

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6



Terminal LLX



Etanol

46.HA106

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\46.HA106

User-Defined Data

Material

Material Identifier	ETHANOL (Imported Study Etanol)
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Volume Inventory	81 m3

Scenario

Scenario Type	Line rupture
Phase to be Released	Liquid
Building Wake Effect	None
Specify Pump Head	No pump head supplied
Tank Head	2.7 m
Number of Excess Flow Valves	0
Number of Non-Return Valves	0
Number of Shut-Off Valves	0

Pipe

Internal Diameter	203.2 mm
Line length	1 m

Location

[Elevation	1 m]
Use ERPG averaging time	ERPG not selected
Use IDLH averaging time	IDLH not selected
Use STEL averaging time	STEL not selected
Supply a user defined averaging time	Not supplied

Bund

Status of Bund	Bund present
Bund Area	976 m2
[Type of Bund Surface	Concrete]
Bund Height	0.1 m
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Jet Fire Method	Cone Model
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Dispersion

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Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	6.366E4 kg

Fireball Parameters

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[TNO model flame temperature	1727 degC]

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1145 m
North(1)	1134 m

Path: \Terminal LLX\Etanol\46.HA106

Discharge Data

User-Defined Quantities

Material	ETHANOL (Imported Study Etanol)
Temperature	25,00 degC
Pressure	1,01 bar
Inventory	63.657,50 kg
Scenario	Line rupture
Fixed Duration	n/a s

Calculated Quantities

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Diurno

Mass Flow of Air (Vent from Vapor Space Only)	n/a
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Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
Final Temperature	25,01 degC
Final Velocity	4,78 m/s
Droplet Diameter	592,52 um
Continuous Release Data:	
Mass Flowrate	1.21868E+002 kg/s
Release Duration	522,35 s
Orifice Velocity	4,78 m/s
Exit Pressure	1,01 bar
Exit Temperature	25,01 degC
Discharge Coefficient	1,00

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Expanded Radius 0,10 m

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Noturno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction

FinalTemperature 25,01 degC

Final Velocity 4,78 m/s

Droplet Diameter 592,52 um

Continuous Release Data:

Mass Flowrate 1.21868E+002 kg/s

Release Duration 522,35 s

Orifice Velocity 4,78 m/s

Exit Pressure 1,01 bar

Exit Temperature 25,01 degC

Discharge Coefficient 1,00

Expanded Radius 0,10 m

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Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\46.HA106

		Diurno	Noturno
Release Segment 1			
Release Duration	s	522.347	522.347
Liquid Rainout	fraction	0.995832	0.998256
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	48.3025	47.9556
Pool Vaporization Rate	kg/s	0.6602	0.482655
Total Vapor Flowrate	kg/s	1.16811	0.695189
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	3551.7	3552.04
Pool Vaporization Rate	kg/s	1.15044	0.907163
Total Vapor Flowrate	kg/s	1.65834	1.1197
Maximum Pool Radius	m	17.6258	17.6258

Distance to Concentration Results

Path: \Terminal LLX\Etanol\46.HA106

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	2.19947	2.1405
LFL	(43000)	18.75	s	10.6422	8.84138
LFL Frac	(43000)	18.75	s	10.6422	8.84138
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0.0756854	0.0647536
LFL	(43000)	18.75	s	0	0
LFL Frac	(43000)	18.75	s	0	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\46.HA106

Jet fire method used: Cone model - DNV recommended

	Diurno	Noturno
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

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Study Folder: Terminal LLX

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Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\46.HA106

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	34.9239	26.4186
Radiation Level	18.18	kW/m2	28.5089	21.4147
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\46.HA106

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\46.HA106

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\46.HA106

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	67.0112	65.257
Radiation Level	18.18	kW/m2	42.7496	39.7582
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\46.HA106

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\46.HA106

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

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Study Folder: Terminal LLX

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Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\46.HA106

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	67.0112	65.257
Radiation Level	18.18	kW/m2	42.7496	39.7582
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\46.HA106

		Radiation Level (kW/m2)	
		Diurno	Noturno

Flash Fire Envelope

Path: \Terminal LLX\Etanol\46.HA106

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	10.6422	8.84138
Furthest Extent	43000	ppm	10.6422	8.84138
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0	0
Furthest Extent	43000	ppm	0	0

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Study Folder: Terminal LLX

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Explosion Effects: Late Ignition

Path: \Terminal LLX\Etanol\46.HA106

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Center

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

Maximum Distance (m) at Overpressure Level

Diurno

Overpressure	0.069	bar	32.1181
Overpressure	0.1	bar	26.0992
Overpressure	0.45	bar	13.2814

Supplementary Data at 0.069 bar

Diurno

Supplied Flammable Mass	kg	1.37935
Used Flammable Mass	kg	1.37935
Overpressure Radius	m	27.1181
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

Supplementary Data at 0.1 bar

Diurno

Supplied Flammable Mass	kg	1.37935
Used Flammable Mass	kg	1.37935
Overpressure Radius	m	21.0992
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

Supplementary Data at 0.45 bar

Diurno

Supplied Flammable Mass	kg	1.37935
Used Flammable Mass	kg	1.37935
Overpressure Radius	m	8.28139
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

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Weather Conditions

Path: \Terminal LLX\Etanol\46.HA106

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

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47.HA108

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\47.HA108

User-Defined Data

Material

Material Identifier ETHANOL (Imported Study Etanol)

Scenario

Building Wake Effect None

Vessel/Tank

Release Type Continuous

Location

[Elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund Bund present
Bund Area 976 m2
[Type of Bund Surface Concrete]
Bund Height 0.1 m
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 1.37 m/s
Droplet Diameter(1) 100 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25 degC
Release Rate(1) 19.64 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 6.366E4 kg
Model Risk Effects for Vertical Jet Fires Do not model vertical jet fires

Fireball Parameters

[Mass Modification Factor 3]
[Calculation method for fireball DNV Recommended]
[TNO model flame temperature 1727 degC]

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Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1145 m
North(1)	1134 m

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Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\47.HA108

		Diurno	Noturno
Release Segment 1			
Release Duration	s	600	600
Liquid Rainout	fraction	0.986854	0.996473
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	81.9025	80.1025
Pool Vaporization Rate	kg/s	0.309352	0.2271
Total Vapor Flowrate	kg/s	0.567541	0.296371
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	34.7375	34.3875
Pool Vaporization Rate	kg/s	0.733977	0.534199
Total Vapor Flowrate	kg/s	0.992166	0.60347
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s	27.36	27.12
Pool Vaporization Rate	kg/s	0.93724	0.683351
Total Vapor Flowrate	kg/s	1.19543	0.752623
Release Segment 1 Cloud Segment 4			
Cloud Segment Duration	s	23.7025	22.8706
Pool Vaporization Rate	kg/s	1.09797	0.80072
Total Vapor Flowrate	kg/s	1.35616	0.869991
Release Segment 1 Cloud Segment 5			
Cloud Segment Duration	s	38.22	37.87
Pool Vaporization Rate	kg/s	1.28602	0.939258
Total Vapor Flowrate	kg/s	1.54421	1.00853
Release Segment 1 Cloud Segment 6			
Cloud Segment Duration	s	3394.08	3397.65
Pool Vaporization Rate	kg/s	1.01633	0.798487
Total Vapor Flowrate	kg/s	1.27452	0.867759
Maximum Pool Radius	m	17.6258	17.6258

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Distance to Concentration Results

Path: \Terminal LLX\Etanol\47.HA108

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	1.12056	4.10511
LFL	(43000)	18.75	s	5.77401	9.99444
LFL Frac	(43000)	18.75	s	5.77401	9.99444
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0	0
LFL	(43000)	18.75	s	0	0
LFL Frac	(43000)	18.75	s	0	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\47.HA108

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\47.HA108

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

				Distance (m)	
				Diurno	Noturno
Radiation Level	5	kW/m2		26.2547	16.4906
Radiation Level	18.18	kW/m2		21.9118	13.8938
Radiation Level	100	kW/m2		Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\47.HA108

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\47.HA108

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

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Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\47.HA108

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	59.5513	58.4824
Radiation Level	18.18	kW/m2	37.465	35.0349
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\47.HA108

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\47.HA108

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\47.HA108

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	65.5174	63.8128
Radiation Level	18.18	kW/m2	41.2557	38.3141
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\47.HA108

		Radiation Level (kW/m2)	
		Diurno	Noturno

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Study Folder: Terminal LLX

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Flash Fire Envelope

Path: \Terminal LLX\Etanol\47.HA108

All flammable results are reported at the cloud centreline height

				Distance (m)	
				Diurno	Noturno
Furthest Extent	43000	ppm	5.77401	5.77401	9.99444
Furthest Extent	43000	ppm	5.77401	5.77401	9.99444
				Heights (m) for above distances	
				Diurno	Noturno
Furthest Extent	43000	ppm	0	0	0
Furthest Extent	43000	ppm	0	0	0

Weather Conditions

Path: \Terminal LLX\Etanol\47.HA108

			Diurno	Noturno
Wind Speed	m/s	3.916	3.916	2.329
Pasquill Stability		D	D	F
Surface Roughness Length	mm	950.891	950.891	950.891
Surface Roughness Parameter		0.17	0.17	0.17
Atmospheric Temperature	degC	25.287	25.287	21.695
Surface Temperature	degC	25.287	25.287	21.695
Relative Humidity	fraction	0.69625	0.69625	0.84719

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Study Folder: Terminal LLX

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48.HA110

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\48.HA110

User-Defined Data

Material

Material Identifier ETHANOL (Imported Study Etanol)

Scenario

Building Wake Effect None

Vessel/Tank

Release Type Continuous

Location

[Elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund Bund present
Bund Area 1800 m2
[Type of Bund Surface Concrete]
Bund Height 0.1 m
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 1.37 m/s
Droplet Diameter(1) 100 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25 degC
Release Rate(1) 19.64 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 6.366E4 kg
Model Risk Effects for Vertical Jet Fires Do not model vertical jet fires

Fireball Parameters

[Mass Modification Factor 3]
[Calculation method for fireball DNV Recommended]
[TNO model flame temperature 1727 degC]

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Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1134 m
North(1)	1163 m

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Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\48.HA110

		Diurno	Noturno
Release Segment 1			
Release Duration	s	600	600
Liquid Rainout	fraction	0.986854	0.996473
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	123.21	120.451
Pool Vaporization Rate	kg/s	0.458993	0.334854
Total Vapor Flowrate	kg/s	0.717182	0.404125
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	53.68	52.4719
Pool Vaporization Rate	kg/s	1.06117	0.77072
Total Vapor Flowrate	kg/s	1.31936	0.839991
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s	42.15	40.9681
Pool Vaporization Rate	kg/s	1.3522	0.98406
Total Vapor Flowrate	kg/s	1.61039	1.05333
Release Segment 1 Cloud Segment 4			
Cloud Segment Duration	s	36.1606	34.96
Pool Vaporization Rate	kg/s	1.57905	1.15113
Total Vapor Flowrate	kg/s	1.83724	1.22041
Release Segment 1 Cloud Segment 5			
Cloud Segment Duration	s	61.6394	60.03
Pool Vaporization Rate	kg/s	1.85035	1.35332
Total Vapor Flowrate	kg/s	2.10854	1.42259
Release Segment 1 Cloud Segment 6			
Cloud Segment Duration	s	75.2	72.345
Pool Vaporization Rate	kg/s	2.21252	1.6252
Total Vapor Flowrate	kg/s	2.47071	1.69447
Release Segment 1 Cloud Segment 7			
Cloud Segment Duration	s	3207.96	3218.77
Pool Vaporization Rate	kg/s	1.74909	1.41831
Total Vapor Flowrate	kg/s	2.00728	1.48758
Maximum Pool Radius	m	23.9365	23.9365

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Distance to Concentration Results

Path: \Terminal LLX\Etanol\48.HA110

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	1.31758	4.8247
LFL	(43000)	18.75	s	5.75355	12.211
LFL Frac	(43000)	18.75	s	5.75355	12.211
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0	0
LFL	(43000)	18.75	s	0	0
LFL Frac	(43000)	18.75	s	0	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\48.HA110

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\48.HA110

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

				Distance (m)	
				Diurno	Noturno
Radiation Level	5	kW/m2		26.2547	16.4906
Radiation Level	18.18	kW/m2		21.9118	13.8938
Radiation Level	100	kW/m2		Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\48.HA110

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\48.HA110

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

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Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\48.HA110

				Distance (m)
				Diurno
				Noturno
Radiation Level	5	kW/m2	59.5513	58.4824
Radiation Level	18.18	kW/m2	37.465	35.0349
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\48.HA110

		Radiation Level (kW/m2)
		Diurno
		Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\48.HA110

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\48.HA110

				Distance (m)
				Diurno
				Noturno
Radiation Level	5	kW/m2	85.9745	83.9173
Radiation Level	18.18	kW/m2	54.2738	50.7186
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\48.HA110

		Radiation Level (kW/m2)
		Diurno
		Noturno

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Flash Fire Envelope

Path: \Terminal LLX\Etanol\48.HA110

All flammable results are reported at the cloud centreline height

				Distance (m)	
				Diurno	Noturno
Furthest Extent	43000	ppm	5.75355	5.75355	12.211
Furthest Extent	43000	ppm	5.75355	5.75355	12.211
				Heights (m) for above distances	
				Diurno	Noturno
Furthest Extent	43000	ppm	0	0	0
Furthest Extent	43000	ppm	0	0	0

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Explosion Effects: Late Ignition

Path: \Terminal LLX\Etanol\48.HA110

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Center

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level
			Noturno
Overpressure	0.069	bar	52.0505
Overpressure	0.1	bar	41.6075
Overpressure	0.45	bar	19.3684

			Supplementary Data at 0.069 bar
			Noturno
Supplied Flammable Mass	kg		7.20427
Used Flammable Mass	kg		7.20427
Overpressure Radius	m		47.0505
Distance to:			
- Ignition Source	m		10
- Cloud Front/Centre	m		10
- Explosion Centre	m		5

			Supplementary Data at 0.1 bar
			Noturno
Supplied Flammable Mass	kg		7.20427
Used Flammable Mass	kg		7.20427
Overpressure Radius	m		36.6075
Distance to:			
- Ignition Source	m		10
- Cloud Front/Centre	m		10
- Explosion Centre	m		5

			Supplementary Data at 0.45 bar
			Noturno
Supplied Flammable Mass	kg		7.20427
Used Flammable Mass	kg		7.20427
Overpressure Radius	m		14.3684
Distance to:			
- Ignition Source	m		10
- Cloud Front/Centre	m		10
- Explosion Centre	m		5

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Weather Conditions

Path: \Terminal LLX\Etanol\48.HA110

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

49.HA112

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\49.HA112

User-Defined Data

Material

Material Identifier ETHANOL (Imported Study Etanol)

Scenario

Building Wake Effect None

Vessel/Tank

Release Type Continuous

Location

[Elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund Bund present
Bund Area 4211 m2
[Type of Bund Surface Concrete]
[Bund Height 1.5 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 1.37 m/s
Droplet Diameter(1) 100 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25 degC
Release Rate(1) 19.64 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 6.366E4 kg
Model Risk Effects for Vertical Jet Fires Do not model vertical jet fires

Fireball Parameters

[Mass Modification Factor 3]
[Calculation method for fireball DNV Recommended]
[TNO model flame temperature 1727 degC]

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1382 m
North(1)	1261 m

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\49.HA112

		Diurno	Noturno
Release Segment 1			
Release Duration	s	600	600
Liquid Rainout	fraction	0.986854	0.996473
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	184.96	187.006
Pool Vaporization Rate	kg/s	0.668321	0.501515
Total Vapor Flowrate	kg/s	0.92651	0.570786
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	82.3625	82.775
Pool Vaporization Rate	kg/s	1.51508	1.13745
Total Vapor Flowrate	kg/s	1.77327	1.20672
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s	64.8281	65.1094
Pool Vaporization Rate	kg/s	1.92451	1.45098
Total Vapor Flowrate	kg/s	2.1827	1.52025
Release Segment 1 Cloud Segment 4			
Cloud Segment Duration	s	55.9394	55.1725
Pool Vaporization Rate	kg/s	2.24219	1.69532
Total Vapor Flowrate	kg/s	2.50038	1.76459
Release Segment 1 Cloud Segment 5			
Cloud Segment Duration	s	95.91	95.0381
Pool Vaporization Rate	kg/s	2.62167	1.98884
Total Vapor Flowrate	kg/s	2.87986	2.05812
Release Segment 1 Cloud Segment 6			
Cloud Segment Duration	s	116	114.899
Pool Vaporization Rate	kg/s	3.12249	2.38223
Total Vapor Flowrate	kg/s	3.38068	2.4515
Release Segment 1 Cloud Segment 7			
Cloud Segment Duration	s	3000	3000
Pool Vaporization Rate	kg/s	1.86246	1.62282
Total Vapor Flowrate	kg/s	1.86246	1.62282
Maximum Pool Radius	m	29.1463	29.6781

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Distance to Concentration Results

Path: \Terminal LLX\Etanol\49.HA112

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	1.38414	5.47215
LFL	(43000)	18.75	s	5.89508	14.03
LFL Frac	(43000)	18.75	s	5.89508	14.03
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0	0
LFL	(43000)	18.75	s	0	0
LFL Frac	(43000)	18.75	s	0	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\49.HA112

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\49.HA112

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

				Distance (m)	
				Diurno	Noturno
Radiation Level	5	kW/m2		26.2547	16.4906
Radiation Level	18.18	kW/m2		21.9118	13.8938
Radiation Level	100	kW/m2		Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\49.HA112

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\49.HA112

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\49.HA112

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	59.5513	58.4824
Radiation Level	18.18	kW/m2	37.465	35.0349
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\49.HA112

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\49.HA112

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\49.HA112

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	102.412	101.728
Radiation Level	18.18	kW/m2	64.7643	61.7594
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\49.HA112

		Radiation Level (kW/m2)	
		Diurno	Noturno

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Flash Fire Envelope

Path: \Terminal LLX\Etanol\49.HA112

All flammable results are reported at the cloud centreline height

				Distance (m)	
				Diurno	Noturno
Furthest Extent	43000	ppm		5.89508	14.03
Furthest Extent	43000	ppm		5.89508	14.03
				Heights (m) for above distances	
				Diurno	Noturno
Furthest Extent	43000	ppm		0	0
Furthest Extent	43000	ppm		0	0

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Explosion Effects: Late Ignition

Path: \Terminal LLX\Etanol\49.HA112

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Center

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level
			Noturno
Overpressure	0.069	bar	54.9337
Overpressure	0.1	bar	43.8508
Overpressure	0.45	bar	20.2488

Supplementary Data at 0.069 bar

Noturno

Supplied Flammable Mass	kg	8.61147
Used Flammable Mass	kg	8.61147
Overpressure Radius	m	49.9337
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

Supplementary Data at 0.1 bar

Noturno

Supplied Flammable Mass	kg	8.61147
Used Flammable Mass	kg	8.61147
Overpressure Radius	m	38.8508
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

Supplementary Data at 0.45 bar

Noturno

Supplied Flammable Mass	kg	8.61147
Used Flammable Mass	kg	8.61147
Overpressure Radius	m	15.2488
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Weather Conditions

Path: \Terminal LLX\Etanol\49.HA112

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

50.HA114

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\50.HA114

User-Defined Data

Material

Material Identifier	ETHANOL (Imported Study Etanol)
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Volume Inventory	40.5 m3

Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	2.25 m

Location

[Elevation	1 m]
Use ERPG averaging time	ERPG not selected
Use IDLH averaging time	IDLH not selected
Use STEL averaging time	STEL not selected
Supply a user defined averaging time	Not supplied

Bund

Status of Bund	Bund present
Bund Area	976 m2
[Type of Bund Surface	Concrete]
Bund Height	0.1 m
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
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Flammable

Jet Fire Method	Cone Model
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Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	3.183E4 kg
Use Burst Pressure	No - Use release pressure for fireball

Fireball Parameters

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[TNO model flame temperature	1727 degC]

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

[Set averaging time equal to exposure time Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation 0.05 fraction]
[Cut-off concentration for exposure time calculations 0 fraction]

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 1145 m
North(1) 1134 m

Path: \Terminal LLX\Etanol\50.HA114

Discharge Data

User-Defined Quantities

Material ETHANOL (Imported Study Etanol)
Temperature 25,00 degC
Pressure 1,01 bar
Inventory 31.828,75 kg
Scenario Catastrophic rupture
Fixed Duration n/a s

Calculated Quantities

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Diurno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
FinalTemperature 25,00 degC
Final Velocity 2,10 m/s
Droplet Diameter 10.000,00 um

Continuous Release Data:

Mass Flowrate n/a kg/s
Release Duration n/a s
Orifice Velocity n/a m/s
Exit Pressure n/a bar
Exit Temperature n/a degC
Discharge Coefficient n/a
Expanded Radius n/a m

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Noturno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
FinalTemperature 25,00 degC
Final Velocity 2,10 m/s
Droplet Diameter 10.000,00 um

Continuous Release Data:

Mass Flowrate n/a kg/s

SUMMARY REPORT

Study Folder: **Terminal LLX**

193.279



Phast 6.6

Release Duration	n/a s
Orifice Velocity	n/a m/s
Exit Pressure	n/a bar
Exit Temperature	n/a degC
Discharge Coefficient	n/a
Expanded Radius	n/a m

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\50.HA114

N.B. Pool vaporization segments begin when the cloud has left the pool

		Diurno	Noturno
Liquid Rainout	fraction	0.998988	0.998976
Initial Vapor Cloud	kg	32.2255	32.5927
Time Pool Left Behind	s	16.1385	49.7385

Cloud Segment 1

Cloud Segment Duration	s	31.36	3600
Pool Vaporization Rate	kg/s	1.28389	0.851608

Cloud Segment 2

Cloud Segment Duration	s	3568.64
Pool Vaporization Rate	kg/s	1.09768

Maximum Pool Radius	m	17.6258	17.6258
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Distance to Concentration Results

Path: \Terminal LLX\Etanol\50.HA114

The height for user defined concentrations is the user defined height 1 m

All toxic results are reported at the toxic effect height 1 m

All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	4.91439	4.71745
LFL	(43000)	18.75	s	5.22378	5.17549
LFL Frac	(43000)	18.75	s	5.22378	5.17549
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0.806428	0.806052
LFL	(43000)	18.75	s	0	0
LFL Frac	(43000)	18.75	s	0	0

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\50.HA114

	Diurno	Noturno
Late Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\50.HA114

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	65.5779	63.6832
Radiation Level	18.18	kW/m2	41.3162	38.1845
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\50.HA114

Radiation Level (kW/m2)	
Diurno	Noturno

Fireball Hazard

Path: \Terminal LLX\Etanol\50.HA114

		Diurno	Noturno
Fireball Flame Status		No Hazard	No Hazard

Flash Fire Envelope

Path: \Terminal LLX\Etanol\50.HA114

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	5.22378	5.17549
Furthest Extent	43000	ppm	5.22378	5.17549
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0	0
Furthest Extent	43000	ppm	0	0

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Explosion Effects: Early Explosion

Path: \Terminal LLX\Etanol\50.HA114

Early Explosions are assumed to be centered at the release location
Explosion Model Used : TNT

			Diurno	Noturno
Supplied Flammable Mass			31828.7	31828.7
			Distance (m) at Overpressure Levels	
			Diurno	Noturno
Overpressure	0.069	bar	No Hazard	No Hazard
Overpressure	0.1	bar	No Hazard	No Hazard
Overpressure	0.45	bar	No Hazard	No Hazard
			Used Mass (kg) at Overpressure Levels	
			Diurno	Noturno
Overpressure	0.069	bar	0	0
Overpressure	0.1	bar	0	0
Overpressure	0.45	bar	0	0

Weather Conditions

Path: \Terminal LLX\Etanol\50.HA114

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

51.HA115

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\51.HA115

User-Defined Data

Material

Material Identifier	ETHANOL (Imported Study Etanol)
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Volume Inventory	40.5 m3

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10 mm
Building Wake Effect	None
Tank Head	2.25 m

Location

[Elevation	1 m]
Use ERPG averaging time	ERPG not selected
Use IDLH averaging time	IDLH not selected
Use STEL averaging time	STEL not selected
Supply a user defined averaging time	Not supplied

Bund

Status of Bund	Bund present
Bund Area	976 m2
[Type of Bund Surface	Concrete]
Bund Height	0.1 m
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Jet Fire Method	Cone Model
-----------------	------------

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	3.183E4 kg

Fireball Parameters

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[TNO model flame temperature	1727 degC]

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

[Tail Time 1800 s]
[Set averaging time equal to exposure time Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation 0.05 fraction]
[Cut-off concentration for exposure time calculations 0 fraction]

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 1145 m
North(1) 1134 m

Path: \Terminal LLX\Etanol\51.HA115

Discharge Data

User-Defined Quantities

Material ETHANOL (Imported Study Etanol)
Temperature 25,00 degC
Pressure 1,01 bar
Inventory 31.828,75 kg
Scenario Leak
Fixed Duration n/a s

Calculated Quantities

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Diurno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 25,00 degC
Final Velocity 7,28 m/s
Droplet Diameter 605,90 um

Continuous Release Data:

Mass Flowrate 2.69428E-001 kg/s
Release Duration 3.600,00 s
Orifice Velocity 7,28 m/s
Exit Pressure 1,01 bar
Exit Temperature 25,00 degC
Discharge Coefficient 0,60
Expanded Radius 0,00 m

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Noturno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 25,00 degC
Final Velocity 7,28 m/s
Droplet Diameter 605,90 um

Continuous Release Data:

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Mass Flowrate	2.69428E-001 kg/s
Release Duration	3.600,00 s
Orifice Velocity	7,28 m/s
Exit Pressure	1,01 bar
Exit Temperature	25,00 degC
Discharge Coefficient	0,60
Expanded Radius	0,00 m

SUMMARY REPORT

Unique Audit Number:

193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\51.HA115

		Diurno	Noturno
Release Segment 1			
Release Duration	s	3600	3600
Liquid Rainout	fraction	0.939354	0.947668
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	947.101	992.25
Pool Vaporization Rate	kg/s	0.0449288	0.0340417
Total Vapor Flowrate	kg/s	0.0612686	0.0481414
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	444.189	451.75
Pool Vaporization Rate	kg/s	0.095579	0.0746882
Total Vapor Flowrate	kg/s	0.111919	0.0887879
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s	362.226	362.25
Pool Vaporization Rate	kg/s	0.117506	0.0931152
Total Vapor Flowrate	kg/s	0.133846	0.107215
Release Segment 1 Cloud Segment 4			
Cloud Segment Duration	s	610.875	316.656
Pool Vaporization Rate	kg/s	0.139732	0.106797
Total Vapor Flowrate	kg/s	0.156071	0.120897
Release Segment 1 Cloud Segment 5			
Cloud Segment Duration	s	1235.61	555.157
Pool Vaporization Rate	kg/s	0.171158	0.122415
Total Vapor Flowrate	kg/s	0.187497	0.136514
Release Segment 1 Cloud Segment 6			
Cloud Segment Duration	s		921.938
Pool Vaporization Rate	kg/s		0.14528
Total Vapor Flowrate	kg/s		0.15938
Maximum Pool Radius	m	6.27049	6.85579

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Distance to Concentration Results

Path: \Terminal LLX\Etanol\51.HA115

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	1.78091	2.09002
LFL	(43000)	18.75	s	2.62926	5.4599
LFL Frac	(43000)	18.75	s	2.62926	5.4599
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0.734172	0.517056
LFL	(43000)	18.75	s	0.529656	0
LFL Frac	(43000)	18.75	s	0.529656	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\51.HA115

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\51.HA115

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

				Distance (m)	
				Diurno	Noturno
Radiation Level	5	kW/m2		7.28962	7.57056
Radiation Level	18.18	kW/m2		6.64463	Not Reached
Radiation Level	100	kW/m2		Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\51.HA115

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\51.HA115

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

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Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\51.HA115

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	10.9477	10.6215
Radiation Level	18.18	kW/m2	6.39034	6.02748
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\51.HA115

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\51.HA115

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\51.HA115

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	28.1821	29.3661
Radiation Level	18.18	kW/m2	18.1945	17.8882
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\51.HA115

		Radiation Level (kW/m2)	
		Diurno	Noturno

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

Flash Fire Envelope

Path: \Terminal LLX\Etanol\51.HA115

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	2.62926	5.4599
Furthest Extent	43000	ppm	2.62926	5.4599
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0.529656	0
Furthest Extent	43000	ppm	0.529656	0

Weather Conditions

Path: \Terminal LLX\Etanol\51.HA115

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

52.HA117

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\52.HA117

User-Defined Data

Material

Material Identifier	ETHANOL (Imported Study Etanol)
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Volume Inventory	81 m3

Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	2.7 m

Location

[Elevation	1 m]
Use ERPG averaging time	ERPG not selected
Use IDLH averaging time	IDLH not selected
Use STEL averaging time	STEL not selected
Supply a user defined averaging time	Not supplied

Bund

Status of Bund	Bund present
Bund Area	976 m2
[Type of Bund Surface	Concrete]
Bund Height	0.1 m
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
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Flammable

Jet Fire Method	Cone Model
-----------------	------------

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	6.366E4 kg
Use Burst Pressure	No - Use release pressure for fireball

Fireball Parameters

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[TNO model flame temperature	1727 degC]

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]

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Study Folder: Terminal LLX

Phast 6.6

[Set averaging time equal to exposure time Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation 0.05 fraction]
[Cut-off concentration for exposure time calculations 0 fraction]

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 1145 m
North(1) 1134 m

Path: \Terminal LLX\Etanol\52.HA117

Discharge Data

User-Defined Quantities

Material ETHANOL (Imported Study Etanol)
Temperature 25,00 degC
Pressure 1,01 bar
Inventory 63.657,50 kg
Scenario Catastrophic rupture
Fixed Duration n/a s

Calculated Quantities

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Diurno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
FinalTemperature 25,00 degC
Final Velocity 2,30 m/s
Droplet Diameter 10.000,00 um

Continuous Release Data:

Mass Flowrate n/a kg/s
Release Duration n/a s
Orifice Velocity n/a m/s
Exit Pressure n/a bar
Exit Temperature n/a degC
Discharge Coefficient n/a
Expanded Radius n/a m

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Noturno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
FinalTemperature 25,00 degC
Final Velocity 2,30 m/s
Droplet Diameter 10.000,00 um

Continuous Release Data:

Mass Flowrate n/a kg/s

SUMMARY REPORT

Study Folder: **Terminal LLX**

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Phast 6.6

Release Duration	n/a s
Orifice Velocity	n/a m/s
Exit Pressure	n/a bar
Exit Temperature	n/a degC
Discharge Coefficient	n/a
Expanded Radius	n/a m

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\52.HA117

N.B. Pool vaporization segments begin when the cloud has left the pool

		Diurno	Noturno
Liquid Rainout	fraction	0.99882	0.998807
Initial Vapor Cloud	kg	75.0847	75.9259
Time Pool Left Behind	s	18.1815	56.5815

Cloud Segment 1

Cloud Segment Duration	s	32.7756	3600
Pool Vaporization Rate	kg/s	1.34697	0.90892

Cloud Segment 2

Cloud Segment Duration	s	3567.22	
Pool Vaporization Rate	kg/s	1.17808	

Maximum Pool Radius	m	17.6258	17.6258
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Distance to Concentration Results

Path: \Terminal LLX\Etanol\52.HA117

The height for user defined concentrations is the user defined height 1 m

All toxic results are reported at the toxic effect height 1 m

All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	8.29634	7.98259
LFL	(43000)	18.75	s	8.3891	8.0756
LFL Frac	(43000)	18.75	s	8.3891	8.0756
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0.807239	0.806653
LFL	(43000)	18.75	s	0.807239	0.806653
LFL Frac	(43000)	18.75	s	0.807239	0.806653

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\52.HA117

	Diurno	Noturno
Late Pool Fire Status	Hazard	Hazard

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Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\52.HA117

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	65.9539	63.9423
Radiation Level	18.18	kW/m2	41.6922	38.4435
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\52.HA117

Radiation Level (kW/m2)	
Diurno	Noturno

Fireball Hazard

Path: \Terminal LLX\Etanol\52.HA117

		Diurno	Noturno
Fireball Flame Status		No Hazard	No Hazard

Flash Fire Envelope

Path: \Terminal LLX\Etanol\52.HA117

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	8.3891	8.0756
Furthest Extent	43000	ppm	8.3891	8.0756
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0.807239	0.806653
Furthest Extent	43000	ppm	0.807239	0.806653

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

Explosion Effects: Early Explosion

Path: \Terminal LLX\Etanol\52.HA117

Early Explosions are assumed to be centered at the release location
Explosion Model Used : TNT

			Diurno	Noturno
Supplied Flammable Mass			63657.5	63657.5
			Distance (m) at Overpressure Levels	
			Diurno	Noturno
Overpressure	0.069	bar	No Hazard	No Hazard
Overpressure	0.1	bar	No Hazard	No Hazard
Overpressure	0.45	bar	No Hazard	No Hazard
			Used Mass (kg) at Overpressure Levels	
			Diurno	Noturno
Overpressure	0.069	bar	0	0
Overpressure	0.1	bar	0	0
Overpressure	0.45	bar	0	0

Weather Conditions

Path: \Terminal LLX\Etanol\52.HA117

			Diurno	Noturno
Wind Speed	m/s		3.916	2.329
Pasquill Stability			D	F
Surface Roughness Length	mm		950.891	950.891
Surface Roughness Parameter			0.17	0.17
Atmospheric Temperature	degC		25.287	21.695
Surface Temperature	degC		25.287	21.695
Relative Humidity	fraction		0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

53.HA118

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\53.HA118

User-Defined Data

Material

Material Identifier	ETHANOL (Imported Study Etanol)
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Volume Inventory	81 m3

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10 mm
Building Wake Effect	None
Tank Head	2.7 m

Location

[Elevation	1 m]
Use ERPG averaging time	ERPG not selected
Use IDLH averaging time	IDLH not selected
Use STEL averaging time	STEL not selected
Supply a user defined averaging time	Not supplied

Bund

Status of Bund	Bund present
Bund Area	976 m2
[Type of Bund Surface	Concrete]
Bund Height	0.1 m
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Jet Fire Method	Cone Model
-----------------	------------

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	6.366E4 kg

Fireball Parameters

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[TNO model flame temperature	1727 degC]

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]

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Study Folder: Terminal LLX

Phast 6.6

[Tail Time 1800 s]
[Set averaging time equal to exposure time Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation 0.05 fraction]
[Cut-off concentration for exposure time calculations 0 fraction]

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 1145 m
North(1) 1134 m

Path: \Terminal LLX\Etanol\53.HA118

Discharge Data

User-Defined Quantities

Material ETHANOL (Imported Study Etanol)
Temperature 25,00 degC
Pressure 1,01 bar
Inventory 63.657,50 kg
Scenario Leak
Fixed Duration n/a s

Calculated Quantities

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Diurno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 25,00 degC
Final Velocity 7,97 m/s
Droplet Diameter 592,52 um

Continuous Release Data:

Mass Flowrate 2.95150E-001 kg/s
Release Duration 3.600,00 s
Orifice Velocity 7,97 m/s
Exit Pressure 1,01 bar
Exit Temperature 25,00 degC
Discharge Coefficient 0,60
Expanded Radius 0,00 m

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Noturno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 25,00 degC
Final Velocity 7,97 m/s
Droplet Diameter 592,52 um

Continuous Release Data:

SUMMARY REPORT

Study Folder: Terminal LLX

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Phast 6.6



Mass Flowrate	2.95150E-001 kg/s
Release Duration	3.600,00 s
Orifice Velocity	7,97 m/s
Exit Pressure	1,01 bar
Exit Temperature	25,00 degC
Discharge Coefficient	0,60
Expanded Radius	0,00 m

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\53.HA118

		Diurno	Noturno
Release Segment 1			
Release Duration	s	3600	3600
Liquid Rainout	fraction	0.937647	0.946978
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	947.101	992.25
Pool Vaporization Rate	kg/s	0.0488169	0.0368566
Total Vapor Flowrate	kg/s	0.0672205	0.0525062
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	444.189	451.75
Pool Vaporization Rate	kg/s	0.103822	0.0810715
Total Vapor Flowrate	kg/s	0.122225	0.0967211
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s	362.226	362.25
Pool Vaporization Rate	kg/s	0.127605	0.101143
Total Vapor Flowrate	kg/s	0.146009	0.116793
Release Segment 1 Cloud Segment 4			
Cloud Segment Duration	s	610.875	316.656
Pool Vaporization Rate	kg/s	0.15126	0.116048
Total Vapor Flowrate	kg/s	0.169663	0.131698
Release Segment 1 Cloud Segment 5			
Cloud Segment Duration	s	1014.13	552.57
Pool Vaporization Rate	kg/s	0.182871	0.132998
Total Vapor Flowrate	kg/s	0.201275	0.148648
Release Segment 1 Cloud Segment 6			
Cloud Segment Duration	s	221.484	924.524
Pool Vaporization Rate	kg/s	0.201529	0.157505
Total Vapor Flowrate	kg/s	0.219932	0.173154
Maximum Pool Radius	m	6.5754	7.19017

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Study Folder: Terminal LLX

Phast 6.6

Distance to Concentration Results

Path: \Terminal LLX\Etanol\53.HA118

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	1.85625	2.16498
LFL	(43000)	18.75	s	2.89022	5.70957
LFL Frac	(43000)	18.75	s	2.89022	5.70957
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0.751961	0.561915
LFL	(43000)	18.75	s	0.520307	0
LFL Frac	(43000)	18.75	s	0.520307	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\53.HA118

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\53.HA118

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

				Distance (m)	
				Diurno	Noturno
Radiation Level	5	kW/m2		7.70988	7.93484
Radiation Level	18.18	kW/m2		6.891	Not Reached
Radiation Level	100	kW/m2		Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\53.HA118

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\53.HA118

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

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Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\53.HA118

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	11.2981	10.9898
Radiation Level	18.18	kW/m2	6.61603	6.2625
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\53.HA118

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\53.HA118

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\53.HA118

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	29.3051	30.5794
Radiation Level	18.18	kW/m2	18.9168	18.6451
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\53.HA118

		Radiation Level (kW/m2)	
		Diurno	Noturno

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

Flash Fire Envelope

Path: \Terminal LLX\Etanol\53.HA118

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	2.89022	5.70957
Furthest Extent	43000	ppm	2.89022	5.70957
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0.520307	0
Furthest Extent	43000	ppm	0.520307	0

Weather Conditions

Path: \Terminal LLX\Etanol\53.HA118

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

54.HA120 e HA128

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\54.HA120 e HA128

User-Defined Data

Material

Material Identifier ETHANOL (Imported Study Etanol)

Scenario

Building Wake Effect None

Vessel/Tank

Release Type Continuous

Location

[Elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund Bund present
Bund Area 1600 m2
[Type of Bund Surface Concrete]
Bund Height 0.1 m
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 2.74 m/s
Droplet Diameter(1) 100 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25 degC
Release Rate(1) 109.2 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 7.073E6 kg
Model Risk Effects for Vertical Jet Fires Do not model vertical jet fires

Fireball Parameters

[Mass Modification Factor 3]
[Calculation method for fireball DNV Recommended]
[TNO model flame temperature 1727 degC]

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1176 m
North(1)	1039 m

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\54.HA120 e HA128

			Diurno	Noturno
Release Segment 1				
Release Duration	s		600	600
Liquid Rainout	fraction		0.996552	0.998659
Release Segment 1 Cloud Segment 1				
Cloud Segment Duration	s		55.1306	54.76
Pool Vaporization Rate	kg/s		0.746993	0.536321
Total Vapor Flowrate	kg/s		1.12337	0.682691
Release Segment 1 Cloud Segment 2				
Cloud Segment Duration	s		19.26	3545.24
Pool Vaporization Rate	kg/s		2.078	1.40247
Total Vapor Flowrate	kg/s		2.45438	1.54884
Release Segment 1 Cloud Segment 3				
Cloud Segment Duration	s		3525.61	
Pool Vaporization Rate	kg/s		1.79056	
Total Vapor Flowrate	kg/s		2.16694	1.40247
Maximum Pool Radius	m		22.5676	22.5676

Distance to Concentration Results

Path: \Terminal LLX\Etanol\54.HA120 e HA128

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	2.03193	1.83242
LFL	(43000)	18.75	s	7.98601	7.59971
LFL Frac	(43000)	18.75	s	7.98601	7.59971
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0	0
LFL	(43000)	18.75	s	0	0
LFL Frac	(43000)	18.75	s	0	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\54.HA120 e HA128

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\54.HA120 e HA128

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	30.7575	22.7042
Radiation Level	18.18	kW/m2	25.4307	18.6845
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\54.HA120 e HA128

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\54.HA120 e HA128

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\54.HA120 e HA128

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	82.2619	80.2091
Radiation Level	18.18	kW/m2	52.1522	48.659
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\54.HA120 e HA128

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\54.HA120 e HA128

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\54.HA120 e HA128

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	82.2619	80.2091
Radiation Level	18.18	kW/m2	52.1522	48.659
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\54.HA120 e HA128

		Radiation Level (kW/m2)	
		Diurno	Noturno

Flash Fire Envelope

Path: \Terminal LLX\Etanol\54.HA120 e HA128

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	7.98601	7.59971
Furthest Extent	43000	ppm	7.98601	7.59971
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0	0
Furthest Extent	43000	ppm	0	0

Weather Conditions

Path: \Terminal LLX\Etanol\54.HA120 e HA128

			Diurno	Noturno
Wind Speed	m/s		3.916	2.329
Pasquill Stability			D	F
Surface Roughness Length	mm		950.891	950.891
Surface Roughness Parameter			0.17	0.17
Atmospheric Temperature	degC		25.287	21.695
Surface Temperature	degC		25.287	21.695
Relative Humidity	fraction		0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

55.HA122

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\55.HA122

User-Defined Data

Material

Material Identifier ETHANOL (Imported Study Etanol)

Scenario

Building Wake Effect None

Vessel/Tank

Release Type Continuous

Location

[Elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund Bund present
Bund Area 4211 m2
[Type of Bund Surface Concrete]
[Bund Height 1.5 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 2.74 m/s
Droplet Diameter(1) 100 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25 degC
Release Rate(1) 109.2 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 7.073E6 kg
Model Risk Effects for Vertical Jet Fires Do not model vertical jet fires

Fireball Parameters

[Mass Modification Factor 3]
[Calculation method for fireball DNV Recommended]
[TNO model flame temperature 1727 degC]

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1382 m
North(1)	1261 m

SUMMARY REPORT

Unique Audit Number:

193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\55.HA122

		Diurno	Noturno
Release Segment 1			
Release Duration	s	600	600
Liquid Rainout	fraction	0.996552	0.998659
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	79.6556	78.7656
Pool Vaporization Rate	kg/s	1.1884	0.841296
Total Vapor Flowrate	kg/s	1.56477	0.987666
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	29.5469	29.3944
Pool Vaporization Rate	kg/s	3.23778	2.27235
Total Vapor Flowrate	kg/s	3.61416	2.41872
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s	22.4731	22.3706
Pool Vaporization Rate	kg/s	4.24868	2.98675
Total Vapor Flowrate	kg/s	4.62505	3.13312
Release Segment 1 Cloud Segment 4			
Cloud Segment Duration	s	19	18.92
Pool Vaporization Rate	kg/s	5.04018	3.55158
Total Vapor Flowrate	kg/s	5.41656	3.69795
Release Segment 1 Cloud Segment 5			
Cloud Segment Duration	s	15.7344	15.6719
Pool Vaporization Rate	kg/s	5.69034	4.01948
Total Vapor Flowrate	kg/s	6.06672	4.16585
Release Segment 1 Cloud Segment 6			
Cloud Segment Duration	s	3433.59	3434.88
Pool Vaporization Rate	kg/s	4.28799	3.35044
Total Vapor Flowrate	kg/s	4.66437	3.49681
Maximum Pool Radius	m	36.6115	36.6115

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Distance to Concentration Results

Path: \Terminal LLX\Etanol\55.HA122

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	2.29979	2.27079
LFL	(43000)	18.75	s	7.89447	8.96168
LFL Frac	(43000)	18.75	s	7.89447	8.96168
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0	0
LFL	(43000)	18.75	s	0	0
LFL Frac	(43000)	18.75	s	0	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\55.HA122

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\55.HA122

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

				Distance (m)	
				Diurno	Noturno
Radiation Level	5	kW/m2		30.7575	22.7042
Radiation Level	18.18	kW/m2		25.4307	18.6845
Radiation Level	100	kW/m2		Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\55.HA122

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\55.HA122

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\55.HA122

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	126.084	123.355
Radiation Level	18.18	kW/m2	80.1552	75.4464
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\55.HA122

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\55.HA122

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\55.HA122

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	126.084	123.355
Radiation Level	18.18	kW/m2	80.1552	75.4464
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\55.HA122

		Radiation Level (kW/m2)	
		Diurno	Noturno

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Flash Fire Envelope

Path: \Terminal LLX\Etanol\55.HA122

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	7.89447	8.96168
Furthest Extent	43000	ppm	7.89447	8.96168
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0	0
Furthest Extent	43000	ppm	0	0

Weather Conditions

Path: \Terminal LLX\Etanol\55.HA122

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

56.HA126

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\56.HA126

User-Defined Data

Material

Material Identifier	ETHANOL (Imported Study Etanol)
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Volume Inventory	9000 m3

Scenario

Scenario Type	Line rupture
Phase to be Released	Liquid
Building Wake Effect	None
Specify Pump Head	No pump head supplied
Tank Head	15.9 m
Number of Excess Flow Valves	0
Number of Non-Return Valves	0
Number of Shut-Off Valves	0

Pipe

Internal Diameter	254 mm
Line length	1 m

Location

[Elevation	1 m]
Use ERPG averaging time	ERPG not selected
Use IDLH averaging time	IDLH not selected
Use STEL averaging time	STEL not selected
Supply a user defined averaging time	Not supplied

Bund

Status of Bund	Bund present
Bund Area	4211 m2
[Type of Bund Surface	Concrete]
[Bund Height	1.5 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Jet Fire Method	Cone Model
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Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	7.073E6 kg

Fireball Parameters

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[TNO model flame temperature	1727 degC]

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1382 m
North(1)	1261 m

Path: \Terminal LLX\Etanol\56.HA126

Discharge Data

User-Defined Quantities

Material	ETHANOL (Imported Study Etanol)
Temperature	25,00 degC
Pressure	1,01 bar
Inventory	7.073.055,00 kg
Scenario	Line rupture
Fixed Duration	n/a s

Calculated Quantities

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Diurno

Mass Flow of Air (Vent from Vapor Space Only)	n/a
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Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
Final Temperature	25,04 degC
Final Velocity	11,61 m/s
Droplet Diameter	462,37 um
Continuous Release Data:	
Mass Flowrate	4.62132E+002 kg/s
Release Duration	3.600,00 s
Orifice Velocity	11,61 m/s
Exit Pressure	1,01 bar
Exit Temperature	25,04 degC
Discharge Coefficient	1,00
Expanded Radius	0,13 m

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Noturno

Mass Flow of Air (Vent from Vapor Space Only)	n/a
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SUMMARY REPORT

Study Folder: Terminal LLX

Unique Audit Number: 193.279

Phast 6.6



Average Values for Segment Number		1
Liquid Fraction		1,00 fraction
FinalTemperature		25,04 degC
Final Velocity		11,61 m/s
Droplet Diameter		462,37 um
Continuous Release Data:		
Mass Flowrate		4.62132E+002 kg/s
Release Duration		3.600,00 s
Orifice Velocity		11,61 m/s
Exit Pressure		1,01 bar
Exit Temperature		25,04 degC
Discharge Coefficient		1,00
Expanded Radius		0,13 m

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\56.HA126

		Diurno	Noturno
Release Segment 1			
Release Duration	s	3600	3600
Liquid Rainout	fraction	0.996739	0.997479
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	56.25	56.25
Pool Vaporization Rate	kg/s	1.73444	1.26165
Total Vapor Flowrate	kg/s	3.24149	2.42667
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	3543.75	19.0056
Pool Vaporization Rate	kg/s	5.29185	3.6442
Total Vapor Flowrate	kg/s	6.7989	4.80922
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s		3524.74
Pool Vaporization Rate	kg/s		4.037
Total Vapor Flowrate	kg/s		5.20202
Maximum Pool Radius	m	36.6115	36.6115

Distance to Concentration Results

Path: \Terminal LLX\Etanol\56.HA126

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL (190000)	18.75	s		6.57232	5.98273
LFL (43000)	18.75	s		19.3463	21.2605
LFL Frac (43000)	18.75	s		19.3463	21.2605
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL (190000)	18.75	s		0.169432	0.159137
LFL (43000)	18.75	s		0.0104121	0
LFL Frac (43000)	18.75	s		0.0104121	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\56.HA126

Jet fire method used: Cone model - DNV recommended

	Diurno	Noturno
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\56.HA126

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	55.1482	53.9729
Radiation Level	18.18	kW/m2	44.0479	43.126
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\56.HA126

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\56.HA126

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\56.HA126

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	131.08	127.866
Radiation Level	18.18	kW/m2	85.151	79.9568
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\56.HA126

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\56.HA126

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\56.HA126

				Distance (m)
				Diurno
				Noturno
Radiation Level	5	kW/m2	131.08	127.866
Radiation Level	18.18	kW/m2	85.151	79.9568
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\56.HA126

		Radiation Level (kW/m2)
		Diurno
		Noturno

Flash Fire Envelope

Path: \Terminal LLX\Etanol\56.HA126

All flammable results are reported at the cloud centreline height

				Distance (m)
				Diurno
				Noturno
Furthest Extent	43000	ppm	19.3463	21.2605
Furthest Extent	43000	ppm	19.3463	21.2605
				Heights (m) for above distances
				Diurno
				Noturno
Furthest Extent	43000	ppm	0.0104121	0
Furthest Extent	43000	ppm	0.0104121	0

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

Explosion Effects: Late Ignition

Path: \Terminal LLX\Etanol\56.HA126

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Center

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Diurno	Noturno
Overpressure	0.069	bar	30.9582	60.4691
Overpressure	0.1	bar	25.1967	49.2674
Overpressure	0.45	bar	12.9272	25.4124

			Supplementary Data at 0.069 bar	
			Diurno	Noturno
Supplied Flammable Mass	kg		1.20982	8.89148
Used Flammable Mass	kg		1.20982	8.89148
Overpressure Radius	m		25.9582	50.4691
Distance to:				
- Ignition Source	m		10	20
- Cloud Front/Centre	m		10	20
- Explosion Centre	m		5	10

			Supplementary Data at 0.1 bar	
			Diurno	Noturno
Supplied Flammable Mass	kg		1.20982	8.89148
Used Flammable Mass	kg		1.20982	8.89148
Overpressure Radius	m		20.1967	39.2674
Distance to:				
- Ignition Source	m		10	20
- Cloud Front/Centre	m		10	20
- Explosion Centre	m		5	10

			Supplementary Data at 0.45 bar	
			Diurno	Noturno
Supplied Flammable Mass	kg		1.20982	8.89148
Used Flammable Mass	kg		1.20982	8.89148
Overpressure Radius	m		7.92717	15.4124
Distance to:				
- Ignition Source	m		10	20
- Cloud Front/Centre	m		10	20
- Explosion Centre	m		5	10

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Weather Conditions

Path: \Terminal LLX\Etanol\56.HA126

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

57.HA130

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\57.HA130

User-Defined Data

Material

Material Identifier ETHANOL (Imported Study Etanol)

Scenario

Building Wake Effect None

Vessel/Tank

Release Type Continuous

Location

[Elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund Bund present
Bund Area 1800 m2
[Type of Bund Surface Concrete]
Bund Height 0.1 m
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 2.14 m/s
Droplet Diameter(1) 100 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25 degC
Release Rate(1) 54.57 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 7.073E6 kg
Model Risk Effects for Vertical Jet Fires Do not model vertical jet fires

Fireball Parameters

[Mass Modification Factor 3]
[Calculation method for fireball DNV Recommended]
[TNO model flame temperature 1727 degC]

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1134 m
North(1)	1163 m

SUMMARY REPORT

Unique Audit Number:

193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\57.HA130

			Diurno	Noturno
Release Segment 1				
Release Duration	s		600	600
Liquid Rainout	fraction		0.994046	0.998043
Release Segment 1 Cloud Segment 1				
Cloud Segment Duration	s		70.1406	68.89
Pool Vaporization Rate	kg/s		0.624071	0.44293
Total Vapor Flowrate	kg/s		0.948986	0.549729
Release Segment 1 Cloud Segment 2				
Cloud Segment Duration	s		26.39	26.6606
Pool Vaporization Rate	kg/s		1.6406	1.15818
Total Vapor Flowrate	kg/s		1.96551	1.26498
Release Segment 1 Cloud Segment 3				
Cloud Segment Duration	s		20.65	20.55
Pool Vaporization Rate	kg/s		2.1274	1.50855
Total Vapor Flowrate	kg/s		2.45232	1.61534
Release Segment 1 Cloud Segment 4				
Cloud Segment Duration	s		16.8	16.1494
Pool Vaporization Rate	kg/s		2.50045	1.77417
Total Vapor Flowrate	kg/s		2.82537	1.88097
Release Segment 1 Cloud Segment 5				
Cloud Segment Duration	s		3466.02	3467.75
Pool Vaporization Rate	kg/s		1.88752	1.47868
Total Vapor Flowrate	kg/s		2.21244	1.58548
Maximum Pool Radius	m		23.9365	23.9365

Distance to Concentration Results

Path: \Terminal LLX\Etanol\57.HA130

The height for user defined concentrations is the user defined height 1 m

All toxic results are reported at the toxic effect height 1 m

All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	1.45117	6.07935
LFL	(43000)	18.75	s	6.91379	14.0088
LFL Frac	(43000)	18.75	s	6.91379	14.0088
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0	0
LFL	(43000)	18.75	s	0	0
LFL Frac	(43000)	18.75	s	0	0

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Jet Fire Hazard

Path: \Terminal LLX\Etanol\57.HA130

Jet fire method used: Cone model - DNV recommended

	Diurno	Noturno
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\57.HA130

This table gives the distances to the specified radiation levels for each jet fire listed in the above hazard table

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	28.8985	19.8442
Radiation Level	18.18	kW/m2	23.9962	16.4266
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\57.HA130

	Radiation Level (kW/m2)
	Diurno
	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\57.HA130

	Diurno	Noturno
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\57.HA130

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	86.2804	84.2476
Radiation Level	18.18	kW/m2	54.5797	51.0489
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\57.HA130

	Radiation Level (kW/m2)
	Diurno
	Noturno

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\57.HA130

Late Pool Fire Status	Diurno	Noturno
	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\57.HA130

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	86.2804	84.2476
Radiation Level	18.18	kW/m2	54.5797	51.0489
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\57.HA130

	Radiation Level (kW/m2)	
	Diurno	Noturno

Flash Fire Envelope

Path: \Terminal LLX\Etanol\57.HA130

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	6.91379	14.0088
Furthest Extent	43000	ppm	6.91379	14.0088
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0	0
Furthest Extent	43000	ppm	0	0

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

Explosion Effects: Late Ignition

Path: \Terminal LLX\Etanol\57.HA130

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Center

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level
			Noturno
Overpressure	0.069	bar	55.8175
Overpressure	0.1	bar	44.5384
Overpressure	0.45	bar	20.5187

Supplementary Data at 0.069 bar

Noturno

Supplied Flammable Mass	kg	9.07687
Used Flammable Mass	kg	9.07687
Overpressure Radius	m	50.8175
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

Supplementary Data at 0.1 bar

Noturno

Supplied Flammable Mass	kg	9.07687
Used Flammable Mass	kg	9.07687
Overpressure Radius	m	39.5384
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

Supplementary Data at 0.45 bar

Noturno

Supplied Flammable Mass	kg	9.07687
Used Flammable Mass	kg	9.07687
Overpressure Radius	m	15.5187
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	5

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Weather Conditions

Path: \Terminal LLX\Etanol\57.HA130

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

58.HA132 e HA134

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\58.HA132 e HA134

User-Defined Data

Material

Material Identifier ETHANOL (Imported Study Etanol)

Scenario

Building Wake Effect None

Vessel/Tank

Release Type Continuous

Location

[Elevation 1 m]
Use ERPG averaging time ERPG not selected
Use IDLH averaging time IDLH not selected
Use STEL averaging time STEL not selected
Supply a user defined averaging time Not supplied

Bund

Status of Bund Bund present
Bund Area 976 m2
[Type of Bund Surface Concrete]
Bund Height 0.1 m
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 2.14 m/s
Droplet Diameter(1) 100 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25 degC
Release Rate(1) 54.57 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 7.073E6 kg
Model Risk Effects for Vertical Jet Fires Do not model vertical jet fires

Fireball Parameters

[Mass Modification Factor 3]
[Calculation method for fireball DNV Recommended]
[TNO model flame temperature 1727 degC]

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0.05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	1145 m
North(1)	1134 m

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\58.HA132 e HA134

			Diurno	Noturno
Release Segment 1				
Release Duration	s		600	600
Liquid Rainout	fraction		0.994046	0.998043
Release Segment 1 Cloud Segment 1				
Cloud Segment Duration	s		56.6256	56.25
Pool Vaporization Rate	kg/s		0.482924	0.34911
Total Vapor Flowrate	kg/s		0.807839	0.45591
Release Segment 1 Cloud Segment 2				
Cloud Segment Duration	s		20.8144	3543.75
Pool Vaporization Rate	kg/s		1.29381	0.852633
Total Vapor Flowrate	kg/s		1.61873	0.959432
Release Segment 1 Cloud Segment 3				
Cloud Segment Duration	s		3522.56	
Pool Vaporization Rate	kg/s		1.08339	
Total Vapor Flowrate	kg/s		1.40831	0.852633
Maximum Pool Radius	m		17.6258	17.6258

Distance to Concentration Results

Path: \Terminal LLX\Etanol\58.HA132 e HA134

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL (190000)	18.75	s		1.17217	4.69553
LFL (43000)	18.75	s		6.93262	10.9445
LFL Frac (43000)	18.75	s		6.93262	10.9445
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL (190000)	18.75	s		0	0
LFL (43000)	18.75	s		0	0
LFL Frac (43000)	18.75	s		0	0

Jet Fire Hazard

Path: \Terminal LLX\Etanol\58.HA132 e HA134

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\58.HA132 e HA134

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	28.8985	19.8442
Radiation Level	18.18	kW/m2	23.9962	16.4266
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\58.HA132 e HA134

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\58.HA132 e HA134

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\58.HA132 e HA134

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	65.8232	64.1432
Radiation Level	18.18	kW/m2	41.5616	38.6444
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\58.HA132 e HA134

		Radiation Level (kW/m2)	
		Diurno	Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\58.HA132 e HA134

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

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Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\58.HA132 e HA134

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	65.8232	64.1432
Radiation Level	18.18	kW/m2	41.5616	38.6444
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\58.HA132 e HA134

		Radiation Level (kW/m2)	
		Diurno	Noturno

Flash Fire Envelope

Path: \Terminal LLX\Etanol\58.HA132 e HA134

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	6.93262	10.9445
Furthest Extent	43000	ppm	6.93262	10.9445
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0	0
Furthest Extent	43000	ppm	0	0

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

Explosion Effects: Late Ignition

Path: \Terminal LLX\Etanol\58.HA132 e HA134

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Center

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level
			Noturno
Overpressure	0.069	bar	50.8009
Overpressure	0.1	bar	40.6353
Overpressure	0.45	bar	18.9868

Supplementary Data at 0.069 bar

			Noturno
Supplied Flammable Mass	kg		6.64539
Used Flammable Mass	kg		6.64539
Overpressure Radius	m		45.8009
Distance to:			
- Ignition Source	m		10
- Cloud Front/Centre	m		10
- Explosion Centre	m		5

Supplementary Data at 0.1 bar

			Noturno
Supplied Flammable Mass	kg		6.64539
Used Flammable Mass	kg		6.64539
Overpressure Radius	m		35.6353
Distance to:			
- Ignition Source	m		10
- Cloud Front/Centre	m		10
- Explosion Centre	m		5

Supplementary Data at 0.45 bar

			Noturno
Supplied Flammable Mass	kg		6.64539
Used Flammable Mass	kg		6.64539
Overpressure Radius	m		13.9868
Distance to:			
- Ignition Source	m		10
- Cloud Front/Centre	m		10
- Explosion Centre	m		5

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Weather Conditions

Path: \Terminal LLX\Etanol\58.HA132 e HA134

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

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Study Folder: Terminal LLX

Phast 6.6

59.HA136

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\59.HA136

User-Defined Data

Material

Material Identifier	ETHANOL (Imported Study Etanol)
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Volume Inventory	9000 m3

Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	15.9 m

Location

[Elevation	1 m]
Use ERPG averaging time	ERPG not selected
Use IDLH averaging time	IDLH not selected
Use STEL averaging time	STEL not selected
Supply a user defined averaging time	Not supplied

Bund

Status of Bund	Bund present
Bund Area	4211 m2
[Type of Bund Surface	Concrete]
[Bund Height	1.5 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
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Flammable

Jet Fire Method	Cone Model
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Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	7.073E6 kg
Use Burst Pressure	No - Use release pressure for fireball

Fireball Parameters

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[TNO model flame temperature	1727 degC]

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]

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Study Folder: Terminal LLX

Phast 6.6

[Set averaging time equal to exposure time Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation 0.05 fraction]
[Cut-off concentration for exposure time calculations 0 fraction]

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 1382 m
North(1) 1261 m

Path: \Terminal LLX\Etanol\59.HA136

Discharge Data

User-Defined Quantities

Material ETHANOL (Imported Study Etanol)
Temperature 25,00 degC
Pressure 1,01 bar
Inventory 7.073.055,00 kg
Scenario Catastrophic rupture
Fixed Duration n/a s

Calculated Quantities

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Diurno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
FinalTemperature 24,99 degC
Final Velocity 5,58 m/s
Droplet Diameter 10.000,00 um

Continuous Release Data:

Mass Flowrate n/a kg/s
Release Duration n/a s
Orifice Velocity n/a m/s
Exit Pressure n/a bar
Exit Temperature n/a degC
Discharge Coefficient n/a
Expanded Radius n/a m

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Noturno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
FinalTemperature 24,99 degC
Final Velocity 5,58 m/s
Droplet Diameter 10.000,00 um

Continuous Release Data:

Mass Flowrate n/a kg/s

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Study Folder: Terminal LLX

Phast 6.6

Release Duration	n/a s
Orifice Velocity	n/a m/s
Exit Pressure	n/a bar
Exit Temperature	n/a degC
Discharge Coefficient	n/a
Expanded Radius	n/a m

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Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\59.HA136

N.B. Pool vaporization segments begin when the cloud has left the pool

		Diurno	Noturno
Liquid Rainout	fraction	0.99483	0.994795
Initial Vapor Cloud	kg	36564.5	36818.5
Time Pool Left Behind	s	74.3876	136.188

Cloud Segment 1

Cloud Segment Duration	s	3600	3600
Pool Vaporization Rate	kg/s	5.46482	4.01764

Maximum Pool Radius	m	36.6115	36.6115
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Distance to Concentration Results

Path: \Terminal LLX\Etanol\59.HA136

The height for user defined concentrations is the user defined height 1 m

All toxic results are reported at the toxic effect height 1 m

All flammable results are reported at the cloud centreline height

Concentration(ppm)	Averaging Time		Diurno	Noturno
UFL (190000)	18.75	s	72.1136	69.1183
LFL (43000)	18.75	s	86.8895	97.7392
LFL Frac (43000)	18.75	s	86.8895	97.7392

Concentration(ppm)	Averaging Time		Diurno	Heights (m) for above distances
UFL (190000)	18.75	s	1	Noturno
LFL (43000)	18.75	s	0	1
LFL Frac (43000)	18.75	s	0	0

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\59.HA136

	Diurno	Noturno
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\59.HA136

			Diurno	Distance (m)
Radiation Level	5	kW/m2	150.899	Noturno
Radiation Level	18.18	kW/m2	104.97	144.928
Radiation Level	100	kW/m2	Not Reached	97.0191

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Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\59.HA136

	Radiation Level (kW/m2)
Diurno	Noturno

Fireball Hazard

Path: \Terminal LLX\Etanol\59.HA136

	Diurno	Noturno
Fireball Flame Status	No Hazard	No Hazard

Flash Fire Envelope

Path: \Terminal LLX\Etanol\59.HA136

All flammable results are reported at the cloud centreline height

			Diurno	Distance (m)
				Noturno
Furthest Extent	43000	ppm	86.8895	97.7392
Furthest Extent	43000	ppm	86.8895	97.7392

			Diurno	Heights (m) for above distances
				Noturno
Furthest Extent	43000	ppm	0	0
Furthest Extent	43000	ppm	0	0

Explosion Effects: Early Explosion

Path: \Terminal LLX\Etanol\59.HA136

Early Explosions are assumed to be centered at the release location
Explosion Model Used : TNT

			Diurno	Noturno
Supplied Flammable Mass		kg	7.07305e+006	7.07305e+006

			Distance (m) at Overpressure Levels	
			Diurno	Noturno
Overpressure	0.069	bar	No Hazard	No Hazard
Overpressure	0.1	bar	No Hazard	No Hazard
Overpressure	0.45	bar	No Hazard	No Hazard

			Used Mass (kg) at Overpressure Levels	
			Diurno	Noturno
Overpressure	0.069	bar	0	0
Overpressure	0.1	bar	0	0
Overpressure	0.45	bar	0	0

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Explosion Effects: Late Ignition

Path: \Terminal LLX\Etanol\59.HA136

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Center

All distances are measured from the Source

All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Diurno	Noturno
Overpressure	0.069	bar	487.487	462.507
Overpressure	0.1	bar	384.685	366.881
Overpressure	0.45	bar	165.759	163.238

Supplementary Data at 0.069 bar

			Diurno	Noturno
Supplied Flammable Mass	kg		6872.62	5531.49
Used Flammable Mass	kg		6872.62	5531.49
Overpressure Radius	m		463.171	430.839
Distance to:				
- Ignition Source	m		70	70
- Cloud Front/Centre	m		24.3153	31.6678
- Explosion Centre	m		24.3153	31.6678

Supplementary Data at 0.1 bar

			Diurno	Noturno
Supplied Flammable Mass	kg		6872.62	5531.49
Used Flammable Mass	kg		6872.62	5531.49
Overpressure Radius	m		360.37	335.213
Distance to:				
- Ignition Source	m		70	70
- Cloud Front/Centre	m		24.3153	31.6678
- Explosion Centre	m		24.3153	31.6678

Supplementary Data at 0.45 bar

			Diurno	Noturno
Supplied Flammable Mass	kg		6872.62	5531.49
Used Flammable Mass	kg		6872.62	5531.49
Overpressure Radius	m		141.444	131.57
Distance to:				
- Ignition Source	m		70	70
- Cloud Front/Centre	m		24.3153	31.6678
- Explosion Centre	m		24.3153	31.6678

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Weather Conditions

Path: \Terminal LLX\Etanol\59.HA136

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

60.HA137

Base Case

CASE Name: Data

Path: \Terminal LLX\Etanol\60.HA137

User-Defined Data

Material

Material Identifier	ETHANOL (Imported Study Etanol)
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Volume Inventory	9000 m3

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10 mm
Building Wake Effect	None
Tank Head	15.9 m

Location

[Elevation	1 m]
Use ERPG averaging time	ERPG not selected
Use IDLH averaging time	IDLH not selected
Use STEL averaging time	STEL not selected
Supply a user defined averaging time	Not supplied

Bund

Status of Bund	Bund present
Bund Area	4211 m2
[Type of Bund Surface	Concrete]
[Bund Height	1.5 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Jet Fire Method	Cone Model
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Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	7.073E6 kg

Fireball Parameters

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[TNO model flame temperature	1727 degC]

Toxic Parameters

[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]

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Study Folder: Terminal LLX

Phast 6.6

[Tail Time 1800 s]
[Set averaging time equal to exposure time Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation 0.05 fraction]
[Cut-off concentration for exposure time calculations 0 fraction]

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 1382 m
North(1) 1261 m

Path: \Terminal LLX\Etanol\60.HA137

Discharge Data

User-Defined Quantities

Material ETHANOL (Imported Study Etanol)
Temperature 25,00 degC
Pressure 1,01 bar
Inventory 7.073.055,00 kg
Scenario Leak
Fixed Duration n/a s

Calculated Quantities

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Diurno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 24,98 degC
Final Velocity 19,34 m/s
Droplet Diameter 462,37 um

Continuous Release Data:

Mass Flowrate 7.16306E-001 kg/s
Release Duration 3.600,00 s
Orifice Velocity 19,34 m/s
Exit Pressure 1,01 bar
Exit Temperature 24,98 degC
Discharge Coefficient 0,60
Expanded Radius 0,00 m

Weather: Etanol\Estação Automatica MPX (from Global Weathers)\Noturno

Mass Flow of Air (Vent from Vapor Space Only) n/a

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction
Final Temperature 24,98 degC
Final Velocity 19,34 m/s
Droplet Diameter 462,37 um

Continuous Release Data:

SUMMARY REPORT

Unique Audit Number: 193.279



Study Folder: Terminal LLX

Phast 6.6

Mass Flowrate	7.16306E-001 kg/s
Release Duration	3.600,00 s
Orifice Velocity	19,34 m/s
Exit Pressure	1,01 bar
Exit Temperature	24,98 degC
Discharge Coefficient	0,60
Expanded Radius	0,00 m

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Study Folder: Terminal LLX

Phast 6.6

Consequence Results

Pool Vaporization Results

Path: \Terminal LLX\Etanol\60.HA137

		Diurno	Noturno
Release Segment 1			
Release Duration	s	3600	3600
Liquid Rainout	fraction	0.917462	0.927057
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	956.356	1003.31
Pool Vaporization Rate	kg/s	0.106276	0.0808458
Total Vapor Flowrate	kg/s	0.165399	0.133095
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	446.147	452.117
Pool Vaporization Rate	kg/s	0.22782	0.179457
Total Vapor Flowrate	kg/s	0.286943	0.231706
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s	361.497	361.468
Pool Vaporization Rate	kg/s	0.28083	0.224355
Total Vapor Flowrate	kg/s	0.339953	0.276605
Release Segment 1 Cloud Segment 4			
Cloud Segment Duration	s	607.69	315.24
Pool Vaporization Rate	kg/s	0.333847	0.257839
Total Vapor Flowrate	kg/s	0.39297	0.310088
Release Segment 1 Cloud Segment 5			
Cloud Segment Duration	s	1009.73	551.109
Pool Vaporization Rate	kg/s	0.404082	0.296196
Total Vapor Flowrate	kg/s	0.463204	0.348445
Release Segment 1 Cloud Segment 6			
Cloud Segment Duration	s	218.578	916.76
Pool Vaporization Rate	kg/s	0.447407	0.352012
Total Vapor Flowrate	kg/s	0.50653	0.404262
Maximum Pool Radius	m	10.4446	11.288

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Study Folder: Terminal LLX

Phast 6.6

Distance to Concentration Results

Path: \Terminal LLX\Etanol\60.HA137

The height for user defined concentrations is the user defined height 1 m
All toxic results are reported at the toxic effect height 1 m
All flammable results are reported at the cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno	Noturno
UFL	(190000)	18.75	s	2.94151	3.28026
LFL	(43000)	18.75	s	4.7698	6.74814
LFL Frac	(43000)	18.75	s	4.7698	6.74814
Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno	Noturno
UFL	(190000)	18.75	s	0.861108	0.801658
LFL	(43000)	18.75	s	0.630611	0.204373
LFL Frac	(43000)	18.75	s	0.630611	0.204373

Jet Fire Hazard

Path: \Terminal LLX\Etanol\60.HA137

Jet fire method used: Cone model - DNV recommended

		Diurno	Noturno
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \Terminal LLX\Etanol\60.HA137

This table gives the distances to the specified radiation levels
for each jet fire listed in the above hazard table

				Distance (m)	
				Diurno	Noturno
Radiation Level	5	kW/m2		12.766	13.2788
Radiation Level	18.18	kW/m2		10.0884	10.7967
Radiation Level	100	kW/m2		Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \Terminal LLX\Etanol\60.HA137

		Radiation Level (kW/m2)	
		Diurno	Noturno

Early Pool Fire Hazard

Path: \Terminal LLX\Etanol\60.HA137

		Diurno	Noturno
Early Pool Fire Status		Hazard	Hazard

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Study Folder: Terminal LLX

Phast 6.6

Radiation Effects: Early Pool Fire Ellipse

Path: \Terminal LLX\Etanol\60.HA137

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	17.3877	17.0183
Radiation Level	18.18	kW/m2	11.3712	10.7494
Radiation Level	100	kW/m2		

Radiation Effects: Early Pool Fire Distance

Path: \Terminal LLX\Etanol\60.HA137

		Radiation Level (kW/m2)
		Diurno
		Noturno

Late Pool Fire Hazard

Path: \Terminal LLX\Etanol\60.HA137

		Diurno	Noturno
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \Terminal LLX\Etanol\60.HA137

			Distance (m)	
			Diurno	Noturno
Radiation Level	5	kW/m2	45.0258	46.7107
Radiation Level	18.18	kW/m2	29.6316	29.2984
Radiation Level	100	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \Terminal LLX\Etanol\60.HA137

		Radiation Level (kW/m2)
		Diurno
		Noturno

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Study Folder: Terminal LLX

Phast 6.6

Flash Fire Envelope

Path: \Terminal LLX\Etanol\60.HA137

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno	Noturno
Furthest Extent	43000	ppm	4.7698	6.74814
Furthest Extent	43000	ppm	4.7698	6.74814
			Heights (m) for above distances	
			Diurno	Noturno
Furthest Extent	43000	ppm	0.630611	0.204373
Furthest Extent	43000	ppm	0.630611	0.204373

Weather Conditions

Path: \Terminal LLX\Etanol\60.HA137

		Diurno	Noturno
Wind Speed	m/s	3.916	2.329
Pasquill Stability		D	F
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	25.287	21.695
Surface Temperature	degC	25.287	21.695
Relative Humidity	fraction	0.69625	0.84719