

1. Importing a HAZOP

SafeGuard Profiler™ lets you import a HAZOP for use as input for performing a LOPA. Export the completed HAZOP as a CSV (comma-separated value) file from a HAZOP application.

1.1. HAZOP CSV Format

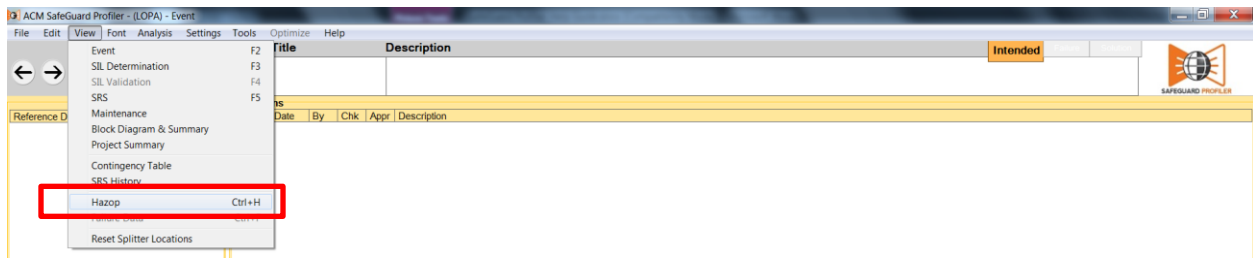
Ensure the HAZOP CSV file you wish to import has the following structure (column header text is suggested only):

Node	Deviation	Initiating Event Cause	Likelihood	Description Consequence	Severity	IPL / Type of IPL / PFD Safeguards	Recommendations
1	1	1				1 FAL-1004	
						2 TAH-1003	
		2				1 PAH-1007	
						2 PSV-1001	
1	1					3 PXHH-1015	
		3				1 TAH-1006	
2	1	1				1 LIC-1015	
						2 FAL-1014	
		2				1 LIC-1015	
						2 TAL-1020	
2	2	1				1 LAH-1028	
						2 LIC-1015	

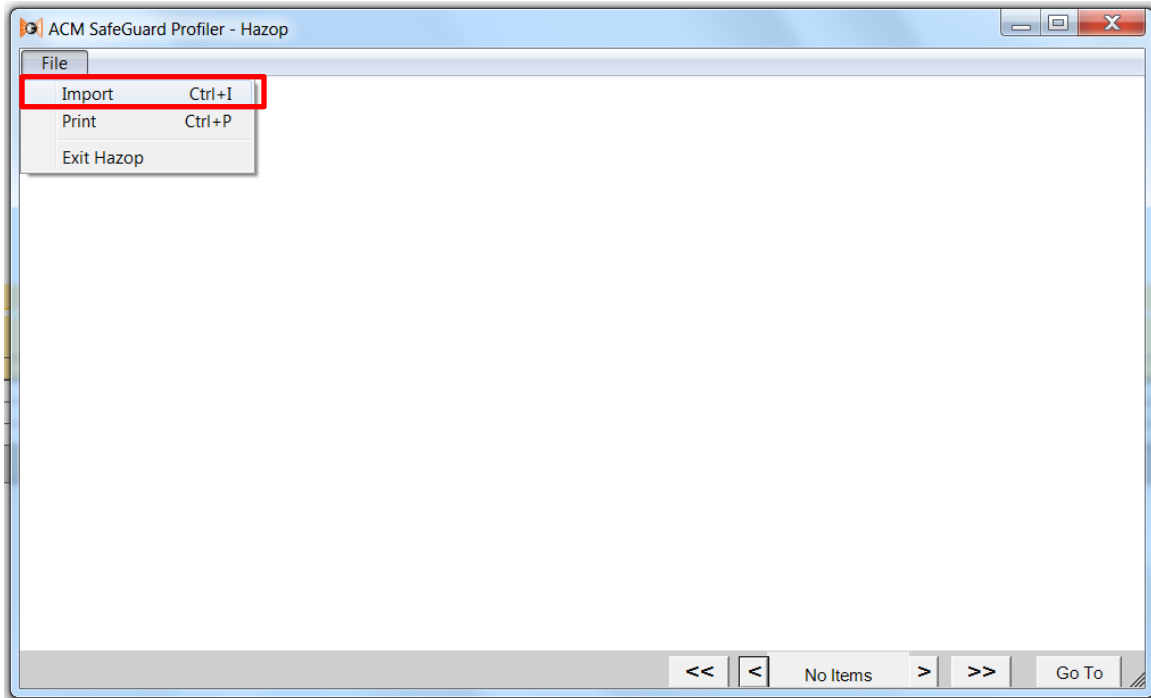
Node	Deviation	Initiating Event Cause	Likelihood	Safeguards / MOD IPL / Type of IPL / PFD
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	1. process upstream upset, loss of supply	0.125	1. FAL-1004
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	1. process upstream upset, loss of supply	0.125	2. TAH-1003
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	2. High pressure	0.25	1. PAH-1007
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	2. High pressure	0.25	2. PSV-1001
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	2. High pressure	0.25	3. PXHH-1015
1. LPG Splitter	1. no/low LPG flow (Loss of supply)	3. High butane Temperature	0.25	1. TAH-1006
2. Re-boiler	1. no/low steam flow (Loss of steam supply)	1. Control loop malfunction FIC-065	0.1	1. LIC-1015
2. Re-boiler	1. no/low steam flow (Loss of steam supply)	1. Control loop malfunction FIC-065	0.1	2. FAL-1014
2. Re-boiler	1. no/low steam flow (Loss of steam supply)	2. Offspec butane	1	1. LIC-1015
2. Re-boiler	1. no/low steam flow (Loss of steam supply)	2. Offspec butane	1	2. TAL-1020
2. Re-boiler	2. no/low condensate flow (no condensate flow)	1. Control loop malfunction LIC-1018	0.1	1. LAH-1028
2. Re-boiler	2. no/low condensate flow (no condensate flow)	1. Control loop malfunction LIC-1018	0.1	2. LIC-1015

1.2. Importing a CSV File

In Profiler, on the Event page, select View > HAZOP.

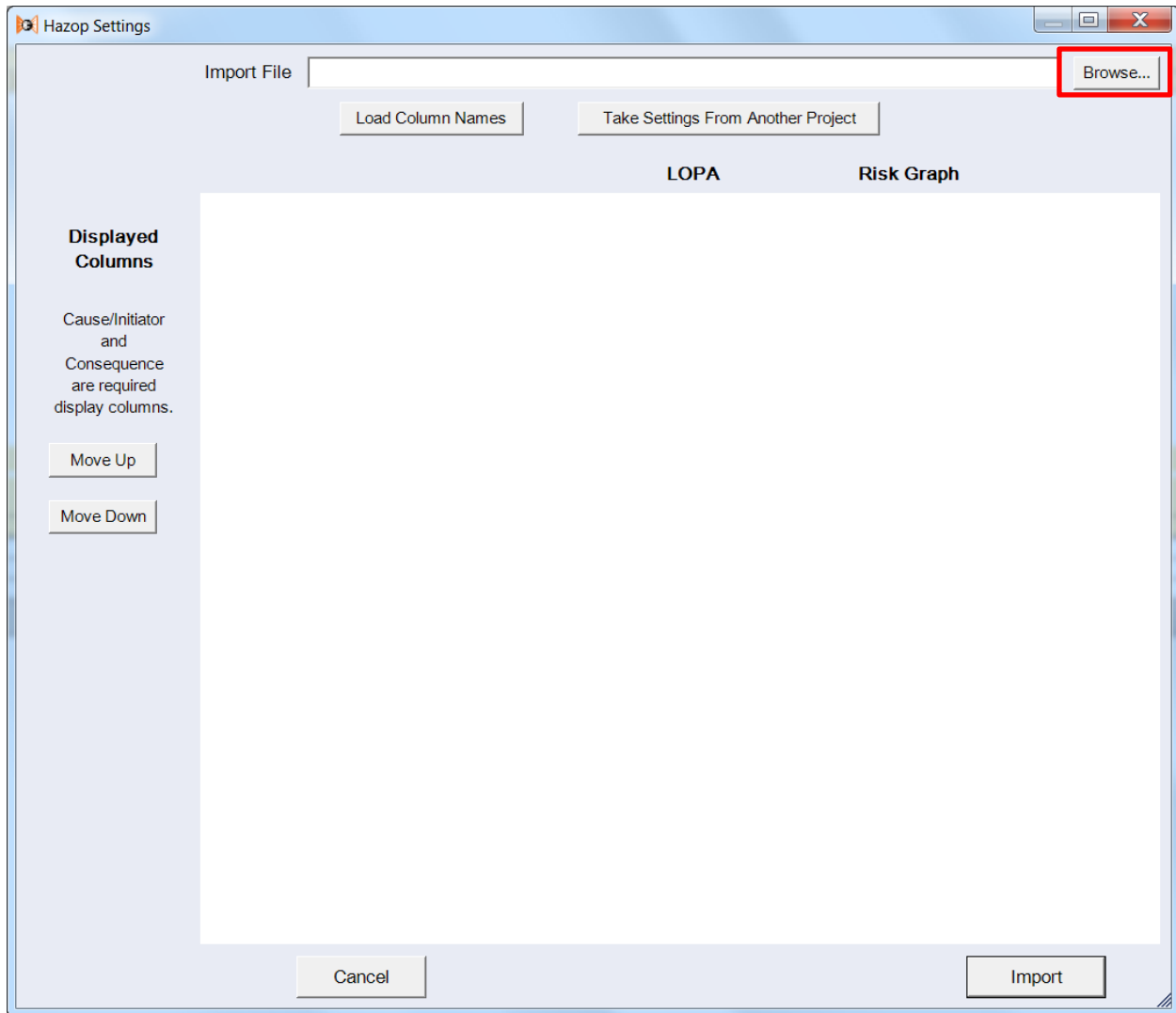


In the “HAZOP” window, select File > Import from the top menu.



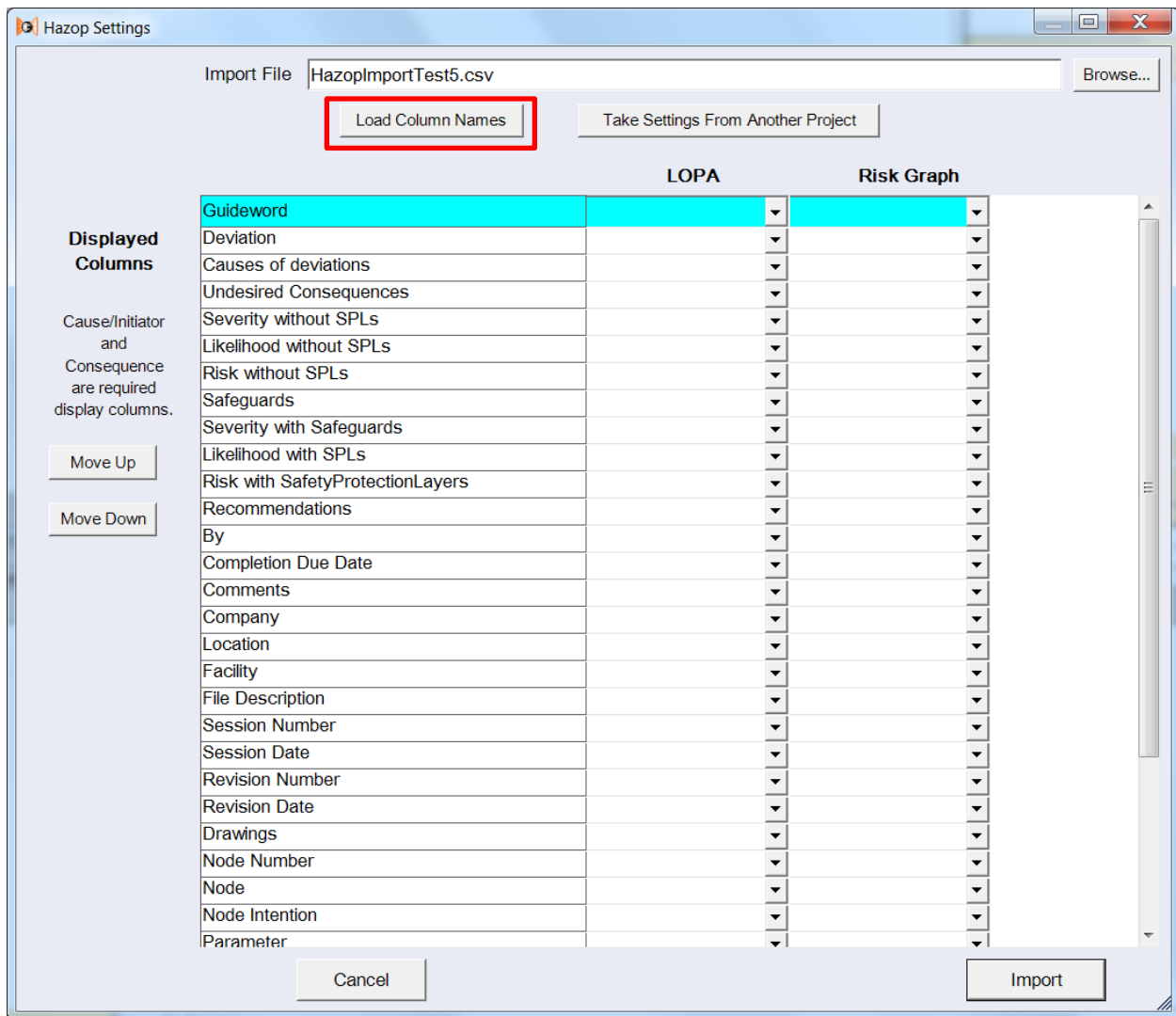
In the “HAZOP Settings” window, click “Browse” at the top right.

Locate the HAZOP CSV file for importing, select the file and click “Open”.



Once the file's path name appears in the “Import File” field, click “Load Column Names”.

The window will update with a list of column headings loaded from the CSV file.



1.3. HAZOP Display Setup

Link the column names from the HAZOP CSV file to existing LOPA fields as follows:

HAZOP	LOPA
Node	Node
Deviation	Scenario (Deviation)
Causes	Cause / Initiating Event
Consequences	Consequence
S [first instance]	Severity [i.e. Severity before Safeguards]
L [first instance]	Likelihood [i.e. Likelihood before Safeguards]
RR [first instance]	Risk Ranking [i.e. RR before Safeguards]
Exist. Safeguards	Protection Layer (Safeguard)
S [second instance]	Severity with SPLs [i.e. Severity after Safeguards]

L [second instance]	Likelihood with SPLs [i.e. Likelihood after Safeguards]
RR [second instance]	Risk Ranking with SPLs [i.e. RR after Safeguards]
Recommendations	Recommendation
Remarks	Notes

If you do not require all the HAZOP columns to perform a LOPA, SafeGuard Profiler™ allows you to select a subset of HAZOP data for import into the HAZOP display window.

For each desired HAZOP column name, right click on the name and select “Display Column”.

The name, along with its linked LOPA and Risk Graph fields, will be highlighted.

Note: At a minimum, SafeGuard Profiler™ requires you to link the “Cause / Initiating Event” and “Consequence” fields under “LOPA” with column names loaded from the HAZOP CSV file.

ACM 511 Hazop Settings

Import File: C:\Users\gpacanins\Desktop\Dr Pasquale\Invensys\ButanePasq.csv [Browse...]

[Load Column Names] [Take Settings From Another Project]

	LOPA	Risk Graph
Node	<Node>	<Node>
Deviation	Scenario (Deviation)	Cause of Demand
Consequences	Consequence	Consequence of Failure
Causes	Cause/Initiating Event	Initiator Tag
S	Severity	Severity
L	Likelihood	Likelihood
RR	Risk Ranking	Risk Ranking
Safeguards	Protection Layer (Safeg)	Additional Safeguard
Recommendations	Recommendation	Recommendation
Loop Number		

[Move Up] [Move Down]

[Cancel] [Import]

Click “Import”.

The import process may take a few seconds.

ACM SafeGuard Profiler - Hazop

File

Node: 1.12 storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-103 + Condensate feed drum liquids to condensate storage tank

Parameter:

Deviation:

Loop Type

☒ LOPA

☐ Risk Graph

☐ Safety Layer Matrix

Create Loop

0 Row(s) Selected

Next Previous

Loop	Guidewor	Deviation	Causes	Consequences	Sev	Like	Ris	Safeguards	Sev	Like	Ris	Recommendations	Node	Node	Parameter
	More	More Flow	More feed flow from depentanizer 14-C-104.	Vent vapour to atmosphere, loss of production, potential vapour cloud fire.				Flame detection.				To be analyzed further under global fire & gas node.	1.12	storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-	
				Asphyxiation.				None identified.				Provide gas detection around tank & roof 21-T-101.	1.12	storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-	
		Higher Pressure	More feed flow from depentanizer 14-C-104.	Vent vapour to atmosphere, loss of production, potential vapour cloud fire.				Flame detection.				To be analyzed further under global fire & gas node.	1.12	storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-103 + Condensate feed drum liquids to condensate storage tank	

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Prior to commencing the LOPA process, check the imported HAZOP against the original, to ensure all the relevant data was imported successfully.

2. Creating LOPA Loops from an Imported HAZOP

2.1. Locating and Highlighting Consequences

The process of creating LOPA loops for analysis begins with the imported HAZOP display window.

ACM SafeGuard Profiler - Hazop

File

Node: 1.12 storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-103 + Condensate feed drum liquids to condensate storage tank

Parameter:

Deviation:

Loop Type

☒ LOPA

☐ Risk Graph

☐ Safety Layer Matrix

Create Loop

0 Row(s) Selected

Next Previous

Loop	Guidewor	Deviation	Causes	Consequences	Sev	Like	Ris	Safeguards	Sev	Like	Ris	Recommendations	Node	Node	Parameter
	More	More Flow	More feed flow from depentanizer 14-C-104.	Vent vapour to atmosphere, loss of production, potential vapour cloud fire.				Flame detection.				To be analyzed further under global fire & gas node.	1.12	storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-	
				Asphyxiation.				None identified.				Provide gas detection around tank & roof 21-T-101.	1.12	storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-	
		Higher Pressure	More feed flow from depentanizer 14-C-104.	Vent vapour to atmosphere, loss of production, potential vapour cloud fire.				Flame detection.				To be analyzed further under global fire & gas node.	1.12	storage tank + Depentanizer reboiler liquids to condensate storage + Condensate line to drain pump 18-P-103 + Condensate feed drum liquids to condensate storage tank	

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LOPA is a consequence-based analysis. Therefore the emphasis is on the consequence column of the HAZOP.

Right click on the desired "Consequence" field and select "Smart Select for Create Loop."

This consequence and its associated causes and safeguards will be highlighted in blue, as shown.

Note the "Row(s) Selected" message in the top right of the window. If it reports greater than one "Consequence the same," then there are at least two instances of the same consequence that need to be located and included in this loop.

ACM SafeGuard Profiler - Hazop

File

Node: 1.13

Parameter: Reverse/Misdirected

Deviation: Reverse/Misdirected Flow

Loop Type

☒ LOPA

☐ Risk Graph

☐ Safety Layer Matrix

Create Loop

1 Row(s) Selected
1 Consequences the same.

Next Previous

Loop	Guideword	Deviation	Causes	Consequences	Sev	Like	Ris	Safeguards	Sev	Like	Ris	Recommendations	Node	Node	Parameter
	Reverse/Misdirected	Reverse/Misdirected Flow	Manual valve left open on inlet line.	Loss of containment, potential for vapour cloud, explosion (need to be				None identified.				Confirm with previous dispersion study if a VCE is possible.	1.13		
								None identified.				Consider use of gas detection (to be reviewed under fire.	1.13		
	Less	Lower Temperature	Chiller failure 15-E-101/102, ie spec break down stream of 15-E-102.	Exceeding low temp spec of piping (check off line previous nodes).				Safeguards to be evaluated outside this node.				Review the requirement of a spec break location downstream of 15	1.13		
								Safeguards to be evaluated outside this node.				Consider using the existing high temp alarm transmitter	1.13		

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Note: Because HAZOP consequence descriptions may not always be copied verbatim by the facilitator, take care to identify similarly worded consequence descriptions. For a selected consequence, the number of instances reported by SafeGuard Profiler™ are those with descriptions which match verbatim.

Ensure only consequences with matching categories (i.e. H&S, ENV, ASSET, Reputation) and matching Severity are grouped.

Similar consequences with different Severity/Category **must not** be grouped.

2.2. LOPA Loop Creation

Once the desired "Consequence" fields have been Smart Selected, select "LOPA" for "Loop Type," then click "Create Loop".

The Smart Selected cells will be highlighted yellow to reflect that their contents have been used in a generated loop. The generated loop's number will appear in the "Loop Number" column.

ACM SafeGuard Profiler - Hazop

File

Node: 1.13

Parameter: Reverse/Misdirected

Deviation: Reverse/Misdirected Flow

Loop Type

- ☒ LOPA
- ☐ Risk Graph
- ☐ Safety Layer Matrix

Create Loop

1 Row(s) Selected
1 Consequences the same.

Next Previous

Loop	Guideword	Deviation	Causes	Consequences	Sev	Like	Ris	Safeguards	Sev	Like	Ris	Recommendations	Node	Node	Parameter
105	Reverse/Misdirected	Reverse/Misdirected Flow	Manual valve left open on inlet line.	Loss of containment, potential for vapour cloud, explosion (need to be				None identified.				Confirm with previous dispersion study if a VCE is possible.	1.13		
105								None identified.				Consider use of gas detection (to be reviewed under fire	1.13		
	Less	Lower Temperature	Chiller failure 15-E-101/102, ie spec break down stream of 15-E-102.	Exceeding low temp spec of piping (check off line previous nodes).				Safeguards to be evaluated outside this node.				Review the requirement of a spec break location downstream of 15	1.13		
								Safeguards to be evaluated outside this node.				Consider using the existing high temp alarm transmitter	1.13		

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Note: In the context of SafeGuard Profiler™, a LOPA “loop” refers to a LOPA scenario, based on a defined consequence.

Minimize the HAZOP display window. The Event page will reflect the HAZOP data used to create the newly generated loop.

ACM SafeGuard Profiler - (LOPA) - Event

File Edit View Fgnt Analysis Settings Tools Optimize Help

Project # Document Title Description

Example Example Document Loss of containment, potential for vapour cloud, explosion (need to be confirmed with disputation study).

Intended

Revisions

Rev	Date	By	Chk	Appr	Description

Reference Doc:

Add Delete

Loop Type: LOPA

Item	Value
LOPA Scenario	Reverse/Misdirected Flow
Initiating Event	Manual valve left open on start time
Worst Consequence	Loss of containment, potential for vapour cloud, explosion (need to be confirmed with disputation study).
Bow Tie Center	

Consequence Rating: User Defined

Tolerable Frequency:

Category: SAFE <Safety>

Severity: S1 <First Severity>

Master 1-Event 2-SIL Determ 3-SIL Guard 4-SRS 105

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We recommend copying the key words of the consequence into the blank “Description” field at the top of the page to identify the scenario being analyzed.

2.3. Tolerable Frequency Criterion

Enter the tolerable frequency criterion against which this scenario will be evaluated. Recall the HAZOP display window and note the severity rating for the selected consequence. From the “Consequence Rating” dropdown list, select the matching severity. (This is why only consequences with the same level of severity can be grouped.)

ACM SafeGuard Profiler - (LOPA) - Event

File Edit View Fgnt Analysis Settings Tools Optimize Help

Project # Document Title Description

Example Example Document Loss of containment, potential for vapour cloud, explosion (need to be confirmed with dispersion study).

Intended

SAFEGUARD PROFILER

Revisions

Rev	Date	By	Chk	Appr	Description

Reference Doc

Add Delete

Loop Type: LOPA

Item	Value
LOPA Scenario	Reverse/Misdirected Flow
Initiating Event	Manual valve left open on inlet line.
Worst Consequence	Loss of containment, potential for vapour cloud, explosion (need to be confirmed with dispersion study).
Bow Tie Center	

Consequence Rating High

Tolerable Frequency 1E-06

Category SAFE <Safety>

Severity S1 <First Severity>

Master 1-Event 2-SIL Determ 3-CC Table 4-SRS 105

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This completes the creation and setup of a LOPA scenario for detailed analysis.