shown in Figure 298:

- **Maturity levels:** Many standards come with their own set of maturity levels. These are used to indicate how well an objective is realized (i.e. complied with) within the organization.
- **Objectives:** These are the actual statements that are described in the standard that the organization must comply with.

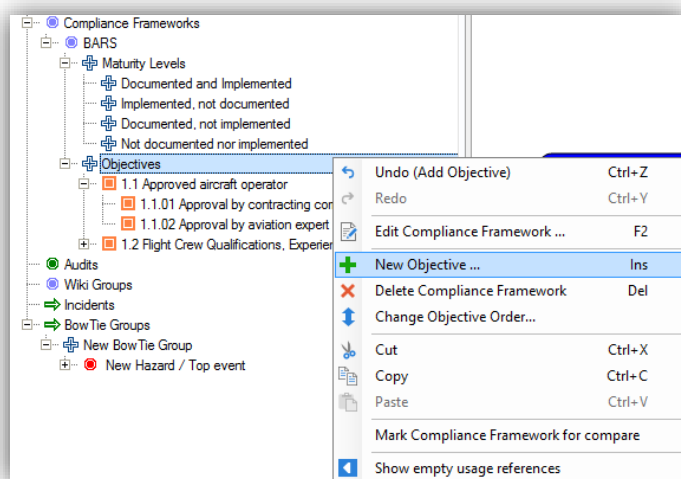


Figure 298 - Defining objectives and maturity levels

Objectives can also be imported from Excel sheets using the Import External Data option in the File menu.

### 25.2.2. Linking Objectives to Barriers

Once the Objectives are defined in the file, they can be linked to their relevant barriers. This can be done like any link collection by dragging and dropping the objectives from the Tree view to the barriers. Alternatively, the Objectives tab on the barrier editor can be used (similar to other link collections), or the Assigned to Barriers tab on the Objective.

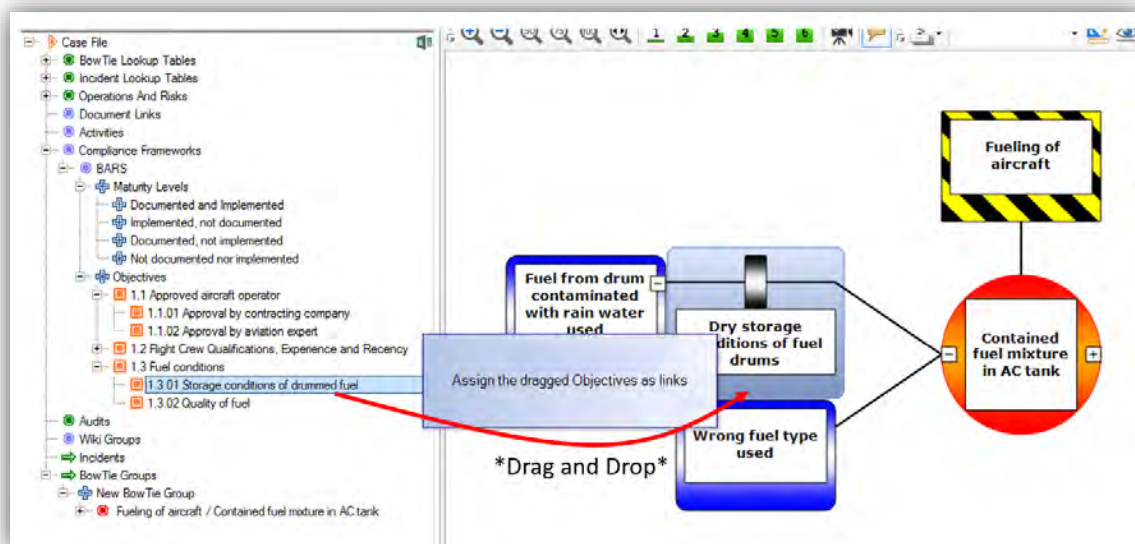


Figure 299 – E.g. drag/drop objectives to assign (1 of 3 assignment methods)

## 25.3. Interpreting Compliance Frameworks

An overview of all objectives and related barriers can be found in the Case Overview. This overview shows all objectives and whether they have been assigned to barriers. By double clicking on an objective, the audit results of all linked barriers can be displayed.

Objectives	Maturity Level	Implemented by Barriers	Implemented by Activities	Implemented by sub Objectives	No associations
Comp. Frmw. BARS					
Objt. 1.1 Approved aircraft operator					Not implemented
Objt. 1.1.01 Approval by contracting company					Not implemented
Objt. 1.1.02 Approval by aviation expert					Not implemented
Objt. 1.2 Flight Crew Qualifications, Experience and Recency					Not implemented
Objt. 1.2.01 Diplomas					Not implemented
Objt. 1.3 Fuel conditions				X	
Objt. 1.3.01 Storage conditions of drummed fuel	Implemented, not documented	X			
Objt. 1.3.02 Quality of fuel	Not documented nor implemented	X			

Figure 300 - Case Overview for compliance frameworks

In the objective editor, the tab “audit results” shows all audit results of all barrier and activities onto which this objective has been linked. This information can then be used to decide to which maturity level this objective has been established. Once assigned, the maturity level will also be displayed in the corresponding column in the case overview.

Another overview of states can be seen on BowTieServer, which is described in the BowTieServer manual.

# 26

## LOPA Plug in

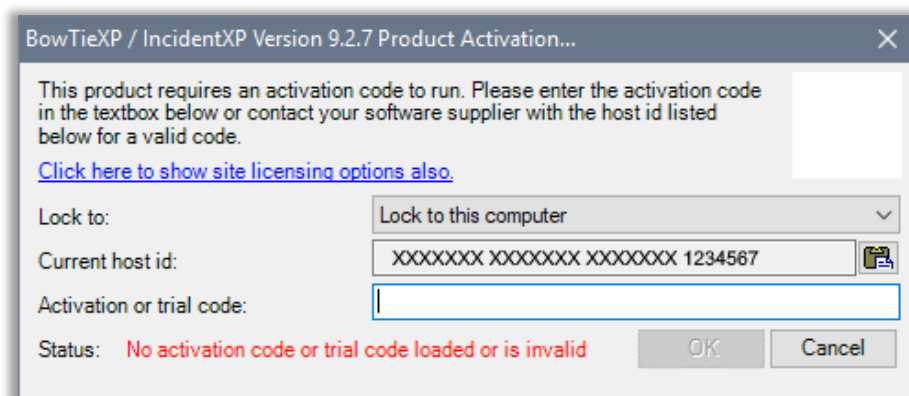
This chapter describes how the LOPA (Layer Of Protection Analysis) module is activated for BowTieXP version 10.0 or higher. Note that LOPA is commercially distributed as a separate BowTieXP plugin, but as of BowTieXP 10.0 LOPA is technically an internal module of the application and the API.

### *Conversion of old casefiles*

When wanting to convert casefiles containing LOPA data from the old plug in, go to chapter 26.16 for further instructions.

## 26.1. LOPA activation

To be able to perform LOPA analysis a valid BowTieXP product code must be obtained that includes and activates the internal LOPA module. The LOPA module can be activated on BowTieXP standard or advanced License. The BowTieXP product code should be entered in the BowTieXP product activation screen:



**Figure 301: BowTieXP product activation**

To check whether the LOPA module has been loaded and activated a restart of the software might be required before the LOPA module can be used.

For other types of activation such as group locked or site locked activation, refer to the BowTieXP Installation reference in the regular BowTieXP manual.

Once the LOPA module is loaded and activated, the text "LOPA" should show up in the BowTieXP application status bar (down under left) after the program starts. Also, in the Help -> About... form of BowTieXP it should show "LOPA" as an enabled feature.

## 26.2. LOPA elements

The LOPA module adds LOPA specific fields on the editors of several BowTieXP elements.

LOPA data entry and result fields are present on a special LOPA tab in the edit forms of the following objects:

- Hazard/Top Events:
  - o Enter target frequencies,

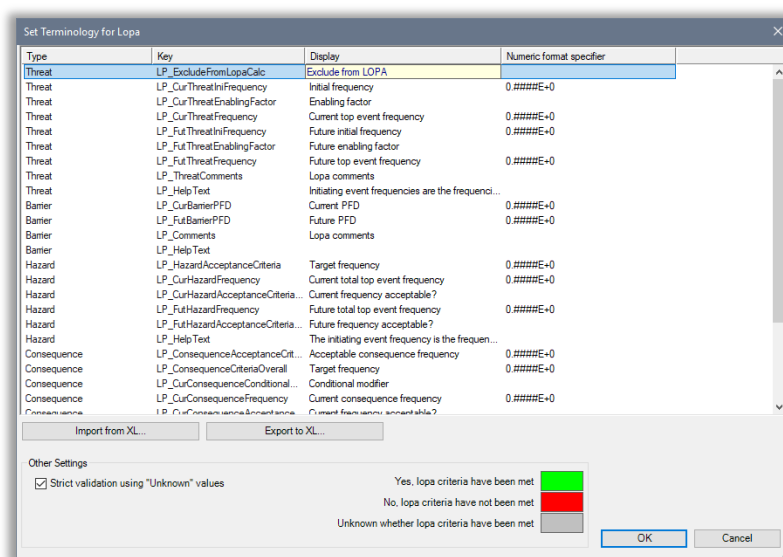


- Show LOPA results
- Consequences:
  - Enter acceptable frequencies
  - Show LOPA results
- Threats:
  - Enter initial frequencies
- Barriers:
  - Enter PFD values (that reduce the Threat frequency)
- Consequence Categories:
  - Enter category default acceptable frequencies
- Effectiveness:
  - Enter default PFD values for barriers to be used as PFD values when no specific PFD values are filled in on a barrier
- Frequencies:
  - Enter default initial frequency values for Threats to be used as default values when no specific initial frequencies are filled in on a Threat

The LOPA module also adds specialized LOPA **reports**, a LOPA **classic scenario case overview**, LOPA **display profiles** and the LOPA **menu items** under the BowTieXP menu *tools -> options*

All editor fields, reports, overviews, display profiles and menu items are described in more detail in this manual.

## 26.3. Configuring LOPA settings



**Figure 302 Configuring LOPA settings**

The LOPA settings screen can be opened by clicking menu *tools-> LOPA Settings...* Several settings can be configured/customized here:

- The terminology used for LOPA fields
- The desired display format for numeric fields. Details can be found here:
  - <https://docs.microsoft.com/en-us/dotnet/standard/base-types/custom-numeric-format-strings>
- Whether to use strict or non-strict field validation
- The colour scheme used for displaying LOPA results ("Criteria met", "Criteria not met", "Unknown")

Note: The terminology for LOPA fields can also be changed in menu *Case -> Edit Property Descriptions...*

These LOPA Settings are stored in the current Case File and can also be configured as part of a customized BowTieXP template.

The LOPA terminology and formatting can be exported to- and imported from a properly formatted excel sheet for convenience.

### 26.3.1. Strict vs. Non-Strict calculation mode

#### Strict

In general: when using the “strict” mode all fields need to be filled with sensible values in order to come up with a valid LOPA result, otherwise the LOPA results will collapse to “unknown”. Introducing a new Threat in the diagram without LOPA fields properly filled will immediately turn the Hazard and all Consequence LOPA results to “unknown”.

#### Non-strict

When using the “non-strict” mode of the LOPA calculation:

- Compared to the “strict” mode, other default values are assumed during calculation,
- Empty “future” field values are assumed to be the same as current values
- No “unknown” LOPA results show up, the LOPA criteria are always either “met” or “not met”.

In the software the “strict” calculation mode is defaulted. To change this, go to *Tools - > LOPA setting* and un-tick (!) the ‘*Strict validation using “Unknown” values*’ box shown in figure 2 (see above).

## 26.4. LOPA in BowTieXP

In addition to the strict or non-strict interpretation of field values, the LOPA module in BowTieXP performs two different ways of calculating results. We call these algorithms the “Bowtie method” and the “Classic scenario method”

### 26.4.1. The Bowtie method

Engaging a BowTieXP LOPA display profile will by default show the LOPA results in Bowtie diagrams using the “Bowtie method”. This algorithm accumulates the resulting frequencies of all diagram Threats on the central Hazard/Top Event. This will result in the *total top event frequency*. This value is then used as a frequency factor in the calculations for each Consequence. This way we’re able to display a single LOPA result on the Hazard/Top Event as well as each Consequence. There are several “Bowtie method” reports that show the LOPA results using this algorithm.

---

**Note:** The LOPA results in the Hazard and Consequence editor tab pages are calculated using the Bowtie method.

---

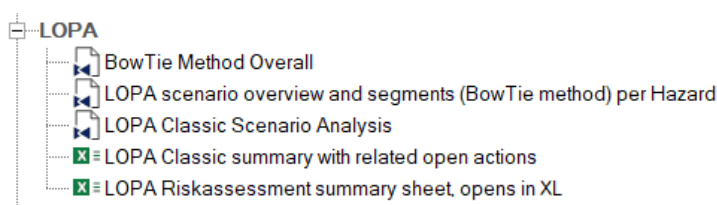
### 26.4.2. The Classic scenario method

In the “Classic” LOPA analysis each single *Threat -> barrier chain -> Consequence* scenario is considered. Within a single BowTieXP diagram containing 3 Threats and 5 Consequences, 15 (= 3 x 5) of such scenarios can be identified. Each scenario can be calculated using the “classic LOPA method”. So, using the classic scenario method, each Consequence can possibly have multiple LOPA results. Due to the “cartesian” nature of scenarios within a BowTieXP diagram, the classic LOPA results can only be displayed in specialized “classic” **reports** (available in both Word and Excel, see figure 3) and in a **real time case overview**, rather than displaying the results on the BowTieXP diagram or editor pages.

---

**Note:** In the classic scenario calculation any LOPA values set on the Hazard/Top Event are ignored

---



**Figure 303 LOPA reports for both methods**

### 26.4.3. Current and Future fields

Several input fields on a LOPA item have a “Current” value field and “Future” value field. The future field can be filled in when the future is expected to be different than the current value. Therefore, all LOPA results have a current and a future value. When future fields are not filled, LOPA usually considers the future value to be the same as the current value during calculation.

## 26.5. Entering numeric data in LOPA fields

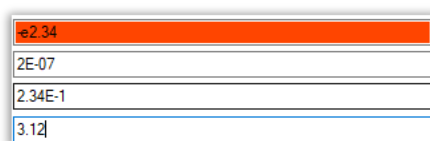
Most of the LOPA data entry fields in the editors expect a number. It is possible to enter numeric data in scientific notation (e.g. 1.2E-3) as well as the normal notation (e.g. 3.141592). Note that while entering the number the application accepts only “computer expected” formatting using the dot as a decimal separator. Once the number has been entered the field may display in another configured format, but it will return to “computer” data entry mode whenever the field is focussed again.

---

**Note:** Entering LOPA numeric data: please use a dot as decimal separator and not a comma.

---

Whenever the data entry in a LOPA field can't be parsed as a valid number the field background will turn orange and the user needs to correct or finish his entry. Note that when a field has an invalid entry and the field background is orange, the underlying data value is not changed and remains the last correct numeric value.



**Figure 304** Numeric data entry examples

None of the LOPA fields in the application are mandatory, but sometimes assume a default value in the calculation when not filled in. This default however can depend on which LOPA calculation mode has been set in the LOPA settings (“strict” or “not strict”), see Chapter 26.3.1.

---

**Note:** press “apply” in the editor dialog to view the updated recalculated LOPA results after entering new data

---

## 26.6. Recommended practice

Although there's no specific order in which the LOPA fields need to be filled in, we would recommend this practice

- Fill in the target frequency on the Hazard/Top Event
- Fill in the acceptance frequencies on each Consequence
- Fill in initial frequencies on Threats
- Fill in PFD values foreach barrier.
- Examine results.

### 26.6.1. Target frequencies on the Hazard/Top Event

**Edit Hazard & Top event**

General Risk assessments Sign Off Headers and Footers Revision Info Other Lopa **Operations**

**Lopa Calculations**

Target frequency: 6E-1

Current total top event frequency:

Current frequency acceptable?: Unknown

Future total top event frequency:

Future frequency acceptable?: Unknown

The initiating event frequency is the frequency of the threat without taking barriers / IPLs into account.

OK Cancel Apply

**Figure 305 - Setting Top event Target Frequency**

Default calculation values when left empty		
Input Field	Strict	Non-Strict
Target frequency	Unknown	0

In strict mode: not filling in a field value for “target frequency” will cause all consequences to collapse to “unknown” also.

### 26.6.2. Acceptable Consequence frequencies, conditional modifiers

**Edit Consequence**

General Risk assessments Lopa **Operations** Document Links User Data

**Lopa Calculations**

Category default frequency:

Acceptable consequence frequency: 7E-1

Conditional modifier:

Future conditional modifier:

Current consequence frequency:

Current frequency acceptable?: Unknown

Future consequence frequency:

Future frequency acceptable?: Unknown

Lopa comments:

(edit in popup)

The initiating event frequency is the frequency of the threat without taking barriers / IPLs into account.

OK Cancel Apply

**Figure 306 - Setting acceptable consequence frequency**

Default calculation values when left empty		
Input Field	Strict	Non-Strict
Acceptable consequence frequency	Category default frequency if filled in otherwise Unknown	Category default frequency if filled in otherwise 0
Conditional modifier	1	1
Future conditional modifier	Current Conditional modifier value	Current Conditional modifier value

It is possible to add a probability to the consequence in the 'Conditional modifier' field. Conditional modifiers within the LOPA method allow you to take factors like luck into account to estimate the probability that an event will actually lead to damage or harm. Common conditional modifiers are probability of occupancy, ignition and fatality. The comments box of the consequence can be used to describe the basis for the conditional modifier. It is also possible to fill in the expected conditional modifier in the future if it differs from the current value.

### 26.6.3. Threat initial event frequency, enabling factor

The screenshot shows the 'Edit Threat' dialog box with the 'Lopa Calculations' tab selected. The fields are as follows:

- Default Frequency value: (empty text box)
- Initial frequency: 3E-1
- Enabling factor: 0.5
- Current top event frequency: (empty text box)
- Future initial frequency: (empty text box)
- Future enabling factor: (empty text box)
- Future top event frequency: (empty text box)
- Exclude from LOPA: ☐
- Lopa comments: (large text area)

At the bottom, there is a note: "Initiating event frequencies are the frequencies of the threat, without taking barriers / IPLs into account." and buttons for 'OK', 'Cancel', and 'Apply'.

Figure 307 – Initial frequency on threat

Default calculation values when left empty		
Input Field	Strict	Non-Strict
Initial frequency	Threat Frequency default value. When this is also empty: Unknown	Threat Frequency default value. When this value is also empty: 0
Enabling factor	1	1
Future initial frequency	Initial frequency	Initial frequency
Future enabling factor	(Current) Enabling factor	(Current) Enabling factor

It is possible to add a probability to the threat in the 'Enabling factor' field. An Enabling Factor is something that cannot directly cause the next event but must be present for the scenario to proceed. For example: when the threat is 'Strong winds' and the top event 'Fall of scaffold', the enabling factor is 'Presence of personnel on scaffold'. The initiating frequency is then the probability of strong winds and the enabling factor is the probability of presence of personnel on scaffold. These numbers will be multiplied by the software.

**Note:** The Enabling Factor is by default '1' (100%) in the bowtie, indicating that the threat can cause the top event on its own.

#### Exclude from LOPA

A Threat and its barrier chain can be excluded from taking part in any LOPA calculation, by checking the box "Exclude from LOPA" (see Figure 7). This will also hide the Threat using the LOPA display profiles and hide any scenarios involving this Threat in classic calculations.

In strict mode: When the Threat is part of the LOPA calculation (so not excluded) and the initial frequency as wells as default frequency values are not filled, the hazard/top event and all consequences will collapse to "unknown" values.

### 26.6.4. Barrier Probability of failure on demand (PFD) values

The PFD value is the *Probability of Failure on Demand* of the barrier. For safety instrumented systems it is equivalent to the SIL (Safety integrity level) level. The range of acceptable values is from

1 (no effect, same as barrier not present) down to

0 (always available and will always work and stop the scenario)

Note that each barrier must be an IPL - *Independent Protection layer*. This requires the barrier to be fully independent and have no common failure modes with other barriers and must be enough to stop the event chain from progressing - if it works as intended.

**Note:** LOPA calculations can be performed on the elements of a bowtie diagram provided that the scenario barriers are logically independent of each other (IPL).

The screenshot shows the 'Edit Barrier' dialog box with the 'Lopa Calculations' tab selected. The 'Default PFD for Effectiveness' field is empty. The 'Current PFD' field contains the value '0.2'. The 'Future PFD' field is empty. Below these are fields for 'Effective current PFD' and 'Effective future PFD', both of which are empty. A text box for 'Lopa comments' is at the bottom, with a '(edit in popup)' link. The bottom right of the dialog has 'OK', 'Cancel', and 'Apply' buttons.

**Figure 308 - Setting the PFD for a barrier**

Default calculation values when left empty		
Input Field	Strict	Non-Strict
Current PFD	The Default PFD value for the Barriers' assigned effectiveness. When this value is also left empty: Unknown	The Default PFD value for the Barriers' assigned effectiveness. When this value is also left empty: 1 (no reduction)
Future PFD	Current PFD	Current PFD

In strict mode: When a threat barrier's PFD is left empty its threat frequency will be unknown and the hazard, and all consequences will collapse to "unknown". When the barrier is on the consequence side, only the involved consequence will collapse to "unknown" result when the PFD is left empty.

## 26.7. Calculation

Whenever a change is *committed* to the casefile data a LOPA calculation automatically is executed. In BowTieXP a change can be committed by clicking “Apply” or “OK” in the editor windows.

### 26.7.1. Bowtie method of calculation

- a) Multiply each threat’s Initial event frequency with the enabling factor (if present) and with all PFD’s from the barriers on that line to get a residual event frequency for each threat. Below example illustrates this:  
 $1\text{E}-2 * 0.5 * 0.2 = 1\text{E}-3$

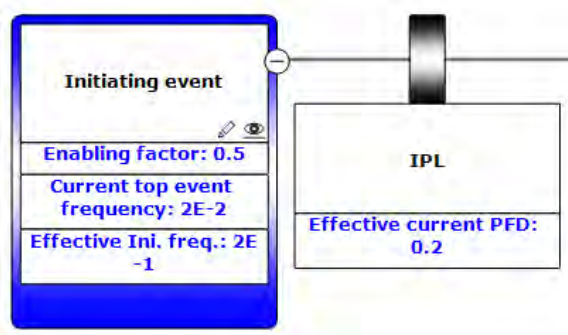


Figure 309 – Calculation of the Current Top Event frequency per threat

- b) The current top event frequency for each threat/initiating event will be summed to get the Total current top event frequency, visualised on the hazard-top event pair. That frequency is compared against the acceptable top event frequency, and the LOPA will tell you if the acceptance criteria is either met or not.

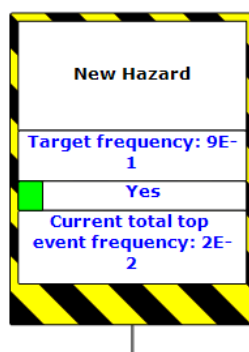


Figure 310 Display LOPA results on the Hazard/Top Event

- c) Each consequence frequency is calculated by starting with the current total top event frequency and multiplying it with the barrier PFD’s on a consequence line, and finally with the conditional modifier, if present. (For consequence frequencies calculated per scenario, see section 26.14 Classic LOPA reports.)  
 d) The calculated frequency of the consequence will be compared to the acceptable consequence frequency and LOPA will tell you whether the acceptance criteria is met or not.  
 e) The same is done for the future situation, using all the future calculation values instead of the current values. This results in acceptance criteria either being met or not in the future.

**Note:** When determining if acceptance criteria are met, a small error is allowed to compensate for floating-point rounding errors. The actual frequency is allowed to be larger than the acceptable frequency by a margin of  $\text{acceptable frequency} \times 10^{-5}$ .

**Note:** Escalation factors and escalation factor barriers are not included in the LOPA calculation.

## 26.7.2. Future fields

The current frequency/enabling factor/conditional modifier/IPL fields show the calculated current level of protection. The future frequency/enabling factor/conditional modifier/IPL field allow you to compare the current frequencies to a predicted frequency given an expected or hypothesized change

Note: A barrier we currently plan to implement would get a current PFD of 1, and the future PFD will be the expected probability of failure. A PFD of 1 means no contribution / reduction.

## 26.8. LOPA display profiles

The LOPA module adds two standard display profiles to the file. The normal "LOPA" profile shows just the current situation, whereas the "LOPA – Future" profile shows both the current and future situations.

The LOPA display profiles can be added / restored to their defaults by executing menu Tools -> Add/Reset LOPA display profiles. For instance when they are not present yet in your casefile.

In BowTieXP advanced edition these profiles can be edited in the same manner as any other display profile within BowTieXP.

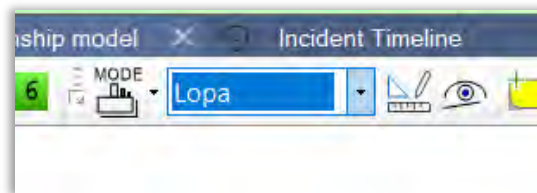


Figure 311 – Where to find LOPA display profiles

Engaging the LOPA display profiles will temporarily hide Threats excluded from calculations and also will hide any escalation factors and their barriers, since LOPA performs calculations of the main barriers only.

## 26.9. Frequency defaults for Threats

Optionally you can use Frequencies to standardise a default initial frequency for Threats having that frequency assigned. This is done like this:

Go to BowTie Lookup tables > Frequencies and right click > New / Edit Frequency. In the Lopa tab an appropriate value can be entered.

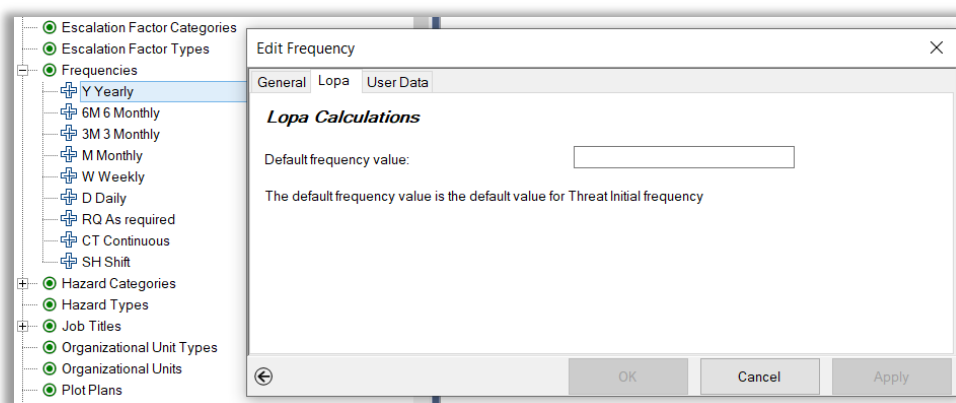


Figure 312 - Edit default frequency values



Note that the values entered here are only apply to Threats having the edited/created frequency assigned and that have no further LOPA specific initial frequencies filled in.

## 26.10. Barrier PFD defaults based on assigned Effectiveness

Optionally you can use Effectiveness to standardise a default PFD value for Barriers having that Effectiveness assigned and that have no further LOPA specific PFD values filled in.

Go to BowTie Lookup tables > Effectiveness and right click > New / Edit Effectiveness. In the Lopa tab an appropriate value can be entered.

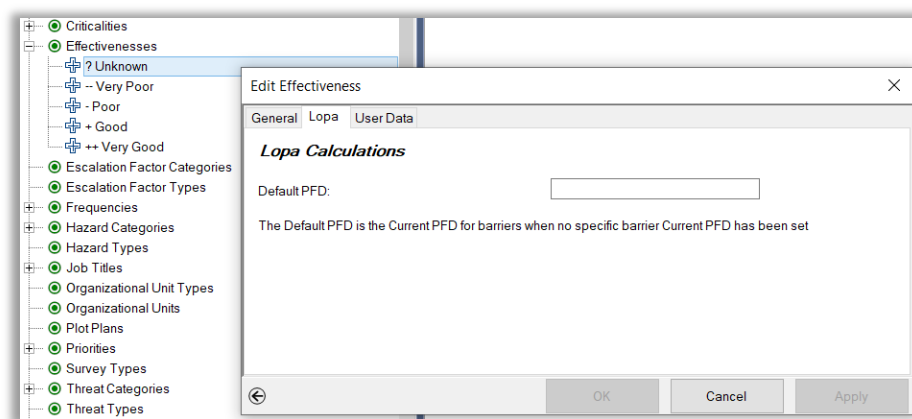


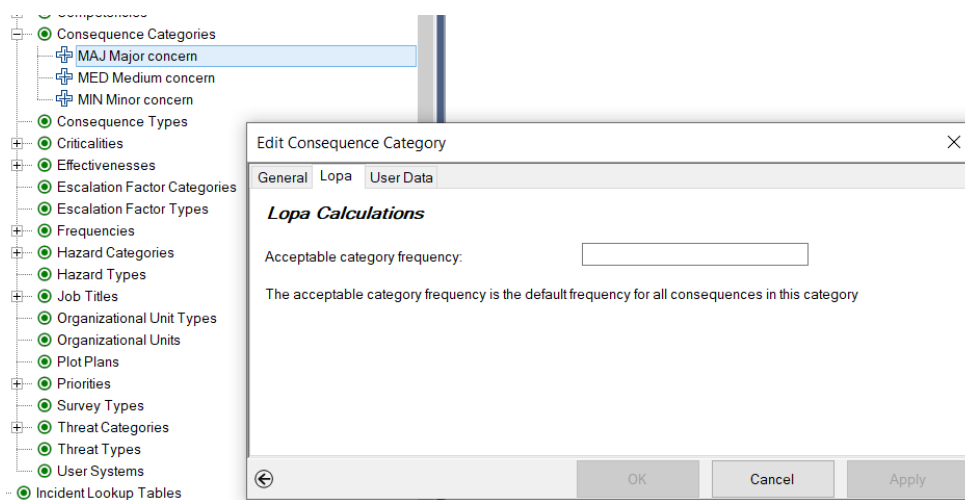
Figure 313 - Assigning default PFD values on effectiveness

Note that the values entered here are only apply to Barriers having the edited/created effectiveness assigned and that have no further LOPA specific PFD values filled in.

## 26.11. Consequence category acceptance criteria

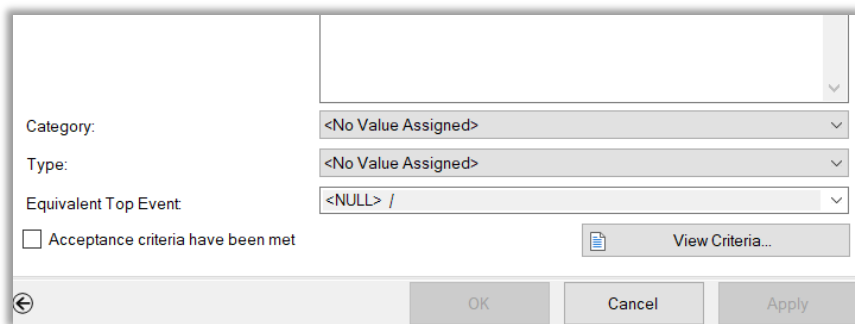
Optionally you can use consequence categories to standardise acceptance criteria for different kinds of consequences. This is done like this:

Go to BowTie Lookup tables > Consequence Categories and right click > New / Edit Consequence Categories. In the Lopa tab an appropriate value can be entered.



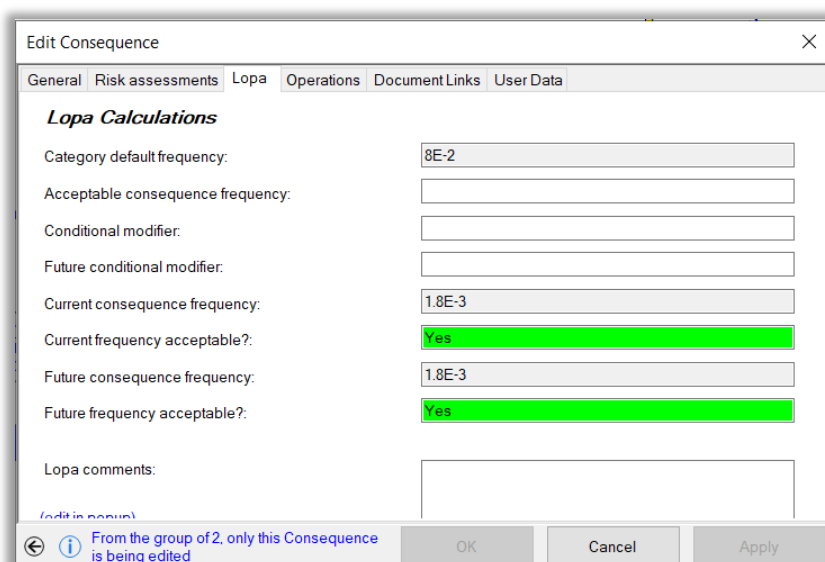
**Figure 314 - Edit acceptable category frequency**

Now when editing a consequence, you can choose the applicable category from the drop down:



**Figure 315- Assigning a consequence category to a consequence**

The LOPA tab on the consequence will show the acceptable category frequency, which comes from the consequence category.



**Figure 316 - Acceptable category frequency applied to consequence**

This category frequency will be overridden if you manually put in an acceptable consequence frequency on the consequence.

## 26.12. Reports and Overviews

There are a number of reports available for the LOPA module. Some reports follow the bowtie method calculations and others follow the classic LOPA approach. The difference is that the bowtie method calculates the frequency of the consequence given all the threats, while the classic LOPA calculates the frequency of a specific scenario line, thus the frequency of the consequence given one threat (see chapter 2.3 for further background).

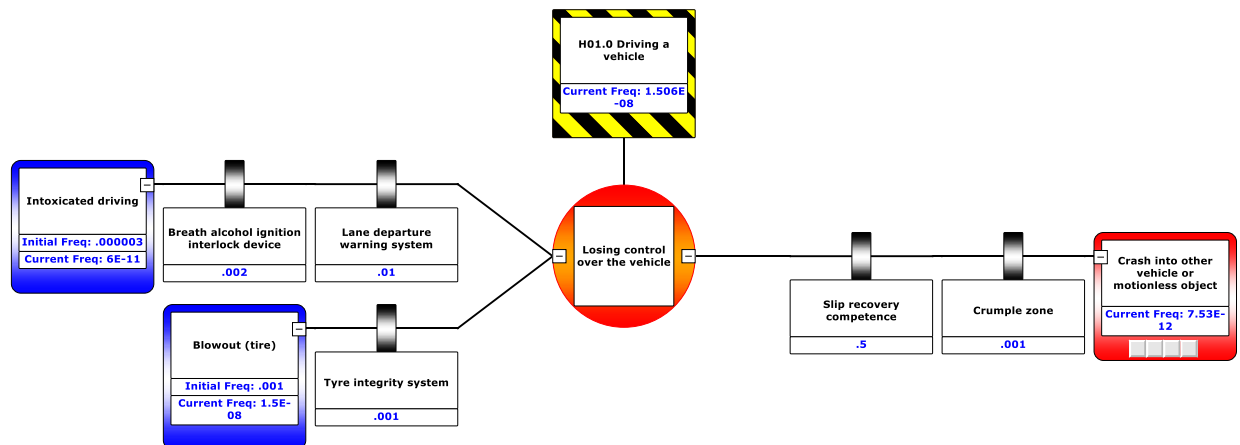


Figure 317 - Consequence frequency calculation via bowtie method

Consequence frequency of 'Crash into other vehicle or motionless object' =  
 (Residual event frequency of 'Intoxicated driving' + Residual event frequency of 'Blowout (tire)') \* .5 \* .001 = 7.53E-12

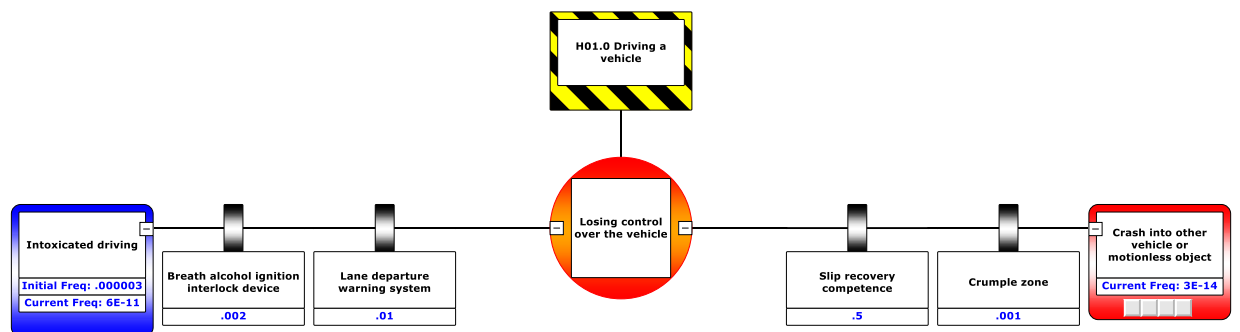
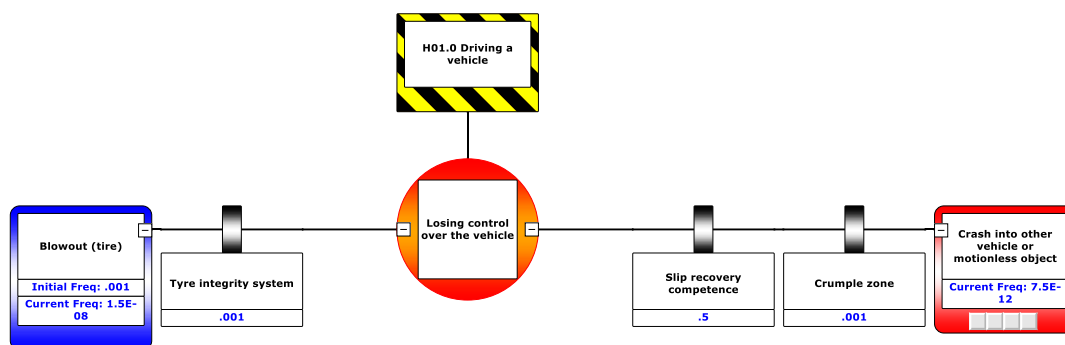


Figure 318 - Consequence frequency calculation via Classic LOPA: part 1

Consequence frequency of 'Crash into other vehicle or motionless object' caused by 'Intoxicated driving' =  
 Residual event frequency of 'Intoxicated driving' \* .5 (PFD) \* .001 (PFD) = 3E-14



**Figure 319 - Consequence frequency calculation via Classic LOPA: part 2**

Consequence frequency of 'Crash into other vehicle or motionless object' caused by 'Intoxicated driving' =  
 Residual event frequency of 'blowout (tire)' \* .5 (PFD) \* .001 (PFD) = 7.5E-12

## 26.13. Standard reports

The two reports 'BowTie Method Overall' and 'LOPA scenario overview and segments (BowTie method) per Hazard' follow the calculation of the consequence frequency via the bowtie method. These reports include the top event frequency and the top event target frequency.

The report 'BowTie Method Overall' is an Excel report in which each bowtie is concisely described per Excel sheet. The report 'LOPA scenario overview and segments (BowTie method) per Hazard' is a report in which parts of the bowtie are described separately. Each threat to top event is described and the top event to each consequence. The descriptions include a diagram depicting the part of the bowtie being described.

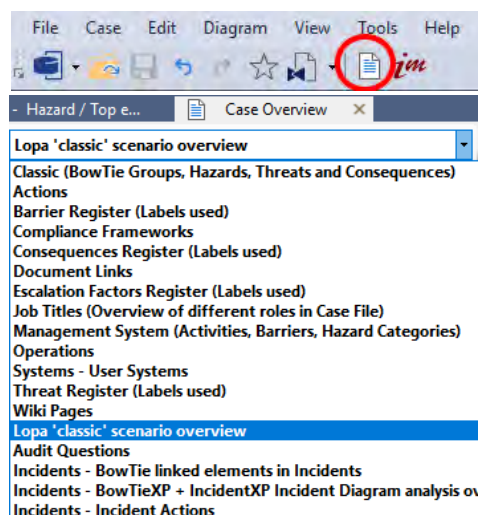
## 26.14. Classic LOPA reports

The three reports 'LOPA Classic Scenario Analysis', 'LOPA classic summary with related open Actions' and 'LOPA Riskassessment summary sheet, opens in XL' show the calculations per line (one threat to one consequence). Please be aware that if you use these reports, you should adjust the target frequency to be the frequency for a threat leading to the consequence and not for the occurrence of the consequence. For example if you state for a specific consequence that it may only occur at a frequency of .001, and you have two threats, you can pick a target frequency of .0005 for the first line and thereby also a target frequency of .0005 for the second line, so the total frequency of both lines is .001.

The Classic LOPA report only works when there are consequences in the bowtie diagram. If you have a bowtie which has a left side only, you can use the standard reports to get the classic LOPA approach, by looking at the current top event frequency of each threat.

## 26.15. Classic LOPA Case File overview

To view the Realtime Lopa results and gaps of all classic scenarios within a Case File open the “Lopa classic scenario overview”. You can open this overview window by going to the menu *view -> windows -> case overview*, or by clicking on the case overview toolbar button on the main application toolbar.

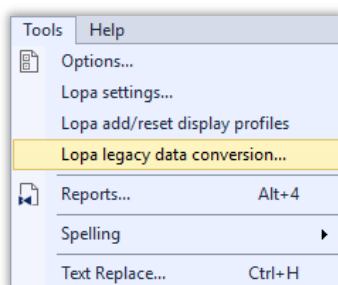


## 26.16. Legacy plug in data conversion

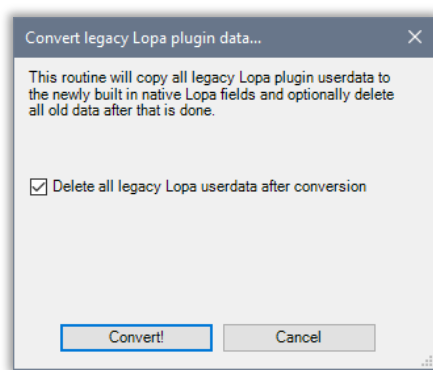
As of BowTieXP 9.4, the legacy LOPA plugin will not load and work anymore, only the internal module that uses native field properties instead of the plugins' “user data fields”. Note that all LOPA reports and overviews take their data from the new fields rather than from the legacy data. BowTieXP 9.4 supports converting the legacy filled in data to the new situation as follows:

- Detect whether the Case File contains legacy plugin data and if so:
  - o Copy all legacy input data to corresponding new fields
  - o Optionally delete all legacy user data and key definitions
  - o Perform a LOPA re-calculation
  - o Adapt/add the legacy display profiles

This conversion process must be manually performed from the menu *Tools -> Lopa legacy data conversion...*. The menu-item will only be there when there's actually any LOPA legacy data present in the current open Case File.



**Figure 320 Data conversion menu item**



**Figure 321 Conversion dialog**

Sometimes parts of the Case File might be marked as “read only” (e.g. hazards), This will prevent the read only entity from being converted. Also, when there’s read only data present the old legacy user data fields cannot be deleted.

#### *Undo*

When not satisfied with the conversion results, it is possible to “Undo” the entire conversion this by pressing CTL+Z.

# 27

## Introducing BowTieXL

This chapter introduces BowTieXL and discusses the general architecture.

### 27.1. Introduction

To meet customer demand of having the possibility to create quantitative and semi-quantitative analyses, built on the bowtie model, BowTieXL has been developed.

BowTieXL introduces a Microsoft Excel compatible spreadsheet into BowTieXP, which exposes the majority of the information in the Case File as tabular data in this spreadsheet. This allows you to use that data to do spreadsheet calculations based on that data, and feed the results back into your bowtie model.

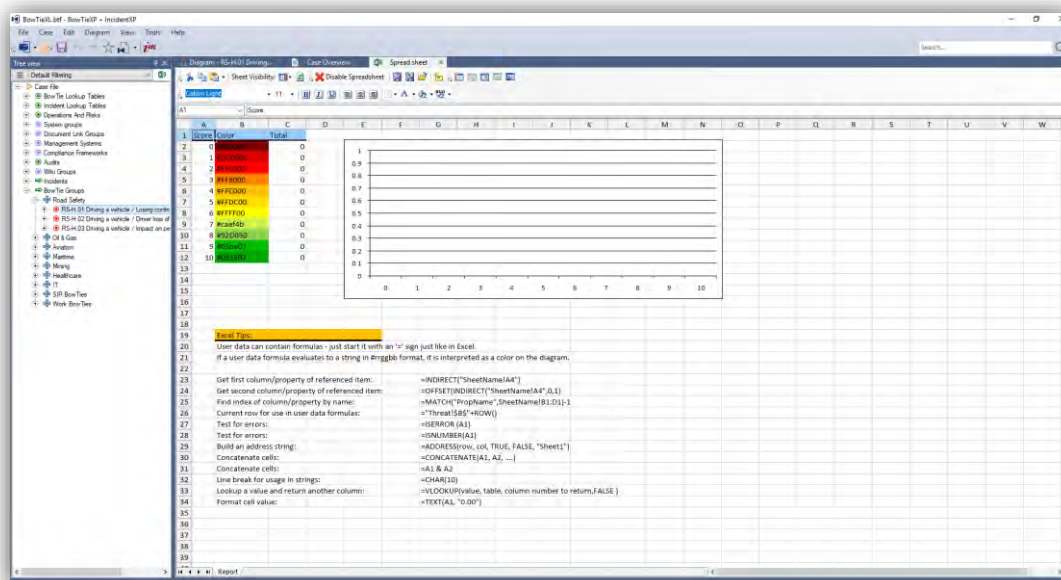


Figure 322 - Screenshot of BowTieXL

Apart from being able to do calculations based on the bowtie model data, you can also use BowTieXL to:

- Store reference information in spreadsheets, which are stored in the Case File,
- Add notes and calculations which serve as underpinning of the analysis in the Case File,
- Add general reference information into the Case File,
- Use the tabular representation of the bowtie model data to quickly edit data in bulk,
- Use Excel formulas to create custom aggregated displays of data on the diagram,
- And much more...

**Note:** If you intend to use BowTieXL in combination with BowTieServer, please be aware that BowTieServer does not store the spreadsheets but does store user data. BowTieServer also does not recalculate any formula. Please contact CGE support for details on what this means for your specific case.

## 27.2. Assumed knowledge

This chapter assumes the reader has a basic knowledge of working with Microsoft Excel. The following topics are assumed to be known:

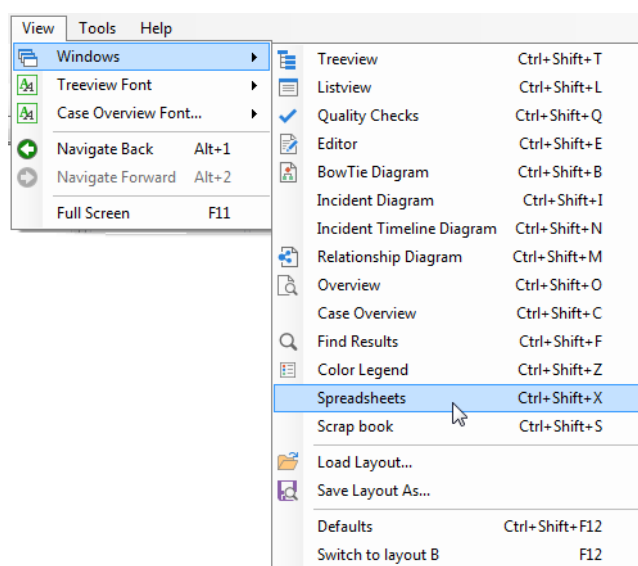
- Basic formulas, working with single cells and ranges  
=A1+B2  
=SUM(A1:A5)
- Absolute and relative cell references  
A1, \$A1, \$A\$1 and Sheetname!A1  
what the \$ modifier does and how Excel treats it when copying your formulas
- Named ranges
- The Excel IF function

It also helps if you are already familiar with:

- Hiding and unhiding sheets
- Sheet and cell protection

## 27.3. Displaying the spreadsheet

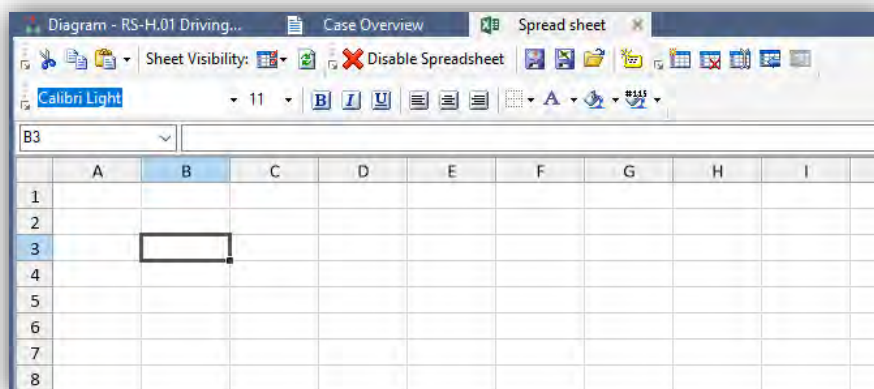
To view the spreadsheet, select View → Windows → Spreadsheets from the menu. The spreadsheets will be displayed.



**Figure 323 - How to display the spreadsheets**

You can also bring them up using the keyboard combination of Control+Shift+X.















**Figure 324 - The spreadsheets**

This spreadsheet should be familiar - it is Microsoft Excel compatible in most regards - most keyboard shortcuts are there, the mouse actions are the same, formulas are identical. The formula bar and cell reference bar work the same.

Some of the toolbar buttons will also be familiar, but some will not. We will describe them here.

Button	Function
	Disable and enable entire spreadsheet - this is used to speed up BowTieXP if the spreadsheet is not needed.
	Save the built-in workbook as an xls or xlsx file.
	Save and open the built-in workbook in Microsoft Excel.
	Open and replace the built-in workbook.
	Add or remove escalation factors from spreadsheet.
	Add a new sheet.
	Delete the current sheet.
	Rename the current sheet.
	Move sheet left or right
Button	Function
	Print
	Print Preview
	Cut
	Copy
	Paste
	Sort Ascending
	Sort Descending
100%	Zoom
	Show Managed Sheets
	Refresh

Button	Function
Calibri	Font
11	Font Size
	Bold
	Italic
	Underline
	Align left
	Align center
	Align right
	Borders
	Font color
	Background color
	Set hex color definition

Note that the number of options is much smaller than in Microsoft Excel - BowTieXP only offers a basic set of editing functions.

We recommend exporting the sheet to Excel and editing it from there if you are working on a big complicated spreadsheet. You can do this with these two buttons:



Saves the built-in spreadsheet to disk under a name of your choosing and open it in Excel.




Replace the built-in spreadsheet with a file on disk (usually the one you exported and edited in Excel).

When saving the sheet to disk, note that all the managed sheets (see below) containing almost ALL data in your entire BowTieXP btf Case File is present in those sheets!

This data is not immediately visible as the sheets are hidden and protected by default, to prevent you accidentally editing them and cluttering up your display with all these sheets.

## 27.4. Tabular representation of Case File data

By default, all you see when displaying the spreadsheets is a single empty sheet. All the Case File data is hidden. To show it, you need to press the following toolbar button: . A drop down will appear which allows you to show and hide the sheets managed by BowTieXP:

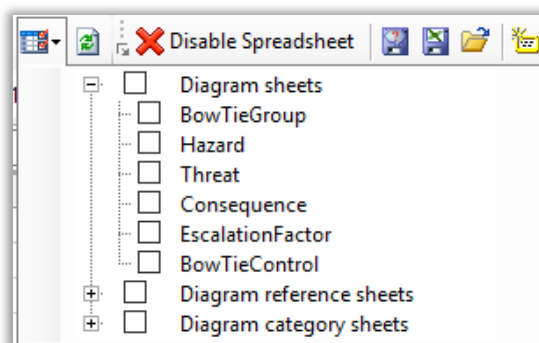


Figure 325 - Displaying spreadsheets

Clicking a checkmark will display the corresponding sheet. Note that your sheets, the so-called user sheets are always visible.

Note: Some information is currently unavailable as tabular data but might be added in the future. If you are missing data, please contact [support@cgerisk.com](mailto:support@cgerisk.com).

Let's open the test Case File and unhide the effectiveness sheet:

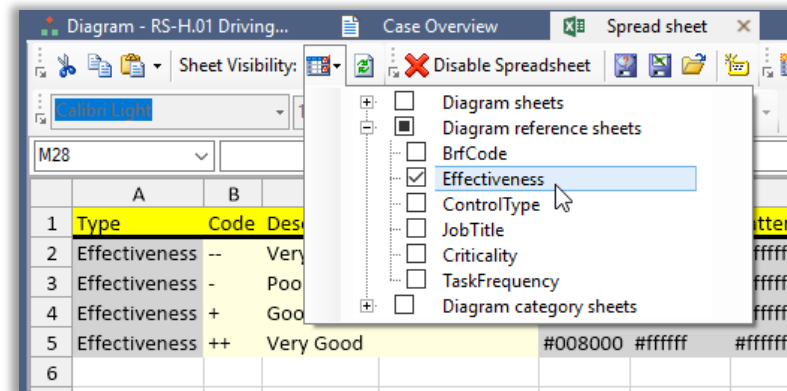


Figure 326 - Tabular representation of effectiveness values

Please note that BowTieXL controls these sheets - you cannot modify them, except for the light-yellow cells. Editing these will actually change the definition of the item, and you will see the item update where it is visible, such as in the Tree view or the diagram.

Color	Meaning
Yellow	Heading
Gray	Not editable
Pale Yellow	Editable
Orange	Not yet editable, will be implemented in a future version

Let us look at the threats spreadsheet, in the threat diagram sheets:

	A	B	C	D	E	F	G
1	Type	Name	Description	Control Count	Parent Hazard	AcceptanceCriteriaMet	Category
2	Threat	Inadequate design of plant		4	Hazard!\$B\$2	FALSE	
3	Threat	Improper construction of plant		4	Hazard!\$B\$2	FALSE	
4	Threat	Improper operation of plant		4	Hazard!\$B\$2	FALSE	
5	Threat	Injected Chemical over-temperature		2	Hazard!\$B\$2	FALSE	
6	Threat	Incorrect Chemical specification		1	Hazard!\$B\$2	FALSE	
7	Threat	Temperature Excursion in Process		5	Hazard!\$B\$2	FALSE	

Figure 327 - Tabular representation of threats

Please see how the parent hazard is filled in: Those cells contain the sheet and cell reference of where to find the parent hazard of each threat.

You can see the parent hazard for the first threat is "Hazard!\$B\$2". If we look at the hazard sheet:

	A	B	C
1	Type	Code	Name
2	Hazard	5.4.4.1	Heating Chemicals in the Catalyser Heater
3	Hazard	5.4.4.2	Liquefied Hazardous Chemicals Used in Production Facility
4	Hazard	5.4.4.3	Liquefied Hazardous Chemicals Used in Production Facility
5	Hazard	5.4.4.4	Toxic Chemicals in Storage Vessels in Production Facility
6	Hazard	5.4.4.5	(INCIDENT) Propane Stored in a Pressurised Cylinder in the Warehouse
7	Hazard	5.4.4.6	Liquefied Gas in Storage Vessels in Production Facility

**Figure 328 - Part of the hazards sheet**

We see that "Hazard!\$B\$2" refers to 5.4.4.1, "Heating chemicals in the Catalyser Heater". How we can use these sheet and cell references in calculations, we will show later on.

## 27.5. Editing via the spreadsheet

Editing items is as easy as modifying cells in Excel. You can copy, paste, type, and do any of the normal cell modifications you can do in Excel, except now you are directly editing your bowtie data.

Bulk adding of data from external data sources such as e.g. Excel is a breeze - simply copy and paste.

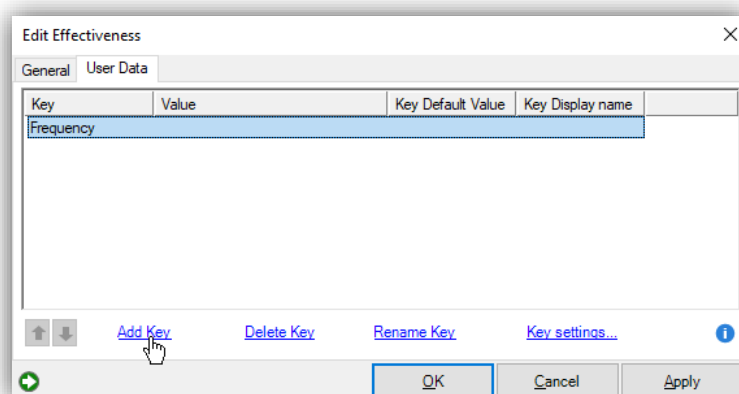
Note that you cannot remove or add items to a sheet directly - you cannot add and delete rows. There is a simple workaround for that: add a whole bunch of items in the Tree view by using copy and paste, then paste over those in the spreadsheet, and delete the excess items.

## 27.6. User defined data

In order to leverage the usefulness of the bowtie model data, BowTieXL introduces the addition of user-defined data fields to all objects in the Case File. For example, we can add numerical frequency fields to barrier effectiveness, allowing us to calculate with this value via barriers.

Custom data is defined per object type. If we define a field called 'Frequency' on any effectiveness value, that field is immediately available on all effectiveness values.

Adding custom data is done by means of the editor. It now has a tab, called 'User Data', which allows us to add, edit and delete these extra fields.



**Figure 329 - User data editor**

The "Add Key" button allows us to define an extra field on a type. Once we define a new key name on a type, e.g. barriers, each barrier will now have this field.

The delete key removes a field. Note that this will remove whatever is filled in on any object of the same type!

The rename key allows you to change a key name.

The Key default value allows you to add a standard value that is added to each new item. This is useful if each new element should automatically get certain formulas.

Another way of looking at what we are doing when we add user data, is that we are adding columns to the spreadsheet. Look at the effectiveness spreadsheet:

	A	B	C	D	E	F	G	H	I
1	Type	Code	Description	LongDescription	Color	TextColor	PatternColor	Pattern	Frequency
2	Effectiveness	--	Very Poor		#ff0000	#000000	#ffffff	-1	2
3	Effectiveness	-	Poor		#ff9900	#000000	#ffffff	-1	
4	Effectiveness	+	Good		#008000	#000000	#ffffff	-1	
5	Effectiveness	++	Very Good		#00ff00	#000000	#ffffff	-1	
6	Effectiveness	N/A	NOT Applicable		#808080	#000000	#ffffff	-1	
7	Effectiveness	3P	Third Party		#c0c0c0	#000000	#333333	-1	

**Figure 330 - Tabular representation of effectiveness values with custom data**

As you can see in the user data editor, we have defined a key called "Frequency" on effectiveness values, and you see that column in the sheet all the way to the right.

## 27.7. Showing user data on the diagram

User data fields can be shown on the diagram by selecting the field to show in the Diagram→Diagram Options. Here you can choose which user data field to show on which type. This is limited to the elements in the bowtie. For instance, user data that is added to an effectiveness value cannot be displayed on the bowtie, whereas user data on a barrier can be displayed.

## 27.8. Formulas in user data

When showing user data on the diagram, and if a user data value contains a formula (starts with an '=' equals sign), the formula is interpreted and the results are displayed. This allows you to bring calculation results from the spreadsheets back into the bowtie diagram.

The formulas are evaluated in context of the managed sheet for the type - formulas on barriers are evaluated in the BowTieControl sheet, formulas on threats on the Threat sheet.

In the next chapter, we will take a deeper look into what we can use this for.

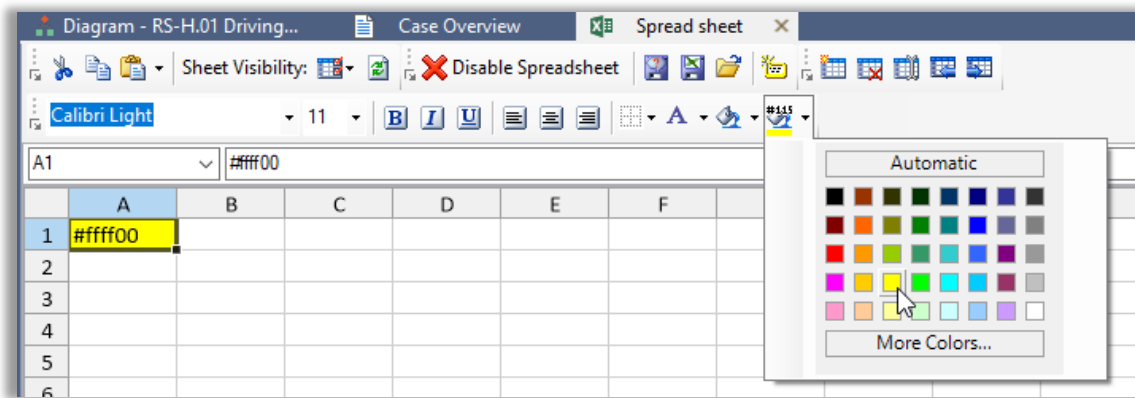
## 27.9. Coloring using user data

If a user data contains a html color code, it can be applied to the shape it is on. Html colors are color definitions look as follows:

#rrggbb

Where rr is the amount of red, gg is the amount of green, and bb is the amount of blue. These numbers are in hexadecimal.

If you are not familiar with hexadecimal notation, you can use the built-in color picker to choose and apply a color:



**Figure 331 - Selecting an html color code for a cell**

After selection, the color is applied, and the code is put into the cell.

There are many references on the internet about html color codes, such as <http://html-color-codes.info/>.

In the next chapter, we will show how to use this in depth, such as creating color lookup tables.

# 28

## Calculating with BowTieXL

Now that we have a basic understanding of what BowTieXL comprises, we delve into best practices for calculating with the bowtie data.

### 28.1. Introduction

Calculating with BowTieXL is not hard if you have a good working knowledge of Microsoft Excel formulas.

Assuming you are familiar with concepts such as cell references, relative (e.g. D14) and absolute (e.g. \$D\$14), summing and adding of ranges, and the IF function you should have little trouble getting started quickly.

One important concept we will work a lot with is the concept of indirect cell references, which we will explain next.

Note: If you intend to use BowTieXL in combination with BowTieServer, please be aware that BowTieServer does not store the spreadsheets but does store user data. BowTieServer also does not recalculate any formula. Please contact CGE support for details on what this means for your specific case.

### 28.2. Indirect cell references

In order to do calculations in Excel, it is preferable to have all the information we need in a single table. However, the information in BowTieXL is spread out over many tables in many sheets, linked together by means of cell references.

Look at the barriers sheet:

	A	B	C	D	E	F	H	I
1	Type	Code	Name	Parent Hazard	Parent Threat	Parent Cons	Accountable	Effectiveness
2	BowTieControl		Main elements of p	Hazard!\$B\$2	Threat!\$B\$2			Effectiveness!\$B\$4
3	BowTieControl		Design (including C	Hazard!\$B\$2	Threat!\$B\$2		JobTitle!\$B\$3	Effectiveness!\$B\$5
4	BowTieControl		Design subjected to	Hazard!\$B\$2	Threat!\$B\$2		JobTitle!\$B\$6	Effectiveness!\$B\$5
5	BowTieControl		System materials a	Hazard!\$B\$2	Threat!\$B\$2			Effectiveness!\$B\$3
6	BowTieControl		Manufacturer empl	Hazard!\$B\$2	Threat!\$B\$3			Effectiveness!\$B\$3
7	BowTieControl		No high pressure or	Hazard!\$B\$2	Threat!\$B\$3		JobTitle!\$B\$9	Effectiveness!\$B\$4

Figure 332 - Barriers sheet (some columns left out)

In order to do meaningful calculations, we need to bring information together. We need to be able to use "Effectiveness!\$B\$4" cell references, and bring properties of that effectiveness value into our own worksheet.

Conceptually, what we want to do is as follows:

	A	B	C	D	E
1	Control #	Cell Reference	Control Name	Effectiveness Cell Ref	Effectiveness Name
2		BowTieControl!C2			
3		2 BowTieControl!C3			
4					
5					

	A	B	C	D	E	F	G	H	I	J
1	Type	Code	Name	Descr	Parent Hazard	Parent Threat	Parent Cons	Acceptance Crit	Accountability	Effectiveness
2	BowTieControl		Main elements of plant designed by reputable		Hazard!\$B\$2	Threat!\$B\$2		FALSE		Effectiveness!\$B\$4
3	BowTieControl		Design (including Company aspects) approved		Hazard!\$B\$2	Threat!\$B\$2		FALSE		Effectiveness!\$B\$5
4	BowTieControl		Design subjected to HAZOP review		Hazard!\$B\$2	Threat!\$B\$2		FALSE		Effectiveness!\$B\$6
5	BowTieControl		System materials appropriate for chemical serv		Hazard!\$B\$2	Threat!\$B\$2		FALSE		Effectiveness!\$B\$3
6	BowTieControl		Manufacturer employed to carry out on-site pro		Hazard!\$B\$2	Threat!\$B\$3		FALSE		Effectiveness!\$B\$3
7	BowTieControl		No high pressure on-site pipe welding carried o		Hazard!\$B\$2	Threat!\$B\$3		FALSE		Effectiveness!\$B\$4

	A	B	C	D	E	F	G	H	I
1	Type	Code	Description	LongDescription	Color	TextColor	PatternColor	Pattern	Frequency
2	Effectiveness	-	Very Poor		N/A	N/A	N/A	N/A	2
3	Effectiveness	-	Poor		N/A	N/A	N/A	N/A	4
4	Effectiveness	+	Good		N/A	N/A	N/A	N/A	6
5	Effectiveness	++	Very Good		N/A	N/A	N/A	N/A	8
6	Effectiveness	N/A	NOT Applicable		N/A	N/A	N/A	N/A	
7	Effectiveness	3P	Third Party		N/A	N/A	N/A	N/A	

Figure 333 - Following cell references to the wanted information

**Step 1, blue arrow:** From a cell reference in our worksheet, we need to go to the barriers sheet to the specified cell, and get the name of the barrier.

**Step 2, green arrow:** We need to get a cell from a different column in the barriers sheet, to bring the barrier's effectiveness into our sheet.

**Step 3, red arrow:** We need to go to the effectiveness sheet, and bring the effectiveness code into our sheet.

**Step 4, turquoise arrow:** We need to get a cell from a different column in the effectiveness sheet, and bring it into our sheet.

Now we should end up with our sheet looking like this:

	A	B	C	D	E	F
1	Control #	Cell Reference	Control Name	Effectiveness Cell Ref	Effectiveness	Eff Freq
2		1 BowTieControl!C2	Main elements of plant designed	Effectiveness!\$B\$4	+	6
3		2 BowTieControl!C3	Design (including Company aspec	Effectiveness!\$B\$5	++	8
4						

Figure 334 - Sheet with reference info brought in

Column B is the cell reference to the wanted barrier.

Column C is the result of step 1, the blue arrow: the barrier name.

Column D is the result of step 2, the green arrow: the barrier's effectiveness cell reference.

Column E is the result of step 3, the red arrow: the effectiveness code.

Column F is the result of step 4, the turquoise arrow: the effectiveness frequency.

With this sheet, it is straightforward to e.g. calculate the average effectiveness frequency.

Now onto the formulas on how to accomplish this: Microsoft Excel, and therefore BowTieXL, offers a couple of functions designed to do exactly what we set out in this section.

### 28.2.1. The INDIRECT function

The INDIRECT function allows us to treat a textual cell reference as an actual cell reference.

Look at this demonstration:



	A	B	C	D	E	F
1						
2	Reference:	D4		Name	Age	
3	=INDIRECT(B2)	Mike		John	30	
4	=OFFSET(INDIRECT(B2),0,1)	35		Mike	35	
5				Sarah	40	
6						

**Figure 335 - Workings of the INDIRECT function**

In Cell B2, we have the location of interest, in this case the text value D4. By means of the INDIRECT function, we can get at the value in the cell we specified - we turn the text value into a reference.

This can be seen in cell B3. The formula in B3 is =INDIRECT(B2), and the value displayed is "Mike", the value present in cell D4.

This works for all possible cell references, such as:

- just a cell coordinate, e.g. B3
- sheet + cell reference, e.g. Sheet2!D24
- filename + sheet + cell reference, e.g. [D:\test.xlsx]Sheet1!E5

Note that for the last reference to work, the target file has to be open, or you will get a #REF error.

### 28.2.2. The OFFSET function

Getting the contents of the cell we specified is nice, but gets us only half-way - we would only get the indicated column, so we need a way to shift to the right from the reference. The OFFSET function comes to the rescue.

The offset function allows us to step away from a reference in either direction. Usually we want to move to the right to get at the different properties of e.g. an effectiveness value.

	A	B	C	D	E	F
1						
2	Reference:	D4		Name	Age	
3	=INDIRECT(B2)	Mike		John	30	
4	=OFFSET(INDIRECT(B2),0,1)	35		Mike	35	
5				Sarah	40	
6						
7						

**Figure 336 - Workings of the OFFSET function**

As you can see in the above screenshot, we stepped one column to the right to get the age of the person we selected.

### 28.3. Setting up the test Case File for an example

As an example, we will add a value called 'Frequency' to each effectiveness value, and calculate the average barrier effectiveness frequency for each threat.

**Note:** This sample does not carry any real-world meaning, but only serves as an example on how to do calculations.

1. Open the test Case File (File → Open test case).
2. Select the 'Very Poor' effectiveness value.
3. Select the User Data tab in the editor.

4. Click Add Key. Enter 'Frequency' as the key name. Press Enter.
5. Double click the newly added line to edit it. Enter '2' as the value. Press enter to commit.
6. Edit the rest of the user values and apply the following values:

Effectiveness	Frequency
Very Poor	2
Poor	4
Good	6
Very Good	8

If you go to the spreadsheets, show the diagram reference sheets, and look at the effectiveness sheet it should look as follows:

	A	B	C	D	E	F	G	H	I
1	Type	Code	Description	LongDescription	Color	TextColor	PatternColor	Pattern	Frequency
2	Effectiveness	--	Very Poor		N/A	N/A	N/A	N/A	2
3	Effectiveness	-	Poor		N/A	N/A	N/A	N/A	4
4	Effectiveness	+	Good		N/A	N/A	N/A	N/A	6
5	Effectiveness	++	Very Good		N/A	N/A	N/A	N/A	8
6	Effectiveness	N/A	NOT Applicable		N/A	N/A	N/A	N/A	
7	Effectiveness	3P	Third Party		N/A	N/A	N/A	N/A	

**Figure 337 - Desired effectiveness frequencies**

The test Case File is now set up for the examples in this chapter.

## 28.4. One-off calculations

The easiest method of doing calculations is by copying and pasting or referencing the relevant data from the different sheets, and calculating what is needed.

As an example, we will calculate the average effectiveness frequency of the barriers of the first threat in the test Case File we prepared earlier.

By peeking at the barriers worksheet, we see that there are four barriers on the first threat, and we are interested in their names and effectiveness values, which reside in columns C and J. Therefore, we reference those:

**Note:** Be sure to notice the **formula** displayed in the top of the screenshots.

B2      =BowTieControl!J2			
	A	B	C
1	Name	Effectiveness	
2	Main elements of plant designed by reput	Effectiveness!\$B\$4	
3	Design (including Company aspects) apprc	Effectiveness!\$B\$5	
4	Design subjected to HAZOP review	Effectiveness!\$B\$5	
5	System materials appropriate for chemical	Effectiveness!\$B\$3	
6			

**Figure 338 - Effectiveness values brought in**

In the next column, we want to fetch the frequency field we defined for each effectiveness value, and for that we need to INDIRECT the cell reference and OFFSET it by 7 columns (counted by hand in the effectiveness sheet):

C2      =OFFSET(INDIRECT(B2),0,7)				
	A	B	C	D
1	Name	Effectiveness	Eff Freq	
2	Main elements of plant designed by reput	Effectiveness!\$B\$4	6	
3	Design (including Company aspects) apprc	Effectiveness!\$B\$5	8	
4	Design subjected to HAZOP review	Effectiveness!\$B\$5	8	
5	System materials appropriate for chemica	Effectiveness!\$B\$3	4	
6				

Figure 339 - Effectiveness frequency brought in

Take note of the formula of C2, which you can see, in the formula bar, just as we discussed.

Now we can calculate the average, and some nice colors and borders, and end up with:

C7      =AVERAGE(C2:C5)				
	A	B	C	D
1	Name	Effectiveness	Eff Freq	
2	Main elements of plant designed by reput	Effectiveness!\$B\$4	6	
3	Design (including Company aspects) apprc	Effectiveness!\$B\$5	8	
4	Design subjected to HAZOP review	Effectiveness!\$B\$5	8	
5	System materials appropriate for chemica	Effectiveness!\$B\$3	4	
6				
7		Average Eff Freq:	6.5	
8				

Figure 340 - Average effectiveness frequency calculated

## 28.5. Building dynamic sheets

In the previous sections, we discussed the basics of building a sheet. They were easy to set up, but also fragile because changes in the sheets can break your formulas. For example, with different versions of BowTieXP, some columns might shift, or users can reorder user data field columns themselves. If you do not anticipate this, it can mean broken formulas or worse, undetected references to the wrong data. To avoid this, we will dive into making sheets dynamic so they are less fragile.

### 28.5.1. The MATCH function to find columns

One of the main reasons why sheets break is shifting columns. To avoid this, we can find column by name instead of by direct reference.

Let us assume we want to find the effectiveness value that belongs to a barrier.

1. OFFSET NUMBERS: we create a table where we list the horizontal coordinate for each column. We do this by using MATCH to find a User data key in a range using three columns:

C2      =MATCH(A2,INDIRECT(B2),0)			
	A	B	C
1	Property	Range	Offset
2	Effectiveness	BowTieControl!1:1	12
3			

Figure 341 – Match function usage example

The first two columns are put in manually. In the third column, we use this formula:

**=MATCH(A2,INDIRECT(B2),0)**

What this formula does is look for A2 in a range. A2 is Effectiveness in this case.

We get the range by using INDIRECT on B2. This translates the text that is in B2 into an actual range.

The last addition is 0, which makes sure that MATCH searches in the correct way (search for match\_type to find out more).

This makes sure that even if the Effectiveness column shifts, all of the formulas that reference Effectiveness shift with it.

- Now that we have the dynamic offset, we can build a formula to create a reference that will keep working:

	E	F	G
1	Barrier name	Barrier reference	Barrier effectiveness reference
2	Periodic medical examination for professional drivers	BowTieControl!A2	Effectiveness!\$B\$4
3	Breath alcohol ignition interlock device	BowTieControl!A3	Effectiveness!\$B\$5
4	Agreeing on a designated driver	BowTieControl!A4	Effectiveness!\$B\$8

**Figure 342 – Create dynamic reference**

In the rest of the spreadsheet, column E just lists the barriers for easy reference using **=BowTieControl!C2**

In column F we manually put a reference to the first column of the BowTieControl sheet.

Column G looks up the effectiveness value reference for each barrier using:

**=OFFSET(INDIRECT(F2),0,\$C\$2-1)**

We will break it down into steps.

- First, OFFSET is used to move to the Effectiveness column and return the Effectiveness reference.
- To do this, we first use INDIRECT(F2) to start us off in the first column of the BowTieControl sheet.
- Then we do not want a vertical offset, so the second parameter is 0.
- The third is our dynamic horizontal offset \$C\$2. The dollar signs are there because we do not want the reference to that cell to change when we copy it down.
- Lastly, you see we decrease the reference by 1. This is because if the effectiveness is in column 12, and we offset it by 12 starting from the first column, we will actually end up in column 13. Therefore, we decrease it by one to make sure everything is correct.

There were a couple of things shown in this section, but remember that the most important point is how to make an offset that will keep working even when columns change position.

### 28.5.2. Calculating using the current row in user data

Because user data can be moved around due to reordering, inserting and deleting of barriers and other items, you cannot just reference B2, B3, B4, as those will no longer point to the current row.

To fix this, there is a simple trick: We can return the current row number using the ROW() function. Using that we can build an address which we can use with INDIRECT().

For example, on the Threats sheet we can use either of the following:

= "Threat!" & ADDRESS(ROW(), 2)                      returns e.g. Threat!\$B\$2  
 = "Threat!\$B\$" & ROW()                                returns the same :)

### 28.5.3. Detecting change in a column of values

It can be valuable to do a calculation across all the barriers on a threat or consequence. This section will explain how to do that.

First, we make a list with all the barriers and include a column with threat and consequence references. Then we have a column with, in this case, a barrier criticality value for each barrier (we will not go into how to do this here, look at the other sections for more details). The magic happens in the last two columns.

E2 =IF(AND(B2=B1, C2=C1),E1+1,1)						
	A	B	C	D	E	F
1	Barrier	Threat	Consequence	Criticality	Barrier count on threat and consequence	Criticality sum
2	Feed monitoring	Threat!\$B\$2	0	2	1	
3	Inflow/Outflow monitoring	Threat!\$B\$2	0	1	2	
4	Vapour detectors	Threat!\$B\$2	0	0	3	3
5	Feed monitoring	Threat!\$B\$3	0	2	1	
6	New Barrier	Threat!\$B\$3	0	1	2	
7	New Barrier2	Threat!\$B\$3	0	1	3	4
8	Inflow/Outflow monitoring	Threat!\$B\$4	0	2	1	2

Figure 343 – Detect change using count formulas (1/2)

In column E, we want to have a counter that increases until the next threat or consequence line. Essentially, the formula says: if the current cell is equal to the previous cell, increment the count by 1, in any other case reset it to 1:

=IF(AND(B2=B1, C2=C1),E1+1,1)

The AND statement is to make it work for both the threat and consequence lines. If either a threat or consequence is not the same, we reset the counter.

In column F, we use that counter to tell us when a new line starts, and how many barriers were on that line. Column F essentially says: if the next cell is larger, do nothing, in any other case, perform some action. This will result in the cell remaining empty as long as the counter is increasing. However, as soon as the counter is reset, we perform some action. In this example, we do a sum of all the criticality values.

In F4, we see the formula actually displaying something:

=IF(E3>E2, " ",SUM(OFFSET(D2,0,0,-E2)))

The logic goes like this:

If E5 is greater than E4:

Do nothing.

Else:

Sum a range.

We get this range by using OFFSET. In this case, OFFSET starts at D4 and does not change its start position (hence, the two zero parameters). The next parameter indicates how high the selection needs to be, since we can specify multiple cells to be selected by OFFSET. In this case, we say -E4, because we want to go up by the number of barriers on the line, which can be found in E4.

F4 =IF(E5>E4," ",SUM(OFFSET(D4,0,0,-E4)))						
	A	B	C	D	E	F
1	Barrier	Threat	Consequence	Criticality	Barrier count on threat and consequence	Criticality sum
2	Feed monitoring	Threat!\$B\$2	0	2	1	
3	New Barrier2	Threat!\$B\$2	0	1	2	
4	New Barrier2	Threat!\$B\$2	0	0	3	3
5	Feed monitoring	Threat!\$B\$3	0	2	1	
6	New Barrier2	Threat!\$B\$3	0	1	2	
7	New Barrier2	Threat!\$B\$3	0	1	3	4
8	Inflow/Outflow monitoring	Threat!\$B\$4	0	2	1	2

Figure 344 – Detect change using count formulas (2/2)

### 28.5.4. Removing #N/A values

Sometimes values have not been filled in, which can cause formulas to give a #N/A value. This is ugly and likely not what we want to show. We can catch it by including another column that tests for #N/A values.

B2 =IF(ISERROR(A2),"No data",A2)				
	A	B	C	D
1	Result	Tested result		
2	5	5		
3	6	6		
4	2	2		
5	8	8		
6	5	5		
7	#N/A	No data		
8	#N/A	No data		

Figure 345 – Spreadsheet where #N/A values are shown

In this example, we have column A with results, but some of the results result in an error #N/A. To deal with this gracefully, we add another column B called Tested result, where we put the following formula:

**=IF(ISERROR(A2),"No data",A2)**

This tests if A2 contains an error, and if that is the case, it will put "No data" in the cell. If the cell does not contain an error, it will just put in the value for A2.

### 28.5.5. Compacting a column of values

After following section 28.5.3 where we calculate across all the barriers on a line, we get a list of values with spaces in between them. This is a pattern we see a lot, and users often want to remove the whitespace and get a single list of values. This section describes a way to compact a list of values with blank cells. See this example:

M2 =VLOOKUP(Threat!B2,I:K,3,FALSE)							
	I	J	K	L	M	N	O
1	Threat name	Consequence name	Result	Threat	Status	Consequence	Status
2				Feed rate too high	OK	Spill to environment	OK
3				Unintentional feed from other line	Remediate	Vapour cloud	Remediate
4	Feed rate too high		OK	Outflow too low	OK	Loss of product	OK
5					0		0
6							
7	Unintentional feed from other line		Remediate				
8	Outflow too low		OK				
9							
10							
11		Spill to environment	OK				
12							
13							
14		Vapour cloud	Remediate				
15		Loss of product	OK				

Figure 346 – Spreadsheet where blank cells are shown

This sheet calculated whether each threat and consequence was sufficiently controlled. This leads to columns I, J and K. There is a lot of whitespace, so we want to compact it. The core formula is VLOOKUP in columns M and O. The formula is quite straightforward:

**=VLOOKUP(Threat!B2,I:K,3,FALSE)**

We search for the first threat name (Threat!B2) in columns I to K (I:K), and return the value in the third column. FALSE indicates that it should look for an exact match.

## 28.6. Excel reference

These are some commonly used functions that we use in BowTieXL. Descriptions taken from techonthenet.com.

Formula	Description
IF( condition, [value_if_true], [value_if_false] )	Normal If statement. Can be used for all kinds of conditional statements.
ISERROR( value )	Returns True if the value is an error value.
ISNUMBER	Returns True if the value is a number
INDIRECT( string_reference, [ref_style])	Returns the reference to a cell based on its string representation.
ADDRESS( row, column, [ref_type], [ref_style], [sheet_name] )	Returns a text representation of a cell address.
OFFSET( range, rows, columns, [height], [width] )	Returns a reference to a range that is offset a number of rows and columns from another range or cell.
ROW( [reference] )	Returns the row number of a cell reference.
COLUMN( [reference] )	Returns the column number of a cell reference.
VLOOKUP( value, table_array, index_number, [not_exact_match] )	Performs a vertical lookup by searching for a value in the left-most column of table_array and returning the value in the same row in the index_number position.
MATCH( value, array, [match_type] )	Searches for a value in an array and returns the relative position of that item.
TEXT( value, format )	Returns a value converted to text with a specified format.
CONCATENATE( text1, text2, ... text_n )	Allows you to join 2 or more strings together.

## 28.7. FAQs

Q: Excel's auto fit row height is not working.

Q: Excel's wrap text not working.

A: Ensure the cell's formatting is set to "general", not to "text".





# 29

## IncidentXP and BowTieXP together

### 29.1. Introduction

After an incident of large enough impact, incident investigation and analysis is done. These investigations lead to recommendations on how to adjust our management system so they will be prevented in the future.



Similar to audits, incident analysis is a valuable way of gaining insight into barrier quality/effectiveness. It is a lagging indicator, but a useful one nonetheless. Information about real world failure of barriers is difficult to gain and very valuable.

By relating the barriers in incident analysis with the barriers in the proactive risk assessments, we are offering another tool for helping close the Deming circle. After defining the barriers in your safety management system (i.e. the plan stage) and implementing them (i.e. the do stage), a check is required to ensure the quality of the barriers. Relying on barriers that are in reality inadequate can be dangerous. In addition, a thorough examination of the barriers during the check stage facilitates the generation of relevant recommendations later on (i.e. act stage).

The coupling of incident analysis with risk analysis also works in the other direction. By having the proactive risk assessments on hand during the investigation, identification of the involved barriers is made simpler and recommendations will probably be more compatible with the safety management system, allowing quicker and more effective adoption.

---

**Note:** Please refer to the IncidentXP software manual for more details on how to enter incidents into the software. Please also refer to our theory guide on more details on how incident analysis, but also audits tie into bowties.

---

In practice, this translates to the following software options:

1. Relating of bowtie barriers to incident barriers.
2. Allowing you to visualize incidents on bowtie diagrams (including some reports).
3. Allowing re-use of bowtie barriers and events on your incident analysis diagrams.
4. Offering Case File overviews to explore the relation between incidents and bowties.

## 29.2. Relating of bowtie barriers with incident barriers

To relate barriers between bowties and incident diagrams, you must first ensure you have both in the same file. Use the import function or the Scrap book to get all diagrams into a single file.

The next step is to position the two diagrams we are going to relate side by side, or on top of each other.

**Note:** a large monitor will help a lot on this process.

We open both diagrams, and then grab the tab and drag the window to the right position. Reorganizing the windows is described in chapter 6.7, How to configure your main window on page 52.

See the screenshots below for two ways to organize your windows:

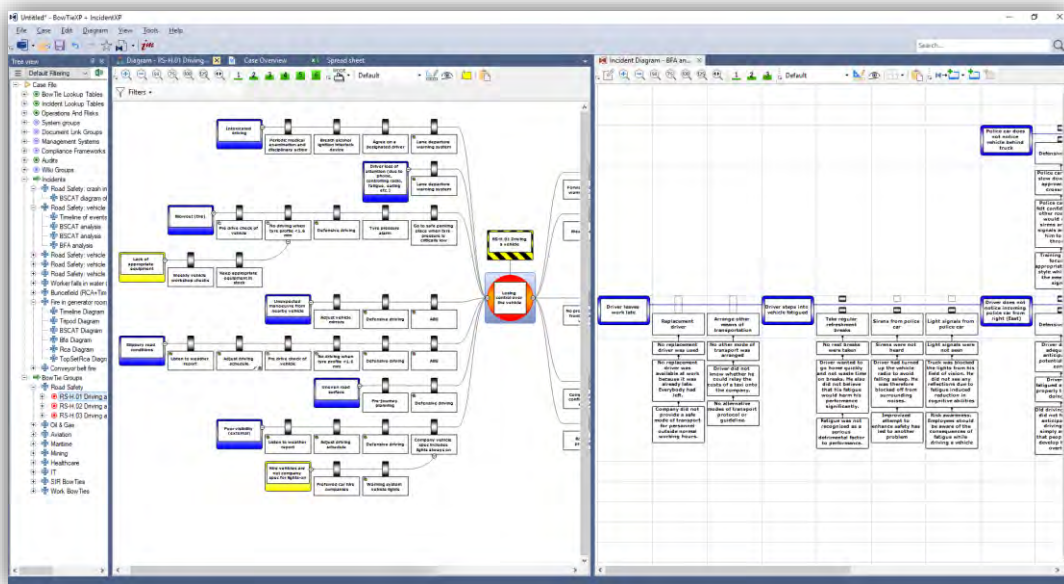


Figure 347 - Incident diagram and bowtie diagram side-by-side

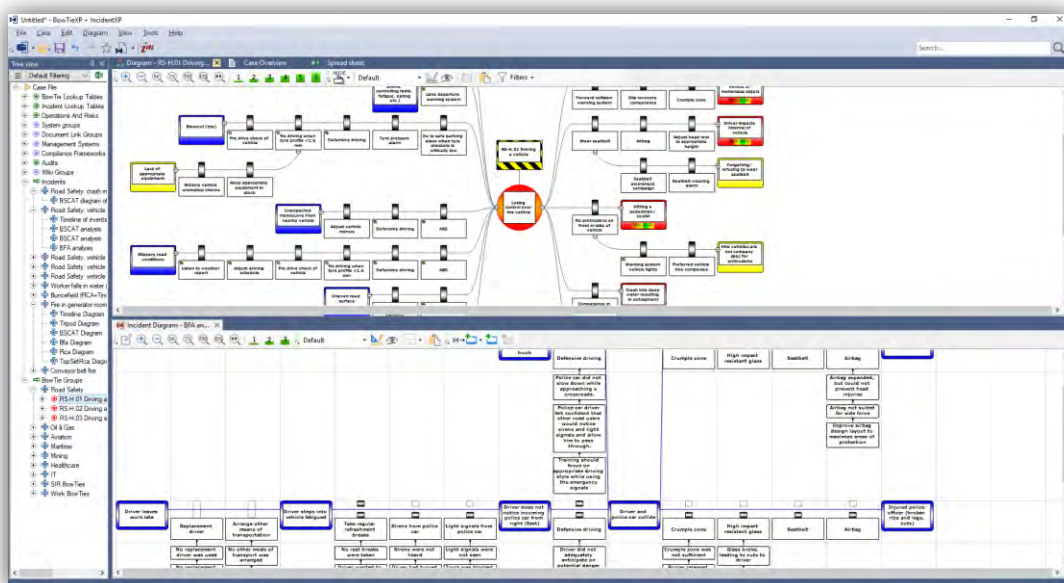


Figure 348 - Incident diagram and bowtie diagram on top of each other

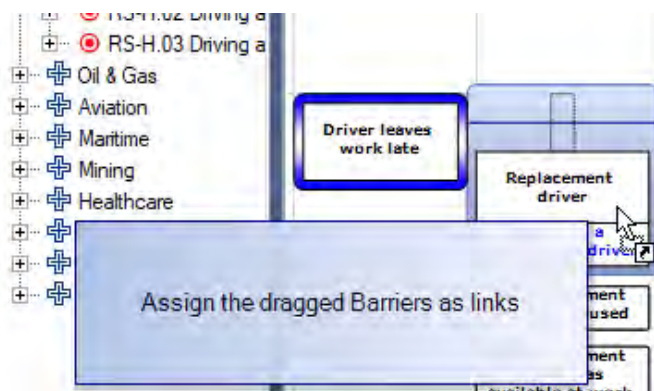
Once we have this window arrangement, associating the barriers is done by means of drag and drop. Simply drag the barrier from the bowtie diagram onto the barrier you want to relate it to on the incident diagram and the association is made.

---

**Note:** if the barrier you are trying to drag starts repositioning, try holding down the ALT key.

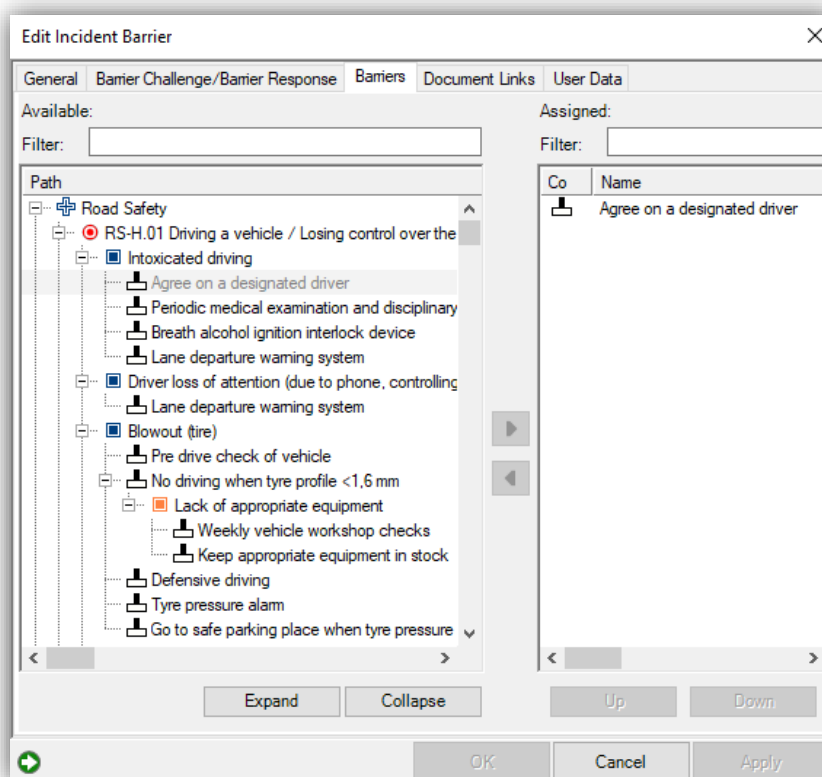
---

The ALT key switches from dragging to reorder to dragging to drag an item out of the diagram.



**Figure 349 - Linking bowtie barriers with incident barriers**

If you need to remove an association between two barriers, double click the incident barrier. On the barriers tab you can remove the offending bowtie barrier:



**Figure 350 - Linking incident barriers to bowtie barriers**

---

**Note:** if you used bowtie elements while building your incident diagram, associations will already be present. When you copy and paste a barrier from a bowtie into an incident, BowTieXP automatically associates them for you. Likewise, if using the “from bowtie” drop down button when building “templated” incident diagrams.

---

## 29.3. Add incident event from bowtie

An incident could have the same sequence of events that you have identified in the bowtie. In this case, you might want to select a threat, the top event and a consequence from the bowtie into your incident analysis diagram. You can do this by creating an incident analysis diagram via Case File → incidents → new incident and fill in the pop-up screen. Once you have the incident analysis screen, you can select a threat, top event, or consequence using the icon 'Add event from bowtie' icon. A list of all bowties within the same file appears. If you select, for example the top event, it appears into your screen.

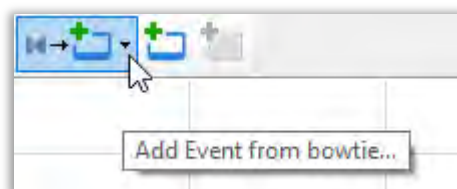


Figure 351 - Add incident from bowtie

When an item from the bowtie is in your screen, you can continue from there by clicking on the bowtie item. The barriers and escalation factor barriers in between the threat-top event and top event –consequence will automatically appear in the incident diagram. If you do not want the escalation factors in your diagram, you can turn this off by deselecting Tools → Options → Behavior → Include EF barriers when creating edges from bowtie template.

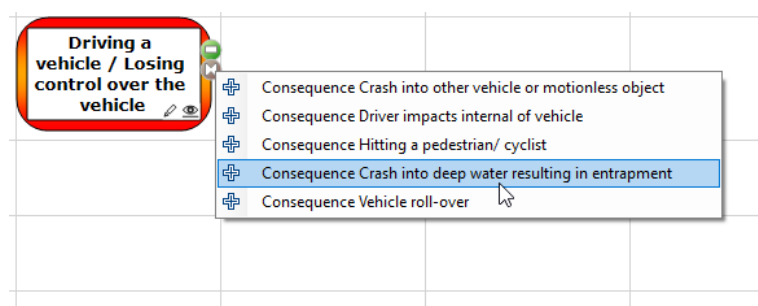


Figure 352 Selecting events from bowtie

## 29.4. Visualizing incidents on bowtie diagrams

Once the links between the bowtie barriers and the incident barriers have been made, we can show the barriers failure statistics and failure details in the bowtie diagram. Failure details include the barrier failure state, the Tripod causation paths and the BSCAT causations. These diagrams are known as incident bowties.

To enable this view, you select the incident filter from the filters drop down on the bowtie diagram toolbar:

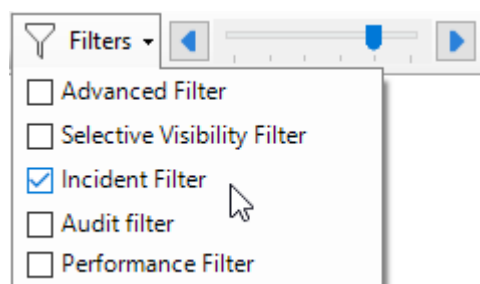


Figure 353 - Enabling Incident Filter

Once selected, the incident filter toolbar will be displayed, allowing you to fine-tune what will be shown. You can choose to show data from all incidents or from a specific incident.

Here is a sample of a Tripod Beta diagram linked onto a bowtie diagram:

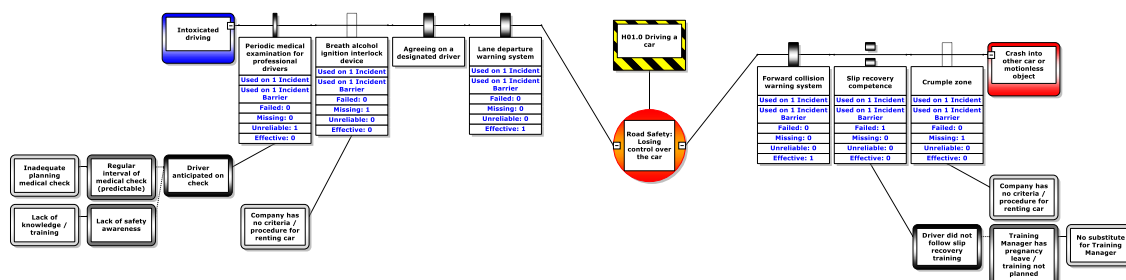


Figure 354 - An incident bowtie with Tripod causation paths

Here is a sample diagram showing a BSCAT incident on a bowtie diagram:

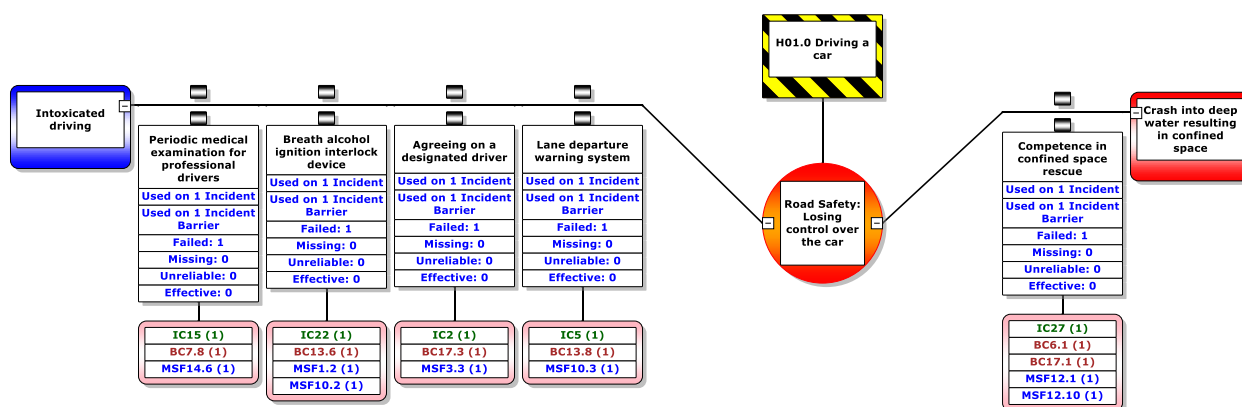


Figure 355 - An incident bowtie with BSCAT causations

You can choose which incident diagram you would like to display.

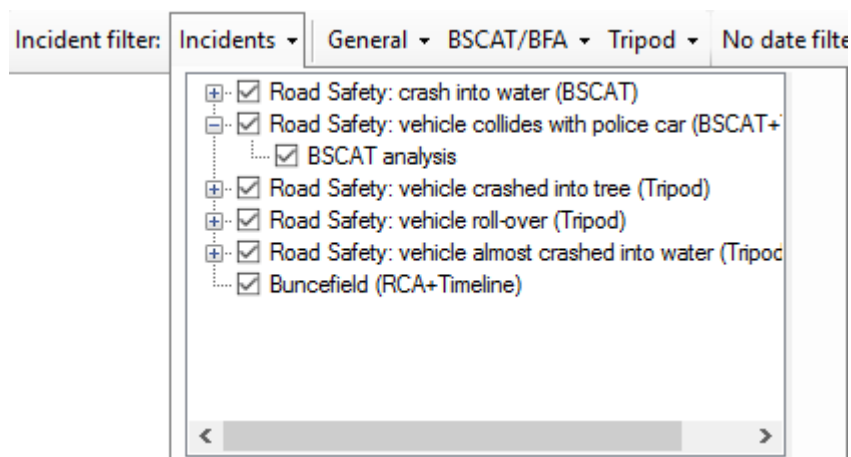


Figure 356 - Incident filter (incident selection)

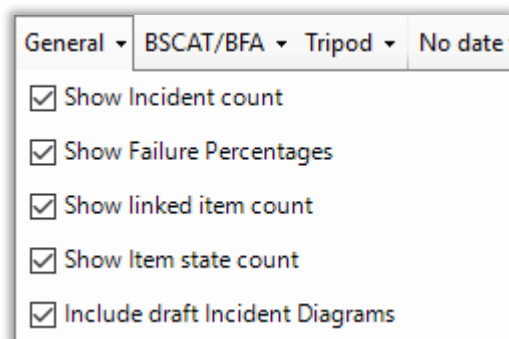
You can choose to show all bowtie elements, or limit the bowtie to only the paths involved in the incident(s). This is arranged in the filter strength:



Figure 357 - Filter strength

You can change various general settings, applicable to all kinds of incident data:

- Whether to show the number of incidents the barrier was linked to.
- Whether to show the percentage failure of the linked barriers.
- Whether to show the number of incident barriers the barrier was linked to. As incidents tend to be more specific (where bowties are more general/abstract), it will happen that a single bowtie barrier will be linked to multiple incident barriers. This count reflects that.
- Show the different counts of how (and if) the barrier has failed, such as broken, missing, unreliable.
- Whether to include draft incident diagrams.

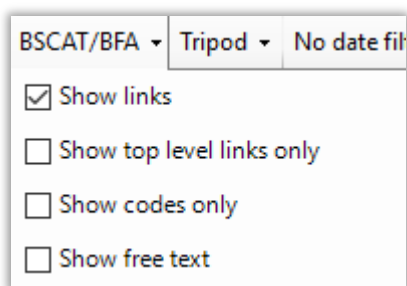


**Figure 358 - Incident filter (general settings)**

Some settings are not applicable to all incident diagram types. For example, certain aggregated lists are not available in Tripod Beta.

Some settings are only applicable to BSCAT and BFA:

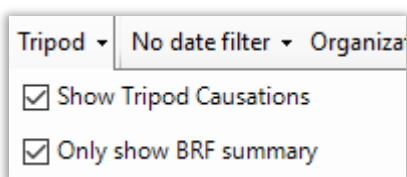
- Whether or not to show the free text description for failure reasons
- Whether or not to show the assigned items from the SCAT lists (show links option)
  - If we want to see the actual item, or only the main category (show top level links only)
  - If we want to see the full description, or just the code
  - If we want to see how often an item was linked in total or not



**Figure 359 - Incident filter (BSCAT / BFA setting)**

Some settings are only applicable to Tripod Beta:

- Whether to show Tripod Causation paths.
  - If we want to see the whole causation path or only the BRF code



**Figure 360 - Incident filter (Tripod settings)**

It is also possible to filter on a specific date/time frame or on an organizational unit. The latter is mainly relevant in combination with BowTieServer. For date ranges, a number of presets can be selected, or a specific period can be specified using the custom date range setting.

The image shows a dropdown menu for filtering by date range. The menu is titled 'No date filter' and 'Organizational Units'. It contains several radio button options: 'No date filter' (selected), 'March 2016', 'February 2016', 'January 2016', 'Q1 2016', 'Q4 2015', 'Q3 2015', 'Q2 2015', '2016', '2015', and 'Custom date range'. Below these options are two date pickers labeled 'Start:' and 'End:', both showing '01-Mar-16'.

**Figure 361 - date range filter**

It is also possible to filter incidents results per organizational unit if the incident is linked to an organizational unit. For more information on this please see 23.2.1 Organizational units grouping.

The image shows a dropdown menu for filtering by organizational unit. The menu is titled 'Organizational Units'. It contains a list of organizational units with checkboxes: '<NULL> <No Value Assigned>', 'Europe', 'North America', 'South America' (highlighted in green), 'Brazil', 'Chile', 'Argentina', 'Asia', 'Australia', 'Africa', and 'Middle East'. Each item has a small expand/collapse icon to its left.

**Figure 362 - Organizational unit filter**

## 29.5. Re-using bowtie barriers on incident analysis diagrams

It is possible to copy a bowtie barrier and paste it into your incident diagram. It will be automatically converted for you. At the same time, BowTieXP will make an association between the original bowtie barrier and the incident barriers, so you do not have to do that later on manually.

In the same way, if you are creating your incident diagram using either templated BSCAT or templated Tripod Beta, you are re-using your bowties. Also in this instance will a link be automatically made for you.



## 29.6. Incident grouping in the Tree view

The incident diagrams are displayed in the Tree view. The incidents can be sorted per year, quarter or month, category, type or tier.

In the Tree view, you can configure the incident categories, types and tiers. You may want to sort your incidents according to these categories, types and tiers, which is possible by clicking on the icon next to 'default filtering'.

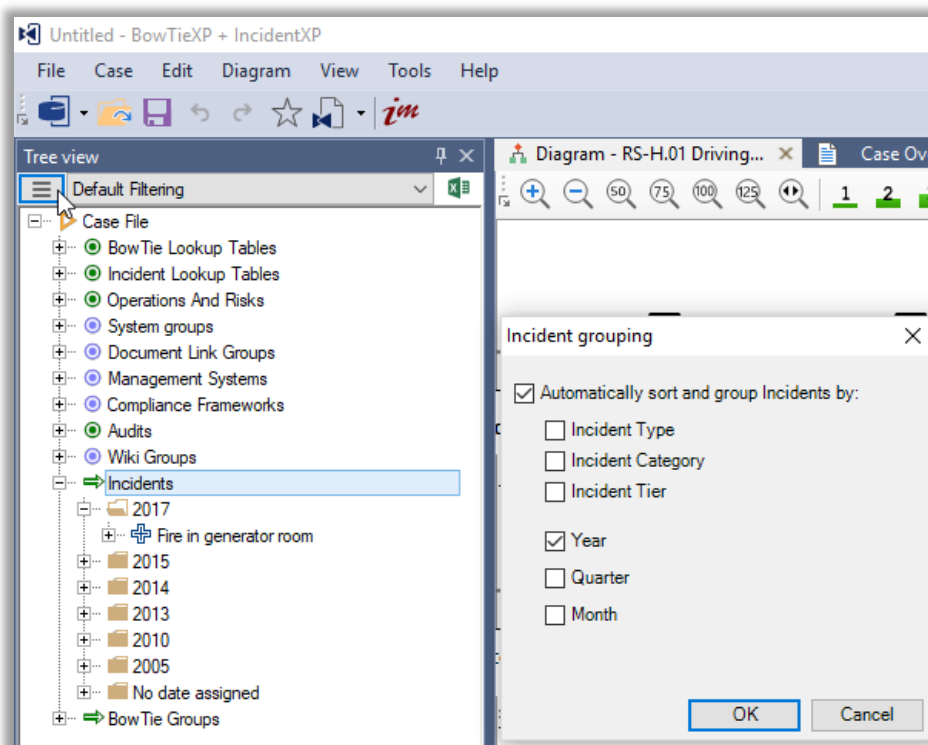


Figure 363 Incident grouping

## 29.7. Case File overview

There one Case File overview dedicated to how bowties are related to incidents. It is the “bowtie linked elements in incidents” overview. It shows how elements between the diagrams are related, where they are located and what the various failure states are.

	# links (if > 1)	Missing	Unreliable	Inadequate
<b>Unrelated Events</b>				
<b>Related Equivalent Hazards, Threats, Consequences and Escalation Factors</b>				
<b>Unrelated Incident Barriers</b>				
Inc.Dia. BSCAT analysis				
Inc.Br. Sirens from police car			x	
Inc.Br. Light signals from police car			x	
Inc.Br. Arrange other means of transportation		x		
Inc.Br. High impact resistant glass			x	
Inc.Br. High impact resistant glass			x	
Inc.Dia. Tripod analysis diagram				
Inc.Dia. Bfa Diagram				
<b>Related Equivalent Barriers</b>				

Figure 364 - Case File overview (Bowtie linked elements in incidents)



# 30

## Installation reference

In this chapter, we walk you through the steps to install  
**BowTieXP.**

### 30.1. Technical specifications

BowTieXP is a regular desktop application, which runs on the hardware of the end user. It adheres to all Microsoft specifications and only requires domain user rights to be run. It has been validated by Microsoft as Windows 7, 8 and Windows Server 2016 Platform Ready.

BowTieXP adheres to all Microsoft specifications and only requires regular user rights to be run - important for corporate network environments.

BowTieXP can be provided as an msi installer for deployment with network tools like Microsoft Systems Management Server.

BowTieXP stores information in a file-based compressed XML database. It does not require database software to be installed. Even large BowTieXP files typically stay under 1 Megabyte of size. Even if hundreds of BowTieXP files are stored, storage requirements on a network file share should stay well under 1 gigabyte.

Configuration information is stored on disk in the user's profile, in both the local and the roaming part. Some system-wide data is stored in the all users profile (Program Data on Windows 7 and above). The registry is used for file extension association and protocol handler association. If possible, these are made system wide in HKLM. If access to HKLM is denied, the HKCU hive is used. Citrix and Terminal Server environments are supported, but do place constraints on the allowed software activation type.

#### 30.1.1. Supported operating systems

BowTieXP can run on Windows 7 and newer.

#### 30.1.2. OS prerequisites

BowTieXP requires the .NET framework 4.7 or 4.8. If you run BowTieXP and the .NET framework is too old, BowTieXP will tell you so. You can then download and install it:

<https://dotnet.microsoft.com/download/dotnet-framework/thank-you/net48-web-installer>

Note that Windows 10 Creators Update (1703) and later come with a new enough version of the framework already installed out of the box.

#### 30.1.3. Hardware requirements

If your computer meets the Windows recommended system requirements, BowTieXP will work. For intensive use, more RAM and CPU speed is recommended.

You must have a minimum screen resolution of 1024x768 and a color depth of 16 bits. But considering the graphical nature of BowTieXP – the bigger your screen the better.

BowTieXP can interoperate with all Microsoft Word and Excel versions. The supported Visio versions are 2000, 2002, XP (2003), 2007, 2010, 2013 and 2016.

If you want to use the (deprecated) SharePoint add-on, there are also requirements on your SharePoint server. Please see section **Error! Reference source not found.** for details.

## 30.2. The Microsoft .NET Framework

BowTieXP requires the .NET framework 4.7 or 4.8. If you run BowTieXP and the .NET framework is too old, BowTieXP will tell you so. You can then download and install it:

<https://dotnet.microsoft.com/download/dotnet-framework/thank-you/net48-web-installer>

Note that Windows 10 Creators Update (1703) and later come with a new enough version of the framework already installed out of the box.

### 30.2.1. Is the framework already installed?

You can simply install BowTieXP and try to run it. If the framework is missing, you will be notified and can install it then.

### 30.2.2. Install the framework from the MS downloads site

Browse to: <https://dotnet.microsoft.com/download/dotnet-framework/thank-you/net48-web-installer>

Then download and run the installer. Note the above link is for version 4.8 – newer 4.x versions may already exist.

## 30.3. Install BowTieXP

Browse to:

<http://www.cgerisk.com/downloads/bowtiexp/>

Download and run the BowTieXP installer (.msi).

Click through the wizard using the next button until the installation is finished. Note that you will need to check the checkbox to indicate you agree with the end-user license agreement in order to continue the wizard.

If you do not want to install BowTieXP through the Microsoft Installer (.msi), you can also choose manual installation:

1. Browse the downloads page to find the BowTieXP executable (.exe).
2. Unzip the zip file you just downloaded.
3. Copy the executable in any location you want and run BowTieXP from there.

---

**Note:** You will need to extract the software from the .zip archive before it will run correctly! If you receive an error message, please check to see if you have done this.

---

## 30.4. Activating the software

See section 2.3, Activating BowTieXP, on page 11 on page for instructions on standard host locked activation.

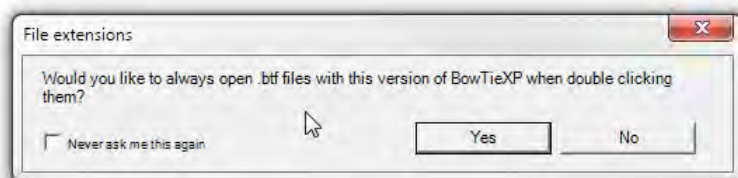
See section 30.7, BowTieXP site activation on page 263 for details on mass activation using active directory groups.

## 30.5. EULA and release notes

After activating BowTieXP and starting for the first time, you will have to agree to the end-user license agreement. Please read this legally binding document carefully, as you cannot use BowTieXP without full agreement. If you agree to the terms and conditions in the license agreement, click the 'I Do Agree' button to start using BowTieXP. If you do not agree, BowTieXP will exit.

Next, the release notes will be displayed. They contain the latest information about BowTieXP, which may have not made it into the official documentation. By selecting *Help ▶ Release Notes* they can be redisplayed.

## 30.6. File extension registration



**Figure 365 - File association prompt**

BowTieXP automatically tries to keep the file association to .btf files in order. If BowTieXP detects something wrong with it, you are prompted if you would like to restore it. Note that you can check to never be asked again. In that case, BowTieXP remembers your choice and automatically applies it the next time.

## 30.7. BowTieXP site activation

BowTieXP can be configured to activate all members of a global or universal domain user group. This is known as site activation.

This has the following advantages:

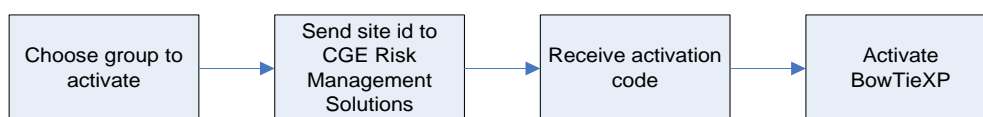
1. Only one code for all users – can be installed along with the application by IT.
2. IT can reassign licenses by add/removing users from the group.

Site activation has the following disadvantages:

1. Only activates computers/users that are members of the domain.
2. IT needs to create and maintain the group of licensed users.

The group must be a global or universal security group. Distribution groups cannot be activated.

The site activation process is as follows:



**Figure 366 - Site activation process**

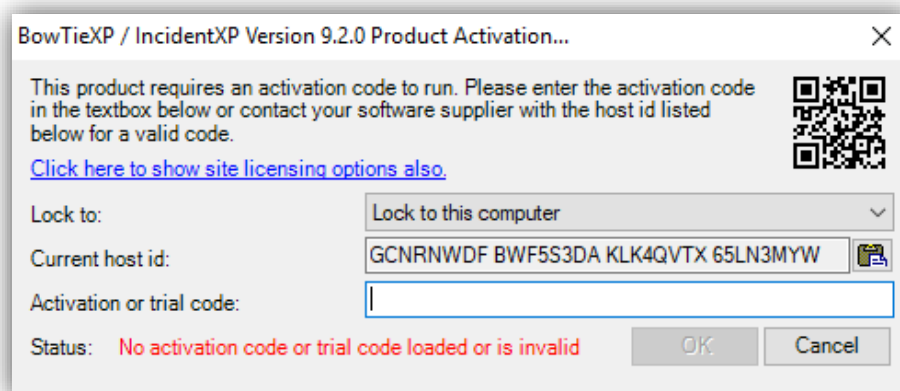
First, choose the user group to activate. BowTieXP creates a site id for this group, which must be sent to CGE so they can create an activation code for you. After entering this activation code into BowTieXP, it is activated and will run.

Note that the site id can also be retrieved in a different manner, and the codes can be entered in a different manner. These alternate methods for site activation are described below the sections that show you the process to follow in the user interface – just keep on reading.

Now we proceed with the steps to take using the user interface:

### 30.7.1. Showing site activation options

BowTieXP can be configured to activate all members of a global or universal domain user group. This is known as site activation. Click the blue link label to show site activation options.



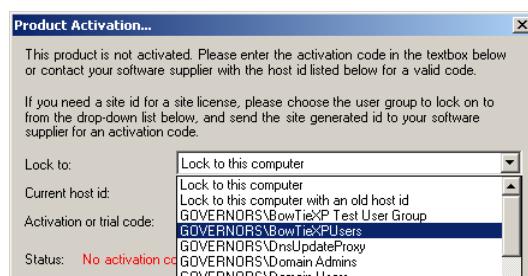
**Figure 367 - The product activation codes dialog box**

If BowTieXP is already activated, the activation dialog box is not shown on startup. You can bring it up via the Help menu - click the “product activation codes” option.

### 30.7.2. Choosing a group to activate

The computer administration department must create a dedicated group to hold all the users that are licensed to use BowTieXP. By doing this, it is easy to reassign licenses between users.

Choose this group from the drop-down:

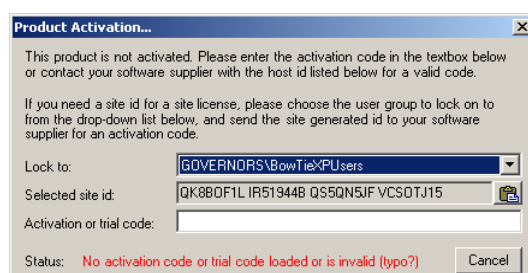


**Figure 368 - Choosing the group to activate**

Note: if you have a very large number of groups, this can take very long. In that case, close BowTieXP, and you can get the information which CGE requires, via the command line. See section 30.7.5, Getting a site id on page 265 below.

### 30.7.3. Sending the site id to CGE

After selecting the user group to activate, the site id for the selected group is shown.



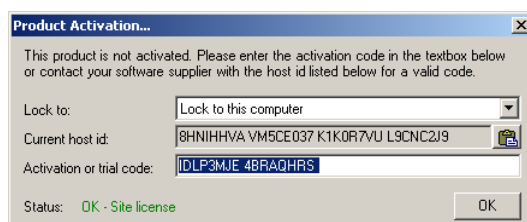
**Figure 369 - The group to activate has been chosen**

The “selected site id” should be sent to CGE so an activation code can be generated.

Note that if your group is not listed, it is probably not of the correct type. It must be a global or universal security group.

### 30.7.4. Entering the activation code

After receiving the activation code, it can be entered into the dialog to activate BowTieXP.



**Figure 370 - BowTieXP with a valid site activation code**

Note that you do not need to select the group again – just entering code is enough.

Note also that you must be a member of the intended group for this to function; otherwise, access to the software will be denied and the newly entered activation code will not be saved.

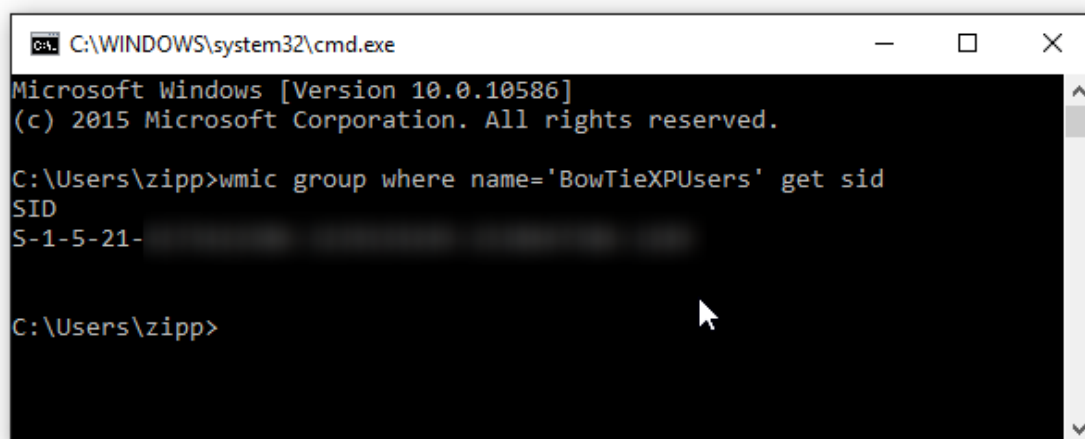
Third, note that after changing group memberships, users will need to log off and on again for these membership changes to take effect. Changes made on the AD server can take several hours to take effect. This is because active directory servers synchronize on a schedule of two hours by default.

### 30.7.5. Getting a site id using the command line

Sometimes the user interface can be a bit of a bothersome manner to retrieve the site id and enter the activation code. This will especially be the case when a very large number of groups exist in your network. In this case, it can be easier to use a different way to retrieve the necessary information.

Internally, BowTieXP uses the SID (Security Identifier) of the group you want to activate to lock itself to. Using the GUI, all that is happening is you are presented with a nice manner in which to choose a group and send us the SID.

Another way to give CGE the group security identifier to generate an activation code for is by means of the command line, by using the wmic tool, which is built into windows:



Open a command prompt and issue the following command:

```
wmic group where name='BowTieXPUsers' get sid
```

Where you replace BowTieXPUsers with your own group name. Please mail the output to CGE Risk.

### 30.7.6. Distributing your activation code

Instead of having every activated user, enter the activation code, you can also deploy it with the software. To this end, CGE will send you a file called "activation.dat" which contains your license code.

If this file is placed next to the bowtie.exe file, it will be read automatically when the software starts.

Note that if you deploy your code via a .dat file next to the exe, the activation code dialog box will remain empty. You are completely bypassing that dialog box (it looks at a different place for the code).

If your code does not work when placed next to the exe, you can get diagnostic output by manually entering it into the dialog box. Only then will you see any errors.

Note: Please read section 30.7.8, How to manage multiple editions of BowTieXP on page 266 about managing multiple codes and the behavior BowTieXP has when multiple codes are encountered.

### 30.7.7. activation.dat file format

The .dat file we send you will probably be an XML file. Inside the <ActivationCode> tag is the actual code.

For convenience at large site installations, we have added another file format for activation.dat files which allows multiple codes per file and allows you to add comments as well.

Here is an example file:

```
; BowTieXP activation codes for our site:
12345678 ABCDEFGH           ; Advanced BowTieXP License for DOMAIN
12345678 ABCDEFGH           ` Another license

; Now some licenses:

12345678 ABCDEFGH
```

Each line can be blank or contain an activation code and/or a comment. Activation codes and comments are separated by a semicolon character.

### 30.7.8. How to manage multiple editions of BowTieXP

There are multiple editions of BowTieXP:

- BowTieXP Standard (for regular users)
- BowTieXP Advanced (contains many advanced features)
- BowTieXP and IncidentXP (Allows Incident Analysis)
- Audits add-on
- Spreadsheets add-on
- etc.

All editions are run using the same executable. The activation code signals what edition will be started.

Each edition of BowTieXP can be activated for a specific AD domain user group. It is often easiest to create a specific AD user group for each BowTieXP edition that will be used.

For example:

- 'BowTieXPUsers'
- 'BowTieXPAdvancedUsers'

After creating a new user group, an activation.dat file can be generated based on the group SID.

Multiple activation files can be placed next to the executable. Each activation file's filename should start with the string "activation" should have a ".dat" file extension. For example:

CORRECT

- Activation-Std.dat
- Activation-Adv.dat
- Activation-Nav.dat

#### INCORRECT

- Activation-Std.txt (wrong file extension)
- Std-Activation.dat (does not start with "activation")

Note that the first file found which activates BowTieXP will be the file that gets used – BowTieXP will not keep searching for a "better" license, so it is up to you to ensure that the "best" license is tried first by giving it a filename that is alphabetically earlier than the other license files.

When using the new style activation.dat files you should place the "best" license codes first in the file – they are tried first.

### 30.7.9. Storing activation data on the network

---

**Note:** Available since BowTieXP version 9.0.8 for regular codes and since 9.0.11 for plugin codes.

---

By default, as well as in the examples above, the activation information is stored on the computer along with the software. The codes are present on all your computers.

This would mean that updating the activation data would require redeploying of the application to update the activation files. Note that activation files need to be updated if e.g.:

- Your feature set changes, because you purchased an add-on module
- The number of licenses changes, so the maximum number of users in a group is changed.
- Etc.

If redeploying to update codes is problematic, note that it is also possible to configure BowTieXP to copy those files from the network. You can do this by placing an activation.dat file next to the bowtie.exe executable which contains the following text:

```
; Copy activation files from the network:
CopyFrom = \\someserver.intranet.domain.com\sharedfolder\some\folder
```

In this manner, you can configure a regular path with a drive letter or a UNC path from where BowTieXP can copy activation code files.

On startup, BowTieXP will read the activation.dat file next to the exe and read the configured network path to copy code files from. Those are then cached in %APPDATA%, in case the network could be unavailable in the future.

With this configuration, you only need to update the codes in the central network location, if they ever change.

Files copied must conform to the following pattern:

- activation\*.dat For regular activation codes
- pluginactivation\*.dat For plugin activation codes

## 30.8. Large scale deployment

BowTieXP/IncidentXP has been regularly deployed on large worldwide scale (hundreds of installs) without problems.

Deployment of the software consists of two parts:

- Installation
- Activation

### 30.8.1. Installation

The installation of the software is very simple – it consists of a single executable file (.exe) without external dependencies (apart from the .NET framework).

During training sessions, we distribute the software on USB stick. This works as admin rights are not required to run the software. It runs straight off the USB stick. If the user so prefers, he can copy the software onto his desktop and it will run from there.

For actual installation, we also offer an msi that does a minimal set of actions:

- Copy the exe to the program files folder
- Add a start menu entry
- Add a desktop shortcut
- Registers itself in the “add & remove programs” control panel applet.

File extension registration is done on start of the software.

This msi is easily scripted by means of msixec or by capturing the changes to the system. A sample script is included below.

### 30.8.2. Activation

After getting the exe onto the system, the software has to be activated.

For large-scale deployments, group activation is advised. All the licensed users are made members of a dedicated AD global or universal group. The SID (globally unique numerical group ID) of the group is the basis for an activation key, which allows everybody who is a member of that group to run the software.

This key can be deployed along with the software in the scripted installation. If placed within a text file called “activation.dat”, and placed besides the exe, it will be automatically picked up.

Group activation also has the advantage of allowing the customer to do license reassignment without our intervention – just substitute the user in the group.

### 30.8.3. Sample installation script

Below is a sample installation script (usable in software such as SCCM / SMS), which also copies the activation key into the correct directory:

```
msiexec.exe /i "%~dp0BowTieXP-10.0.0.msi" /qb  
copy "%~dp0activation.dat" "C:\Program Files\BowTieXP\activation.dat" /y
```

## 30.9. Active Directory group management

It is possible to give permission to regular users (users without domain admin permissions) to change the membership of specific AD security groups.

This allows the IT department to delegate control of these groups to non-IT staff within the organization, offloading the IT department from tasks such as group membership.

This section explains how to do this, from both an admin perspective (how to set it up), as well as from an end-user perspective (how to modify group membership).

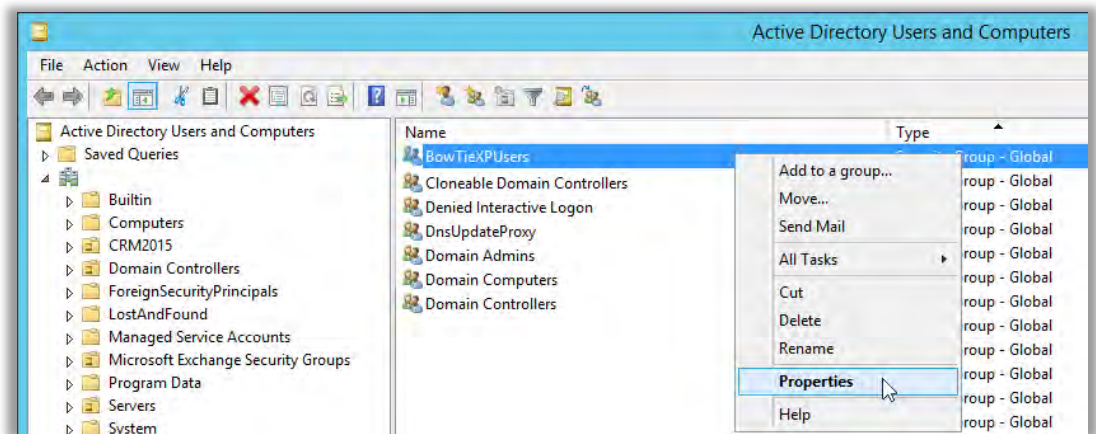
### 30.9.1. Admin: delegate AD group management

In order to allow a non-admin user to modify the members of a group, the user requires read and write permission on the group object.

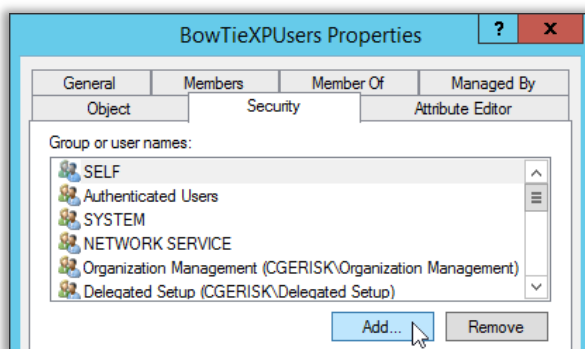
In the example below, we will allow the user called “Demo User” to control who is a member of an Active Directory global security group called “BowTieXPUsers”.

1. As a domain admin, log onto a computer or domain controller with Active Directory Users and Computers (ADUC) installed.
2. Open Active Directory Users and Computers (ADUC).
3. Find the group you want to delegate membership management of (BowTieXPUsers).
4. Right click the group and choose Properties:

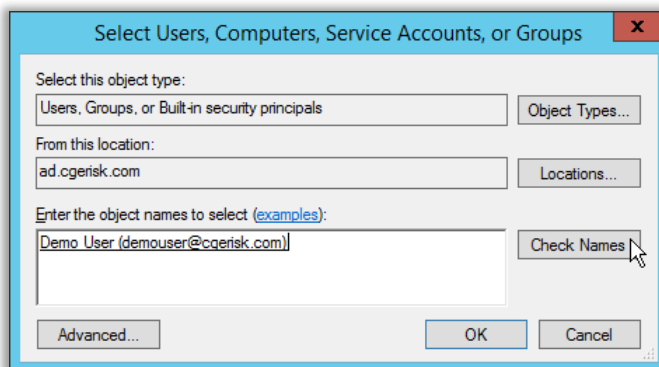




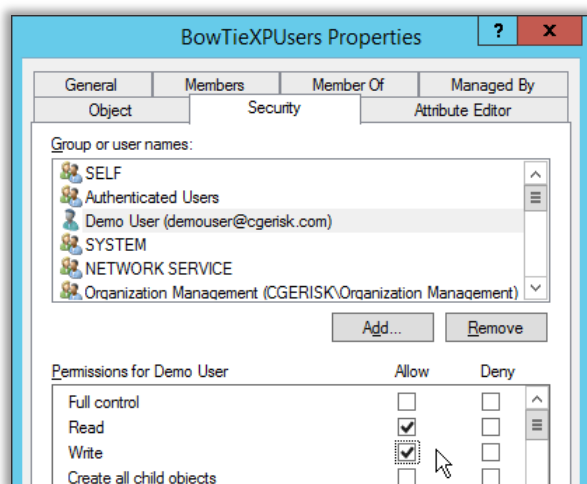
5. Select the Security tab and choose Add:



6. Enter the user or group name to delegate permission to (Demo User) and click "Check Names" to ensure it was entered correctly. If so, the name will become underlined.



7. If the name is okay, press the OK button. The newly added username should be selected in the permission list, and we can now check the write permission checkbox. Ensure both the Read and Write permissions are checked:



8. Click OK to apply the changes.

You are now done, and in the example above, the Demo User now has permission to modify the group membership of the BowTieXPUsers group.

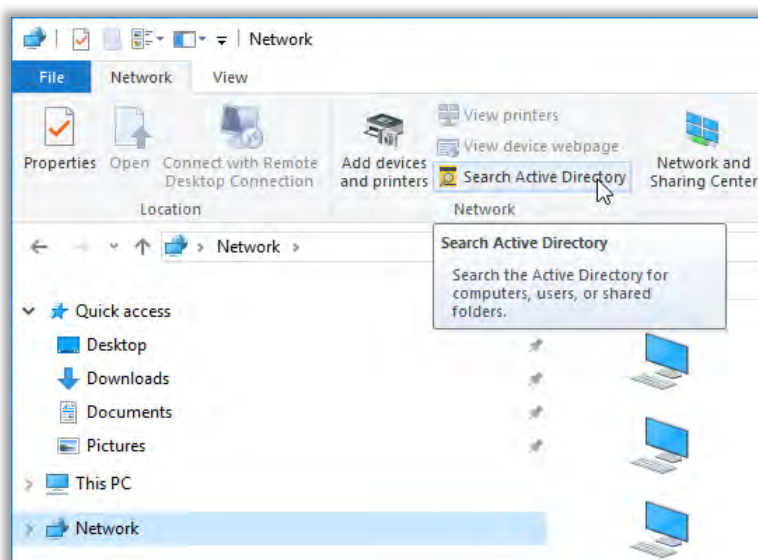
**Please note:** in general, permissions are best managed via groups, and never directly via user accounts, and as such, it is advised to create a group to hold the users who can modify the group membership (the manager group), grant the read and write permissions on the target group to this manager group, and add the managers to the manager group.

Additionally, note that if you manage permissions via groups, and you make changes to group members, that those members might need to log off and back on again to refresh their membership and allow the new permissions to take effect – just like with BowTieXP AD group activation.

### 30.9.2. Regular user: How to change group memberships

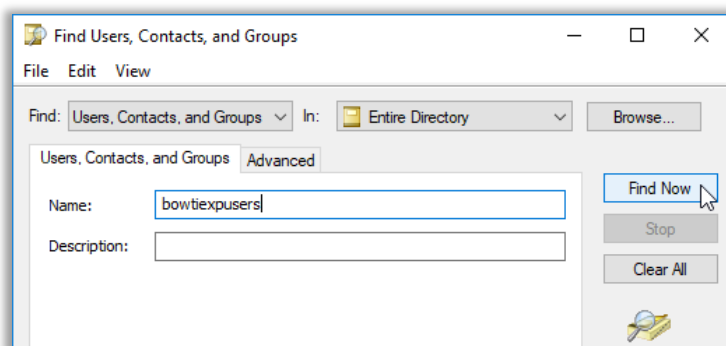
In order to review or modify the group members of an active directory group, we need to find the group in active directory.

1. To do so, open a Windows (File) Explorer window.
2. Click on the network node in the navigation tree on the left.
3. Now click on the “Network” tab in the ribbon at the top.
4. In the Network tab in the ribbon, there is an option called “Search Active Directory”:

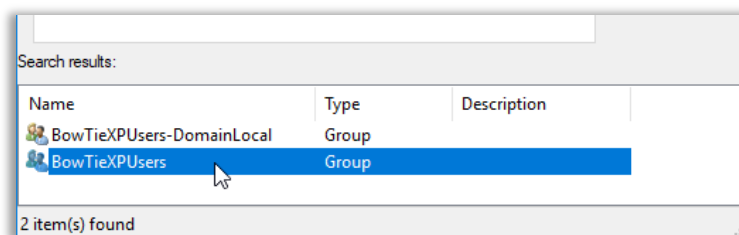


Note the location of the mouse, above the button, in the “Network” tab in the ribbon.

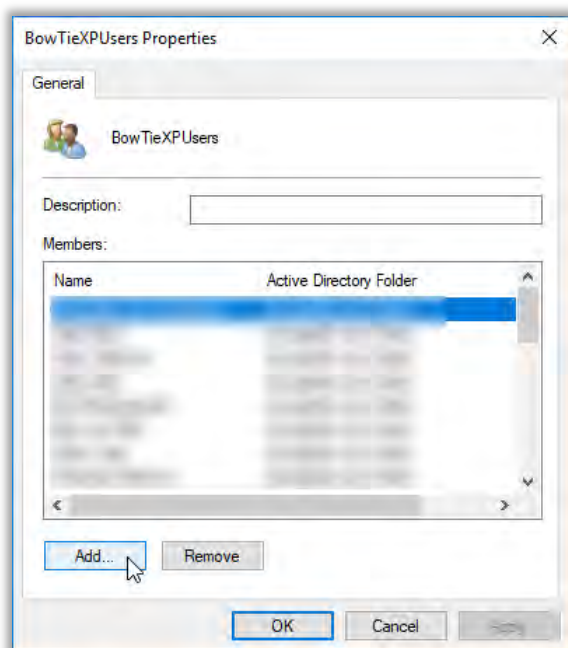
- Click the “Search Active Directory” button, and enter the group name to manage:



6. If the group was found, it will appear in the find results:



7. Double click the group to view or edit it:



Here you can use the add and remove buttons to change the group memberships. If you do not have permission, the buttons will be disabled (grayed out).

Note: you can also bring up the “Search Active Directory” dialog by means of the following command line, e.g. for entry into Start / Run:

rundll32 dsquery,OpenQueryWindow

## 30.10. Plugin installation

BowTieXP has support for plugins. Plugins are small pieces of computer code that extend BowTieXP with custom functionality, allowing CGE to add customer functionality (as long as it falls within the possibilities offered by the plugin architecture / interface).

One example of a plugin is our LOPA plugin, which extends BowTieXP with on-the-fly LOPA calculations on the bowties. See our LOPA plugin manual for more details.

---

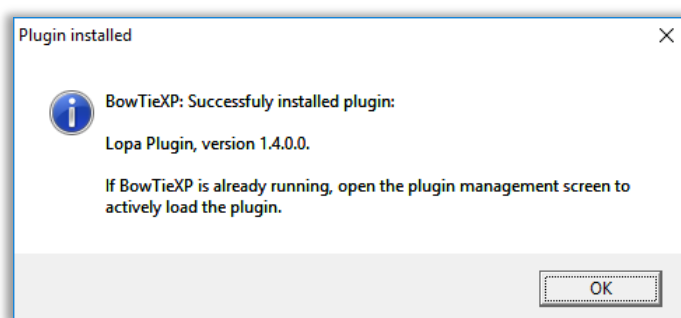
**Note:** from version 10.0 onwards LOPA is no longer a plugin and is instead built-in, please contact [support@cgerisk.com](mailto:support@cgerisk.com) for more information.

---

Plugins are delivered in files with a “.btp” extension (short for BowTieXP Plugin Package).

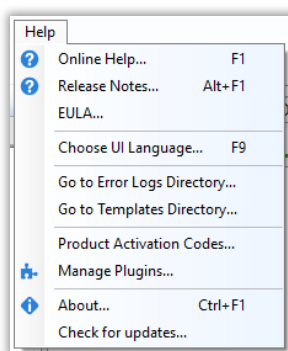
To install a plugin we take the following steps:

- Download the plugin package from our web site.
- Double click the btp file. This will install the plugin. You will get a confirmation window like this:



**Figure 371: Plugin installation confirmation**

- You can now check everything went ok by going to Help -> Manage Plugins:



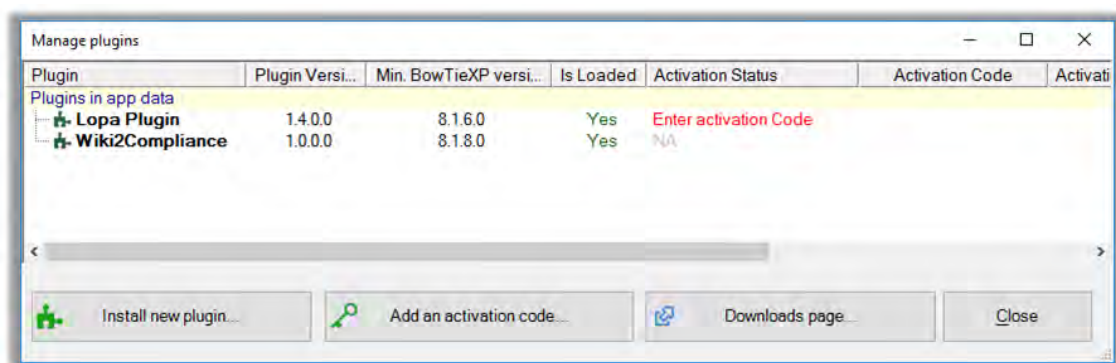
**Figure 372: Manage Plugins**

## 30.11. Plugin activation

Some plugins require an activation code, just like BowTieXP. The process is the same, except that you can have multiple activation codes for multiple plugins. Please note that plugins have the same host and site ids as BowTieXP. Make sure to send it along when you request your plugin activation code.

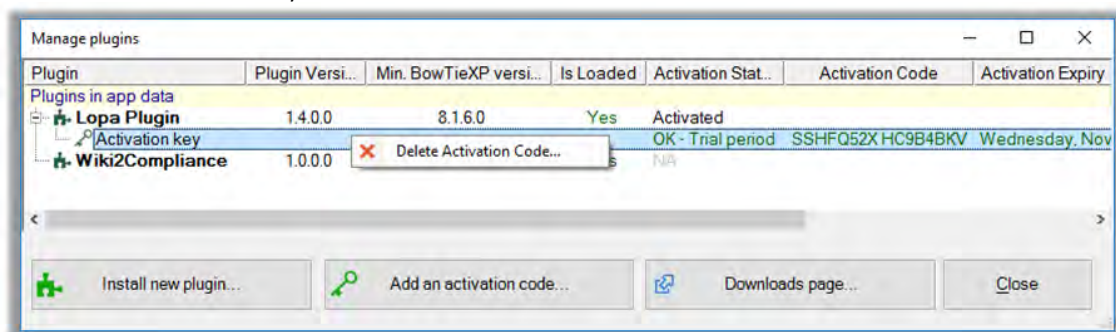
To add a new plugin activation code:

1. Navigate in the menu bar to Help -> Manage Plugins.
2. The Lopa plugin still needs to be activated with an activation key. To do this, I can select the plugin and click 'Add an activation code'. This will give a popup where a valid activation key can be entered.



**Figure 373: Plugin requiring activation**

- Once the activation key is added, it will be displayed in a dropdown. Right clicking a key will allow you to delete it if necessary.



**Figure 374: Managing plugin activation keys**

- A restart of the software might be required before the plugin can be used.

### 30.11.1. Plugin activation for group locked codes

If you are doing a group locked activation, and want to deploy codes by means of a dat file, you can do the same for plugins. Please request your plugin activation code in a dat file from us, and we will supply one. This dat file will be picked up when placed next to the bowtie.exe executable, just like for regular activation codes. The name of this dat file must match the "pluginactivation\*.dat" pattern.

## 30.12. Activation file search locations

BowTieXP searches for activation files in the following locations:

Program data: %PROGRAMDATA%\Governors\BowTieXP\activation.dat  
 User profile local app data: %LOCALAPPDATA%\Governors\BowTieXP\activation.dat  
 Next to the executable: Wildcard pattern activation\*.dat

# 31

## Keyboard Shortcuts

### 31.1. General

Keyboard shortcut	Description
Alt + 1	Navigate Back
Alt + 2	Navigate Forward
Alt + 4	Reports
Alt + A	Apply changes without closing the Edit window
Alt + B	Open from BowTieServer
Alt + C	Case menu
Alt + D	Diagram menu
Alt + E	Edit menu
Alt + F	File menu
Alt + F1	Release notes
Alt + H	Help menu
Alt + O	Cancel BowTieServer checkout
Alt + T	Tools menu
Alt + V	View menu
Ctrl + 1,2,3,4,5,6	Expand levels for current diagram
Ctrl + Alt + C	Copy bowtie diagram to clipboard
Ctrl + D	Import from external file
Ctrl + F1	About
Ctrl + H	Text replace
Ctrl + I	Import from bowtie file
Ctrl + L	Open most recent file
Ctrl + N	New file
Ctrl + O	Open file
Ctrl + S	Save
Ctrl + Shift + 1,2,3,4,5,6	Expand levels for all diagrams
Ctrl + Shift + A	Display options
Ctrl + T	Open Test File
Ctrl + Y	Redo
Ctrl + Z	Undo
F1	Online help
F11	Full screen
F5	Refresh diagram
F9	Choose UI language

### 31.2. Windows

Keyboard shortcut	Description
Ctrl + Shift + B	Bowtie Diagram
Ctrl + Shift + C	Case Overview
Ctrl + Shift + E	Editor (Deprecated)
Ctrl + Shift + F	Find results
Ctrl + Shift + F12	Default window layout
Ctrl + Shift + I	Incident Diagram
Ctrl + Shift + L	Listview
Ctrl + Shift + M	Relationship Diagram
Ctrl + Shift + N	Incident Timeline Diagram

<b>Ctrl + Shift + O</b>	Overview
<b>Ctrl + Shift + Q</b>	Quality Checks
<b>Ctrl + Shift + S</b>	Scrap book
<b>Ctrl + Shift + T</b>	Tree view
<b>Ctrl + Shift + X</b>	Spreadsheets
<b>Ctrl + Shift + Z</b>	Color Legend
<b>F12</b>	Switch to layout B

### 31.3. Selection actions

Keyboard shortcut	Description
<b>Ctrl + B</b>	Show usage references
<b>Ctrl + C</b>	Copy selection
<b>Ctrl + Shift + R</b>	Repeat paste special
<b>Ctrl + Shift + V</b>	Paste special
<b>Ctrl + V</b>	Paste on selection
<b>Ctrl + X</b>	Cut selection
<b>Delete</b>	Delete selection
<b>F2</b>	Edit selection
<b>Insert</b>	Add new item

### 31.4. Tree view

Keyboard shortcut	Description
<b>* (on numeric keypad)</b>	Expands the selected node and all children recursively.
<b>/ (on numeric keypad)</b>	Collapses the selected node and all children recursively.
<b>Left arrow</b>	Collapse the currently selected node.
<b>Right arrow</b>	Expand the currently selected node.

# 32

## Frequently asked questions

### 32.1. General questions

#### 32.1.1. Q: Can I be kept up to date about new releases?

Yes, just send an email to [bowtiexp-releases-join@lists.cgerisk.com](mailto:bowtiexp-releases-join@lists.cgerisk.com) to subscribe to the mailing list.

### 32.2. Installation questions

#### 32.2.1. Q: Can I Install and run BowTieXP on Apple Mac (OSX)?

The BowTieXP software is built for the Microsoft Windows operating system. Unfortunately, BowTieXP is not Apple Mac (OSX) compatible. Macs nowadays do have the ability to run Windows software on them. There are two main ways to go about that:

1. Actually, install Microsoft Windows on your Mac using Boot Camp. You can switch between Windows and OSX, but it requires rebooting.  
(<https://www.apple.com/support/bootcamp/>)
2. Emulate Microsoft Windows via a program such as Parallels.  
(<https://www.parallels.com/eu/products/desktop/>).

Our advice is to run BowTieXP on the Microsoft Windows operating system (not emulated) as we support this option and it works best, but we have seen clients successfully use BowTieXP on their Mac by emulating Windows using products such as parallels.

If cross platform support and device support is of interest to you, you might want to make your bowties easily accessible for viewing by (all) the employees in your organization by using our web viewer – a part of BowTieServer. The web viewer (for viewing only, not editing) is independent of operating system, as it is a web solution which runs on your browser. Therefore, it runs on Microsoft Windows, Apple Mac OSX, but also your iPads

#### 32.2.2. Q: Can I install BowTieXP on a server?

That depends on what is meant exactly – see the questions below regarding network shares and Terminal Server / Citrix.

#### 32.2.3. Q: Can BowTieXP run off a network share?

This is not advised, but yes, you can, provided that the network share is always available.

If the software is running, and the network share becomes unreachable, the software will crash.

Because of this, we do not recommend it.

#### 32.2.4. Q: Can BowTieXP run under Terminal Server or Citrix Server?

Yes, BowTieXP is fully compatible with Terminal Server and we have reports from customers it runs flawlessly on Citrix. You will need a group locked activation – host locked activation is not supported in this scenario.



### 32.2.5. Q: Does BowTieXP support virtualization?

This depends on what is meant with virtualization:

- If with virtualization you mean running the software on a remote server and showing the app via the network (also known as desktop virtualization/VDI), then the answer is yes –for Microsoft Terminal Server. See the questions about Terminal Server and Citrix.
- If virtualization refers to portable application generators like Spoon studio or VMware ThinApp, the answer is no, but this does not mean it will not work – just that we cannot support that scenario. Should any issues present, we will of course try to resolve those but we cannot guarantee we can – some of those applications do some very complex things to the software. We know, we used some of those tools for previous BowTieXP versions.

### 32.2.6. Q: What rights/access does BowTieXP need on the computer to run / can BowTieXP be used in a no-touch deployment situation / is a portable version available?

BowTieXP requires only regular user rights to function. BowTieXP adheres to the Microsoft standards about where to store data. In practice, this means:

Configuration files are stored in the user's application profile (in `%APPDATA%\Governors\BowTieXP`).

Activation data is stored in the local part of the profile (`%LOCALAPPDATA%\Governors\BowTieXP`).

If BowTieXP has admin rights, it will store activation data in the all users profile / application data path (`%ALLUSERSPROFILE%\Governors\BowTieXP`).

If allowed, a registry entry will be added to HKCR for the file association and protocol handler. The association is stored in HKLM if allowed, else in HKCU.

### 32.2.7. Q: How can I deploy activation keys along with the application / when scripting the application?

You can place the codes in a text file names activationcodes.dat and place that next to the exe. They will be picked up automatically. Note that all files which start with activation and end with .dat (`activation*.dat`) are tested. The first working code that is found is used.

Note that instead of deploying the codes with the executable, you can also tell BowTieXP to copy the codes from a central network share (UNC path). See section 30.7.9 on page 267 for details.

Plugin activation codes can also be placed next to the exe. The files must conform to the `pluginactivation*.dat` search pattern.

If you have entered a code into BowTieXP, you can copy the activation codes file ("activation.dat" or "pluginactivation.dat") from one of the below folders and copy it next to the exe:

- `%PROGRAMDATA%\Governors\BowTieXP\` or
- `%APPDATA%\Governors\BowTieXP\`

That ensures the format of the file is correct. Note that plugin activation files must be in the XML file format.

### 32.2.8. Q: Activating all the licenses we bought one computer at a time is too much work. Is there an alternative?

Yes – if your computers are domain computers you can activate the software by making the users members of a dedicated active directory group.

The group has to be a global or universal security group. A code is generated for this group. The code works for all members of that group.

The code contains a maximum number of users. If there are more users in the group than the maximum, the software will not run.

### **32.2.9. Q: Group locked - if I change the number of licensed users or the type of license, do I need to update each computer?**

It depends on your BowTieXP version. In the latest versions of BowTieXP (9.0.8 and newer), you can configure BowTieXP to copy code files from a central location (network UNC path). See section 30.7.9 on page 267 for details.

For older versions of BowTieXP, yes – when you purchase additional licenses, you will be issued a new activation code. This code has to be deployed to every computer where BowTieXP is installed. This can be done by IT updating the scripted installation package or by mailing the users so they can enter the new code manually.

### **32.2.10. Q: What are the steps to create this group-locked activation code?**

This is also covered in-depth in our software manual.

Short list of steps:

1. Create group in AD
2. Make all licensed users members of this group
3. Send group SID or site id to us
4. We respond with an activation key

Here are the detailed instructions for doing so:

1. Create a user group in Active Directory to hold the licensed accounts: e.g. "BowTieXPUsers". This can be done on a domain controller using the "Active Directory Users and Computers" MMC applet.
2. Add all the user accounts that will be licensed into the group.
3. We will need the group SID/site id (internal numerical group code) in order to calculate an activation code for this group. We will store this code into a small text file called activation.dat, which must be placed next to the BowTieXP executable so it can be found.

The next step is retrieving this SID/site id. This can be done via BowTieXP, unless the number of groups on the server is very large. Then we recommend using the command line.

- A. Via BowTieXP: Start BowTieXP. The activation dialog will appear. If not, go to Help->Activation Codes. Click the blue link to show site licensing options also. Select the BowTieXPUsers group from the drop down. Send the site id to us.
- B. Via the command line. Open up the command line and issue the following command for your own BowTieXP users group:

```
wmic group where name='BowTieXPUsers' get sid
```

and mail the SID (S-1-5-21-....) back to us.

4. After receiving the code, we will create an unlock code for you and send this back in a small text file, called activation.dat, which must be placed next to the BowTieXP executable. After this, all members in the group should be able to run BowTieXP.

Tips for testing:

- Make sure the test user is actually a member of the group (this is often forgotten),
- Group membership changes take effect after log-off and log-on.

### **32.2.11. Q: Will group activation still function if my computer is without network access for a long period?**

Yes.

**32.2.12. Q: I am testing BowTieXP group activation but I get the following error:  
“Activation code does not match any of the current user’s group memberships”.**

Ensure the current user is a member of the activated group. You can verify this by letting BowTieXP show you the current user’s group membership.

**32.2.13. Q: The user is added to the group in active directory, but BowTieXP does not pick up this change.**

There are several reasons why the change might not have taken effect yet:

- Active directory servers need to synchronize before changes are applied. The default schedule is two hours. Wait at least this long and try again, or ask the AD admins to force a sync.
- The group membership info for the current user is only updated when logging on. Please log off and back on again to update the user’s group memberships (the security ‘token’).
- If the activated group is a distribution group BowTieXP will not see it. Ensure it is a security group. You can double check this in AD users and computers by viewing the group properties. Security groups are the default group type.

**32.2.14. Q: Activation error: Activation code does not match the activated or current host id.**

Before you entered the activation key, the hardware was changed. Perhaps a laptop docking station was attached or detached.

Solutions:

1. Restore the original hardware situation. You need to close and open BowTieXP after changing this.
  - a. If the docking station is connected, unplug the docking station and try again.
  - b. If it is disconnected, try connecting it.
2. If that does not work: Select “lock to this computer with an old host id”.
  - a. If the box is empty: enter the original host id sent to us in the activated host id box.
  - b. If it is not empty: Try clearing it.
3. If both fail: Contact us for a new key.

**32.2.15. Q: How can I script the installation?**

The msi can be with the regular command line options:

```
msiexec.exe /i <msifile> /qb
```

If you want to also deploy the dat license file, you might need to capture changes to create a deployment script, or manually make sure the dat file is placed next to the exe. Another option is for end-users to enter it manually. Note that BowTieXP has no dependencies other than having the .NET Framework 4.7 or 4.8 installed. Deployment is xcopy deployment; all the msi does is:

1. Copy the bowtie.exe file to `C:\Program Files\BowTieXP\`
2. Add a shortcut to the start menu and the desktop.

A sample script could look like this:

```
msiexec.exe /i "%~dp0bowtiexp-10.0.0.msi" /qb  
copy "%~dp0activation.dat" "C:\Program Files\BowTieXP\activation.dat" /y
```

The variable `%0` in a batch script is set to the name of the executing batch file. The `~dp` special syntax between the `%` and the `0` basically says to expand the variable `%0` to show the drive letter and path, which gives you the current directory containing the batch file.

### 32.2.16. Q: What prerequisites / dependencies does BowTieXP have?

BowTieXP requires the .NET Framework 4.7 or 4.8 to be installed.

### 32.2.17. Q: Can I deploy templates along with the software?

Yes, just place the btf files in a directory called “Templates” located next to the executable. They will be automatically picked up and built-in templates will be automatically hidden.

### 32.2.18. Q: Can I install multiple versions side by side? I need to support files that must stay in an old file format.

Some people, for example consultants, need to run different versions of BowTieXP side by side in order to keep files in the file format their clients use. We have made sure that you can run different versions side by side, and from version 3.6.4 and onwards, we have added some more support in the software for this scenario: you can view the version in which a file was last saved.

To view in which version a file was last saved, open it in BowTieXP and choose File->Properties.

For example, assume we see that the file was written using a 3.6 version. Since all 3.6 versions share the same file format, we can edit this file using the latest 3.6 version and send it back to the person we got it from, and they will be able to read it without having to upgrade to the latest version.

In order to run different versions of BowTieXP side by side, all we have to do is to download the different versions we want and make sure to grab the versions for manual installation (the zip files).

All BowTieXP versions needed to support every file format version ever released, are available on the download page located at <http://www.cgerisk.com/downloads/bowtiexp/index-all.php>.

Let us show by means of an example (the 2.3.0 file) how to install the correct version. We need BowTieXP 2.3.0 to edit this file without upgrading the file format. Go to the download page and locate 2.3.0.

Download the executable (“in a zip file, for manual installation”). This zip file contains the bowtie.exe version 2.3.0. Unzip it to a suitable location, such as your desktop. You probably want to rename it to reflect the version number.

After starting the older BowTieXP version, you might be confronted with an activation dialog. Contact us for an older key – we can put this into a small file called activation.dat that is automatically picked up by BowTieXP, so you do not need to enter the key manually. Just make sure the file is located next to the executable.

### 32.2.19. Q: How does the auto update work?

The behavior of the auto-update depends on the way in which BowTieXP was installed.

BowTieXP can be installed in two ways:

1. Via the msi
2. By placing the exe somewhere on the system

If an update is available, the following will happen if the user requests it / clicks the notification:

In the first case (msi installed), BowTieXP will download the msi and ask windows to install it, upgrading the old installation. Windows will ask for admin credentials if the current user is not an administrator.

In the second case (installed from zip file), BowTieXP will download the new exe and replace the current one. If the user has no write access to the exe no attempt will be made (i.e. the update check is notification only, auto-upgrade is not possible).

### 32.2.20. Q: How can I disable the auto-update?

To disable the auto-update, the read-only bit on the file can be set. This will disable all upgrade functionality. In this case the software will still check for updates (if requested or if the periodic check is enabled), but it will only be a notification, no attempt at auto-upgrading is done.

### **32.2.21. Q: How often are updates and upgrades released? What is your release schedule?**

BowTieXP has regular updates, addressing bugs. These versions are recognizable by having the same first two numbers but a new third number. E.g. if you have 5.2.2, then version 5.2.3 will have the exact same functionality but less bugs. The same goes for versions 5.2.4, 5.2.5 etc.

Once or twice per year, we also bring out a new version with new functionality. The version with new functionality will have a new file format to accommodate the new features. To indicate this, we change the first and/or second version numbers. E.g., we go from 5.0 to 5.2.

If keeping up with the new versions is a challenge, it is advisable to pick a version to stay with for a longer time. Only when users are running into bugs or if critical bugs are discovered and fixed, should a new version with fixes be deployed. To prevent this, it is advisable to wait a while when a new version with new functionality is released before deploying it, allowing more time for bugs to be fixed before that version is deployed.

### **32.2.22. Q: I get an exception about “no more files” on startup when trying to run BowTieXP deployed/virtualized with App-V**

We have seen this problem when during scripting; one of the directories used by BowTieXP was monitored and should have been excluded. In that case the directory that should have been excluded was:

`%APPDATA%\Governors\BowTieXP\Backups`

After excluding this directory, the software worked correctly. See here for someone with a similar problem, but for a different software product (not related to us):

<http://www.danieletosatto.com/2010/09/09/fix-rssowl-virtualized-with-microsoft-app-v-fails-to-launch-after-the-first-attempt/>

### **32.2.23. Q: Plugins do not seem to load, but are placed in the right location.**

Please check to see if you are running BowTieXP from a network location. Plugins can only be loaded from the local hard disk, not from a network drive.

## **32.3. Q: Software questions**

### **32.3.1. Q: Can I convert diagrams to pdf?**

Yes – either copy the diagram to the clipboard, paste in Word/Excel/Visio 2007 or higher. You can save the file as a pdf from Office.

Another option is to print to a pdf printer, but in our experience, the Office route offers better image quality.

### **32.3.2. Q: Which Office versions does BowTieXP support?**

We support all office versions higher than Office 2000.

### **32.3.3. Q: Which Visio versions does BowTieXP support?**

We support Visio 2002 and higher. See paragraph 13.4 for Visio diagram exporting details.

### **32.3.4. Q: Can I save files to an older file format?**

This is unfortunately not possible. You might be able to convert a file back to an older version by means of the Scrap book – the Scrap book has somewhat better forward compatibility because the Scrap book exchange file format is being kept as constant as possible.

Unfortunately, after the introduction of BowTieServer, some Scrap book file format changes had to be made. Introducing a new file format always leads to the situation where “old” versions of the software will not be able to read the “new” Scrap book file format. The “old” Scrap book format is supported up to versions 6.2.7 of BowTieXP. The new Scrap book exchange format was introduced in version 6.2.8 of BowTieXP.

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**Note:** be sure to use the latest version of the target version (i.e. if you need to convert to file format 4.2, be sure to use the latest 4.2 version in this case 4.2.9).

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For example, here are the steps to take to down-convert a file from v5.2 to v5.0

1. Open 5.2 and 5.0 side by side and ensure you are running BowTieXP Advanced. Ensure the Scrap book is visible in both. Open 5.2 on the left, 5.0 on the right.
2. Open the file to convert in 5.2. Create a new file in 5.0 on the right. Empty ALL the lookup table entries in the destination file.

How to move items from 5.2 on the left to 5.0 on the right:

- a. Drag items from the tree view onto the Scrap book in 5.2 (left) onto the Scrap book. Save the Scrap book. In 5.0 on the right, click the load Scrap book button and open the file.
- b. Drag the items in 5.0 (right) to the correct bowtie group in the tree view.

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**Note:** this mini guide is not verified for completeness / i.e. it might not be an exhaustive list!

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3. Transfer the contents of all lookup tables, starting from the top and working your way down. Include activities, document links, etc.
4. Manually recreate the risk matrices. This has to be done by hand.
  - a. Recreate the categories.
  - b. Recreate the matrices themselves.
  - c. Use the copy matrix function where possible.
5. Terminology. Export the terminology from 5.2 to Excel. Try to import in 5.0. Errors will be given, fix each by hand and try until it succeeds. Fixing involves removing lines of terminology that 5.0 does not understand.
6. Transfer all incidents and bowtie groups using the Scrap book. This is done in the same manner as the lookups.
7. Save the spreadsheet if any. Load into 5.0. Check for moved columns and adjust accordingly until the calculations are in order again.
8. Verify completeness using the Case File compare function.
9. Check the following and transfer manually if needed:
  - a. Null value descriptions and colors.
  - b. File property fields (File->Properties).
  - c. Tree view filter profiles.
  - d. Tree view tooltips.
  - e. Diagram display profiles.
  - f. Verify font settings.
  - g. Header and footer layout.

Now most items should be transferred.

## 32.4. Q: Software problems

### 32.4.1. Q: Printing does not work/crashes.

There are some incompatibilities between .NET and some printer drivers, which unfortunately we can do nothing about. If printing does not work for you, please copy the diagram to the clipboard and paste in Word, Excel or Visio and print for there. Excel has very good multi-page printing support.

### **32.4.2. Q: Startup of the software takes very long.**

We have reports from Sophos users that starting the software the first time takes quite long – apparently, Sophos wants to take a detailed look. This problem goes away by itself. Otherwise, you can whitelist the application in Sophos.

Note: BowTieXP normally starts in a couple of seconds.

### **32.4.3. Q: When opening BowTieXP, I get an error message about fonts.**

Please install the Microsoft European Union Expansion Font Update:

<http://www.microsoft.com/en-us/download/details.aspx?displaylang=en&id=16083>

### **32.4.4. Q: I can no longer save documents as pdf if they have bowtie images in it (Office 2007)**

This is a known incompatibility with Office 2007 – the images generated by BowTieXP version 5.0 or earlier cannot be converted to pdf by the Office 2007 pdf add-in.

This used to work okay but stopped working due to a change in Office, by means of Windows Update, and started in April 2012. Office was changed and now no longer can make pdfs of those documents.

There are several resolutions, listed in order of preference:

- Upgrade to Office 2010. Office 2010 does not have this problem.
- Use an external PDF printer - free ones exist such as <http://www.bullzip.com/>.
- Upgrade to BowTieXP v5.2 and redo the graphics.





# 33

## Support

### 33.1. BowTieXP helpdesk

For users that have bought BowTieXP with support and maintenance a helpdesk is available. This helpdesk assists people that have technical and user-related questions regarding BowTieXP, how to install it and how to use it to its fullest extent.

You can reach the BowTieXP helpdesk by e-mail at [support@cgerisk.com](mailto:support@cgerisk.com) or by telephone on +31 (0) 88 1001 350.

Please refer to [www.cgerisk.com](http://www.cgerisk.com) for our BowTieXP Support & Maintenance Brochure. It explains what customers receive when purchasing support & maintenance.