

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

UTE Pampa rev 0 Hidrogenio

Study

Cenário 002A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 kg

Fireball Parameters

[Mass Modification Factor	3]
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[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]

Multi Energy Explosion

Use Unconfined Strength] Do not use unconfined strength
Use Fractions] Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction]

Geometry

Shape] Point
Dimension] 2D
System] Absolute
East(1) 0 m
North(1) 0 m]

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Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	703.00 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

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Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	695.43 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

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Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

			Dia	Noite
	Release Segment 1			
Release Duration	s		600	600
Liquid Rainout	fraction		0.943826	0.947333
Maximum Pool Radius	m		5.60193	5.61013

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		Hazard	Hazard
Flame Direction		Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

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

			Dia	Noite
Radiation Level	3	kW/m2	9.53352	9.17269
Radiation Level	12.5	kW/m2	5.17448	4.81731
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

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Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

	Dia	Radiation Level (kW/m2)
	Noite	

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	28.3936	27.7117
Radiation Level	12.5	kW/m2	20.7824	19.8608
Radiation Level	37.5	kW/m2	14.3883	13.5876
Radiation Level	44	kW/m2	13.5262	12.7963

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

	Dia	Radiation Level (kW/m2)
	Noite	

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	46.7364	45.1935
Radiation Level	12.5	kW/m2	30.1177	28.1165
Radiation Level	37.5	kW/m2	16.4125	15.8611
Radiation Level	44	kW/m2	16.4125	15.8611

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Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

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Phast 6.7

Cenário 002H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

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Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	703.00 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	695.43 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

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Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.985013	0.985624
Maximum Pool Radius	m		5.72211	5.72255

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	
LFL (7000)	18.75	s	4.288	No Hazard	
LFL Frac (7000)	18.75	s	4.288	No Hazard	
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	
LFL (7000)	18.75	s	0	0	
LFL Frac (7000)	18.75	s	0	0	

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	5.76623	5.89985	
Radiation Level	12.5	kW/m2	3.76023	3.86571	
Radiation Level	37.5	kW/m2	2.55485	Not Reached	
Radiation Level	44	kW/m2	Not Reached	Not Reached	

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

	Dia	Radiation Level (kW/m2)
	Noite	

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	23.2676	23.1052
Radiation Level	12.5	kW/m2	15.5418	15.1447
Radiation Level	37.5	kW/m2	9.04394	8.77555
Radiation Level	44	kW/m2	8.14558	7.96859

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

	Dia	Radiation Level (kW/m2)
	Noite	

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	41.7069	40.6593
Radiation Level	12.5	kW/m2	24.8257	23.3385
Radiation Level	37.5	kW/m2	11.1371	11.1216
Radiation Level	44	kW/m2	11.1371	11.1216

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Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

	Radiation Level (kW/m2)
Dia	
Noite	

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

All flammable results are reported at the flammable effect height 0 m

				Distance (m)
				Dia
Furthest Extent	7000	ppm		4.288
Furthest Extent	7000	ppm		4.288
				Heights (m) for above distances
				Dia
Furthest Extent	7000	ppm		0
Furthest Extent	7000	ppm		0

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 002I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	703.00 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	695.43 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

Release Segment 1		Dia	Noite
Release Duration	s	600	600
Liquid Rainout	fraction	1	1
Maximum Pool Radius	m	5.76474	5.76419

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	Noite
LFL (7000)	18.75	s	0	0	Noite
LFL Frac (7000)	18.75	s	0	0	Noite

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	No Hazard	No Hazard
Flame Direction	Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

			Dia	Noite
Radiation Level	3	kW/m2	18.9486	18.7965
Radiation Level	12.5	kW/m2	11.1821	10.7956
Radiation Level	37.5	kW/m2	4.64565	4.39151
Radiation Level	44	kW/m2	3.74325	3.57063

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

			Dia	Noite
Radiation Level	3	kW/m2	37.42	36.3765
Radiation Level	12.5	kW/m2	20.4444	18.9649
Radiation Level	37.5	kW/m2	6.76474	6.76419
Radiation Level	44	kW/m2	6.76474	6.76419

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 002V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	703.00 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	695.43 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

			Dia	Noite
	Release Segment 1			
Release Duration	s		600	600
Liquid Rainout	fraction		0.937254	0.94076
Maximum Pool Radius	m		5.58241	5.59062

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		Hazard	Hazard
Flame Direction		Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	9.4411	9.21441	
Radiation Level	12.5	kW/m2	5.26769	4.70586	
Radiation Level	37.5	kW/m2	2.99696	Not Reached	
Radiation Level	44	kW/m2	44	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	27.5402	26.171
Radiation Level	12.5	kW/m2	19.9476	18.3392
Radiation Level	37.5	kW/m2	13.5672	12.0844
Radiation Level	44	kW/m2	12.7092	11.293

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	45.8666	43.6398
Radiation Level	12.5	kW/m2	29.2902	26.6042
Radiation Level	37.5	kW/m2	15.5835	14.3437
Radiation Level	44	kW/m2	15.5835	14.3437

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 002V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 003A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Angle 45 deg
Outdoor Release Direction Angled from Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 10.94 m/s
Droplet Diameter(1) 1952 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.06 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.988609	0.989622
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	200.931	179.56
Pool Vaporization Rate	kg/s	0.121023	0.0576759
Total Vapor Flowrate	kg/s	0.347022	0.263567
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.795	78.8456
Pool Vaporization Rate	kg/s	0.307195	0.131444
Total Vapor Flowrate	kg/s	0.533194	0.337335
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.755	61.11
Pool Vaporization Rate	kg/s	0.406193	0.168733
Total Vapor Flowrate	kg/s	0.632192	0.374624
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.5819	52.01
Pool Vaporization Rate	kg/s	0.48741	0.198241
Total Vapor Flowrate	kg/s	0.713409	0.404132
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6181	46.6769
Pool Vaporization Rate	kg/s	0.558204	0.223619
Total Vapor Flowrate	kg/s	0.784203	0.42951
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.95	81.32
Pool Vaporization Rate	kg/s	0.649891	0.256086
Total Vapor Flowrate	kg/s	0.875891	0.461977
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	100.477
Pool Vaporization Rate	kg/s	0.780225	0.301519
Total Vapor Flowrate	kg/s	1.00622	0.50741
Maximum Pool Radius	m	32.1566	32.1246

SUMMARY REPORT

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time			Dia	Noite
UFL (56000)	18.75	s		No Hazard	No Hazard
LFL (7000)	18.75	s		10.0927	10.2592
LFL Frac (7000)	18.75	s		10.0927	10.2592

Concentration(ppm)	Averaging Time			Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

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

			Dia	Noite
Radiation Level	3	kW/m2	22.7456	21.5807
Radiation Level	12.5	kW/m2	12.7084	11.6016
Radiation Level	37.5	kW/m2	7.8308	Not Reached
Radiation Level	44	kW/m2	6.31262	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

	Dia	Noite
Radiation Level (kW/m2)		

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

			Dia	Noite
Radiation Level	3	kW/m2	58.9281	57.6218
Radiation Level	12.5	kW/m2	30.6124	29.3043
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

			Dia	Noite
Radiation Level	3	kW/m2	113.914	109.423
Radiation Level	12.5	kW/m2	45.6188	44.6123
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	10.0927	10.2592	
Furthest Extent	7000	ppm	10.0927	10.2592	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level	
			Dia	Noite
Overpressure	0.05	bar	35.5171	33.1673
Overpressure	0.1	bar	23.7763	22.5077
Overpressure	0.3	bar	15.4506	14.9487
Overpressure	0.4	bar	13.9451	13.5818

			Supplementary Data at 0.05 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.283528	0.212192
Used Flammable Mass				
Overpressure Radius		m	25.5171	23.1673
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.1 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.283528	0.212192
Used Flammable Mass				
Overpressure Radius		m	13.7763	12.5077
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.3 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.283528	0.212192
Used Flammable Mass				
Overpressure Radius		m	5.45058	4.94866
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.4 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.283528	0.212192
Used Flammable Mass				
Overpressure Radius		m	3.94506	3.58177
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre	m	10	10
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Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 003H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 10.94 m/s
Droplet Diameter(1) 1952 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.06 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.997469	0.997626
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	198.81	176.89
Pool Vaporization Rate	kg/s	0.125643	0.0605714
Total Vapor Flowrate	kg/s	0.17586	0.107665
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.2456	79.11
Pool Vaporization Rate	kg/s	0.31596	0.136271
Total Vapor Flowrate	kg/s	0.366178	0.183365
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	60.5044	61.7306
Pool Vaporization Rate	kg/s	0.417894	0.174716
Total Vapor Flowrate	kg/s	0.468112	0.22181
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.5156	52.8319
Pool Vaporization Rate	kg/s	0.501191	0.20525
Total Vapor Flowrate	kg/s	0.551408	0.252344
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.5644	46.6181
Pool Vaporization Rate	kg/s	0.573193	0.231336
Total Vapor Flowrate	kg/s	0.62341	0.27843
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.8625	82.3419
Pool Vaporization Rate	kg/s	0.666367	0.264658
Total Vapor Flowrate	kg/s	0.716585	0.311751
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	91.4975	100.477
Pool Vaporization Rate	kg/s	0.799699	0.311139
Total Vapor Flowrate	kg/s	0.849917	0.358233
Maximum Pool Radius	m	32.2978	32.2557

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	4.77993	4.81917
LFL (7000)	18.75	s	10.5517	6.94538
LFL Frac (7000)	18.75	s	10.5517	6.94538

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

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

			Distance (m)	
Radiation Level			Dia	Noite
3	kW/m2		12.8956	13.0837
12.5	kW/m2		9.10264	9.33152
37.5	kW/m2		7.27337	7.51554
44	kW/m2		7.07469	7.43305

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

	Radiation Level (kW/m2)
Dia	Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

			Dia	Noite
Radiation Level	3	kW/m2	52.6483	51.5541
Radiation Level	12.5	kW/m2	24.126	23.0716
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

			Dia	Distance (m)
				Noite
Radiation Level	3	kW/m2	107.886	103.587
Radiation Level	12.5	kW/m2	39.3813	38.5981
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	10.5517	6.94538	
Furthest Extent	7000	ppm	10.5517	6.94538	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level
			Dia
Overpressure	0.05	bar	36.202
Overpressure	0.1	bar	24.1461
Overpressure	0.3	bar	15.5969
Overpressure	0.4	bar	14.0509

Supplementary Data at 0.05 bar

Dia

Supplied Flammable Mass	kg	0.306975
Used Flammable Mass		
Overpressure Radius	m	26.202
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.1 bar

Dia

Supplied Flammable Mass	kg	0.306975
Used Flammable Mass		
Overpressure Radius	m	14.1461
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.3 bar

Dia

Supplied Flammable Mass	kg	0.306975
Used Flammable Mass		
Overpressure Radius	m	5.59687
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.4 bar

Dia

Supplied Flammable Mass	kg	0.306975
Used Flammable Mass		
Overpressure Radius	m	4.05094
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre m 10

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 003I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Down - Impinging on the Ground

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 10.94 m/s
Droplet Diameter(1) 1952 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.06 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	1	1
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	198.106	176.226
Pool Vaporization Rate	kg/s	0.127043	0.0615532
Total Vapor Flowrate	kg/s	0.127044	0.0615538
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.1169	78.975
Pool Vaporization Rate	kg/s	0.318381	0.137838
Total Vapor Flowrate	kg/s	0.318382	0.137838
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	60.4181	61.6394
Pool Vaporization Rate	kg/s	0.420768	0.176508
Total Vapor Flowrate	kg/s	0.420769	0.176509
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.4494	52.7606
Pool Vaporization Rate	kg/s	0.504405	0.207202
Total Vapor Flowrate	kg/s	0.504406	0.207202
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	44.55	89.43
Pool Vaporization Rate	kg/s	0.577494	0.244592
Total Vapor Flowrate	kg/s	0.577494	0.244592
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.8625	112.179
Pool Vaporization Rate	kg/s	0.671917	0.296544
Total Vapor Flowrate	kg/s	0.671918	0.296544
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	91.4975	28.79
Pool Vaporization Rate	kg/s	0.805907	0.332305
Total Vapor Flowrate	kg/s	0.805907	0.332305
Maximum Pool Radius	m	32.3379	32.2944

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	Noite
LFL (7000)	18.75	s	0	0	Noite
LFL Frac (7000)	18.75	s	0	0	Noite

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Along Ground	Along Ground

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

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

			Dia	Noite
Radiation Level	3	kW/m2	Not Reached	Not Reached
Radiation Level	12.5	kW/m2	Not Reached	Not Reached
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

			Dia	Noite
Radiation Level	3	kW/m2	47.7798	46.6469
Radiation Level	12.5	kW/m2	19.2313	18.1424
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	103.089	98.7482
Radiation Level	12.5	kW/m2	34.5248	33.6501
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

	Dia	Radiation Level (kW/m2)
		Noite

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 003V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Vertical

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 10.94 m/s
Droplet Diameter(1) 1952 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.06 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.983855	0.985124
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	201.64	180.231
Pool Vaporization Rate	kg/s	0.11867	0.0560457
Total Vapor Flowrate	kg/s	0.438995	0.35119
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.9225	78.9794
Pool Vaporization Rate	kg/s	0.30284	0.12872
Total Vapor Flowrate	kg/s	0.623166	0.423864
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.84	61.2
Pool Vaporization Rate	kg/s	0.40098	0.165599
Total Vapor Flowrate	kg/s	0.721305	0.460743
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	49.66	52.08
Pool Vaporization Rate	kg/s	0.480812	0.194814
Total Vapor Flowrate	kg/s	0.801137	0.489958
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6181	46.7356
Pool Vaporization Rate	kg/s	0.550271	0.219955
Total Vapor Flowrate	kg/s	0.870596	0.515099
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.95	81.415
Pool Vaporization Rate	kg/s	0.641145	0.252138
Total Vapor Flowrate	kg/s	0.96147	0.547281
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	99.3594
Pool Vaporization Rate	kg/s	0.770379	0.296895
Total Vapor Flowrate	kg/s	1.0907	0.592039
Maximum Pool Radius	m	32.0803	32.0507

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	5.89514	4.30283
LFL Frac (7000)	18.75	s	5.89514	4.30283

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

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

			Dia	Noite
Radiation Level	3	kW/m2	25.3955	24.4898
Radiation Level	12.5	kW/m2	14.3136	12.8417
Radiation Level	37.5	kW/m2	8.99051	7.71481
Radiation Level	44	kW/m2	8.3949	6.55396

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

	Dia	Noite
Radiation Level (kW/m2)		

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

			Dia	Noite
Radiation Level	3	kW/m2	55.7328	52.3649
Radiation Level	12.5	kW/m2	27.4902	24.1074
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

			Dia	Distance (m)
				Noite
Radiation Level	3	kW/m2	110.582	104.035
Radiation Level	12.5	kW/m2	42.4004	39.33
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	5.89514	4.30283	
Furthest Extent	7000	ppm	5.89514	4.30283	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 003V

			Dia	Noite
Wind Speed	m/s		3.73	2.78
Pasquill Stability			C/D	D
Surface Roughness Length	mm		950.891	950.891
Surface Roughness Parameter			0.17	0.17
Atmospheric Temperature	degC		19.6	16.5
Surface Temperature	degC		24.6	16.5
Relative Humidity	fraction		0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 005A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	703.00 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	695.43 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.943826	0.947333
Maximum Pool Radius	m		5.60193	5.61013

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	9.53352	9.17269	
Radiation Level	12.5	kW/m2	5.17448	4.81731	
Radiation Level	37.5	kW/m2	Not Reached	Not Reached	
Radiation Level	44	kW/m2	Not Reached	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	28.3936	27.7117
Radiation Level	12.5	kW/m2	20.7824	19.8608
Radiation Level	37.5	kW/m2	14.3883	13.5876
Radiation Level	44	kW/m2	13.5262	12.7963

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	46.7364	45.1935
Radiation Level	12.5	kW/m2	30.1177	28.1165
Radiation Level	37.5	kW/m2	16.4125	15.8611
Radiation Level	44	kW/m2	16.4125	15.8611

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 005H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	703.00 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	695.43 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

			Dia	Noite
	Release Segment 1			
Release Duration	s		600	600
Liquid Rainout	fraction		0.985013	0.985624
Maximum Pool Radius	m		5.72211	5.72255

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	4.288	No Hazard
LFL Frac (7000)	18.75	s	4.288	No Hazard

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		Hazard	Hazard
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	5.76623	5.89985	
Radiation Level	12.5	kW/m2	3.76023	3.86571	
Radiation Level	37.5	kW/m2	2.55485	Not Reached	
Radiation Level	44	kW/m2	Not Reached	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	23.2676	23.1052
Radiation Level	12.5	kW/m2	15.5418	15.1447
Radiation Level	37.5	kW/m2	9.04394	8.77555
Radiation Level	44	kW/m2	8.14558	7.96859

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	41.7069	40.6593
Radiation Level	12.5	kW/m2	24.8257	23.3385
Radiation Level	37.5	kW/m2	11.1371	11.1216
Radiation Level	44	kW/m2	11.1371	11.1216

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

	Radiation Level (kW/m2)
Dia	Noite

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

All flammable results are reported at the flammable effect height 0 m

				Distance (m)
				Dia
Furthest Extent	7000	ppm		4.288
Furthest Extent	7000	ppm		4.288
				Heights (m) for above distances
				Dia
Furthest Extent	7000	ppm		0
Furthest Extent	7000	ppm		0

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 005I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	703.00 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	695.43 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		1	1
Maximum Pool Radius	m		5.76474	5.76419

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)		Averaging Time		Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	No Hazard	No Hazard
Flame Direction	Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

			Dia	Noite
Radiation Level	3	kW/m2	18.9486	18.7965
Radiation Level	12.5	kW/m2	11.1821	10.7956
Radiation Level	37.5	kW/m2	4.64565	4.39151
Radiation Level	44	kW/m2	3.74325	3.57063

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

			Dia	Noite
Radiation Level	3	kW/m2	37.42	36.3765
Radiation Level	12.5	kW/m2	20.4444	18.9649
Radiation Level	37.5	kW/m2	6.76474	6.76419
Radiation Level	44	kW/m2	6.76474	6.76419

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 005V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
-------------------------------	-----------------

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	703.00 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.33301E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.98 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	18.23 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.98 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	695.43 um
- Expanded Radius	0.00 m
- Velocity	18.23 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.937254	0.94076
Maximum Pool Radius	m		5.58241	5.59062

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	9.4411	9.21441	
Radiation Level	12.5	kW/m2	5.26769	4.70586	
Radiation Level	37.5	kW/m2	2.99696	Not Reached	
Radiation Level	44	kW/m2	44	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	27.5402	26.171
Radiation Level	12.5	kW/m2	19.9476	18.3392
Radiation Level	37.5	kW/m2	13.5672	12.0844
Radiation Level	44	kW/m2	12.7092	11.293

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	45.8666	43.6398
Radiation Level	12.5	kW/m2	29.2902	26.6042
Radiation Level	37.5	kW/m2	15.5835	14.3437
Radiation Level	44	kW/m2	15.5835	14.3437

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 005V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 006A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Angle 45 deg
Outdoor Release Direction Angled from Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 10.94 m/s
Droplet Diameter(1) 1952 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.06 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.988609	0.989622
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	200.931	179.56
Pool Vaporization Rate	kg/s	0.121023	0.0576759
Total Vapor Flowrate	kg/s	0.347022	0.263567
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.795	78.8456
Pool Vaporization Rate	kg/s	0.307195	0.131444
Total Vapor Flowrate	kg/s	0.533194	0.337335
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.755	61.11
Pool Vaporization Rate	kg/s	0.406193	0.168733
Total Vapor Flowrate	kg/s	0.632192	0.374624
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.5819	52.01
Pool Vaporization Rate	kg/s	0.48741	0.198241
Total Vapor Flowrate	kg/s	0.713409	0.404132
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6181	46.6769
Pool Vaporization Rate	kg/s	0.558204	0.223619
Total Vapor Flowrate	kg/s	0.784203	0.42951
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.95	81.32
Pool Vaporization Rate	kg/s	0.649891	0.256086
Total Vapor Flowrate	kg/s	0.875891	0.461977
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	100.477
Pool Vaporization Rate	kg/s	0.780225	0.301519
Total Vapor Flowrate	kg/s	1.00622	0.50741
Maximum Pool Radius	m	32.1566	32.1246

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	10.0927	10.2592
LFL Frac (7000)	18.75	s	10.0927	10.2592

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

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

			Dia	Noite
Radiation Level	3	kW/m2	22.7456	21.5807
Radiation Level	12.5	kW/m2	12.7084	11.6016
Radiation Level	37.5	kW/m2	7.8308	Not Reached
Radiation Level	44	kW/m2	6.31262	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

	Dia	Noite
Radiation Level (kW/m2)		

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

			Dia	Noite
Radiation Level	3	kW/m2	58.9281	57.6218
Radiation Level	12.5	kW/m2	30.6124	29.3043
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

			Dia	Distance (m)
				Noite
Radiation Level	3	kW/m2	113.914	109.423
Radiation Level	12.5	kW/m2	45.6188	44.6123
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	10.0927	10.2592	
Furthest Extent	7000	ppm	10.0927	10.2592	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level	
			Dia	Noite
Overpressure	0.05	bar	35.5171	33.1673
Overpressure	0.1	bar	23.7763	22.5077
Overpressure	0.3	bar	15.4506	14.9487
Overpressure	0.4	bar	13.9451	13.5818

			Supplementary Data at 0.05 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.283528	0.212192
Used Flammable Mass				
Overpressure Radius		m	25.5171	23.1673
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.1 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.283528	0.212192
Used Flammable Mass				
Overpressure Radius		m	13.7763	12.5077
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.3 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.283528	0.212192
Used Flammable Mass				
Overpressure Radius		m	5.45058	4.94866
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.4 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.283528	0.212192
Used Flammable Mass				
Overpressure Radius		m	3.94506	3.58177
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre	m	10	10
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Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 006H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 10.94 m/s
Droplet Diameter(1) 1952 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.06 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.997469	0.997626
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	198.81	176.89
Pool Vaporization Rate	kg/s	0.125643	0.0605714
Total Vapor Flowrate	kg/s	0.17586	0.107665
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.2456	79.11
Pool Vaporization Rate	kg/s	0.31596	0.136271
Total Vapor Flowrate	kg/s	0.366178	0.183365
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	60.5044	61.7306
Pool Vaporization Rate	kg/s	0.417894	0.174716
Total Vapor Flowrate	kg/s	0.468112	0.22181
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.5156	52.8319
Pool Vaporization Rate	kg/s	0.501191	0.20525
Total Vapor Flowrate	kg/s	0.551408	0.252344
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.5644	46.6181
Pool Vaporization Rate	kg/s	0.573193	0.231336
Total Vapor Flowrate	kg/s	0.62341	0.27843
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.8625	82.3419
Pool Vaporization Rate	kg/s	0.666367	0.264658
Total Vapor Flowrate	kg/s	0.716585	0.311751
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	91.4975	100.477
Pool Vaporization Rate	kg/s	0.799699	0.311139
Total Vapor Flowrate	kg/s	0.849917	0.358233
Maximum Pool Radius	m	32.2978	32.2557

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	4.77993	4.81917
LFL (7000)	18.75	s	10.5517	6.94538
LFL Frac (7000)	18.75	s	10.5517	6.94538

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

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

			Distance (m)	
Radiation Level			Dia	Noite
3	kW/m2		12.8956	13.0837
12.5	kW/m2		9.10264	9.33152
37.5	kW/m2		7.27337	7.51554
44	kW/m2		7.07469	7.43305

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

	Radiation Level (kW/m2)
Dia	Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

			Dia	Noite
Radiation Level	3	kW/m2	52.6483	51.5541
Radiation Level	12.5	kW/m2	24.126	23.0716
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

			Dia	Distance (m)
				Noite
Radiation Level	3	kW/m2	107.886	103.587
Radiation Level	12.5	kW/m2	39.3813	38.5981
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	10.5517	6.94538	
Furthest Extent	7000	ppm	10.5517	6.94538	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level
			Dia
Overpressure	0.05	bar	36.202
Overpressure	0.1	bar	24.1461
Overpressure	0.3	bar	15.5969
Overpressure	0.4	bar	14.0509

Supplementary Data at 0.05 bar

Dia

Supplied Flammable Mass	kg	0.306975
Used Flammable Mass		
Overpressure Radius	m	26.202
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.1 bar

Dia

Supplied Flammable Mass	kg	0.306975
Used Flammable Mass		
Overpressure Radius	m	14.1461
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.3 bar

Dia

Supplied Flammable Mass	kg	0.306975
Used Flammable Mass		
Overpressure Radius	m	5.59687
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.4 bar

Dia

Supplied Flammable Mass	kg	0.306975
Used Flammable Mass		
Overpressure Radius	m	4.05094
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre m 10

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 006I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Down - Impinging on the Ground

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 3.43 m/s
Droplet Diameter(1) 1952 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.06 degC
Release Rate(1) 10.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	1	1
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	197.403	176.226
Pool Vaporization Rate	kg/s	0.0721096	0.0351241
Total Vapor Flowrate	kg/s	0.0721098	0.0351243
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.82	78.975
Pool Vaporization Rate	kg/s	0.179704	0.0782448
Total Vapor Flowrate	kg/s	0.179705	0.0782451
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	60.4181	61.6394
Pool Vaporization Rate	kg/s	0.237447	0.100214
Total Vapor Flowrate	kg/s	0.237447	0.100214
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.4494	52.7606
Pool Vaporization Rate	kg/s	0.284281	0.117658
Total Vapor Flowrate	kg/s	0.284281	0.117658
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	44.55	89.43
Pool Vaporization Rate	kg/s	0.325142	0.138913
Total Vapor Flowrate	kg/s	0.325142	0.138913
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.8625	112.179
Pool Vaporization Rate	kg/s	0.377846	0.168453
Total Vapor Flowrate	kg/s	0.377847	0.168453
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	91.4975	28.79
Pool Vaporization Rate	kg/s	0.4525	0.188789
Total Vapor Flowrate	kg/s	0.4525	0.188789
Maximum Pool Radius	m	24.0042	23.977

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	No Hazard	No Hazard
Flame Direction	Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	41.6403	40.792
Radiation Level	12.5	kW/m2	20.0757	18.8145
Radiation Level	37.5	kW/m2	8.35241	8.40222
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

	Dia	Radiation Level (kW/m2) Noite
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

			Dia	Noite
				Distance (m)
Radiation Level	3	kW/m2	81.8688	78.4252
Radiation Level	12.5	kW/m2	26.457	25.7806
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

	Dia	Noite
		Radiation Level (kW/m2)

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 006V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Vertical

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 10.94 m/s
Droplet Diameter(1) 1952 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.06 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.983855	0.985124
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	201.64	180.231
Pool Vaporization Rate	kg/s	0.11867	0.0560457
Total Vapor Flowrate	kg/s	0.438995	0.35119
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.9225	78.9794
Pool Vaporization Rate	kg/s	0.30284	0.12872
Total Vapor Flowrate	kg/s	0.623166	0.423864
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.84	61.2
Pool Vaporization Rate	kg/s	0.40098	0.165599
Total Vapor Flowrate	kg/s	0.721305	0.460743
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	49.66	52.08
Pool Vaporization Rate	kg/s	0.480812	0.194814
Total Vapor Flowrate	kg/s	0.801137	0.489958
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6181	46.7356
Pool Vaporization Rate	kg/s	0.550271	0.219955
Total Vapor Flowrate	kg/s	0.870596	0.515099
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.95	81.415
Pool Vaporization Rate	kg/s	0.641145	0.252138
Total Vapor Flowrate	kg/s	0.96147	0.547281
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	99.3594
Pool Vaporization Rate	kg/s	0.770379	0.296895
Total Vapor Flowrate	kg/s	1.0907	0.592039
Maximum Pool Radius	m	32.0803	32.0507

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	5.89514	4.30283
LFL Frac (7000)	18.75	s	5.89514	4.30283

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

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

			Dia	Noite
Radiation Level	3	kW/m2	25.3955	24.4898
Radiation Level	12.5	kW/m2	14.3136	12.8417
Radiation Level	37.5	kW/m2	8.99051	7.71481
Radiation Level	44	kW/m2	8.3949	6.55396

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

	Dia	Noite
Radiation Level (kW/m2)		

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

			Dia	Noite
Radiation Level	3	kW/m2	55.7328	52.3649
Radiation Level	12.5	kW/m2	27.4902	24.1074
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

			Dia	Distance (m)
				Noite
Radiation Level	3	kW/m2	110.582	104.035
Radiation Level	12.5	kW/m2	42.4004	39.33
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	5.89514	4.30283	
Furthest Extent	7000	ppm	5.89514	4.30283	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 006V

			Dia	Noite
Wind Speed	m/s		3.73	2.78
Pasquill Stability			C/D	D
Surface Roughness Length	mm		950.891	950.891
Surface Roughness Parameter			0.17	0.17
Atmospheric Temperature	degC		19.6	16.5
Surface Temperature	degC		24.6	16.5
Relative Humidity	fraction		0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 008A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	2 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	8.95602E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.96 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	25.77 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.96 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	351.56 um
- Expanded Radius	0.00 m
- Velocity	25.77 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	8.95602E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.96 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	25.77 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.96 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	347.78 um
- Expanded Radius	0.00 m
- Velocity	25.77 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.814754	0.835378
Maximum Pool Radius	m		6.19055	6.26524

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	19.3622	18.2815	
Radiation Level	12.5	kW/m2	10.6745	9.7057	
Radiation Level	37.5	kW/m2	6.53864	Not Reached	
Radiation Level	44	kW/m2	5.36036	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	35.9594	34.4592
Radiation Level	12.5	kW/m2	27.8019	25.9818
Radiation Level	37.5	kW/m2	20.8782	19.1564
Radiation Level	44	kW/m2	19.9477	18.3162

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	54.744	52.3384
Radiation Level	12.5	kW/m2	36.7554	33.7457
Radiation Level	37.5	kW/m2	23.2832	21.8668
Radiation Level	44	kW/m2	23.2832	21.8668

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 008H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	2 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	8.95602E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.96 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	25.77 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.96 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	351.56 um
- Expanded Radius	0.00 m
- Velocity	25.77 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	8.95602E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.96 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	25.77 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.96 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	347.78 um
- Expanded Radius	0.00 m
- Velocity	25.77 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.960331	0.964746
Maximum Pool Radius	m		6.72114	6.73325

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	5.84747	5.81356
LFL Frac (7000)	18.75	s	5.84747	5.81356

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

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

			Dia	Noite
Radiation Level	3	kW/m2	10.7264	10.5455
Radiation Level	12.5	kW/m2	7.38276	7.34106
Radiation Level	37.5	kW/m2	5.83774	6.00601
Radiation Level	44	kW/m2	5.83774	6.00601

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	27.0136	26.7671
Radiation Level	12.5	kW/m2	18.3844	17.8612
Radiation Level	37.5	kW/m2	10.9617	10.6509
Radiation Level	44	kW/m2	10.0051	9.79966

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	46.1182	45.0075
Radiation Level	12.5	kW/m2	26.4939	24.949
Radiation Level	37.5	kW/m2	13.7633	13.695
Radiation Level	44	kW/m2	Not Reached	Not Reached

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

	Dia	Noite
Radiation Level (kW/m2)		

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

All flammable results are reported at the flammable effect height 0 m

			Distance (m)	
			Dia	Noite
Furthest Extent	7000	ppm	5.84747	5.81356
Furthest Extent	7000	ppm	5.84747	5.81356
			Heights (m) for above distances	
			Dia	Noite
Furthest Extent	7000	ppm	0	0
Furthest Extent	7000	ppm	0	0

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 008I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	2 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	8.95602E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.96 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	25.77 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.96 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	351.56 um
- Expanded Radius	0.00 m
- Velocity	25.77 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	8.95602E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.96 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	25.77 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.96 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	347.78 um
- Expanded Radius	0.00 m
- Velocity	25.77 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

Release Segment 1		Dia	Noite
Release Duration	s	600	600
Liquid Rainout	fraction	1	1
Maximum Pool Radius	m	6.85695	6.85544

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	Noite
LFL (7000)	18.75	s	0	0	Noite
LFL Frac (7000)	18.75	s	0	0	Noite

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	No Hazard	No Hazard
Flame Direction	Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

			Dia	Noite
Radiation Level	3	kW/m2	21.2495	21.0457
Radiation Level	12.5	kW/m2	12.5012	12.0308
Radiation Level	37.5	kW/m2	4.97927	4.72692
Radiation Level	44	kW/m2	4.01289	3.86705

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

			Dia	Noite
Radiation Level	3	kW/m2	40.4234	39.3757
Radiation Level	12.5	kW/m2	20.4665	18.9992
Radiation Level	37.5	kW/m2	7.85695	7.85544
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 008V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	2 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	10.16 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
-------------------------------	-----------------

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	8.95602E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.96 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	25.77 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.96 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	351.56 um
- Expanded Radius	0.00 m
- Velocity	25.77 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	8.95602E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.96 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	25.77 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.96 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	347.78 um
- Expanded Radius	0.00 m
- Velocity	25.77 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.784939	0.801883
Maximum Pool Radius	m		6.07608	6.13829

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	19.7511	18.9994	
Radiation Level	12.5	kW/m2	10.9291	9.82497	
Radiation Level	37.5	kW/m2	6.74894	5.65513	
Radiation Level	44	kW/m2	6.24972	6.24972	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	35.0253	32.5481
Radiation Level	12.5	kW/m2	26.9721	24.1896
Radiation Level	37.5	kW/m2	20.135	17.454
Radiation Level	44	kW/m2	19.2131	16.6342

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	53.7317	50.3329
Radiation Level	12.5	kW/m2	36.0331	32.0788
Radiation Level	37.5	kW/m2	22.4792	20.0929
Radiation Level	44	kW/m2	22.4792	20.0929

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 008V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 009A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Angle 45 deg
Outdoor Release Direction Angled from Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 15.47 m/s
Droplet Diameter(1) 975.6 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.12 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.965236	0.969729
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	203.776	182.926
Pool Vaporization Rate	kg/s	0.112522	0.0525375
Total Vapor Flowrate	kg/s	0.80224	0.653113
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.4644	78.705
Pool Vaporization Rate	kg/s	0.290334	0.122526
Total Vapor Flowrate	kg/s	0.980052	0.723101
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	60.01	61.47
Pool Vaporization Rate	kg/s	0.385147	0.158156
Total Vapor Flowrate	kg/s	1.07487	0.758731
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	49.79	52.29
Pool Vaporization Rate	kg/s	0.462788	0.186586
Total Vapor Flowrate	kg/s	1.15251	0.787161
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.7256	45.885
Pool Vaporization Rate	kg/s	0.530406	0.210835
Total Vapor Flowrate	kg/s	1.22012	0.81141
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	74.9944	80.4844
Pool Vaporization Rate	kg/s	0.6181	0.241692
Total Vapor Flowrate	kg/s	1.30782	0.842267
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	89.24	98.24
Pool Vaporization Rate	kg/s	0.742223	0.284787
Total Vapor Flowrate	kg/s	1.43194	0.885362
Maximum Pool Radius	m	31.7778	31.7974

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	14.9205	14.6966
LFL Frac (7000)	18.75	s	14.9205	14.6966

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

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

			Dia	Noite
Radiation Level	3	kW/m2	37.7094	35.0213
Radiation Level	12.5	kW/m2	20.5345	18.6713
Radiation Level	37.5	kW/m2	12.9785	8.45116
Radiation Level	44	kW/m2	11.5367	3.96713

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

	Dia	Noite
Radiation Level (kW/m2)		

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

			Dia	Noite
Radiation Level	3	kW/m2	64.353	63.0724
Radiation Level	12.5	kW/m2	36.3477	34.9916
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

			Dia	Distance (m)
Radiation Level	3	kW/m2	118.659	Noite 114.295
Radiation Level	12.5	kW/m2	50.9286	49.8847
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	14.9205	14.6966	
Furthest Extent	7000	ppm	14.9205	14.6966	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level	
			Dia	Noite
Overpressure	0.05	bar	No Hazard	No Hazard
Overpressure	0.1	bar	No Hazard	No Hazard
Overpressure	0.3	bar	No Hazard	No Hazard
Overpressure	0.4	bar	No Hazard	No Hazard

			Supplementary Data at 0.05 bar	
			Dia	Noite
Supplied Flammable Mass		kg	No Hazard	No Hazard
Used Flammable Mass				
Overpressure Radius		m	0	0
Distance to:				
- Ignition Source		m	No Hazard	No Hazard
- Cloud Front/Centre		m	No Hazard	No Hazard
- Explosion Centre		m	0	0

			Supplementary Data at 0.1 bar	
			Dia	Noite
Supplied Flammable Mass		kg	No Hazard	No Hazard
Used Flammable Mass				
Overpressure Radius		m	0	0
Distance to:				
- Ignition Source		m	No Hazard	No Hazard
- Cloud Front/Centre		m	No Hazard	No Hazard
- Explosion Centre		m	0	0

			Supplementary Data at 0.3 bar	
			Dia	Noite
Supplied Flammable Mass		kg	No Hazard	No Hazard
Used Flammable Mass				
Overpressure Radius		m	0	0
Distance to:				
- Ignition Source		m	No Hazard	No Hazard
- Cloud Front/Centre		m	No Hazard	No Hazard
- Explosion Centre		m	0	0

			Supplementary Data at 0.4 bar	
			Dia	Noite
Supplied Flammable Mass		kg	No Hazard	No Hazard
Used Flammable Mass				
Overpressure Radius		m	0	0
Distance to:				
- Ignition Source		m	No Hazard	No Hazard
- Cloud Front/Centre		m	No Hazard	No Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre	m	0	0
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Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 009H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 15.47 m/s
Droplet Diameter(1) 975.6 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.12 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.994211	0.99462
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	199.516	177.556
Pool Vaporization Rate	kg/s	0.123994	0.0594472
Total Vapor Flowrate	kg/s	0.238845	0.166185
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.3744	79.245
Pool Vaporization Rate	kg/s	0.313026	0.134445
Total Vapor Flowrate	kg/s	0.427877	0.241183
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.67	61.8219
Pool Vaporization Rate	kg/s	0.413709	0.172621
Total Vapor Flowrate	kg/s	0.52856	0.279358
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.5156	52.9031
Pool Vaporization Rate	kg/s	0.495819	0.20296
Total Vapor Flowrate	kg/s	0.61067	0.309698
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.5644	46.6769
Pool Vaporization Rate	kg/s	0.567349	0.228892
Total Vapor Flowrate	kg/s	0.6822	0.33563
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.8625	82.4381
Pool Vaporization Rate	kg/s	0.659943	0.262027
Total Vapor Flowrate	kg/s	0.774794	0.368764
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	91.4975	99.3594
Pool Vaporization Rate	kg/s	0.792486	0.307958
Total Vapor Flowrate	kg/s	0.907337	0.414695
Maximum Pool Radius	m	32.2459	32.2065

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	6.25435	6.30205
LFL (7000)	18.75	s	10.9969	6.50105
LFL Frac (7000)	18.75	s	10.9969	6.50105

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

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

Radiation Level		kW/m2	Distance (m)	
			Dia	Noite
3		kW/m2	18.753	18.8925
12.5		kW/m2	13.1846	13.4333
37.5		kW/m2	10.6264	10.8804
44		kW/m2	10.3237	10.5715

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

	Dia	Radiation Level (kW/m2)
	Noite	

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

			Dia	Noite
Radiation Level	3	kW/m2	54.2057	53.1248
Radiation Level	12.5	kW/m2	25.7423	24.732
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

			Dia	Noite
Radiation Level	3	kW/m2	109.351	105.071
Radiation Level	12.5	kW/m2	40.9231	40.1515
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	10.9969	6.50105	
Furthest Extent	7000	ppm	10.9969	6.50105	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009H

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level
			Dia
Overpressure	0.05	bar	32.7781
Overpressure	0.1	bar	22.2976
Overpressure	0.3	bar	14.8655
Overpressure	0.4	bar	13.5216

Supplementary Data at 0.05 bar

Dia

Supplied Flammable Mass	kg	0.201676
Used Flammable Mass		
Overpressure Radius	m	22.7781
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.1 bar

Dia

Supplied Flammable Mass	kg	0.201676
Used Flammable Mass		
Overpressure Radius	m	12.2976
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.3 bar

Dia

Supplied Flammable Mass	kg	0.201676
Used Flammable Mass		
Overpressure Radius	m	4.86552
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10
- Explosion Centre	m	10

Supplementary Data at 0.4 bar

Dia

Supplied Flammable Mass	kg	0.201676
Used Flammable Mass		
Overpressure Radius	m	3.5216
Distance to:		
- Ignition Source	m	10
- Cloud Front/Centre	m	10

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 009I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Down - Impinging on the Ground

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 15.47 m/s
Droplet Diameter(1) 975.6 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.12 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	1	1
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	198.106	176.226
Pool Vaporization Rate	kg/s	0.127176	0.0616294
Total Vapor Flowrate	kg/s	0.127177	0.0616299
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.1169	78.975
Pool Vaporization Rate	kg/s	0.318613	0.137958
Total Vapor Flowrate	kg/s	0.318614	0.137959
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	60.4181	61.6394
Pool Vaporization Rate	kg/s	0.421034	0.176642
Total Vapor Flowrate	kg/s	0.421034	0.176643
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.4494	52.7606
Pool Vaporization Rate	kg/s	0.504694	0.207345
Total Vapor Flowrate	kg/s	0.504694	0.207346
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	44.55	89.43
Pool Vaporization Rate	kg/s	0.577801	0.244745
Total Vapor Flowrate	kg/s	0.577802	0.244745
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.8625	112.179
Pool Vaporization Rate	kg/s	0.672246	0.296708
Total Vapor Flowrate	kg/s	0.672247	0.296709
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	91.4975	28.79
Pool Vaporization Rate	kg/s	0.806263	0.332477
Total Vapor Flowrate	kg/s	0.806264	0.332477
Maximum Pool Radius	m	32.3379	32.2945

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	Noite
LFL (7000)	18.75	s	0	0	Noite
LFL Frac (7000)	18.75	s	0	0	Noite

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Along Ground	Along Ground

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

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

			Dia	Noite
Radiation Level	3	kW/m2	Not Reached	Not Reached
Radiation Level	12.5	kW/m2	Not Reached	Not Reached
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

	Dia	Radiation Level (kW/m2)
	Noite	

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

			Dia	Noite
Radiation Level	3	kW/m2	47.7798	46.6469
Radiation Level	12.5	kW/m2	19.2313	18.1424
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	103.089	98.7482
Radiation Level	12.5	kW/m2	34.5247	33.6501
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

	Dia	Radiation Level (kW/m2)
		Noite

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 009V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Vertical

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 15.47 m/s
Droplet Diameter(1) 975.6 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.12 degC
Release Rate(1) 19.84 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.95418	0.959411
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	204.49	184.281
Pool Vaporization Rate	kg/s	0.109774	0.0508358
Total Vapor Flowrate	kg/s	1.01885	0.856127
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.5906	78.97
Pool Vaporization Rate	kg/s	0.284634	0.119496
Total Vapor Flowrate	kg/s	1.19371	0.924788
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.1694	60.7494
Pool Vaporization Rate	kg/s	0.37741	0.154329
Total Vapor Flowrate	kg/s	1.28648	0.959621
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	49.79	51.3906
Pool Vaporization Rate	kg/s	0.453236	0.181859
Total Vapor Flowrate	kg/s	1.36231	0.98715
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.7256	45.885
Pool Vaporization Rate	kg/s	0.519805	0.205481
Total Vapor Flowrate	kg/s	1.42888	1.01077
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	74.9944	80.4844
Pool Vaporization Rate	kg/s	0.606172	0.235842
Total Vapor Flowrate	kg/s	1.51525	1.04113
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	89.24	98.24
Pool Vaporization Rate	kg/s	0.728464	0.278273
Total Vapor Flowrate	kg/s	1.63754	1.08356
Maximum Pool Radius	m	31.5961	31.6268

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

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

			Distance (m)	
Radiation Level			Dia	Noite
3	kW/m2		41.1078	38.8
12.5	kW/m2		22.6398	20.1771
37.5	kW/m2		14.1787	12.4721
44	kW/m2		13.2787	11.1356

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

	Radiation Level (kW/m2)
Dia	Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

			Dia	Noite
Radiation Level	3	kW/m2	59.6632	56.2813
Radiation Level	12.5	kW/m2	31.7825	28.3121
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	113.643	107.202
Radiation Level	12.5	kW/m2	46.1832	43.0239
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

	Dia	Radiation Level (kW/m2)
		Noite

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 009V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 010

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Mass Inventory	8.572E5 kg

Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	0 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	400 m ²
[Type of Bund Surface	Concrete]
Bund Height	1.5 m
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
---------------------	------------------

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	8.572E5 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]

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 0 m
North(1) 0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Catastrophic rupture
Inventory	857,151.19 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	1.01 bar
- Temperature	25.00 degC
- Fluid State	Liquid at atmospheric pressure

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	n/a kg/s
Release Duration	n/a s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	n/a bar
- Temperature	n/a degC
- Vena Contracta Velocity (exit velocity for pipe releases)	n/a m/s
- Discharge Coefficient	n/a
Final data (after atmospheric expansion):	
- Temperature	25.00 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	10,000.00 um
- Expanded Radius	n/a m
- Velocity	0.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Catastrophic rupture
Inventory	857,151.19 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	1.01 bar
- Temperature	25.00 degC
- Fluid State	Liquid at atmospheric pressure

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	n/a kg/s
Release Duration	n/a s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	n/a bar
- Temperature	n/a degC
- Vena Contracta Velocity (exit velocity for pipe releases)	n/a m/s
- Discharge Coefficient	n/a
Final data (after atmospheric expansion):	
- Temperature	25.00 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	10,000.00 um
- Expanded Radius	n/a m
- Velocity	0.00 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

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

		Dia	Noite
Liquid Rainout	fraction	0.999979	0.999981
Initial Vapor Cloud	kg	17.9616	15.881
Time Pool Left Behind			

Maximum Pool Radius	m	11.2838	11.2838

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	15.3342	15.2125	
LFL (7000)	18.75	s	15.4904	15.3687	
LFL Frac (7000)	18.75	s	15.4904	15.3687	
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	
LFL (7000)	18.75	s	0	0	
LFL Frac (7000)	18.75	s	0	0	

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

Late Pool Fire Status	Dia	Noite
	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	50.9599	49.4152	
Radiation Level	12.5	kW/m2	19.0488	18.0973	
Radiation Level	37.5	kW/m2	Not Reached	Not Reached	
Radiation Level	44	kW/m2	Not Reached	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

				Radiation Level (kW/m2)
			Dia	Noite

Fireball Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

			Dia	Noite
Fireball Flame Status			No Hazard	No Hazard

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

All flammable results are reported at the flammable effect height 0 m

				Distance (m)
			Dia	Noite
Furthest Extent	7000	ppm	15.4904	15.3687
Furthest Extent	7000	ppm	15.4904	15.3687
				Heights (m) for above distances
			Dia	Noite
Furthest Extent	7000	ppm	0	0
Furthest Extent	7000	ppm	0	0

Explosion Effects: Early Explosion

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

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

				Dia	Noite
Supplied Flammable Mass		kg		857151	857151
				Distance (m) at Overpressure Levels	
				Dia	Noite
Overpressure	0.05	bar		No Hazard	No Hazard
Overpressure	0.1	bar		No Hazard	No Hazard
Overpressure	0.3	bar		No Hazard	No Hazard
Overpressure	0.4	bar		No Hazard	No Hazard
				Used Mass (kg) at Overpressure Levels	
				Dia	Noite
Overpressure	0.05	bar		No Hazard	No Hazard
Overpressure	0.1	bar		No Hazard	No Hazard
Overpressure	0.3	bar		No Hazard	No Hazard
Overpressure	0.4	bar		No Hazard	No Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level	
			Dia	Noite
Overpressure	0.05	bar	35.6835	35.6385
Overpressure	0.1	bar	23.8662	23.8419
Overpressure	0.3	bar	15.4861	15.4765
Overpressure	0.4	bar	13.9708	13.9638

Supplementary Data at 0.05 bar

			Dia	Noite
Supplied Flammable Mass		kg	0.289111	0.287594
Used Flammable Mass				
Overpressure Radius		m	25.6835	25.6385
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	0.228535	0.19123
- Explosion Centre		m	10	10

Supplementary Data at 0.1 bar

			Dia	Noite
Supplied Flammable Mass		kg	0.289111	0.287594
Used Flammable Mass				
Overpressure Radius		m	13.8662	13.8419
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	0.228535	0.19123
- Explosion Centre		m	10	10

Supplementary Data at 0.3 bar

			Dia	Noite
Supplied Flammable Mass		kg	0.289111	0.287594
Used Flammable Mass				
Overpressure Radius		m	5.48613	5.47652
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	0.228535	0.19123
- Explosion Centre		m	10	10

Supplementary Data at 0.4 bar

			Dia	Noite
Supplied Flammable Mass		kg	0.289111	0.287594
Used Flammable Mass				
Overpressure Radius		m	3.97079	3.96383
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	0.228535	0.19123

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre	m	10	10
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Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Carregamento\Cenário 010

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 012A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1.5 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.02978E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.97 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	22.32 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.97 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	468.70 um
- Expanded Radius	0.00 m
- Velocity	22.32 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.02978E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.97 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	22.32 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.97 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	463.66 um
- Expanded Radius	0.00 m
- Velocity	22.32 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.901196	0.908294
Maximum Pool Radius	m		3.78425	3.7988

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	8.74735	8.39702	
Radiation Level	12.5	kW/m2	4.71691	4.37796	
Radiation Level	37.5	kW/m2	Not Reached	Not Reached	
Radiation Level	44	kW/m2	Not Reached	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	24.1815	23.2654
Radiation Level	12.5	kW/m2	18.4435	17.3366
Radiation Level	37.5	kW/m2	13.7507	12.6906
Radiation Level	44	kW/m2	13.0847	12.0618

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	40.2949	38.8623
Radiation Level	12.5	kW/m2	27.4741	25.6467
Radiation Level	37.5	kW/m2	15.6003	14.5717
Radiation Level	44	kW/m2	14.821	13.9554

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 012H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1.5 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material n-NONANE
Scenario Leak
Inventory 1,000,000.00 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 2.51 bar
- Temperature 25.00 degC
- Fluid State Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate 3.02978E-001 kg/s
Release Duration 600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure 1.01 bar
- Temperature 24.97 degC
- Vena Contracta Velocity (exit velocity for pipe releases) 22.32 m/s
- Discharge Coefficient 0.60

Final data (after atmospheric expansion):

- Temperature 24.97 degC
- Liquid Mass Fraction 1.00 fraction
- Droplet Diameter 468.70 um
- Expanded Radius 0.00 m
- Velocity 22.32 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material n-NONANE
Scenario Leak
Inventory 1,000,000.00 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 2.51 bar
- Temperature 25.00 degC
- Fluid State Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.02978E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.97 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	22.32 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.97 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	463.66 um
- Expanded Radius	0.00 m
- Velocity	22.32 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.97075	0.972902
Maximum Pool Radius	m		3.92744	3.93166

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	5.5287	5.54429	
Radiation Level	12.5	kW/m2	3.57109	3.59764	
Radiation Level	37.5	kW/m2	37.5	Not Reached	
Radiation Level	44	kW/m2	Not Reached	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

	Dia	Radiation Level (kW/m2)
	Noite	

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	18.9816	18.818
Radiation Level	12.5	kW/m2	13.0845	12.7376
Radiation Level	37.5	kW/m2	8.26484	7.97302
Radiation Level	44	kW/m2	7.57874	7.33107

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

	Dia	Radiation Level (kW/m2)
	Noite	

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	35.3309	34.6106
Radiation Level	12.5	kW/m2	22.2062	21.1037
Radiation Level	37.5	kW/m2	10.0397	9.78134
Radiation Level	44	kW/m2	9.38396	9.29348

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 012I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1.5 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.02978E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.97 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	22.32 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.97 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	468.70 um
- Expanded Radius	0.00 m
- Velocity	22.32 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.02978E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.97 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	22.32 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.97 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	463.66 um
- Expanded Radius	0.00 m
- Velocity	22.32 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		1	1
Maximum Pool Radius	m		3.98545	3.98606

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)		Averaging Time		Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		No Hazard	No Hazard
Flame Direction		Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

		Dia	Noite
Early Pool Fire Status		Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

			Dia	Noite
Radiation Level	3	kW/m2	14.6792	14.597
Radiation Level	12.5	kW/m2	8.71263	8.45515
Radiation Level	37.5	kW/m2	3.84532	3.64014
Radiation Level	44	kW/m2	3.15082	2.99232

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

			Dia	Noite
Radiation Level	3	kW/m2	31.1227	30.4658
Radiation Level	12.5	kW/m2	17.8713	16.8412
Radiation Level	37.5	kW/m2	5.56792	5.40857
Radiation Level	44	kW/m2	4.98545	4.98606

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 012V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	1.5 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.02978E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.97 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	22.32 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.97 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	468.70 um
- Expanded Radius	0.00 m
- Velocity	22.32 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.02978E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.97 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	22.32 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.97 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	463.66 um
- Expanded Radius	0.00 m
- Velocity	22.32 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.89152	0.897991
Maximum Pool Radius	m		3.76386	3.77718

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time			Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		No Hazard	No Hazard
LFL (7000)	18.75	s		No Hazard	No Hazard
LFL Frac (7000)	18.75	s		No Hazard	No Hazard
Concentration(ppm)	Averaging Time			Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		Hazard	Hazard
Flame Direction		Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

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

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	8.59239	8.36204
Radiation Level	12.5	kW/m2	4.74536	4.22977
Radiation Level	37.5	kW/m2	2.58298	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	23.4383	21.9225
Radiation Level	12.5	kW/m2	17.7231	16.0186
Radiation Level	37.5	kW/m2	13.05	11.3907
Radiation Level	44	kW/m2	12.3854	10.7659

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	39.5167	37.4867
Radiation Level	12.5	kW/m2	26.7396	24.3185
Radiation Level	37.5	kW/m2	14.9096	13.2642
Radiation Level	44	kW/m2	14.1119	12.648

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 012V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 013A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Angle 45 deg
Outdoor Release Direction Angled from Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 13.39 m/s
Droplet Diameter(1) 1301 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.09 degC
Release Rate(1) 6.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.975924	0.977759
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	200.931	181.576
Pool Vaporization Rate	kg/s	0.0424156	0.0200911
Total Vapor Flowrate	kg/s	0.209503	0.174445
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.795	79.2469
Pool Vaporization Rate	kg/s	0.107826	0.0463351
Total Vapor Flowrate	kg/s	0.274913	0.200689
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.755	61.38
Pool Vaporization Rate	kg/s	0.142641	0.0597758
Total Vapor Flowrate	kg/s	0.309728	0.21413
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.5819	52.22
Pool Vaporization Rate	kg/s	0.171131	0.070439
Total Vapor Flowrate	kg/s	0.338218	0.224793
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6181	45.8275
Pool Vaporization Rate	kg/s	0.195915	0.0795289
Total Vapor Flowrate	kg/s	0.363002	0.233883
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.95	80.3906
Pool Vaporization Rate	kg/s	0.227943	0.0910909
Total Vapor Flowrate	kg/s	0.39503	0.245445
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	99.3594
Pool Vaporization Rate	kg/s	0.273358	0.107341
Total Vapor Flowrate	kg/s	0.440445	0.261695
Maximum Pool Radius	m	18.8854	18.8795

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time			Dia	Noite
UFL (56000)	18.75	s		No Hazard	No Hazard
LFL (7000)	18.75	s		No Hazard	10.4012
LFL Frac (7000)	18.75	s		No Hazard	10.4012

Concentration(ppm)	Averaging Time			Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

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

			Dia	Noite
Radiation Level	3	kW/m2	19.6919	18.801
Radiation Level	12.5	kW/m2	10.9421	10.0757
Radiation Level	37.5	kW/m2	6.60158	Not Reached
Radiation Level	44	kW/m2	4.66073	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

	Dia	Noite
Radiation Level (kW/m2)		

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

				Distance (m)	
				Dia	Noite
Radiation Level	3	kW/m2	49.6727	48.528	
Radiation Level	12.5	kW/m2	32.6519	30.9723	
Radiation Level	37.5	kW/m2	18.977	18.8002	
Radiation Level	44	kW/m2	18.977	18.8002	

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

		Radiation Level (kW/m2)	
		Dia	Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

		Dia	Noite
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

				Distance (m)	
				Dia	Noite
Radiation Level	3	kW/m2	81.0973	78.1043	
Radiation Level	12.5	kW/m2	34.3145	33.4166	
Radiation Level	37.5	kW/m2	Not Reached	Not Reached	
Radiation Level	44	kW/m2	Not Reached	Not Reached	

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

		Radiation Level (kW/m2)	
		Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

All flammable results are reported at the flammable effect height 0 m

				Distance (m)
			Noite	
Furthest Extent	7000	ppm	10.4012	
Furthest Extent	7000	ppm	10.4012	
				Heights (m) for above distances
			Noite	
Furthest Extent	7000	ppm	0	
Furthest Extent	7000	ppm	0	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level
			Noite
Overpressure	0.05	bar	No Hazard
Overpressure	0.1	bar	No Hazard
Overpressure	0.3	bar	No Hazard
Overpressure	0.4	bar	No Hazard

Supplementary Data at 0.05 bar

Noite

Supplied Flammable Mass	kg	No Hazard
Used Flammable Mass		
Overpressure Radius	m	0
Distance to:		
- Ignition Source	m	No Hazard
- Cloud Front/Centre	m	No Hazard
- Explosion Centre	m	0

Supplementary Data at 0.1 bar

Noite

Supplied Flammable Mass	kg	No Hazard
Used Flammable Mass		
Overpressure Radius	m	0
Distance to:		
- Ignition Source	m	No Hazard
- Cloud Front/Centre	m	No Hazard
- Explosion Centre	m	0

Supplementary Data at 0.3 bar

Noite

Supplied Flammable Mass	kg	No Hazard
Used Flammable Mass		
Overpressure Radius	m	0
Distance to:		
- Ignition Source	m	No Hazard
- Cloud Front/Centre	m	No Hazard
- Explosion Centre	m	0

Supplementary Data at 0.4 bar

Noite

Supplied Flammable Mass	kg	No Hazard
Used Flammable Mass		
Overpressure Radius	m	0
Distance to:		
- Ignition Source	m	No Hazard
- Cloud Front/Centre	m	No Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre m 0

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 013H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 13.39 m/s
Droplet Diameter(1) 1301 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.09 degC
Release Rate(1) 6.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.995199	0.995429
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	197.403	176.89
Pool Vaporization Rate	kg/s	0.0455335	0.0220738
Total Vapor Flowrate	kg/s	0.0788518	0.0537989
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.82	79.11
Pool Vaporization Rate	kg/s	0.113801	0.0495627
Total Vapor Flowrate	kg/s	0.14712	0.0812878
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	60.4181	61.7306
Pool Vaporization Rate	kg/s	0.15045	0.0636577
Total Vapor Flowrate	kg/s	0.183769	0.0953828
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.4494	52.8319
Pool Vaporization Rate	kg/s	0.180146	0.0748659
Total Vapor Flowrate	kg/s	0.213464	0.106591
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	44.55	46.6181
Pool Vaporization Rate	kg/s	0.206033	0.0844486
Total Vapor Flowrate	kg/s	0.239352	0.116174
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.8625	82.3419
Pool Vaporization Rate	kg/s	0.239393	0.0966964
Total Vapor Flowrate	kg/s	0.272712	0.128422
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	91.4975	100.477
Pool Vaporization Rate	kg/s	0.286597	0.113791
Total Vapor Flowrate	kg/s	0.319915	0.145516
Maximum Pool Radius	m	19.0682	19.0507

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	5.07826	5.11555
LFL (7000)	18.75	s	5.14389	5.19778
LFL Frac (7000)	18.75	s	5.14389	5.19778

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

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

			Distance (m)	
Radiation Level			Dia	Noite
3	kW/m2		10.6136	10.8354
12.5	kW/m2		7.40146	7.64275
37.5	kW/m2		6.03103	6.36126
44	kW/m2		6.03103	6.36126

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

	Radiation Level (kW/m2)
Dia	Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

				Distance (m)
			Dia	Noite
Radiation Level	3	kW/m2	42.8403	41.9436
Radiation Level	12.5	kW/m2	25.692	24.2716
Radiation Level	37.5	kW/m2	12.0326	12.1247
Radiation Level	44	kW/m2	12.0326	12.1247

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

	Radiation Level (kW/m2)
	Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

				Distance (m)
			Dia	Noite
Radiation Level	3	kW/m2	74.5509	71.7795
Radiation Level	12.5	kW/m2	27.4805	26.8047
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

	Radiation Level (kW/m2)
	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	5.14389	5.19778	
Furthest Extent	7000	ppm	5.14389	5.19778	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013H

			Dia	Noite
Wind Speed	m/s		3.73	2.78
Pasquill Stability			C/D	D
Surface Roughness Length	mm		950.891	950.891
Surface Roughness Parameter			0.17	0.17
Atmospheric Temperature	degC		19.6	16.5
Surface Temperature	degC		24.6	16.5
Relative Humidity	fraction		0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 013I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Down - Impinging on the Ground

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 13.39 m/s
Droplet Diameter(1) 1301 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.09 degC
Release Rate(1) 6.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

		Dia	Noite
Release Segment 1			
Release Duration	s	600	600
Liquid Rainout	fraction	1	1
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	196.701	175.563
Pool Vaporization Rate	kg/s	0.0466171	0.022738
Total Vapor Flowrate	kg/s	0.0466172	0.0227382
Release Segment 1 Cloud Segment 2			
Cloud Segment Duration	s	79.69	79.6381
Pool Vaporization Rate	kg/s	0.115718	0.0506739
Total Vapor Flowrate	kg/s	0.115718	0.050674
Release Segment 1 Cloud Segment 3			
Cloud Segment Duration	s	60.3319	61.6394
Pool Vaporization Rate	kg/s	0.152718	0.0650012
Total Vapor Flowrate	kg/s	0.152718	0.0650014
Release Segment 1 Cloud Segment 4			
Cloud Segment Duration	s	50.3831	52.7606
Pool Vaporization Rate	kg/s	0.182675	0.0763264
Total Vapor Flowrate	kg/s	0.182675	0.0763265
Release Segment 1 Cloud Segment 5			
Cloud Segment Duration	s	44.495	46.5594
Pool Vaporization Rate	kg/s	0.208778	0.0860025
Total Vapor Flowrate	kg/s	0.208779	0.0860027
Release Segment 1 Cloud Segment 6			
Cloud Segment Duration	s	76.9019	82.2456
Pool Vaporization Rate	kg/s	0.242723	0.0983626
Total Vapor Flowrate	kg/s	0.242723	0.0983628
Release Segment 1 Cloud Segment 7			
Cloud Segment Duration	s	91.4975	101.594
Pool Vaporization Rate	kg/s	0.290641	0.115719
Total Vapor Flowrate	kg/s	0.290641	0.115719
Maximum Pool Radius	m	19.1132	19.0947

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	No Hazard	No Hazard
Flame Direction	Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	37.6912	36.7377
Radiation Level	12.5	kW/m2	20.5111	19.0357
Radiation Level	37.5	kW/m2	6.856	6.89567
Radiation Level	44	kW/m2	6.856	6.89567

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

	Radiation Level (kW/m2)	
	Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

			Dia	Noite
				Distance (m)
Radiation Level	3	kW/m2	69.4722	66.6409
Radiation Level	12.5	kW/m2	22.3342	21.6001
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

	Dia	Noite
		Radiation Level (kW/m2)
		Noite

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 013V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Vertical

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 13.39 m/s
Droplet Diameter(1) 1301 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.09 degC
Release Rate(1) 6.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.969631	0.971738
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	201.64	182.25
Pool Vaporization Rate	kg/s	0.041633	0.0195392
Total Vapor Flowrate	kg/s	0.252396	0.215679
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.9225	78.5725
Pool Vaporization Rate	kg/s	0.106343	0.0453213
Total Vapor Flowrate	kg/s	0.317106	0.241461
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.84	61.38
Pool Vaporization Rate	kg/s	0.140835	0.058525
Total Vapor Flowrate	kg/s	0.351598	0.254665
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	49.66	52.22
Pool Vaporization Rate	kg/s	0.168818	0.0690628
Total Vapor Flowrate	kg/s	0.379582	0.265203
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6181	45.8275
Pool Vaporization Rate	kg/s	0.193114	0.0780514
Total Vapor Flowrate	kg/s	0.403878	0.274191
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.95	80.3906
Pool Vaporization Rate	kg/s	0.22483	0.0894909
Total Vapor Flowrate	kg/s	0.435594	0.285631
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	99.3594
Pool Vaporization Rate	kg/s	0.269817	0.105577
Total Vapor Flowrate	kg/s	0.480581	0.301717
Maximum Pool Radius	m	18.825	18.8209

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

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

			Distance (m)	
Radiation Level			Dia	Noite
3	kW/m2		20.8138	20.1612
12.5	kW/m2		11.7126	10.5225
37.5	kW/m2		7.31285	6.13497
44	kW/m2		6.78973	4.9366

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

	Radiation Level (kW/m2)
Dia	Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

			Dia	Noite
Radiation Level	3	kW/m2	47.4579	44.9915
Radiation Level	12.5	kW/m2	30.4787	27.4754
Radiation Level	37.5	kW/m2	16.7994	15.2952
Radiation Level	44	kW/m2	16.7994	15.2952

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	78.788	74.4794
Radiation Level	12.5	kW/m2	32.0986	29.8832
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

	Dia	Radiation Level (kW/m2)
		Noite

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 013V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 015A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015A

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (56000)	18.75 s	No Hazard	No Hazard
LFL (7000)	18.75 s	No Hazard	No Hazard
LFL Frac (7000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (56000)	18.75 s	0	0
LFL (7000)	18.75 s	0	0
LFL Frac (7000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015A

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	22.2516	22.4603
12.5	kW/m2	12.6795	12.212
37.5	kW/m2	8.07668	7.36617
44	kW/m2	7.44295	5.79744

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015A

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 015H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
-------------------------------	-----------------

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.56822	0.703459
Maximum Pool Radius	m		4.56734	5.08083

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	24.6111	23.9695	
Radiation Level	12.5	kW/m2	16.9523	16.7799	
Radiation Level	37.5	kW/m2	13.539	13.5468	
Radiation Level	44	kW/m2	13.1479	13.1699	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	30.5099	29.7866
Radiation Level	12.5	kW/m2	23.9258	22.4658
Radiation Level	37.5	kW/m2	18.5479	16.6983
Radiation Level	44	kW/m2	17.7217	15.8961

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	47.7807	46.8707
Radiation Level	12.5	kW/m2	33.3202	30.9187
Radiation Level	37.5	kW/m2	19.9244	18.5986
Radiation Level	44	kW/m2	19.9244	18.5986

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 015I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		1	1
Maximum Pool Radius	m		6.05939	6.05855

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)		Averaging Time		Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		No Hazard	No Hazard
Flame Direction		Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

		Dia	Noite
Early Pool Fire Status		Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

			Dia	Noite
Radiation Level	3	kW/m2	19.5905	19.4256
Radiation Level	12.5	kW/m2	11.5508	11.1425
Radiation Level	37.5	kW/m2	4.72591	4.47013
Radiation Level	44	kW/m2	3.83332	3.65241

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

			Dia	Noite
Radiation Level	3	kW/m2	38.2811	37.1691
Radiation Level	12.5	kW/m2	20.6231	19.1042
Radiation Level	37.5	kW/m2	7.05939	7.05855
Radiation Level	44	kW/m2	7.05939	7.05855

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 015V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015V

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (56000)	18.75 s	No Hazard	No Hazard
LFL (7000)	18.75 s	No Hazard	No Hazard
LFL Frac (7000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (56000)	18.75 s	0	0
LFL (7000)	18.75 s	0	0
LFL Frac (7000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015V

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	21.0417	21.0011
12.5	kW/m2	11.4258	10.8408
37.5	kW/m2	6.98868	6.12723
44	kW/m2	6.46265	5.08977

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015V

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 015V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 016A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Angle 45 deg
Outdoor Release Direction Angled from Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 6.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.59733	0.702591
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	203.063	
Pool Vaporization Rate	kg/s	0.0252125	
Total Vapor Flowrate	kg/s	2.81974	2.06402
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.3381	
Pool Vaporization Rate	kg/s	0.0649644	
Total Vapor Flowrate	kg/s	2.85949	
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.925	
Pool Vaporization Rate	kg/s	0.0860711	
Total Vapor Flowrate	kg/s	2.8806	
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	49.725	
Pool Vaporization Rate	kg/s	0.103268	
Total Vapor Flowrate	kg/s	2.8978	
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6719	
Pool Vaporization Rate	kg/s	0.118187	
Total Vapor Flowrate	kg/s	2.91271	
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	74.9081	
Pool Vaporization Rate	kg/s	0.137459	
Total Vapor Flowrate	kg/s	2.93199	
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	
Pool Vaporization Rate	kg/s	0.16482	
Total Vapor Flowrate	kg/s	2.95935	
Maximum Pool Radius	m	14.7724	16.0015

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

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

Radiation Level			Distance (m)	
			Dia	Noite
3	kW/m2		65.2496	62.4364
12.5	kW/m2		35.0649	33.1946
37.5	kW/m2		22.3871	20.5912
44	kW/m2		20.4755	18.0321

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

	Radiation Level (kW/m2)
Dia	Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

			Dia	Noite
Radiation Level	3	kW/m2	70.652	65.71
Radiation Level	12.5	kW/m2	56.2773	50.0479
Radiation Level	37.5	kW/m2	42.9376	37.7413
Radiation Level	44	kW/m2	42.9098	37.7413

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	96.3508	91.3191
Radiation Level	12.5	kW/m2	57.0393	51.2945
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

	Dia	Radiation Level (kW/m2)
		Noite

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 016H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 6.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.957155	0.963418
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	201.64	182.25
Pool Vaporization Rate	kg/s	0.0410014	0.0193738
Total Vapor Flowrate	kg/s	0.338348	0.273251
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	78.9225	78.5725
Pool Vaporization Rate	kg/s	0.104816	0.0449423
Total Vapor Flowrate	kg/s	0.402163	0.298819
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.84	61.38
Pool Vaporization Rate	kg/s	0.138845	0.0580377
Total Vapor Flowrate	kg/s	0.436192	0.311915
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	49.66	52.22
Pool Vaporization Rate	kg/s	0.166455	0.0684893
Total Vapor Flowrate	kg/s	0.463801	0.322366
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6181	45.8275
Pool Vaporization Rate	kg/s	0.190427	0.0774044
Total Vapor Flowrate	kg/s	0.487773	0.331281
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	75.95	80.3906
Pool Vaporization Rate	kg/s	0.221721	0.0887505
Total Vapor Flowrate	kg/s	0.519067	0.342627
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	99.3594
Pool Vaporization Rate	kg/s	0.26611	0.104706
Total Vapor Flowrate	kg/s	0.563457	0.358582
Maximum Pool Radius	m	18.7035	18.7402

SUMMARY REPORT

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	10.3795	10.2763
LFL Frac (7000)	18.75	s	10.3795	10.2763

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

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

			Dia	Noite
Radiation Level	3	kW/m2	28.4635	27.3835
Radiation Level	12.5	kW/m2	19.6981	19.219
Radiation Level	37.5	kW/m2	15.7778	15.523
Radiation Level	44	kW/m2	15.3256	15.0863

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

	Dia	Noite
Radiation Level (kW/m2)		

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

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Study Folder: UTE Pampa rev_0_Hidrogenio

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Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

				Distance (m)	
				Dia	Noite
Radiation Level	3	kW/m2	47.8539	46.8772	
Radiation Level	12.5	kW/m2	30.9571	29.416	
Radiation Level	37.5	kW/m2	17.2698	17.2248	
Radiation Level	44	kW/m2	17.2698	17.2248	

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

		Radiation Level (kW/m2)	
		Dia	Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

		Dia	Noite
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

				Distance (m)	
				Dia	Noite
Radiation Level	3	kW/m2	78.9936	76.2441	
Radiation Level	12.5	kW/m2	32.4957	31.7675	
Radiation Level	37.5	kW/m2	Not Reached	Not Reached	
Radiation Level	44	kW/m2	Not Reached	Not Reached	

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

		Radiation Level (kW/m2)	
		Dia	Noite

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	7000	ppm	10.3795	10.2763	
Furthest Extent	7000	ppm	10.3795	10.2763	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	7000	ppm	0	0	
Furthest Extent	7000	ppm	0	0	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level	
			Dia	Noite
Overpressure	0.05	bar	30.7244	28.4263
Overpressure	0.1	bar	21.1888	19.9481
Overpressure	0.3	bar	14.4268	13.936
Overpressure	0.4	bar	13.2041	12.8488

			Supplementary Data at 0.05 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.151897	0.106762
Used Flammable Mass				
Overpressure Radius		m	20.7244	18.4263
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.1 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.151897	0.106762
Used Flammable Mass				
Overpressure Radius		m	11.1888	9.9481
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.3 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.151897	0.106762
Used Flammable Mass				
Overpressure Radius		m	4.42685	3.93595
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.4 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.151897	0.106762
Used Flammable Mass				
Overpressure Radius		m	3.20409	2.84879
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre	m	10	10
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Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 016I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Down - Impinging on the Ground

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 6.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	1	1
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	196.701	175.563
Pool Vaporization Rate	kg/s	0.0469235	0.022915
Total Vapor Flowrate	kg/s	0.0469237	0.0229152
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.69	78.84
Pool Vaporization Rate	kg/s	0.116239	0.050866
Total Vapor Flowrate	kg/s	0.11624	0.0508661
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	60.3319	61.5481
Pool Vaporization Rate	kg/s	0.153311	0.0651356
Total Vapor Flowrate	kg/s	0.153311	0.0651357
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	50.3831	52.6894
Pool Vaporization Rate	kg/s	0.183318	0.0764675
Total Vapor Flowrate	kg/s	0.183318	0.0764677
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	44.495	47.52
Pool Vaporization Rate	kg/s	0.20946	0.0862472
Total Vapor Flowrate	kg/s	0.20946	0.0862474
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	76.9019	82.2456
Pool Vaporization Rate	kg/s	0.24345	0.0987178
Total Vapor Flowrate	kg/s	0.24345	0.0987179
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	91.4975	101.594
Pool Vaporization Rate	kg/s	0.291425	0.116095
Total Vapor Flowrate	kg/s	0.291425	0.116095
Maximum Pool Radius	m	19.1128	19.0948

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	No Hazard	No Hazard
Flame Direction	Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	37.6912	36.7377
Radiation Level	12.5	kW/m2	20.5111	19.0357
Radiation Level	37.5	kW/m2	6.856	6.89567
Radiation Level	44	kW/m2	6.856	6.89567

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

			Dia	Noite
				Distance (m)
Radiation Level	3	kW/m2	69.4714	66.6411
Radiation Level	12.5	kW/m2	22.3363	21.6001
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

	Dia	Noite
		Radiation Level (kW/m2)
		Noite

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 016V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Vertical

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 6.94 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

		Dia	Noite
	Release Segment 1		
Release Duration	s	600	600
Liquid Rainout	fraction	0.46736	0.591797
	Release Segment 1 Cloud Segment 1		
Cloud Segment Duration	s	202.351	
Pool Vaporization Rate	kg/s	0.0198924	
Total Vapor Flowrate	kg/s	3.71642	2.83293
	Release Segment 1 Cloud Segment 2		
Cloud Segment Duration	s	79.05	
Pool Vaporization Rate	kg/s	0.0512368	
Total Vapor Flowrate	kg/s	3.74776	
	Release Segment 1 Cloud Segment 3		
Cloud Segment Duration	s	59.925	
Pool Vaporization Rate	kg/s	0.0678928	
Total Vapor Flowrate	kg/s	3.76442	
	Release Segment 1 Cloud Segment 4		
Cloud Segment Duration	s	49.725	
Pool Vaporization Rate	kg/s	0.081369	
Total Vapor Flowrate	kg/s	3.77789	
	Release Segment 1 Cloud Segment 5		
Cloud Segment Duration	s	43.6719	
Pool Vaporization Rate	kg/s	0.0930442	
Total Vapor Flowrate	kg/s	3.78957	
	Release Segment 1 Cloud Segment 6		
Cloud Segment Duration	s	74.9081	
Pool Vaporization Rate	kg/s	0.108106	
Total Vapor Flowrate	kg/s	3.80463	
	Release Segment 1 Cloud Segment 7		
Cloud Segment Duration	s	90.3694	
Pool Vaporization Rate	kg/s	0.129456	
Total Vapor Flowrate	kg/s	3.82598	
Maximum Pool Radius	m	13.0647	14.6852

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time			Dia	Noite
UFL (56000)	18.75	s		No Hazard	No Hazard
LFL (7000)	18.75	s		No Hazard	No Hazard
LFL Frac (7000)	18.75	s		No Hazard	No Hazard

Concentration(ppm)	Averaging Time			Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

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

				Dia	Noite
Radiation Level	3	kW/m2		57.6527	60.8896
Radiation Level	12.5	kW/m2		30.7505	31.5159
Radiation Level	37.5	kW/m2		19.2917	19.2682
Radiation Level	44	kW/m2		17.8603	17.3658

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

			Dia	Noite
Radiation Level	3	kW/m2	71.2669	62.0303
Radiation Level	12.5	kW/m2	57.9775	47.2249
Radiation Level	37.5	kW/m2	45.6932	35.0347
Radiation Level	44	kW/m2	45.0732	35.0347

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

			Dia	Noite
Radiation Level	3	kW/m2	95.0871	86.112
Radiation Level	12.5	kW/m2	59.0868	48.3917
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Distribuição\Cenário 016V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 018A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018A

User-Defined Data

Bund

Status of Bund	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m
Material	
Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg
Scenario	
Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (56000)	18.75 s	No Hazard	No Hazard
LFL (7000)	18.75 s	No Hazard	No Hazard
LFL Frac (7000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (56000)	18.75 s	0	0
LFL (7000)	18.75 s	0	0
LFL Frac (7000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018A

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	22.2516	22.4603
12.5	kW/m2	12.6795	12.212
37.5	kW/m2	8.07668	7.36617
44	kW/m2	7.44295	5.79744

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018A

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 018H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material n-NONANE
Scenario Leak
Inventory 1,000,000.00 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 9.01 bar
- Temperature 25.00 degC
- Fluid State Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate 6.99592E-001 kg/s
Release Duration 600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure 1.01 bar
- Temperature 24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases) 51.54 m/s
- Discharge Coefficient 0.60

Final data (after atmospheric expansion):

- Temperature 24.85 degC
- Liquid Mass Fraction 1.00 fraction
- Droplet Diameter 87.98 um
- Expanded Radius 0.00 m
- Velocity 51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material n-NONANE
Scenario Leak
Inventory 1,000,000.00 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 9.01 bar
- Temperature 25.00 degC
- Fluid State Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.56822	0.703459
Maximum Pool Radius	m		4.56734	5.08083

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time			Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		No Hazard	No Hazard
LFL (7000)	18.75	s		No Hazard	No Hazard
LFL Frac (7000)	18.75	s		No Hazard	No Hazard
Concentration(ppm)	Averaging Time			Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

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

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	24.6111	23.9695
Radiation Level	12.5	kW/m2	16.9523	16.7799
Radiation Level	37.5	kW/m2	13.539	13.5468
Radiation Level	44	kW/m2	13.1479	13.1699

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	30.5099	29.7866
Radiation Level	12.5	kW/m2	23.9258	22.4658
Radiation Level	37.5	kW/m2	18.5479	16.6983
Radiation Level	44	kW/m2	17.7217	15.8961

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	47.7807	46.8707
Radiation Level	12.5	kW/m2	33.3202	30.9187
Radiation Level	37.5	kW/m2	19.9244	18.5986
Radiation Level	44	kW/m2	19.9244	18.5986

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 018I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

			Dia	Noite
	Release Segment 1			
Release Duration	s	600		600
Liquid Rainout	fraction	1		1
Maximum Pool Radius	m	6.05939		6.05855

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	0	0	
LFL (7000)	18.75	s	0	0	
LFL Frac (7000)	18.75	s	0	0	

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	
LFL (7000)	18.75	s	0	0	
LFL Frac (7000)	18.75	s	0	0	

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	No Hazard	No Hazard
Flame Direction	Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

			Dia	Noite
Radiation Level	3	kW/m2	19.5905	19.4256
Radiation Level	12.5	kW/m2	11.5508	11.1425
Radiation Level	37.5	kW/m2	4.72591	4.47013
Radiation Level	44	kW/m2	3.83332	3.65241

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

			Dia	Noite
Radiation Level	3	kW/m2	38.2811	37.1691
Radiation Level	12.5	kW/m2	20.6231	19.1042
Radiation Level	37.5	kW/m2	7.05939	7.05855
Radiation Level	44	kW/m2	7.05939	7.05855

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 018V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018V

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (56000)	18.75 s	No Hazard	No Hazard
LFL (7000)	18.75 s	No Hazard	No Hazard
LFL Frac (7000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (56000)	18.75 s	0	0
LFL (7000)	18.75 s	0	0
LFL Frac (7000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018V

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	21.0417	21.0011
12.5	kW/m2	11.4258	10.8408
37.5	kW/m2	6.98868	6.12723
44	kW/m2	6.46265	5.08977

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018V

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 018V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 019A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Angle 45 deg
Outdoor Release Direction Angled from Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 0.99 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.604182	0.663977
Maximum Pool Radius	m		5.60404	5.87244

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	26.5605	26.5688	
Radiation Level	12.5	kW/m2	14.6294	14.1519	
Radiation Level	37.5	kW/m2	9.23099	9.23099	
Radiation Level	44	kW/m2	8.2149	Not Reached	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

Dia Radiation Level (kW/m2)
Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

Early Pool Fire Status Dia Noite
Hazard Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

			Dia	Distance (m) Noite
Radiation Level	3	kW/m2	42.6996	39.5939
Radiation Level	12.5	kW/m2	35.0865	31.4881
Radiation Level	37.5	kW/m2	28.6908	24.9737
Radiation Level	44	kW/m2	27.828	24.1739

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

Dia Radiation Level (kW/m2)
Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

Late Pool Fire Status Dia Noite
Hazard Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

			Dia	Distance (m) Noite
Radiation Level	3	kW/m2	61.0445	57.238
Radiation Level	12.5	kW/m2	44.4213	39.5876
Radiation Level	37.5	kW/m2	30.7163	27.4359
Radiation Level	44	kW/m2	30.7163	27.4359

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 019H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 0.99 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.930255	0.94228
Maximum Pool Radius	m		6.95553	6.99639

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	6.91056	6.87061
LFL Frac (7000)	18.75	s	6.91056	6.87061

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

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

			Dia	Noite
Radiation Level	3	kW/m2	14.5278	13.7795
Radiation Level	12.5	kW/m2	10.055	9.6609
Radiation Level	37.5	kW/m2	7.9659	7.69999
Radiation Level	44	kW/m2	7.71698	7.47158

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

	Dia	Radiation Level (kW/m2)
	Noite	

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

			Dia	Distance (m)
Radiation Level	3	kW/m2	28.8387	Noite 28.484
Radiation Level	12.5	kW/m2	20.0073	19.3439
Radiation Level	37.5	kW/m2	12.4074	11.8979
Radiation Level	44	kW/m2	11.4488	11.0332

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

	Dia	Radiation Level (kW/m2)
	Noite	

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

			Dia	Distance (m)
Radiation Level	3	kW/m2	48.0668	Noite 46.9089
Radiation Level	12.5	kW/m2	27.8241	26.1446
Radiation Level	37.5	kW/m2	15.3515	15.1595
Radiation Level	44	kW/m2	Not Reached	Not Reached

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

	Dia	Noite
Radiation Level (kW/m2)		

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

All flammable results are reported at the flammable effect height 0 m

			Distance (m)	
			Dia	Noite
Furthest Extent	7000	ppm	6.91056	6.87061
Furthest Extent	7000	ppm	6.91056	6.87061
			Heights (m) for above distances	
			Dia	Noite
Furthest Extent	7000	ppm	0	0
Furthest Extent	7000	ppm	0	0

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 019I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Down - Impinging on the Ground

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 0.99 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		1	1
Maximum Pool Radius	m		7.20958	7.2079

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)		Averaging Time		Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	No Hazard	No Hazard
Flame Direction	Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

			Dia	Noite
Radiation Level	3	kW/m2	21.9485	21.7264
Radiation Level	12.5	kW/m2	12.8996	12.4039
Radiation Level	37.5	kW/m2	5.05339	4.80815
Radiation Level	44	kW/m2	4.08141	3.92699

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

			Dia	Noite
Radiation Level	3	kW/m2	41.2974	40.2979
Radiation Level	12.5	kW/m2	20.2892	18.9233
Radiation Level	37.5	kW/m2	8.20958	8.2079
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 019V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Vertical

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 0.99 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.53173	0.596305
Maximum Pool Radius	m		5.25686	5.56499

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
			Distance (m)	
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite
			Heights (m) for above distances	
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

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

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	25.3561	25.3036
Radiation Level	12.5	kW/m2	13.9065	13.1242
Radiation Level	37.5	kW/m2	8.61086	7.8302
Radiation Level	44	kW/m2	8.01845	6.78719

SUMMARY REPORT

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

	Dia	Radiation Level (kW/m2)
	Noite	

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

			Dia	Distance (m)
Radiation Level	3	kW/m2	43.1874	Noite 38.419
Radiation Level	12.5	kW/m2	35.9089	30.6124
Radiation Level	37.5	kW/m2	29.9214	24.3802
Radiation Level	44	kW/m2	28.9848	23.5949

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

	Dia	Radiation Level (kW/m2)
	Noite	

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

			Dia	Distance (m)
Radiation Level	3	kW/m2	61.2188	Noite 55.8707
Radiation Level	12.5	kW/m2	45.3335	38.8893
Radiation Level	37.5	kW/m2	31.6463	26.6224
Radiation Level	44	kW/m2	31.6463	26.6224

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 019V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 021A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021A

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material n-NONANE
Scenario Leak
Inventory 1,000,000.00 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 9.01 bar
- Temperature 25.00 degC
- Fluid State Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate 6.99592E-001 kg/s
Release Duration 600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure 1.01 bar
- Temperature 24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases) 51.54 m/s
- Discharge Coefficient 0.60

Final data (after atmospheric expansion):

- Temperature 24.85 degC
- Liquid Mass Fraction 1.00 fraction
- Droplet Diameter 87.98 um
- Expanded Radius 0.00 m
- Velocity 51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material n-NONANE
Scenario Leak
Inventory 1,000,000.00 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 9.01 bar
- Temperature 25.00 degC
- Fluid State Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (56000)	18.75 s	No Hazard	No Hazard
LFL (7000)	18.75 s	No Hazard	No Hazard
LFL Frac (7000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (56000)	18.75 s	0	0
LFL (7000)	18.75 s	0	0
LFL Frac (7000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021A

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	22.2516	22.4603
12.5	kW/m2	12.6795	12.212
37.5	kW/m2	8.07668	7.36617
44	kW/m2	7.44295	5.79744

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021A

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 021H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.56822	0.703459
Maximum Pool Radius	m		4.56734	5.08083

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (56000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard	No Hazard
Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Truncated	Truncated
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

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

			Dia	Noite	Distance (m)
Radiation Level	3	kW/m2	24.6111	23.9695	
Radiation Level	12.5	kW/m2	16.9523	16.7799	
Radiation Level	37.5	kW/m2	13.539	13.5468	
Radiation Level	44	kW/m2	13.1479	13.1699	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

	Dia	Radiation Level (kW/m2)
	Noite	

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

			Dia	Noite
Radiation Level	3	kW/m2	30.5099	29.7866
Radiation Level	12.5	kW/m2	23.9258	22.4658
Radiation Level	37.5	kW/m2	18.5479	16.6983
Radiation Level	44	kW/m2	17.7217	15.8961

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

	Dia	Radiation Level (kW/m2)
	Noite	

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

			Dia	Noite
Radiation Level	3	kW/m2	47.7807	46.8707
Radiation Level	12.5	kW/m2	33.3202	30.9187
Radiation Level	37.5	kW/m2	19.9244	18.5986
Radiation Level	44	kW/m2	19.9244	18.5986

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 021I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 0211

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		1	1
Maximum Pool Radius	m		6.05939	6.05855

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)		Averaging Time		Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		No Hazard	No Hazard
Flame Direction		Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

		Dia	Noite
Early Pool Fire Status		Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

			Dia	Noite
Radiation Level	3	kW/m2	19.5905	19.4256
Radiation Level	12.5	kW/m2	11.5508	11.1425
Radiation Level	37.5	kW/m2	4.72591	4.47013
Radiation Level	44	kW/m2	3.83332	3.65241

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

			Dia	Noite
Radiation Level	3	kW/m2	38.2811	37.1691
Radiation Level	12.5	kW/m2	20.6231	19.1042
Radiation Level	37.5	kW/m2	7.05939	7.05855
Radiation Level	44	kW/m2	7.05939	7.05855

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 021V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021V

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Storage Pressure - gauge	8 bar
Temperature	25 degC
Mass Inventory	1E6 kg

Scenario

Scenario Type	Leak
Phase to be Released	Liquid
Hole Diameter	6.35 mm
Building Wake Effect	None
Tank Head	0 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1E6 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60

Final data (after atmospheric expansion):

- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.98 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	n-NONANE
Scenario	Leak
Inventory	1,000,000.00 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	9.01 bar
- Temperature	25.00 degC
- Fluid State	Non-saturated liquid

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	6.99592E-001 kg/s
Release Duration	600.00 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.01 bar
- Temperature	24.85 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	51.54 m/s
- Discharge Coefficient	0.60
Final data (after atmospheric expansion):	
- Temperature	24.85 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	87.03 um
- Expanded Radius	0.00 m
- Velocity	51.54 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (56000)	18.75 s	No Hazard	No Hazard
LFL (7000)	18.75 s	No Hazard	No Hazard
LFL Frac (7000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (56000)	18.75 s	0	0
LFL (7000)	18.75 s	0	0
LFL Frac (7000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021V

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	21.0417	21.0011
12.5	kW/m2	11.4258	10.8408
37.5	kW/m2	6.98868	6.12723
44	kW/m2	6.46265	5.08977

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021V

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 021V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 022A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

User-Defined Data

Geometry

East(1) 0 m
North(1) 0 m

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Angle 45 deg
Outdoor Release Direction Angled from Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 0.99 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		0.604182	0.663977
Maximum Pool Radius	m		5.60404	5.87244

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time			Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		No Hazard	No Hazard
LFL (7000)	18.75	s		No Hazard	No Hazard
LFL Frac (7000)	18.75	s		No Hazard	No Hazard
Concentration(ppm)	Averaging Time			Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		Hazard	Hazard
Flame Direction		Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

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

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	26.5605	26.5688
Radiation Level	12.5	kW/m2	14.6294	14.1519
Radiation Level	37.5	kW/m2	9.23099	9.23099
Radiation Level	44	kW/m2	8.2149	Not Reached

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

Dia Radiation Level (kW/m2)
Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

Early Pool Fire Status Dia Noite
Hazard Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

			Dia	Distance (m) Noite
Radiation Level	3	kW/m2	42.6996	39.5939
Radiation Level	12.5	kW/m2	35.0865	31.4881
Radiation Level	37.5	kW/m2	28.6908	24.9737
Radiation Level	44	kW/m2	27.828	24.1739

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

Dia Radiation Level (kW/m2)
Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

Late Pool Fire Status Dia Noite
Hazard Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

			Dia	Distance (m) Noite
Radiation Level	3	kW/m2	61.0445	57.238
Radiation Level	12.5	kW/m2	44.4213	39.5876
Radiation Level	37.5	kW/m2	30.7163	27.4359
Radiation Level	44	kW/m2	30.7163	27.4359

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 022H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Horizontal

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 0.99 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

			Dia	Noite
	Release Segment 1			
Release Duration	s		600	600
Liquid Rainout	fraction		0.930255	0.94228
Maximum Pool Radius	m		6.95553	6.99639

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	6.91056	6.87061
LFL Frac (7000)	18.75	s	6.91056	6.87061

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (56000)	18.75	s	0	0	0
LFL (7000)	18.75	s	0	0	0
LFL Frac (7000)	18.75	s	0	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		Truncated	Truncated
Flame Direction		Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

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

			Dia	Noite
Radiation Level	3	kW/m2	14.5278	13.7795
Radiation Level	12.5	kW/m2	10.055	9.6609
Radiation Level	37.5	kW/m2	7.9659	7.69999
Radiation Level	44	kW/m2	7.71698	7.47158

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

	Dia	Radiation Level (kW/m2)
		Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	28.8387	28.484
Radiation Level	12.5	kW/m2	20.0073	19.3439
Radiation Level	37.5	kW/m2	12.4074	11.8979
Radiation Level	44	kW/m2	11.4488	11.0332

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

	Dia	Radiation Level (kW/m2)
		Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

			Dia	Distance (m)
			Noite	
Radiation Level	3	kW/m2	48.0668	46.9089
Radiation Level	12.5	kW/m2	27.8241	26.1446
Radiation Level	37.5	kW/m2	15.3515	15.1595
Radiation Level	44	kW/m2	Not Reached	Not Reached

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

	Dia	Noite
Radiation Level (kW/m2)		

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

All flammable results are reported at the flammable effect height 0 m

			Distance (m)	
			Dia	Noite
Furthest Extent	7000	ppm	6.91056	6.87061
Furthest Extent	7000	ppm	6.91056	6.87061
			Heights (m) for above distances	
			Dia	Noite
Furthest Extent	7000	ppm	0	0
Furthest Extent	7000	ppm	0	0

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 022I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Down - Impinging on the Ground

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 0.99 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

			Dia	Noite
		Release Segment 1		
Release Duration	s		600	600
Liquid Rainout	fraction		1	1
Maximum Pool Radius	m		7.20958	7.2079

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)		Averaging Time		Distance (m)	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Dia	Noite
UFL (56000)	18.75	s		0	0
LFL (7000)	18.75	s		0	0
LFL Frac (7000)	18.75	s		0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		No Hazard	No Hazard
Flame Direction		Along Ground	Along Ground

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

		Dia	Noite
Early Pool Fire Status		Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

			Dia	Noite
Radiation Level	3	kW/m2	21.9485	21.7264
Radiation Level	12.5	kW/m2	12.8996	12.4039
Radiation Level	37.5	kW/m2	5.05339	4.80815
Radiation Level	44	kW/m2	4.08141	3.92699

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

	Dia	Noite
Radiation Level (kW/m2)		

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

			Dia	Noite
Radiation Level	3	kW/m2	41.2974	40.2979
Radiation Level	12.5	kW/m2	20.2892	18.9233
Radiation Level	37.5	kW/m2	8.20958	8.2079
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 022V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

User-Defined Data

Material

Material Identifier n-NONANE

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 No bund present
[Type of Bund Surface Concrete]
[Bund Height 0 m]
[Bund Failure Modeling Bund cannot fail]

Indoor/Outdoor

Location of release Open air release
Outdoor Release Direction Vertical

Flammable

Explosion Method Multi-Energy
Jet Fire Method Cone Model

Dispersion

Number of Release Segments 1
Fluid Phase(1) Liquid
Discharge Velocity(1) 30.94 m/s
Droplet Diameter(1) 243.4 um
Duration of Discharge(1) 600 s
Final Temperature(1) 25.48 degC
Release Rate(1) 0.99 kg/s
Pre-Dilution Air Rates(1) 0 kg/s
Late Ignition Location No ignition location
Mass Inventory of material to Disperse 1E6 kg

Fireball Parameters

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

Toxic Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

			Dia	Noite
	Release Segment 1			
Release Duration	s		600	600
Liquid Rainout	fraction		0.53173	0.596305
Maximum Pool Radius	m		5.25686	5.56499

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

The height for user defined concentrations is the user defined height 0 m
All toxic results are reported at the toxic effect height 0 m
All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	No Hazard	No Hazard
LFL (7000)	18.75	s	No Hazard	No Hazard
LFL Frac (7000)	18.75	s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

Jet fire method used: Cone model - DNV recommended

		Dia	Noite
Jet Fire Status		Hazard	Hazard
Flame Direction		Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

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

			Dia	Noite
Radiation Level	3	kW/m2	25.3561	25.3036
Radiation Level	12.5	kW/m2	13.9065	13.1242
Radiation Level	37.5	kW/m2	8.61086	7.8302
Radiation Level	44	kW/m2	8.01845	6.78719

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

	Radiation Level (kW/m2)
Dia	Noite

Early Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

	Dia	Noite
Early Pool Fire Status	Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

			Dia	Distance (m)
Radiation Level	3	kW/m2	43.1874	Noite 38.419
Radiation Level	12.5	kW/m2	35.9089	30.6124
Radiation Level	37.5	kW/m2	29.9214	24.3802
Radiation Level	44	kW/m2	28.9848	23.5949

Radiation Effects: Early Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

	Radiation Level (kW/m2)
Dia	Noite

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

			Dia	Distance (m)
Radiation Level	3	kW/m2	61.2188	Noite 55.8707
Radiation Level	12.5	kW/m2	45.3335	38.8893
Radiation Level	37.5	kW/m2	31.6463	26.6224
Radiation Level	44	kW/m2	31.6463	26.6224

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

	Dia	Noite
Radiation Level (kW/m2)		

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 022V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 023

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

User-Defined Data

Material

Material Identifier	n-NONANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	25 degC
Mass Inventory	1429 kg

Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	0 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	2 m ²
[Type of Bund Surface	Concrete]
Bund Height	0.5 m
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
---------------------	------------------

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1429 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]

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material n-NONANE
Scenario Catastrophic rupture
Inventory 1,428.59 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 1.01 bar
- Temperature 25.00 degC
- Fluid State Liquid at atmospheric pressure

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate n/a kg/s
Release Duration n/a s
Orifice or pipe exit data (before atmospheric expansion):
- Pressure n/a bar
- Temperature n/a degC
- Vena Contracta Velocity (exit velocity for pipe releases) n/a m/s
- Discharge Coefficient n/a
Final data (after atmospheric expansion):
- Temperature 25.00 degC
- Liquid Mass Fraction 1.00 fraction
- Droplet Diameter 10,000.00 um
- Expanded Radius n/a m
- Velocity 0.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material n-NONANE
Scenario Catastrophic rupture
Inventory 1,428.59 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 1.01 bar
- Temperature 25.00 degC
- Fluid State Liquid at atmospheric pressure

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	n/a kg/s
Release Duration	n/a s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	n/a bar
- Temperature	n/a degC
- Vena Contracta Velocity (exit velocity for pipe releases)	n/a m/s
- Discharge Coefficient	n/a
Final data (after atmospheric expansion):	
- Temperature	25.00 degC
- Liquid Mass Fraction	1.00 fraction
- Droplet Diameter	10,000.00 um
- Expanded Radius	n/a m
- Velocity	0.00 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Pool Vaporization Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

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

		Dia	Noite
Liquid Rainout	fraction	0.999834	0.99991
Initial Vapor Cloud	kg	0.237006	0.128755
Time Pool Left Behind	s	7.16114	
Cloud Segment 1			
Cloud Segment Duration	s	91.2025	
Pool Vaporization Rate	kg/s	0.081628	
Cloud Segment 2			
Cloud Segment Duration	s	196.948	
Pool Vaporization Rate	kg/s	0.113576	
Cloud Segment 3			
Cloud Segment Duration	s	311.849	
Pool Vaporization Rate	kg/s	0.141755	
Maximum Pool Radius	m	11.2828	0.797885

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	2.84199	1.76871
LFL (7000)	18.75	s	2.8674	1.78849
LFL Frac (7000)	18.75	s	2.8674	1.78849
Concentration(ppm)	Averaging Time		Dia	Noite
UFL (56000)	18.75	s	0	0
LFL (7000)	18.75	s	0	0
LFL Frac (7000)	18.75	s	0	0

Late Pool Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

	Dia	Noite
Late Pool Fire Status	Hazard	Hazard

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Radiation Effects: Late Pool Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

			Dia	Noite
Radiation Level	3	kW/m2	50.9576	10.664
Radiation Level	12.5	kW/m2	19.0486	6.22956
Radiation Level	37.5	kW/m2	Not Reached	2.75532
Radiation Level	44	kW/m2	Not Reached	2.26001

Radiation Effects: Late Pool Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

	Dia	Noite
Radiation Level (kW/m2)		

Fireball Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

	Dia	Noite
Fireball Flame Status	No Hazard	No Hazard

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

All flammable results are reported at the flammable effect height 0 m

			Dia	Noite
Furthest Extent	7000	ppm	2.8674	1.78849
Furthest Extent	7000	ppm	2.8674	1.78849

			Dia	Noite
Furthest Extent	7000	ppm	0	0
Furthest Extent	7000	ppm	0	0

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Early Explosion

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

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

			Dia	Noite
Supplied Flammable Mass		kg	1428.59	1428.59
Distance (m) at Overpressure Levels				
			Dia	Noite
Overpressure	0.05	bar	No Hazard	No Hazard
Overpressure	0.1	bar	No Hazard	No Hazard
Overpressure	0.3	bar	No Hazard	No Hazard
Overpressure	0.4	bar	No Hazard	No Hazard
Used Mass (kg) at Overpressure Levels				
			Dia	Noite
Overpressure	0.05	bar	No Hazard	No Hazard
Overpressure	0.1	bar	No Hazard	No Hazard
Overpressure	0.3	bar	No Hazard	No Hazard
Overpressure	0.4	bar	No Hazard	No Hazard

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Retorno\Cenário 023

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 024A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024A

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	168 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

Scenario Type	Leak
Phase to be Released	Vapor
Hole Diameter	25 mm
Building Wake Effect	None

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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	920.1 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]
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SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Leak
Inventory	920.14 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	169.01 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	4.31347E+000 kg/s
Release Duration	213.32 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	85.97 bar
- Temperature	-28.06 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,285.81 m/s
- Discharge Coefficient	0.86

Final data (after atmospheric expansion):

- Temperature	25.08 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.18 m
- Velocity	500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Leak
Inventory	920.14 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	169.01 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	4.31347E+000 kg/s
Release Duration	213.32 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	85.97 bar
- Temperature	-28.06 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,285.81 m/s
- Discharge Coefficient	0.86
Final data (after atmospheric expansion):	
- Temperature	25.08 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.18 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (750000)	18.75 s	No Hazard	No Hazard
LFL (40000)	18.75 s	No Hazard	No Hazard
LFL Frac (40000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (750000)	18.75 s	0	0
LFL (40000)	18.75 s	0	0
LFL Frac (40000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024A

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	52.6302	52.853
12.5	kW/m2	26.6972	22.776
37.5	kW/m2	Not Reached	Not Reached
44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024A

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 024H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024H

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	3.5 bar
Temperature	25 degC
Mass Inventory	27.44 kg

Scenario

Scenario Type	Leak
Phase to be Released	Vapor
Hole Diameter	25 mm
Building Wake Effect	None

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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	27.44 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: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Leak
Inventory	27.44 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	4.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.14028E-001 kg/s
Release Duration	240.64 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	2.37 bar
- Temperature	-25.90 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,203.22 m/s
- Discharge Coefficient	0.83

Final data (after atmospheric expansion):

- Temperature	16.41 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Leak
Inventory	27.44 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	4.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.14028E-001 kg/s
Release Duration	240.64 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	2.37 bar
- Temperature	-25.90 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,203.22 m/s
- Discharge Coefficient	0.83
Final data (after atmospheric expansion):	
- Temperature	16.41 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (750000)	18.75 s	No Hazard	No Hazard
LFL (40000)	18.75 s	No Hazard	No Hazard
LFL Frac (40000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (750000)	18.75 s	0	0
LFL (40000)	18.75 s	0	0
LFL Frac (40000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024H

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	9.80941	9.5996
12.5	kW/m2	Not Reached	Not Reached
37.5	kW/m2	Not Reached	Not Reached
44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024H

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 024I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	3.5 bar
Temperature	25 degC
Mass Inventory	27.44 kg

Scenario

Scenario Type	Leak
Phase to be Released	Vapor
Hole Diameter	25 mm
Building Wake Effect	None

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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	27.44 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: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 0 m
North(1) 0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Leak
Inventory 27.44 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 4.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate 1.14028E-001 kg/s
Release Duration 240.64 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure 2.37 bar
- Temperature -25.90 degC
- Vena Contracta Velocity (exit velocity for pipe releases) 1,203.22 m/s
- Discharge Coefficient 0.83

Final data (after atmospheric expansion):

- Temperature 16.41 degC
- Liquid Mass Fraction 0.00 fraction
- Droplet Diameter 0.00 um
- Expanded Radius 0.03 m
- Velocity 500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Leak
Inventory 27.44 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 4.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.14028E-001 kg/s
Release Duration	240.64 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	2.37 bar
- Temperature	-25.90 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,203.22 m/s
- Discharge Coefficient	0.83
Final data (after atmospheric expansion):	
- Temperature	16.41 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (750000)	18.75	s	0.749736	0.719968
LFL (40000)	18.75	s	15.3	13.4415
LFL Frac (40000)	18.75	s	15.3	13.4415

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (750000)	18.75	s	0	0
LFL (40000)	18.75	s	0	0
LFL Frac (40000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Along Ground	Along Ground

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

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

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	4.54811	4.46522
Radiation Level	12.5	kW/m2	Not Reached	Not Reached
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

	Radiation Level (kW/m2)	
	Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	40000	ppm	15.3	13.4415	
Furthest Extent	40000	ppm	15.3	13.4415	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	40000	ppm	0	0	
Furthest Extent	40000	ppm	0	0	

SUMMARY REPORT

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level	
			Dia	Noite
Overpressure	0.05	bar	47.7734	50.8742
Overpressure	0.1	bar	30.3933	32.0674
Overpressure	0.3	bar	18.0686	18.7309
Overpressure	0.4	bar	15.8399	16.3193

			Supplementary Data at 0.05 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.339816	0.430561
Used Flammable Mass				
Overpressure Radius		m	37.7734	40.8742
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.1 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.339816	0.430561
Used Flammable Mass				
Overpressure Radius		m	20.3933	22.0674
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.3 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.339816	0.430561
Used Flammable Mass				
Overpressure Radius		m	8.06859	8.73095
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.4 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.339816	0.430561
Used Flammable Mass				
Overpressure Radius		m	5.83994	6.31934
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre	m	10	10
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Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 024V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024V

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	3.5 bar
Temperature	25 degC
Mass Inventory	27.44 kg

Scenario

Scenario Type	Leak
Phase to be Released	Vapor
Hole Diameter	25 mm
Building Wake Effect	None

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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	27.44 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: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Leak
Inventory	27.44 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	4.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.14028E-001 kg/s
Release Duration	240.64 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	2.37 bar
- Temperature	-25.90 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,203.22 m/s
- Discharge Coefficient	0.83

Final data (after atmospheric expansion):

- Temperature	16.41 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Leak
Inventory	27.44 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	4.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.14028E-001 kg/s
Release Duration	240.64 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	2.37 bar
- Temperature	-25.90 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,203.22 m/s
- Discharge Coefficient	0.83
Final data (after atmospheric expansion):	
- Temperature	16.41 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (750000)	18.75 s	No Hazard	No Hazard
LFL (40000)	18.75 s	No Hazard	No Hazard
LFL Frac (40000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (750000)	18.75 s	0	0
LFL (40000)	18.75 s	0	0
LFL Frac (40000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024V

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	5.82257	5.05178
12.5	kW/m2	Not Reached	Not Reached
37.5	kW/m2	Not Reached	Not Reached
44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024V

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 024V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 025

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	168 bar
Temperature	25 degC
Mass Inventory	920.1 kg

Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Vapor
Building Wake Effect	None

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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
---------------------	------------------

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	920.1 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: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Catastrophic rupture
Inventory 920.14 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 169.01 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate n/a kg/s
Release Duration n/a s
Orifice or pipe exit data (before atmospheric expansion):
- Pressure n/a bar
- Temperature n/a degC
- Vena Contracta Velocity (exit velocity for pipe releases) n/a m/s
- Discharge Coefficient n/a
Final data (after atmospheric expansion):
- Temperature -208.49 degC
- Liquid Mass Fraction 0.00 fraction
- Droplet Diameter 0.00 um
- Expanded Radius n/a m
- Velocity 500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Catastrophic rupture
Inventory 920.14 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 169.01 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	n/a kg/s
Release Duration	n/a s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	n/a bar
- Temperature	n/a degC
- Vena Contracta Velocity (exit velocity for pipe releases)	n/a m/s
- Discharge Coefficient	n/a
Final data (after atmospheric expansion):	
- Temperature	-208.49 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	n/a m
- Velocity	500.00 m/s

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

The height for user defined concentrations is the user defined height 0 m

All toxic results are reported at the toxic effect height 0 m

All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (750000)	18.75	s	4.80052	4.82036
LFL (40000)	18.75	s	42.9006	39.3439
LFL Frac (40000)	18.75	s	42.9006	39.3439

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (750000)	18.75	s	0	0	Noite
LFL (40000)	18.75	s	0	0	Noite
LFL Frac (40000)	18.75	s	0	0	Noite

Fireball Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

	Dia	Noite
Fireball Flame Status	Hazard	Hazard

Radiation Effects: Fireball Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

			Dia	Noite
Radiation Level	3	kW/m2	263.792	264.092
Radiation Level	12.5	kW/m2	125.694	125.831
Radiation Level	37.5	kW/m2	58.2393	58.3283
Radiation Level	44	kW/m2	49.3164	49.4042

Radiation Effects: Fireball Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

	Dia	Radiation Level (kW/m2)
	Noite	

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

All flammable results are reported at the flammable effect height 0 m

			Distance (m)	
			Dia	Noite
Furthest Extent	40000	ppm	42.9006	39.3439
Furthest Extent	40000	ppm	42.9006	39.3439

			Heights (m) for above distances	
			Dia	Noite
Furthest Extent	40000	ppm	0	0
Furthest Extent	40000	ppm	0	0

Explosion Effects: Early Explosion

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

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

			Dia	Noite
Supplied Flammable Mass		kg	920.138	920.138

			Distance (m) at Overpressure Levels	
			Dia	Noite
Overpressure	0.05	bar	526.489	526.489
Overpressure	0.1	bar	284.244	284.244
Overpressure	0.3	bar	112.461	112.461
Overpressure	0.4	bar	81.3975	81.3975

			Used Mass (kg) at Overpressure Levels	
			Dia	Noite
Overpressure	0.05	bar	920.138	920.138
Overpressure	0.1	bar	920.138	920.138
Overpressure	0.3	bar	920.138	920.138
Overpressure	0.4	bar	920.138	920.138

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level	
			Dia	Noite
Overpressure	0.05	bar	520.137	520.59
Overpressure	0.1	bar	294.162	294.142
Overpressure	0.3	bar	134.515	134.508
Overpressure	0.4	bar	105.647	105.641

			Supplementary Data at 0.05 bar	
			Dia	Noite
Supplied Flammable Mass		kg	788.773	790.922
Used Flammable Mass				
Overpressure Radius		m	500.137	500.59
Distance to:				
- Ignition Source		m	20	20
- Cloud Front/Centre		m	0.145975	0.111996
- Explosion Centre		m	20	20

			Supplementary Data at 0.1 bar	
			Dia	Noite
Supplied Flammable Mass		kg	738.569	738.404
Used Flammable Mass				
Overpressure Radius		m	264.162	264.142
Distance to:				
- Ignition Source		m	30	30
- Cloud Front/Centre		m	1.53221	1.2256
- Explosion Centre		m	30	30

			Supplementary Data at 0.3 bar	
			Dia	Noite
Supplied Flammable Mass		kg	738.569	738.404
Used Flammable Mass				
Overpressure Radius		m	104.515	104.508
Distance to:				
- Ignition Source		m	30	30
- Cloud Front/Centre		m	1.53221	1.2256
- Explosion Centre		m	30	30

			Supplementary Data at 0.4 bar	
			Dia	Noite
Supplied Flammable Mass		kg	738.569	738.404
Used Flammable Mass				
Overpressure Radius		m	75.6468	75.6412
Distance to:				
- Ignition Source		m	30	30
- Cloud Front/Centre		m	1.53221	1.2256

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre	m	30	30
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Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 025

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 026A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026A

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	2.5 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

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

Pipe

Internal Diameter	28 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	21.37 kg

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Line rupture
Inventory	21.37 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.09448E-001 kg/s
Release Duration	195.29 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.56 bar
- Temperature	-13.75 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,221.93 m/s
- Discharge Coefficient	1.00

Final data (after atmospheric expansion):

- Temperature	29.99 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Line rupture
Inventory	21.37 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.09448E-001 kg/s
Release Duration	195.29 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.56 bar
- Temperature	-13.75 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,221.93 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	29.99 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (750000)	18.75 s	No Hazard	No Hazard
LFL (40000)	18.75 s	No Hazard	No Hazard
LFL Frac (40000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (750000)	18.75 s	0	0
LFL (40000)	18.75 s	0	0
LFL Frac (40000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026A

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	8.90796	9.00572
12.5	kW/m2	Not Reached	Not Reached
37.5	kW/m2	Not Reached	Not Reached
44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026A

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 026H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026H

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	2.5 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

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

Pipe

Internal Diameter	28 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal Impingement

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	21.37 kg

Fireball Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 0 m
North(1) 0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Line rupture
Inventory	21.37 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.09448E-001 kg/s
Release Duration	195.29 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.56 bar
- Temperature	-13.75 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,221.93 m/s
- Discharge Coefficient	1.00

Final data (after atmospheric expansion):

- Temperature	29.99 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Line rupture
Inventory	21.37 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	3.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.09448E-001 kg/s
Release Duration	195.29 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.56 bar
- Temperature	-13.75 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,221.93 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	29.99 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (750000)	18.75 s	No Hazard	No Hazard
LFL (40000)	18.75 s	No Hazard	No Hazard
LFL Frac (40000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (750000)	18.75 s	0	0
LFL (40000)	18.75 s	0	0
LFL Frac (40000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Impinged	Impinged

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026H

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	4.42489	4.34483
12.5	kW/m2	Not Reached	Not Reached
37.5	kW/m2	Not Reached	Not Reached
44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026H

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026H

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 026I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	2.5 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

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

Pipe

Internal Diameter	28 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	21.37 kg

Fireball Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 0 m
North(1) 0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Line rupture
Inventory 21.37 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 3.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate 1.09448E-001 kg/s
Release Duration 195.29 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure 1.56 bar
- Temperature -13.75 degC
- Vena Contracta Velocity (exit velocity for pipe releases) 1,221.93 m/s
- Discharge Coefficient 1.00

Final data (after atmospheric expansion):

- Temperature 29.99 degC
- Liquid Mass Fraction 0.00 fraction
- Droplet Diameter 0.00 um
- Expanded Radius 0.03 m
- Velocity 500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Line rupture
Inventory 21.37 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 3.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.09448E-001 kg/s
Release Duration	195.29 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.56 bar
- Temperature	-13.75 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,221.93 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	29.99 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite
UFL (750000)	18.75	s	0.718677	0.690235
LFL (40000)	18.75	s	14.9016	13.0477
LFL Frac (40000)	18.75	s	14.9016	13.0477

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (750000)	18.75	s	0	0
LFL (40000)	18.75	s	0	0
LFL Frac (40000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Along Ground	Along Ground

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

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

			Distance (m)	
			Dia	Noite
Radiation Level	3	kW/m2	4.42489	4.34483
Radiation Level	12.5	kW/m2	Not Reached	Not Reached
Radiation Level	37.5	kW/m2	Not Reached	Not Reached
Radiation Level	44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

	Radiation Level (kW/m2)	
	Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	40000	ppm		14.9016	13.0477
Furthest Extent	40000	ppm		14.9016	13.0477
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	40000	ppm		0	0
Furthest Extent	40000	ppm		0	0

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level	
			Dia	Noite
Overpressure	0.05	bar	47.1415	50.1223
Overpressure	0.1	bar	30.0522	31.6615
Overpressure	0.3	bar	17.9336	18.5703
Overpressure	0.4	bar	15.7422	16.2031

			Supplementary Data at 0.05 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.323046	0.407234
Used Flammable Mass				
Overpressure Radius		m	37.1415	40.1223
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.1 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.323046	0.407234
Used Flammable Mass				
Overpressure Radius		m	20.0522	21.6615
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.3 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.323046	0.407234
Used Flammable Mass				
Overpressure Radius		m	7.93361	8.57033
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10
- Explosion Centre		m	10	10

			Supplementary Data at 0.4 bar	
			Dia	Noite
Supplied Flammable Mass		kg	0.323046	0.407234
Used Flammable Mass				
Overpressure Radius		m	5.74224	6.20309
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	10	10

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

- Explosion Centre	m	10	10
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Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 026V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026V

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	2.5 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

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

Pipe

Internal Diameter	28 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	21.37 kg

Fireball Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 0 m
North(1) 0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Line rupture
Inventory 21.37 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 3.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate 1.09448E-001 kg/s
Release Duration 195.29 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure 1.56 bar
- Temperature -13.75 degC
- Vena Contracta Velocity (exit velocity for pipe releases) 1,221.93 m/s
- Discharge Coefficient 1.00

Final data (after atmospheric expansion):

- Temperature 29.99 degC
- Liquid Mass Fraction 0.00 fraction
- Droplet Diameter 0.00 um
- Expanded Radius 0.03 m
- Velocity 500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Line rupture
Inventory 21.37 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 3.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	1.09448E-001 kg/s
Release Duration	195.29 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.56 bar
- Temperature	-13.75 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,221.93 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	29.99 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.03 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (750000)	18.75 s	No Hazard	No Hazard
LFL (40000)	18.75 s	No Hazard	No Hazard
LFL Frac (40000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (750000)	18.75 s	0	0
LFL (40000)	18.75 s	0	0
LFL Frac (40000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026V

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	5.67352	4.90786
12.5	kW/m2	Not Reached	Not Reached
37.5	kW/m2	Not Reached	Not Reached
44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026V

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 026V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 027A

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027A

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	1.5 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

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

Pipe

Internal Diameter	57 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Angle	45 deg
Outdoor Release Direction	Angled from Horizontal

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	15.3 kg

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

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]

Multi Energy Explosion

Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use fractions
Source 1 (Source in Use)	Yes
Source 2 (Source in Use)	No
Source 3 (Source in Use)	No
Source 4 (Source in Use)	No
Source 5 (Source in Use)	No
Source 6 (Source in Use)	No
Source 7 (Source in Use)	No
Source 1 (Strength)	6
Source 1 (Fraction)	1 fraction

Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	0 m
North(1)	0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027A

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Line rupture
Inventory	15.30 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.11597E-001 kg/s
Release Duration	49.11 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure	1.21 bar
- Temperature	-5.86 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,112.64 m/s
- Discharge Coefficient	1.00

Final data (after atmospheric expansion):

- Temperature	28.86 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.05 m
- Velocity	500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Line rupture
Inventory	15.30 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.11597E-001 kg/s
Release Duration	49.11 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.21 bar
- Temperature	-5.86 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,112.64 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	28.86 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.05 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027A

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (750000)	18.75 s	No Hazard	No Hazard
LFL (40000)	18.75 s	No Hazard	No Hazard
LFL Frac (40000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (750000)	18.75 s	0	0
LFL (40000)	18.75 s	0	0
LFL Frac (40000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027A

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Angled	Angled

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027A

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	14.8629	15.0645
12.5	kW/m2	Not Reached	Not Reached
37.5	kW/m2	Not Reached	Not Reached
44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027A

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027A

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 027H

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027H

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	1.5 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

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

Pipe

Internal Diameter	57 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal Impingement

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	15.3 kg

Fireball Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 0 m
North(1) 0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027H

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Line rupture
Inventory 15.30 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 2.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate 3.11597E-001 kg/s
Release Duration 49.11 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure 1.21 bar
- Temperature -5.86 degC
- Vena Contracta Velocity (exit velocity for pipe releases) 1,112.64 m/s
- Discharge Coefficient 1.00

Final data (after atmospheric expansion):

- Temperature 28.86 degC
- Liquid Mass Fraction 0.00 fraction
- Droplet Diameter 0.00 um
- Expanded Radius 0.05 m
- Velocity 500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Line rupture
Inventory 15.30 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 2.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.11597E-001 kg/s
Release Duration	49.11 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.21 bar
- Temperature	-5.86 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,112.64 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	28.86 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.05 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027H

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Distance (m)	
			Dia	Noite
UFL (750000)	18.75	s	No Hazard	No Hazard
LFL (40000)	18.75	s	4.86289	No Hazard
LFL Frac (40000)	18.75	s	4.86289	No Hazard

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Dia	Noite
UFL (750000)	18.75	s	0	0
LFL (40000)	18.75	s	0	0
LFL Frac (40000)	18.75	s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027H

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Impinged	Impinged

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027H

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

Radiation Level			Distance (m)	
			Dia	Noite
3	kW/m2		9.08565	9.21281
12.5	kW/m2		5.2342	4.97432
37.5	kW/m2		Not Reached	Not Reached
44	kW/m2		Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027H

	Radiation Level (kW/m2)
Dia	Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027H

All flammable results are reported at the flammable effect height 0 m

				Distance (m)
				Dia
Furthest Extent	40000	ppm		4.86289
Furthest Extent	40000	ppm		4.86289
				Heights (m) for above distances
				Dia
Furthest Extent	40000	ppm		0
Furthest Extent	40000	ppm		0

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027H

				Dia	Noite
Wind Speed		m/s		3.73	2.78
Pasquill Stability				C/D	D
Surface Roughness Length		mm		950.891	950.891
Surface Roughness Parameter				0.17	0.17
Atmospheric Temperature		degC		19.6	16.5
Surface Temperature		degC		24.6	16.5
Relative Humidity		fraction		0.636	0.749

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Cenário 027I

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027I

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	1.5 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

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

Pipe

Internal Diameter	57 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Down - Impinging on the Ground

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	15.3 kg

Fireball Parameters

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 0 m
North(1) 0 m

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 0271

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed: 3.73 m/s
Wind Speed at Height (Calculated) 2.10 m/s
Pasquill Stability: C/D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Line rupture
Inventory 15.30 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 2.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only) n/a
Mass Flowrate 3.11597E-001 kg/s
Release Duration 49.11 s

Orifice or pipe exit data (before atmospheric expansion):

- Pressure 1.21 bar
- Temperature -5.86 degC
- Vena Contracta Velocity (exit velocity for pipe releases) 1,112.64 m/s
- Discharge Coefficient 1.00

Final data (after atmospheric expansion):

- Temperature 28.86 degC
- Liquid Mass Fraction 0.00 fraction
- Droplet Diameter 0.00 um
- Expanded Radius 0.05 m
- Velocity 500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed: 2.78 m/s
Wind Speed at Height (Calculated) 1.45 m/s
Pasquill Stability: D

USER-DEFINED QUANTITIES

Material HYDROGEN
Scenario Line rupture
Inventory 15.30 kg
Fixed Duration n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure 2.51 bar
- Temperature 25.00 degC
- Fluid State Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.11597E-001 kg/s
Release Duration	49.11 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.21 bar
- Temperature	-5.86 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,112.64 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	28.86 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.05 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027I

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time		Dia	Noite	Distance (m)
UFL (750000)	18.75	s	1.08474		1.02486
LFL (40000)	18.75	s	22.0807		3.05827
LFL Frac (40000)	18.75	s	22.0807		3.05827

Concentration(ppm)	Averaging Time		Dia	Noite	Heights (m) for above distances
UFL (750000)	18.75	s	0		0
LFL (40000)	18.75	s	0		0
LFL Frac (40000)	18.75	s	0		0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027I

Jet fire method used: Cone model - DNV recommended

Jet Fire Status	Dia	Noite
Flame Direction	Hazard	Hazard
	Along Ground	Along Ground

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027I

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

Radiation Level			Dia	Noite	Distance (m)
3	kW/m2		9.08565		9.21281
12.5	kW/m2		5.2342		4.97432
37.5	kW/m2		Not Reached		Not Reached
44	kW/m2		Not Reached		Not Reached

Radiation Effects: Jet Fire Distance

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027I

	Dia	Radiation Level (kW/m2)
		Noite

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Flash Fire Envelope

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027I

All flammable results are reported at the flammable effect height 0 m

				Distance (m)	
				Dia	Noite
Furthest Extent	40000	ppm	22.0807	3.05827	
Furthest Extent	40000	ppm	22.0807	3.05827	
				Heights (m) for above distances	
				Dia	Noite
Furthest Extent	40000	ppm	0	0	
Furthest Extent	40000	ppm	0	0	

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Explosion Effects: Late Ignition

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027I

Explosion Model Used : Multi Energy

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

All flammable results are reported at the flammable effect height 0 m

			Maximum Distance (m) at Overpressure Level
			Dia
Overpressure	0.05	bar	80.4834
Overpressure	0.1	bar	52.6541
Overpressure	0.3	bar	32.9196
Overpressure	0.4	bar	29.351

Supplementary Data at 0.05 bar

Dia

Supplied Flammable Mass	kg	1.39506
Used Flammable Mass		
Overpressure Radius	m	60.4834
Distance to:		
- Ignition Source	m	20
- Cloud Front/Centre	m	20
- Explosion Centre	m	20

Supplementary Data at 0.1 bar

Dia

Supplied Flammable Mass	kg	1.39506
Used Flammable Mass		
Overpressure Radius	m	32.6541
Distance to:		
- Ignition Source	m	20
- Cloud Front/Centre	m	20
- Explosion Centre	m	20

Supplementary Data at 0.3 bar

Dia

Supplied Flammable Mass	kg	1.39506
Used Flammable Mass		
Overpressure Radius	m	12.9196
Distance to:		
- Ignition Source	m	20
- Cloud Front/Centre	m	20
- Explosion Centre	m	20

Supplementary Data at 0.4 bar

Dia

Supplied Flammable Mass	kg	1.39506
Used Flammable Mass		
Overpressure Radius	m	9.351
Distance to:		
- Ignition Source	m	20
- Cloud Front/Centre	m	20

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- Explosion Centre m 20

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027I

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749

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Cenário 027V

Base Case

CASE Name: Data

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027V

User-Defined Data

Material

Material Identifier	HYDROGEN
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Storage Pressure - gauge	1.5 bar
Temperature	25 degC
Volume Inventory	75 m3

Scenario

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

Pipe

Internal Diameter	57 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	No bund present
[Type of Bund Surface	Concrete]
[Bund Height	0 m]
[Bund Failure Modeling	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Vertical

Flammable

Explosion Method	Multi-Energy
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	15.3 kg

Fireball Parameters

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[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]

Multi Energy Explosion

Use Unconfined Strength Do not use unconfined strength
Use Fractions Use fractions
Source 1 (Source in Use) Yes
Source 2 (Source in Use) No
Source 3 (Source in Use) No
Source 4 (Source in Use) No
Source 5 (Source in Use) No
Source 6 (Source in Use) No
Source 7 (Source in Use) No
Source 1 (Strength) 6
Source 1 (Fraction) 1 fraction

Geometry

Shape Point
Dimension 2D
System Absolute
East(1) 0 m
North(1) 0 m

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Phast 6.7

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027V

DISCHARGE DATA for Weather: Global Weathers\Dia

Wind Speed:	3.73 m/s
Wind Speed at Height (Calculated)	2.10 m/s
Pasquill Stability:	C/D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Line rupture
Inventory	15.30 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.11597E-001 kg/s
Release Duration	49.11 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.21 bar
- Temperature	-5.86 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,112.64 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	28.86 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.05 m
- Velocity	500.00 m/s

DISCHARGE DATA for Weather: Global Weathers\Noite

Wind Speed:	2.78 m/s
Wind Speed at Height (Calculated)	1.45 m/s
Pasquill Stability:	D

USER-DEFINED QUANTITIES

Material	HYDROGEN
Scenario	Line rupture
Inventory	15.30 kg
Fixed Duration	n/a s

Stagnation data (data at upstream end for long pipe):

- Pressure	2.51 bar
- Temperature	25.00 degC
- Fluid State	Pressurized gas

CALCULATED QUANTITIES

SUMMARY REPORT

Unique Audit Number: 2,739,689



Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Mass Flow of Air (Vent from Vapor Space only)	n/a
Mass Flowrate	3.11597E-001 kg/s
Release Duration	49.11 s
Orifice or pipe exit data (before atmospheric expansion):	
- Pressure	1.21 bar
- Temperature	-5.86 degC
- Vena Contracta Velocity (exit velocity for pipe releases)	1,112.64 m/s
- Discharge Coefficient	1.00
Final data (after atmospheric expansion):	
- Temperature	28.86 degC
- Liquid Mass Fraction	0.00 fraction
- Droplet Diameter	0.00 um
- Expanded Radius	0.05 m
- Velocity	500.00 m/s



Consequence Results

Distance to Concentration Results

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027V

The height for user defined concentrations is the user defined height 0 m
 All toxic results are reported at the toxic effect height 0 m
 All flammable results are reported at the flammable effect height 0 m

Concentration(ppm)	Averaging Time	Distance (m)	
		Dia	Noite
UFL (750000)	18.75 s	No Hazard	No Hazard
LFL (40000)	18.75 s	No Hazard	No Hazard
LFL Frac (40000)	18.75 s	No Hazard	No Hazard

Concentration(ppm)	Averaging Time	Heights (m) for above distances	
		Dia	Noite
UFL (750000)	18.75 s	0	0
LFL (40000)	18.75 s	0	0
LFL Frac (40000)	18.75 s	0	0

Jet Fire Hazard

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027V

Jet fire method used: Cone model - DNV recommended

	Dia	Noite
Jet Fire Status	Hazard	Hazard
Flame Direction	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027V

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

Radiation Level	kW/m2	Distance (m)	
		Dia	Noite
3	kW/m2	10.3837	9.28684
12.5	kW/m2	Not Reached	Not Reached
37.5	kW/m2	Not Reached	Not Reached
44	kW/m2	Not Reached	Not Reached

Radiation Effects: Jet Fire Distance

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	Radiation Level (kW/m2)
Dia	Noite

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Study Folder: UTE Pampa rev_0_Hidrogenio

Phast 6.7

Weather Conditions

Path: \UTE Pampa rev_0_Hidrogenio\Study\Hidrogênio\Cenário 027V

		Dia	Noite
Wind Speed	m/s	3.73	2.78
Pasquill Stability		C/D	D
Surface Roughness Length	mm	950.891	950.891
Surface Roughness Parameter		0.17	0.17
Atmospheric Temperature	degC	19.6	16.5
Surface Temperature	degC	24.6	16.5
Relative Humidity	fraction	0.636	0.749