

***ANEXO VI***

***LISTAGENS DE SAÍDA***

***DO PROGRAMA PHAST***

# SUMMARY REPORT

Unique Audit Number: 396.402



Study Folder: Candiota Fases A B C - 2011

Phast 6.6



Candiota Fases A B C - 2011



Study

Cen12C - Vazamento linha de OC tanque de 300 m<sup>3</sup>

## Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m<sup>3</sup> Fase C

## User-Defined Data

### Material

Material Identifier	n-TETRADECANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	16,9 degC
Volume Inventory	55 m <sup>3</sup>

### Scenario

Scenario Type	Line rupture
Phase to be Released	Liquid
Building Wake Effect	None
Pump Head	30 m
Specify Pump Head	Pump head supplied
Tank Head	6 m
Number of Excess Flow Valves	0
Number of Non-Return Valves	0
Number of Shut-Off Valves	0

### Pipe

Internal Diameter	50,8 mm
Line length	100 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	707 m <sup>2</sup>
[Type of Bund Surface	Concrete]
Bund Height	1 m
[Bund Failure Modeling	Bund cannot fail]

### Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

### Flammable

Explosion Method	TNT
Jet Fire Method	Cone Model

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## Dispersion

Late Ignition Location No ignition location  
Mass Inventory of material to Disperse 4,206E4 kg

## Fireball Parameters

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

## Toxic Parameters

[Indoor Calculations Unselected]  
[Wind Dependent Exchange Rate Case Specified]  
[Building Exchange Rate 4 /hr]  
[Tail Time 1800 s]  
[Set averaging time equal to exposure time Use a fixed averaging time]  
[Cut-off fraction of toxic load for exposure time calculation 0,05 fraction]  
[Cut-off concentration for exposure time calculations 0 fraction]

## Geometry

Shape Point  
Dimension 2D  
System Absolute  
East(1) 7 m  
North(1) 9 m

Path: \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C

## Discharge Data

### User-Defined Quantities

Material n-TETRADECANE  
Temperature 16,90 degC  
Pressure 0,89 bar  
Inventory 42.064,73 kg  
Scenario Line rupture  
Fixed Duration n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

### Average Values for Segment Number 1

Liquid Fraction 1,00 fraction  
Final Temperature 17,10 degC  
Final Velocity 4,29 m/s  
Droplet Diameter 402,39 um  
Continuous Release Data:  
Mass Flowrate 6.64601E+000 kg/s  
Release Duration 3.600,00 s  
Orifice Velocity 4,29 m/s  
Exit Pressure 0,89 bar

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Exit Temperature	17,10 degC
Discharge Coefficient	1,00
Expanded Radius	0,03 m

**Weather:** Global Weathers\Noturno 2,97/E

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

**Average Values for Segment Number 1**

Liquid Fraction	1,00 fraction
FinalTemperature	17,10 degC
Final Velocity	4,29 m/s
Droplet Diameter	402,39 um
<b>Continuous Release Data:</b>	
Mass Flowrate	6.64601E+000 kg/s
Release Duration	3.600,00 s
Orifice Velocity	4,29 m/s
Exit Pressure	0,89 bar
Exit Temperature	17,10 degC
Discharge Coefficient	1,00
Expanded Radius	0,03 m



**Consequence Results**

**Pool Vaporization Results**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C

Diurno 4,39/B-C Noturno 2,97/E

Release Segment 1				
Release Duration	s	3600	3600	
Liquid Rainout	fraction	0,999977	0,99999	

Maximum Pool Radius	m	15,0015	15,0015	
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**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C

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 cloud centreline height

Concentration(ppm)	Averaging Time		Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
UFL (45000)	18,75	s	1,97045	1,75954
LFL (5000)	18,75	s	1,98948	1,76028
LFL Frac (2500)	18,75	s	1,99066	1,76033

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
UFL (45000)	18,75	s	0,12131	0,183298
LFL (5000)	18,75	s	0,111307	0,182618
LFL Frac (2500)	18,75	s	0,110682	0,182576

**Jet Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C

Jet fire method used: Cone model - DNV recommended

		Diurno 4,39/B-C	Noturno 2,97/E
Jet Fire Status		Hazard	Hazard
Flame Direction		Horizontal	Horizontal

**Radiation Effects: Jet Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C

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

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
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	71,2	kW/m2	Not Reached	Not Reached



**Radiation Effects: Jet Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C  
 Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

**Early Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C  
 Diurno 4,39/B-C Noturno 2,97/E  
 Early Pool Fire Status Hazard Hazard

**Radiation Effects: Early Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C  
 Distance (m)  
 Diurno 4,39/B-C Noturno 2,97/E

Radiation Level	3	kW/m2	40,9331	39,3519
Radiation Level	12,5	kW/m2	21,2354	18,9525
Radiation Level	37,5	kW/m2	7,59122	7,35979
Radiation Level	71,2	kW/m2		

**Radiation Effects: Early Pool Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C  
 Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

**Late Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C  
 Diurno 4,39/B-C Noturno 2,97/E  
 Late Pool Fire Status Hazard Hazard

**Radiation Effects: Late Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C  
 Distance (m)  
 Diurno 4,39/B-C Noturno 2,97/E

Radiation Level	3	kW/m2	72,3162	67,7053
Radiation Level	12,5	kW/m2	21,6078	20,4633
Radiation Level	37,5	kW/m2	Not Reached	Not Reached
Radiation Level	71,2	kW/m2	Not Reached	Not Reached

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## Radiation Effects: Late Pool Fire Distance

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C

Radiation Level (kW/m2)  
Diurno 4,39/B-C Noturno 2,97/E

## Flash Fire Envelope

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	1,99066	1,76033
Furthest Extent	5000	ppm	1,98948	1,76028
			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	0,110682	0,182576
Furthest Extent	5000	ppm	0,111307	0,182618

## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Cen12C - Vazamento linha de OC tanque de 300 m3 Fase C

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed		m/s	4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length		mm	170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature		degC	19,2	15,9
Surface Temperature		degC	24,2	20,9
Relative Humidity		fraction	0,699	0,821

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## Cen18C - Explosão de OC na fornalha da Fase C

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Cen18C - Explosão de OC na fornalha da Fase C

### User-Defined Data

#### Material

Material Identifier n-TETRADECANE

#### TNT Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	900 m
Flammable Mass	634 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1

#### TNT Explosion Parameters

Explosion efficiency	100 %
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#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	7 m
North(1)	9 m





**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Cen18C - Explosão de OC na fornalha da Fase C

Early Explosions are assumed to be centered at the release location

Explosion Model Used : TNT

			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass	kg		634	634
Distance (m) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	309,447	309,447
Overpressure	0,1	bar	192,1	192,1
Overpressure	0,3	bar	95,9224	95,9224
Overpressure	0,43	bar	77,4332	77,4332
Used Mass (kg) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	634	634
Overpressure	0,1	bar	634	634
Overpressure	0,3	bar	634	634
Overpressure	0,43	bar	634	634

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Cen18C - Explosão de OC na fornalha da Fase C

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s		4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length	mm		170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature	degC		19,2	15,9
Surface Temperature	degC		24,2	20,9
Relative Humidity	fraction		0,699	0,821

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## Cen22C - BLEVE da caldeira Fase C

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Cen22C - BLEVE da caldeira Fase C

### User-Defined Data

#### Material

Material Identifier	WATER
First Thermodynamic Specification	Pressure given
Second Thermodynamic Specification	Temperature given
Temperature	540 degC
Pressure - gauge	213 bar
Volume Inventory	150 m3

#### Explosion Distances

Maximum Distance	900 m
Distance Step Size	1 m

#### Vessel/Tank

Vessel Shape	Cylindrical
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#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	7 m
North(1)	9 m

#### Bleve Parameters

Ground Reflection	Air Burst
[Ideal Gas Modeling	Model as real gas]



**Consequence Results**

**Explosion effects: BLEVE**

**Path:** \Candiota Fases A B C - 2011\Study\Cen22C - BLEVE da caldeira Fase C

				Diurno 4,39/B-C Noturno 2,97/E	
Supplied Flammable Mass	kg			9867,87	9867,87
Distance (m) at Overpressure Levels					
Diurno 4,39/B-C Noturno 2,97/E					
Overpressure	0,05	bar		242,696	242,696
Overpressure	0,1	bar		162,973	162,973
Overpressure	0,3	bar		82,1919	82,1919
Overpressure	0,43	bar		66,944	66,944
Used Mass (kg) at Overpressure Levels					
Diurno 4,39/B-C Noturno 2,97/E					
Overpressure	0,05	bar		9867,87	9867,87
Overpressure	0,1	bar		9867,87	9867,87
Overpressure	0,3	bar		9867,87	9867,87
Overpressure	0,43	bar		9867,87	9867,87

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Cen22C - BLEVE da caldeira Fase C

				Diurno 4,39/B-C Noturno 2,97/E	
Wind Speed	m/s			4,39	2,97
Pasquill Stability				B/C	E
Surface Roughness Length	mm			170	170
Surface Roughness Parameter				0,0981705	0,0981705
Atmospheric Temperature	degC			19,2	15,9
Surface Temperature	degC			24,2	20,9
Relative Humidity	fraction			0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Cen42C - Explosão de H2 no prédio do gerador d

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Cen42C - Explosão de H2 no prédio do gerador de energia elétrica

### User-Defined Data

#### Material

Material Identifier

HYDROGEN

#### TNT Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	300 m
Flammable Mass	34 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1

#### TNT Explosion Parameters

Explosion efficiency	100 %
Air or Ground burst	Ground burst

#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-32 m
North(1)	-23 m



**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Cen42C - Explosão de H2 no prédio do gerador de energia elétrica

Early Explosions are assumed to be centered at the release location

Explosion Model Used : TNT

			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass	kg		34	34
Distance (m) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	205,364	205,364
Overpressure	0,1	bar	127,487	127,487
Overpressure	0,3	bar	63,6589	63,6589
Overpressure	0,43	bar	51,3885	51,3885
Used Mass (kg) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	34	34
Overpressure	0,1	bar	34	34
Overpressure	0,3	bar	34	34
Overpressure	0,43	bar	34	34

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Cen42C - Explosão de H2 no prédio do gerador de energia elétrica

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s		4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length	mm		170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature	degC		19,2	15,9
Surface Temperature	degC		24,2	20,9
Relative Humidity	fraction		0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Cen64C - Explosão de H2 na casa de baterias

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Cen64C - Explosão de H2 na casa de baterias

### User-Defined Data

#### Material

Material Identifier HYDROGEN

#### TNT Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	300 m
Flammable Mass	4,12 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1

#### TNT Explosion Parameters

Explosion efficiency	100 %
Air or Ground burst	Ground burst

#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-81 m
North(1)	10 m



**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Cen64C - Explosão de H2 na casa de baterias

Early Explosions are assumed to be centered at the release location

Explosion Model Used : TNT

			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass	kg		4,12	4,12
Distance (m) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	101,624	101,624
Overpressure	0,1	bar	63,087	63,087
Overpressure	0,3	bar	31,5015	31,5015
Overpressure	0,43	bar	25,4296	25,4296
Used Mass (kg) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	4,12	4,12
Overpressure	0,1	bar	4,12	4,12
Overpressure	0,3	bar	4,12	4,12
Overpressure	0,43	bar	4,12	4,12

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Cen64C - Explosão de H2 na casa de baterias

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s		4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length	mm		170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature	degC		19,2	15,9
Surface Temperature	degC		24,2	20,9
Relative Humidity	fraction		0,699	0,821

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## Cilindro de GLP ruptura

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

### User-Defined Data

#### Material

Material Identifier	GLP
Material to Track	GLP
Type of Vessel	Saturated Liquid (Equilibrium vapor/liquid)
Pressure Specification	Pressure not used
Temperature	19,2 degC
Mass Inventory	45 kg

#### Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
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
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#### Flammable

Jet Fire Method	Cone Model
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#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	45 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

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





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



**Consequence Results**

**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

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 cloud centreline height

Concentration(ppm)	Averaging Time			Distance (m)	
				Diurno 4,39/B-C	Noturno 2,97/E
UFL (93442,6)	18,75	s		3,70491	3,04697
LFL (18181,8)	18,75	s		27,7936	19,8739
LFL Frac (9090,91)	18,75	s		49,2362	36,2743

Concentration(ppm)	Averaging Time			Heights (m) for above distances	
				Diurno 4,39/B-C	Noturno 2,97/E
UFL (93442,6)	18,75	s		1	1
LFL (18181,8)	18,75	s		0	0
LFL Frac (9090,91)	18,75	s		0	0

**Fireball Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

Fireball Flame Status	Diurno 4,39/B-C Noturno 2,97/E	
	Hazard	Hazard

**Radiation Effects: Fireball Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Radiation Level	1,7	kW/m2	79,2281	79,3493
Radiation Level	5	kW/m2	44,3543	44,4216
Radiation Level	12,5	kW/m2	23,6452	23,691

**Radiation Effects: Fireball Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

Radiation Level (kW/m2)	
Diurno 4,39/B-C	Noturno 2,97/E



**Flash Fire Envelope**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	9090,91	ppm	49,2362	36,2743
Furthest Extent	18181,8	ppm	27,7936	19,8739

  

			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	9090,91	ppm	0	0
Furthest Extent	18181,8	ppm	0	0

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

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

			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	45	45

  

			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	58,0095	58,0095
Overpressure	0,1	bar	36,0115	36,0115
Overpressure	0,3	bar	17,9818	17,9818
Overpressure	0,43	bar	14,5158	14,5158

  

			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	39,8707	39,8707
Overpressure	0,1	bar	39,8707	39,8707
Overpressure	0,3	bar	39,8707	39,8707
Overpressure	0,43	bar	39,8707	39,8707



**Explosion Effects: Late Ignition**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

Explosion Model Used : TNT  
 Explosion Location Criterion: Cloud Front (LFL Fraction)  
 All distances are measured from the Source  
 All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	59,5486	53,9099
Overpressure	0,1	bar	45,8539	40,2327
Overpressure	0,3	bar	42,6406	35,021
Overpressure	0,43	bar	42,1317	34,0532

			Supplementary Data at 0,05 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	24,8457	17,2919
Used Flammable Mass		kg	24,8457	17,2919
Overpressure Radius		m	49,5486	43,9099
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	3,53002	3,13647
- Explosion Centre		m	10	10

			Supplementary Data at 0,1 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	3,40202	7,0712
Used Flammable Mass		kg	3,40202	7,0712
Overpressure Radius		m	15,8539	20,2327
Distance to:				
- Ignition Source		m	30	20
- Cloud Front/Centre		m	18,7376	8,83868
- Explosion Centre		m	30	20

			Supplementary Data at 0,3 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,126265	0,86801
Used Flammable Mass		kg	0,126265	0,86801
Overpressure Radius		m	2,64064	5,021
Distance to:				
- Ignition Source		m	40	30
- Cloud Front/Centre		m	28,8478	16,7629
- Explosion Centre		m	40	30

			Supplementary Data at 0,43 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,126265	0,86801
Used Flammable Mass		kg	0,126265	0,86801
Overpressure Radius		m	2,13165	4,05319
Distance to:				
- Ignition Source		m	40	30
- Cloud Front/Centre		m	28,8478	16,7629

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Study Folder: Candiota Fases A B C - 2011

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- Explosion Centre	m	40	30
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## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP ruptura

		Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s	4,39	2,97
Pasquill Stability		B/C	E
Surface Roughness Length	mm	170	170
Surface Roughness Parameter		0,0981705	0,0981705
Atmospheric Temperature	degC	19,2	15,9
Surface Temperature	degC	24,2	20,9
Relative Humidity	fraction	0,699	0,821

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## Cilindro de GLP vazamento

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Cilindro de GLP vazamento

### User-Defined Data

#### Material

Material Identifier	GLP
Material to Track	GLP
Type of Vessel	Saturated Liquid (Equilibrium vapor/liquid)
Pressure Specification	Pressure not used
Temperature	19,2 degC
Mass Inventory	45 kg

#### Scenario

Scenario Type	Leak
Phase to be Released	Vapor
Hole Diameter	12,7 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

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

#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	45 kg

#### Fireball Parameters

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

#### Toxic Parameters

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

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[Tail Time 1800 s]  
[Set averaging time equal to exposure time Use a fixed averaging time]  
[Cut-off fraction of toxic load for exposure time calculation 0,05 fraction]  
[Cut-off concentration for exposure time calculations 0 fraction]

## Geometry

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

Path: \Candiota Fases A B C - 2011\Study\Cilindro de GLP vazamento

## Discharge Data

### User-Defined Quantities

Material GLP  
Temperature 19,20 degC  
Pressure 6,22 bar  
Inventory 45,00 kg  
Scenario Leak  
Fixed Duration n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

**Average Values for Segment Number 1**

Liquid Fraction 0,00 fraction  
Final Temperature -35,35 degC  
Final Velocity 365,83 m/s  
Droplet Diameter 0,00 um

Continuous Release Data:

Mass Flowrate 2.07506E-001 kg/s  
Release Duration 216,86 s  
Orifice Velocity 211,99 m/s  
Exit Pressure 3,77 bar  
Exit Temperature 0,61 degC  
Discharge Coefficient 0,87  
Expanded Radius 0,01 m

Weather: Global Weathers\Noturno 2,97/E

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

**Average Values for Segment Number 1**

Liquid Fraction 0,00 fraction  
Final Temperature -35,35 degC  
Final Velocity 365,83 m/s  
Droplet Diameter 0,00 um

Continuous Release Data:



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Study Folder: Candiota Fases A B C - 2011

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Mass Flowrate	2.07506E-001 kg/s
Release Duration	216,86 s
Orifice Velocity	211,99 m/s
Exit Pressure	3,77 bar
Exit Temperature	0,61 degC
Discharge Coefficient	0,87
Expanded Radius	0,01 m



**Consequence Results**

**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP vazamento

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 cloud centreline height

Concentration(ppm)	Averaging Time			Distance (m)	
				Diurno 4,39/B-C	Noturno 2,97/E
UFL (93442,6)	18,75	s		0,90518	0,864165
LFL (18181,8)	18,75	s		4,0373	4,25703
LFL Frac (9090,91)	18,75	s		5,88542	6,58472

  

Concentration(ppm)	Averaging Time			Heights (m) for above distances	
				Diurno 4,39/B-C	Noturno 2,97/E
UFL (93442,6)	18,75	s		0,999937	0,999953
LFL (18181,8)	18,75	s		0,996096	0,994765
LFL Frac (9090,91)	18,75	s		0,991024	0,984895

**Jet Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP vazamento

Jet fire method used: Cone model - DNV recommended

	Diurno 4,39/B-C		Noturno 2,97/E	
Jet Fire Status	Hazard		Hazard	
Flame Direction	Horizontal		Horizontal	

**Radiation Effects: Jet Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP vazamento

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

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Radiation Level	3	kW/m2	7,92894	7,91523
Radiation Level	12,5	kW/m2	Not Reached	Not Reached
Radiation Level	37,5	kW/m2	Not Reached	Not Reached
Radiation Level	71,2	kW/m2	Not Reached	Not Reached

**Radiation Effects: Jet Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP vazamento

Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

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## Flash Fire Envelope

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP vazamento

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	9090,91	ppm	5,88542	6,58472
Furthest Extent	18181,8	ppm	4,0373	4,25703

  

			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	9090,91	ppm	0,991024	0,984895
Furthest Extent	18181,8	ppm	0,996096	0,994765

## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Cilindro de GLP vazamento

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed		m/s	4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length		mm	170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature		degC	19,2	15,9
Surface Temperature		degC	24,2	20,9
Relative Humidity		fraction	0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip11B - Ruptura do tanque de diesel 200 m3 Fas

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B

### User-Defined Data

#### Material

Material Identifier	n-TETRADECANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	16,9 degC
Volume Inventory	200 m3

#### Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	6 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	254 m2
[Type of Bund Surface	Concrete]
Bund Height	1 m
[Bund Failure Modeling	Bund cannot fail]

#### Indoor/Outdoor

Location of release	Open air release
---------------------	------------------

#### Flammable

Explosion Method	TNT
Jet Fire Method	Cone Model

#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1,53E5 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

[Indoor Calculations	Unselected]
[Wind Dependent Exchange Rate	Case Specified]

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Study Folder: Candiota Fases A B C - 2011

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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]

## Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	27,7 m
North(1)	-143,3 m

Path: \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B

## Discharge Data

### User-Defined Quantities

Material	n-TETRADECANE
Temperature	16,90 degC
Pressure	0,89 bar
Inventory	152.962,66 kg
Scenario	Catastrophic rupture
Fixed Duration	n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

#### Continuous Release Data:

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

Weather: Global Weathers\Noturno 2,97/E

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

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Study Folder: Candiota Fases A B C - 2011

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Continuous Release Data:

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



**Consequence Results**

**Pool Vaporization Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B

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

		Diurno 4,39/B-C	Noturno 2,97/E
Liquid Rainout	fraction	0,999553	0,998695
Initial Vapor Cloud			
Time Pool Left Behind			

		8,9917	8,9917
Maximum Pool Radius	m		

**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B

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 cloud centreline height

Concentration(ppm)	Averaging Time		Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
UFL (45000)	18,75	s	13,8512	15,2364
LFL (5000)	18,75	s	13,9809	15,378
LFL Frac (2500)	18,75	s	14,0105	59,07

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
UFL (45000)	18,75	s	0,95234	0,809979
LFL (5000)	18,75	s	0,95234	0,809979
LFL Frac (2500)	18,75	s	0,95234	0

**Late Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B

	Diurno 4,39/B-C	Noturno 2,97/E
Late Pool Fire Status	Hazard	Hazard

**Radiation Effects: Late Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Radiation Level	3	kW/m2	55,7785	53,7401
Radiation Level	12,5	kW/m2	20,5341	19,4539
Radiation Level	37,5	kW/m2	Not Reached	Not Reached
Radiation Level	71,2	kW/m2	Not Reached	Not Reached



**Radiation Effects: Late Pool Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B  
 Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

**Fireball Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B  
 Diurno 4,39/B-C Noturno 2,97/E  
 Fireball Flame Status No Hazard No Hazard

**Flash Fire Envelope**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B  
 All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	14,0105	59,07
Furthest Extent	5000	ppm	13,9809	15,378

  

			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	0,95234	0
Furthest Extent	5000	ppm	0,95234	0,809979

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B  
 Early Explosions are assumed to be centered at the release location  
 Explosion Model Used : TNT

			Diurno 4,39/B-C Noturno 2,97/E	
Supplied Flammable Mass		kg	152963	152963

  

			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
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	0,43	bar	No Hazard	No Hazard

  

			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	0	0
Overpressure	0,1	bar	0	0
Overpressure	0,3	bar	0	0
Overpressure	0,43	bar	0	0





**Explosion Effects: Late Ignition**

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B

Explosion Model Used : TNT  
 Explosion Location Criterion: Cloud Front (LFL Fraction)  
 All distances are measured from the Source  
 All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	13,4706	34,7233
Overpressure	0,1	bar	12,1545	32,9322
Overpressure	0,3	bar	11,0758	31,4641
Overpressure	0,43	bar	10,8685	31,1819

			Supplementary Data at 0,05 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,00894459	0,0225466
Used Flammable Mass		kg	0,00894459	0,0225466
Overpressure Radius		m	3,47064	4,72334
Distance to:				
- Ignition Source		m	10	30
- Cloud Front/Centre		m	1,11619	14,8389
- Explosion Centre		m	10	30

			Supplementary Data at 0,1 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,00894459	0,0225466
Used Flammable Mass		kg	0,00894459	0,0225466
Overpressure Radius		m	2,15453	2,93219
Distance to:				
- Ignition Source		m	10	30
- Cloud Front/Centre		m	1,11619	14,8389
- Explosion Centre		m	10	30

			Supplementary Data at 0,3 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,00894459	0,0225466
Used Flammable Mass		kg	0,00894459	0,0225466
Overpressure Radius		m	1,07583	1,46414
Distance to:				
- Ignition Source		m	10	30
- Cloud Front/Centre		m	1,11619	14,8389
- Explosion Centre		m	10	30

			Supplementary Data at 0,43 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,00894459	0,0225466
Used Flammable Mass		kg	0,00894459	0,0225466
Overpressure Radius		m	0,868463	1,18193
Distance to:				
- Ignition Source		m	10	30
- Cloud Front/Centre		m	1,11619	14,8389

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- Explosion Centre	m	10	30
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## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Hip11B - Ruptura do tanque de diesel 200 m3 Fase B

		Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s	4,39	2,97
Pasquill Stability		B/C	E
Surface Roughness Length	mm	170	170
Surface Roughness Parameter		0,0981705	0,0981705
Atmospheric Temperature	degC	19,2	15,9
Surface Temperature	degC	24,2	20,9
Relative Humidity	fraction	0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip13ABC - Vazamento linha de OC tanque 5000

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

### User-Defined Data

#### Material

Material Identifier	n-TETRADECANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	16,9 degC
Volume Inventory	5000 m3

#### Scenario

Scenario Type	Line rupture
Phase to be Released	Liquid
Building Wake Effect	None
Pump Head	40 m
Specify Pump Head	Pump head supplied
Tank Head	15 m
Number of Excess Flow Valves	0
Number of Non-Return Valves	0
Number of Shut-Off Valves	0

#### Pipe

Internal Diameter	50,8 mm
Line length	100 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	707 m2
[Type of Bund Surface	Concrete]
Bund Height	1 m
[Bund Failure Modeling	Bund cannot fail]

#### Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

#### Flammable

Explosion Method	TNT
Jet Fire Method	Cone Model

#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	3,824E6 kg

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Study Folder: Candiota Fases A B C - 2011

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## Fireball Parameters

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

## Toxic Parameters

[Indoor Calculations	Unselected]
[Wind Dependent Exchange Rate	Case Specified]
[Building Exchange Rate	4 /hr]
[Tail Time	1800 s]
[Set averaging time equal to exposure time	Use a fixed averaging time]
[Cut-off fraction of toxic load for exposure time calculation	0,05 fraction]
[Cut-off concentration for exposure time calculations	0 fraction]

## Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-108 m
North(1)	-230 m

Path: \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

## Discharge Data

### User-Defined Quantities

Material	n-TETRADECANE
Temperature	16,90 degC
Pressure	0,89 bar
Inventory	3.824.066,50 kg
Scenario	Line rupture
Fixed Duration	n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	17,20 degC
Final Velocity	5,30 m/s
Droplet Diameter	371,28 um

#### Continuous Release Data:

Mass Flowrate	8.21447E+000 kg/s
Release Duration	3.600,00 s
Orifice Velocity	5,30 m/s
Exit Pressure	0,89 bar
Exit Temperature	17,20 degC
Discharge Coefficient	1,00
Expanded Radius	0,03 m

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Weather: Global Weathers\Noturno 2,97/E

Mass Flow of Air (Vent from Vapor Space Only)	n/a
<b>Average Values for Segment Number</b>	<b>1</b>
Liquid Fraction	1,00 fraction
FinalTemperature	17,20 degC
Final Velocity	5,30 m/s
Droplet Diameter	371,28 um
Continuous Release Data:	
Mass Flowrate	8.21447E+000 kg/s
Release Duration	3.600,00 s
Orifice Velocity	5,30 m/s
Exit Pressure	0,89 bar
Exit Temperature	17,20 degC
Discharge Coefficient	1,00
Expanded Radius	0,03 m

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Study Folder: Candiota Fases A B C - 2011

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## Consequence Results

### Pool Vaporization Results

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

Diurno 4,39/B-C Noturno 2,97/E

		Release Segment 1	
Release Duration	s	3600	3600
Liquid Rainout	fraction	0,999979	0,99999
Maximum Pool Radius	m	15,0015	15,0015

### Distance to Concentration Results

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

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 cloud centreline height

Concentration(ppm)		Averaging Time		Distance (m)	
				Diurno 4,39/B-C Noturno 2,97/E	
UFL (45000)	18,75	s		2,34873	2,27717
LFL (5000)	18,75	s		2,36694	2,28272
LFL Frac (2500)	18,75	s		2,36808	2,28306

  

Concentration(ppm)		Averaging Time		Heights (m) for above distances	
				Diurno 4,39/B-C Noturno 2,97/E	
UFL (45000)	18,75	s		0,147536	0,114969
LFL (5000)	18,75	s		0,139433	0,111676
LFL Frac (2500)	18,75	s		0,138926	0,11147

### Jet Fire Hazard

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

Jet fire method used: Cone model - DNV recommended

		Diurno 4,39/B-C Noturno 2,97/E	
Jet Fire Status		Hazard	Hazard
Flame Direction		Horizontal	Horizontal

### Radiation Effects: Jet Fire Ellipse

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

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

				Distance (m)	
				Diurno 4,39/B-C Noturno 2,97/E	
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	71,2	kW/m2		Not Reached	Not Reached



**Radiation Effects: Jet Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)  
 Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

**Early Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)  
 Diurno 4,39/B-C Noturno 2,97/E  
 Early Pool Fire Status Hazard Hazard

**Radiation Effects: Early Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)  
 Distance (m)  
 Diurno 4,39/B-C Noturno 2,97/E

Radiation Level	3	kW/m2	43,4015	41,9925
Radiation Level	12,5	kW/m2	21,7774	19,7298
Radiation Level	37,5	kW/m2	8,4826	8,39683
Radiation Level	71,2	kW/m2		

**Radiation Effects: Early Pool Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)  
 Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

**Late Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)  
 Diurno 4,39/B-C Noturno 2,97/E  
 Late Pool Fire Status Hazard Hazard

**Radiation Effects: Late Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)  
 Distance (m)  
 Diurno 4,39/B-C Noturno 2,97/E

Radiation Level	3	kW/m2	72,6936	68,2283
Radiation Level	12,5	kW/m2	21,9852	20,9863
Radiation Level	37,5	kW/m2	Not Reached	Not Reached
Radiation Level	71,2	kW/m2	Not Reached	Not Reached

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## Radiation Effects: Late Pool Fire Distance

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

Radiation Level (kW/m2)  
Diurno 4,39/B-C Noturno 2,97/E

## Flash Fire Envelope

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	2,36808	2,28306
Furthest Extent	5000	ppm	2,36694	2,28272
			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	0,138926	0,11147
Furthest Extent	5000	ppm	0,139433	0,111676

## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Hip13ABC - Vazamento linha de OC tanque 5000 m3 Fase A(1)

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed		m/s	4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length		mm	170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature		degC	19,2	15,9
Surface Temperature		degC	24,2	20,9
Relative Humidity		fraction	0,699	0,821



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Study Folder: Candiota Fases A B C - 2011

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## Hip15ABC - Ruptura do tanque de OC 5000 m3

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3

### User-Defined Data

#### Material

Material Identifier	n-TETRADECANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	16,9 degC
Volume Inventory	5000 m3

#### Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	6 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	1930 m2
[Type of Bund Surface	Concrete]
Bund Height	1 m
[Bund Failure Modeling	Bund cannot fail]

#### Indoor/Outdoor

Location of release	Open air release
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#### Flammable

Explosion Method	TNT
Jet Fire Method	Cone Model

#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	3,824E6 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

[Indoor Calculations	Unselected]
[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]

## Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-118,5 m
North(1)	-148,3 m

Path: \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3

## Discharge Data

### User-Defined Quantities

Material	n-TETRADECANE
Temperature	16,90 degC
Pressure	0,89 bar
Inventory	3.824.066,50 kg
Scenario	Catastrophic rupture
Fixed Duration	n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
Final Temperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

#### Continuous Release Data:

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

Weather: Global Weathers\Noturno 2,97/E

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
Final Temperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

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Study Folder: Candiota Fases A B C - 2011

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## Continuous Release Data:

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



**Consequence Results**

**Pool Vaporization Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3

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

		Diurno 4,39/B-C	Noturno 2,97/E
Liquid Rainout	fraction	0,99996	0,999893
Initial Vapor Cloud			
Time Pool Left Behind			

Maximum Pool Radius	m	24,7858	24,7858
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**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3

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 cloud centreline height

Concentration(ppm)	Averaging Time		Distance (m)
			Diurno 4,39/B-C Noturno 2,97/E
UFL (45000)	18,75	s	46,8759 49,9642
LFL (5000)	18,75	s	47,2665 50,3585
LFL Frac (2500)	18,75	s	47,3557 50,4485

Concentration(ppm)	Averaging Time		Heights (m) for above distances
			Diurno 4,39/B-C Noturno 2,97/E
UFL (45000)	18,75	s	0,809372 0,809847
LFL (5000)	18,75	s	0,809372 0,809847
LFL Frac (2500)	18,75	s	0,809372 0,809847

**Late Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3

	Diurno 4,39/B-C	Noturno 2,97/E
Late Pool Fire Status	Hazard	Hazard

**Radiation Effects: Late Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3

			Distance (m)
			Diurno 4,39/B-C Noturno 2,97/E
Radiation Level	3	kW/m2	109,327 105,537
Radiation Level	12,5	kW/m2	38,2353 40,2164
Radiation Level	37,5	kW/m2	Not Reached Not Reached
Radiation Level	71,2	kW/m2	Not Reached Not Reached

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Study Folder: Candiota Fases A B C - 2011

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## Radiation Effects: Late Pool Fire Distance

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3  
Radiation Level (kW/m2)  
Diurno 4,39/B-C Noturno 2,97/E

## Fireball Hazard

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3  
Diurno 4,39/B-C Noturno 2,97/E  
Fireball Flame Status No Hazard No Hazard

## Flash Fire Envelope

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3  
All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	47,3557	50,4485
Furthest Extent	5000	ppm	47,2665	50,3585
			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	0,809372	0,809847
Furthest Extent	5000	ppm	0,809372	0,809847

## Explosion Effects: Early Explosion

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3  
Early Explosions are assumed to be centered at the release location  
Explosion Model Used : TNT

			Diurno 4,39/B-C Noturno 2,97/E	
Supplied Flammable Mass		kg	3,82407e+006	3,82407e+006
			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
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	0,43	bar	No Hazard	No Hazard
			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	0	0
Overpressure	0,1	bar	0	0
Overpressure	0,3	bar	0	0
Overpressure	0,43	bar	0	0



**Explosion Effects: Late Ignition**

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3

Explosion Model Used : TNT  
 Explosion Location Criterion: Cloud Front (LFL Fraction)  
 All distances are measured from the Source  
 All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	51,9851	94,4186
Overpressure	0,1	bar	47,4402	77,5745
Overpressure	0,3	bar	43,7151	63,7689
Overpressure	0,43	bar	42,999	61,1149

			Supplementary Data at 0,05 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,368343	18,7511
Used Flammable Mass		kg	0,368343	18,7511
Overpressure Radius		m	11,9851	44,4186
Distance to:				
- Ignition Source		m	40	50
- Cloud Front/Centre		m	9,00811	13,1113
- Explosion Centre		m	40	50

			Supplementary Data at 0,1 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,368343	18,7511
Used Flammable Mass		kg	0,368343	18,7511
Overpressure Radius		m	7,44016	27,5745
Distance to:				
- Ignition Source		m	40	50
- Cloud Front/Centre		m	9,00811	13,1113
- Explosion Centre		m	40	50

			Supplementary Data at 0,3 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,368343	18,7511
Used Flammable Mass		kg	0,368343	18,7511
Overpressure Radius		m	3,71513	13,7689
Distance to:				
- Ignition Source		m	40	50
- Cloud Front/Centre		m	9,00811	13,1113
- Explosion Centre		m	40	50

			Supplementary Data at 0,43 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,368343	18,7511
Used Flammable Mass		kg	0,368343	18,7511
Overpressure Radius		m	2,99904	11,1149
Distance to:				
- Ignition Source		m	40	50
- Cloud Front/Centre		m	9,00811	13,1113

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- Explosion Centre	m	40	50
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## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABC - Ruptura do tanque de OC 5000 m3

		Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s	4,39	2,97
Pasquill Stability		B/C	E
Surface Roughness Length	mm	170	170
Surface Roughness Parameter		0,0981705	0,0981705
Atmospheric Temperature	degC	19,2	15,9
Surface Temperature	degC	24,2	20,9
Relative Humidity	fraction	0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip15ABCa - Explosão de OC no tanque de 5000

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip15ABCa - Explosão de OC no tanque de 5000 m3

### User-Defined Data

#### Material

Material Identifier n-TETRADECANE

#### TNT Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	900 m
Flammable Mass	405 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1

#### TNT Explosion Parameters

Explosion efficiency	100 %
Air or Ground burst	Ground burst

#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-118,5 m
North(1)	-148,3 m





**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABCa - Explosão de OC no tanque de 5000 m3

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

			Diurno 4,39/B-C Noturno 2,97/E	
Supplied Flammable Mass	kg		405	405
			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C Noturno 2,97/E	
Overpressure	0,05	bar	335,777	335,777
Overpressure	0,1	bar	208,446	208,446
Overpressure	0,3	bar	104,084	104,084
Overpressure	0,43	bar	84,0219	84,0219
			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C Noturno 2,97/E	
Overpressure	0,05	bar	405	405
Overpressure	0,1	bar	405	405
Overpressure	0,3	bar	405	405
Overpressure	0,43	bar	405	405

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Hip15ABCa - Explosão de OC no tanque de 5000 m3

			Diurno 4,39/B-C Noturno 2,97/E	
Wind Speed	m/s		4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length	mm		170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature	degC		19,2	15,9
Surface Temperature	degC		24,2	20,9
Relative Humidity	fraction		0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip17A - Ruptura do tanque de OC 125 m3 Fase

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A

### User-Defined Data

#### Material

Material Identifier	n-TETRADECANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	16,9 degC
Volume Inventory	125 m3

#### Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	6 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	160 m2
[Type of Bund Surface	Concrete]
Bund Height	1 m
[Bund Failure Modeling	Bund cannot fail]

#### Indoor/Outdoor

Location of release	Open air release
---------------------	------------------

#### Flammable

Explosion Method	TNT
Jet Fire Method	Cone Model

#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	9,56E4 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

[Indoor Calculations	Unselected]
[Wind Dependent Exchange Rate	Case Specified]

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Study Folder: Candiota Fases A B C - 2011

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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]

## Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-119 m
North(1)	-290 m

Path: \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A

## Discharge Data

### User-Defined Quantities

Material	n-TETRADECANE
Temperature	16,90 degC
Pressure	0,89 bar
Inventory	95.601,66 kg
Scenario	Catastrophic rupture
Fixed Duration	n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

**Average Values for Segment Number 1**

Liquid Fraction	1,00 fraction
FinalTemperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

Continuous Release Data:

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

Weather: Global Weathers\Noturno 2,97/E

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

**Average Values for Segment Number 1**

Liquid Fraction	1,00 fraction
FinalTemperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

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Study Folder: Candiota Fases A B C - 2011

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Continuous Release Data:

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



**Consequence Results**

**Pool Vaporization Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A

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

		Diurno 4,39/B-C	Noturno 2,97/E
Liquid Rainout	fraction	0,999802	0,999397
Initial Vapor Cloud			
Time Pool Left Behind			

	m	7,1365	7,1365
Maximum Pool Radius			

**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A

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 cloud centreline height

Concentration(ppm)	Averaging Time		Distance (m)	Diurno 4,39/B-C	Noturno 2,97/E
UFL (45000)	18,75	s		11,6868	12,8869
LFL (5000)	18,75	s		11,7981	13,009
LFL Frac (2500)	18,75	s		11,8235	13,0369

Concentration(ppm)	Averaging Time		Heights (m) for above distances	Diurno 4,39/B-C	Noturno 2,97/E
UFL (45000)	18,75	s		0,952344	0,80994
LFL (5000)	18,75	s		0,952344	0,80994
LFL Frac (2500)	18,75	s		0,952344	0,80994

**Late Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A

	Diurno 4,39/B-C	Noturno 2,97/E
Late Pool Fire Status	Hazard	Hazard

**Radiation Effects: Late Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A

			Distance (m)	Diurno 4,39/B-C	Noturno 2,97/E
Radiation Level	3	kW/m2		49,601	48,194
Radiation Level	12,5	kW/m2		20,5773	19,1337
Radiation Level	37,5	kW/m2		9,58254	9,78199
Radiation Level	71,2	kW/m2		Not Reached	Not Reached

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Study Folder: Candiota Fases A B C - 2011

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## Radiation Effects: Late Pool Fire Distance

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A  
Radiation Level (kW/m2)  
Diurno 4,39/B-C Noturno 2,97/E

## Fireball Hazard

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A  
Diurno 4,39/B-C Noturno 2,97/E  
Fireball Flame Status No Hazard No Hazard

## Flash Fire Envelope

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A  
All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	11,8235	13,0369
Furthest Extent	5000	ppm	11,7981	13,009
			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	0,952344	0,80994
Furthest Extent	5000	ppm	0,952344	0,80994

## Explosion Effects: Early Explosion

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A  
Early Explosions are assumed to be centered at the release location  
Explosion Model Used : TNT

			Diurno 4,39/B-C Noturno 2,97/E	
Supplied Flammable Mass		kg	95601,7	95601,7
			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
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	0,43	bar	No Hazard	No Hazard
			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	0	0
Overpressure	0,1	bar	0	0
Overpressure	0,3	bar	0	0
Overpressure	0,43	bar	0	0



**Explosion Effects: Late Ignition**

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A

Explosion Model Used : TNT  
 Explosion Location Criterion: Cloud Front (LFL Fraction)  
 All distances are measured from the Source  
 All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	13,2209	12,9479
Overpressure	0,1	bar	11,9995	11,83
Overpressure	0,3	bar	10,9984	10,9138
Overpressure	0,43	bar	10,806	10,7377

			Supplementary Data at 0,05 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,0071493	0,00548122
Used Flammable Mass		kg	0,0071493	0,00548122
Overpressure Radius		m	3,2209	2,94792
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	1,08917	1,14036
- Explosion Centre		m	10	10

			Supplementary Data at 0,1 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,0071493	0,00548122
Used Flammable Mass		kg	0,0071493	0,00548122
Overpressure Radius		m	1,99949	1,83003
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	1,08917	1,14036
- Explosion Centre		m	10	10

			Supplementary Data at 0,3 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,0071493	0,00548122
Used Flammable Mass		kg	0,0071493	0,00548122
Overpressure Radius		m	0,998416	0,913796
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	1,08917	1,14036
- Explosion Centre		m	10	10

			Supplementary Data at 0,43 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,0071493	0,00548122
Used Flammable Mass		kg	0,0071493	0,00548122
Overpressure Radius		m	0,80597	0,737661
Distance to:				
- Ignition Source		m	10	10
- Cloud Front/Centre		m	1,08917	1,14036

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- Explosion Centre	m	10	10
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## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Hip17A - Ruptura do tanque de OC 125 m3 Fase A

		Diurno 4,39/B-C Noturno 2,97/E	
Wind Speed	m/s	4,39	2,97
Pasquill Stability		B/C	E
Surface Roughness Length	mm	170	170
Surface Roughness Parameter		0,0981705	0,0981705
Atmospheric Temperature	degC	19,2	15,9
Surface Temperature	degC	24,2	20,9
Relative Humidity	fraction	0,699	0,821



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Study Folder: Candiota Fases A B C - 2011

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## Hip20B - Ruptura do tanque de OC 500 m3 Fase B

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

### User-Defined Data

#### Material

Material Identifier	n-TETRADECANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	16,9 degC
Volume Inventory	500 m3

#### Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	6 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	254 m2
[Type of Bund Surface	Concrete]
Bund Height	1 m
[Bund Failure Modeling	Bund cannot fail]

#### Indoor/Outdoor

Location of release	Open air release
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#### Flammable

Explosion Method	TNT
Jet Fire Method	Cone Model

#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	3,824E5 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

[Indoor Calculations	Unselected]
[Wind Dependent Exchange Rate	Case Specified]

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Study Folder: Candiota Fases A B C - 2011

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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]

## Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	16 m
North(1)	-124 m

Path: \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

## Discharge Data

### User-Defined Quantities

Material	n-TETRADECANE
Temperature	16,90 degC
Pressure	0,89 bar
Inventory	382.406,66 kg
Scenario	Catastrophic rupture
Fixed Duration	n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

#### Continuous Release Data:

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

Weather: Global Weathers\Noturno 2,97/E

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

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Continuous Release Data:

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



**Consequence Results**

**Pool Vaporization Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

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

		Diurno 4,39/B-C	Noturno 2,97/E
Liquid Rainout	fraction	0,997902	0,999844
Initial Vapor Cloud			
Time Pool Left Behind			

Maximum Pool Radius	m	8,9917	8,9917
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**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

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 cloud centreline height

Concentration(ppm)	Averaging Time		Distance (m)
			Diurno 4,39/B-C Noturno 2,97/E
UFL (45000)	18,75	s	19,3207 21,2165
LFL (5000)	18,75	s	45,6275 21,4057
LFL Frac (2500)	18,75	s	155,121 21,4489

Concentration(ppm)	Averaging Time		Heights (m) for above distances
			Diurno 4,39/B-C Noturno 2,97/E
UFL (45000)	18,75	s	0,952327 0,81
LFL (5000)	18,75	s	0 0,81
LFL Frac (2500)	18,75	s	0 0,81

**Late Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

	Diurno 4,39/B-C	Noturno 2,97/E
Late Pool Fire Status	Hazard	Hazard

**Radiation Effects: Late Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

			Distance (m)
			Diurno 4,39/B-C Noturno 2,97/E
Radiation Level	3	kW/m2	57,0558 55,3262
Radiation Level	12,5	kW/m2	21,8114 21,04
Radiation Level	37,5	kW/m2	Not Reached Not Reached
Radiation Level	71,2	kW/m2	Not Reached Not Reached

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## Radiation Effects: Late Pool Fire Distance

Path: \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

Radiation Level (kW/m2)  
Diurno 4,39/B-C Noturno 2,97/E

## Fireball Hazard

Path: \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

Diurno 4,39/B-C Noturno 2,97/E

Fireball Flame Status No Hazard No Hazard

## Flash Fire Envelope

Path: \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	155,121	21,4489
Furthest Extent	5000	ppm	45,6275	21,4057

			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	0	0,81
Furthest Extent	5000	ppm	0	0,81

## Explosion Effects: Early Explosion

Path: \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

Early Explosions are assumed to be centered at the release location

Explosion Model Used : TNT

			Diurno 4,39/B-C Noturno 2,97/E	
Supplied Flammable Mass		kg	382407	382407

			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
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	0,43	bar	No Hazard	No Hazard

			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	0	0
Overpressure	0,1	bar	0	0
Overpressure	0,3	bar	0	0
Overpressure	0,43	bar	0	0



**Explosion Effects: Late Ignition**

**Path:** \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

Explosion Model Used : TNT  
 Explosion Location Criterion: Cloud Front (LFL Fraction)  
 All distances are measured from the Source  
 All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	129,983	38,5382
Overpressure	0,1	bar	88,2756	31,5083
Overpressure	0,3	bar	63,2742	25,7465
Overpressure	0,43	bar	62,6431	24,6388

			Supplementary Data at 0,05 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	284,645	1,36312
Used Flammable Mass		kg	284,645	1,36312
Overpressure Radius		m	109,983	18,5382
Distance to:				
- Ignition Source		m	20	20
- Cloud Front/Centre		m	3,17937	3,40346
- Explosion Centre		m	20	20

			Supplementary Data at 0,1 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	284,645	1,36312
Used Flammable Mass		kg	284,645	1,36312
Overpressure Radius		m	68,2756	11,5083
Distance to:				
- Ignition Source		m	20	20
- Cloud Front/Centre		m	3,17937	3,40346
- Explosion Centre		m	20	20

			Supplementary Data at 0,3 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,252134	1,36312
Used Flammable Mass		kg	0,252134	1,36312
Overpressure Radius		m	3,27417	5,74648
Distance to:				
- Ignition Source		m	60	20
- Cloud Front/Centre		m	44,6974	3,40346
- Explosion Centre		m	60	20

			Supplementary Data at 0,43 bar	
			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	0,252134	1,36312
Used Flammable Mass		kg	0,252134	1,36312
Overpressure Radius		m	2,64307	4,63884
Distance to:				
- Ignition Source		m	60	20
- Cloud Front/Centre		m	44,6974	3,40346

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- Explosion Centre	m	60	20
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## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Hip20B - Ruptura do tanque de OC 500 m3 Fase B

		Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s	4,39	2,97
Pasquill Stability		B/C	E
Surface Roughness Length	mm	170	170
Surface Roughness Parameter		0,0981705	0,0981705
Atmospheric Temperature	degC	19,2	15,9
Surface Temperature	degC	24,2	20,9
Relative Humidity	fraction	0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip29A - Explosão de diesel na fornalha Fase A

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip29A - Explosão de diesel na fornalha Fase A

### User-Defined Data

#### Material

Material Identifier n-TETRADECANE

#### TNT Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	900 m
Flammable Mass	177 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1

#### TNT Explosion Parameters

Explosion efficiency 100 %

#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-22,4 m
North(1)	-328 m





**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Hip29A - Explosão de diesel na fornalha Fase A

Early Explosions are assumed to be centered at the release location

Explosion Model Used : TNT

			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass	kg		177	177
Distance (m) at Overpressure Levels				
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	202,246	202,246
Overpressure	0,1	bar	125,552	125,552
Overpressure	0,3	bar	62,6924	62,6924
Overpressure	0,43	bar	50,6083	50,6083
Used Mass (kg) at Overpressure Levels				
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	177	177
Overpressure	0,1	bar	177	177
Overpressure	0,3	bar	177	177
Overpressure	0,43	bar	177	177

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Hip29A - Explosão de diesel na fornalha Fase A

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s		4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length	mm		170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature	degC		19,2	15,9
Surface Temperature	degC		24,2	20,9
Relative Humidity	fraction		0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip29Aa - BLEVE da caldeira Fase A

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip29Aa - BLEVE da caldeira Fase A

### User-Defined Data

#### Material

Material Identifier	WATER
First Thermodynamic Specification	Pressure given
Second Thermodynamic Specification	Temperature given
Temperature	530 degC
Pressure - gauge	131 bar
Volume Inventory	23 m3

#### Explosion Distances

Maximum Distance	300 m
Distance Step Size	1 m

#### Vessel/Tank

Vessel Shape	Cylindrical
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#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-22,4 m
North(1)	-328 m

#### Bleve Parameters

Ground Reflection	Air Burst
[Ideal Gas Modeling	Model as real gas]



**Consequence Results**

**Explosion effects: BLEVE**

**Path:** \Candiota Fases A B C - 2011\Study\Hip29Aa - BLEVE da caldeira Fase A

			Diurno 4,39/B-C Noturno 2,97/E	
Supplied Flammable Mass	kg		897,913	897,913
			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C Noturno 2,97/E	
Overpressure	0,05	bar	107,515	107,515
Overpressure	0,1	bar	72,1976	72,1976
Overpressure	0,3	bar	36,4113	36,4113
Overpressure	0,43	bar	29,6564	29,6564
			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C Noturno 2,97/E	
Overpressure	0,05	bar	897,913	897,913
Overpressure	0,1	bar	897,913	897,913
Overpressure	0,3	bar	897,913	897,913
Overpressure	0,43	bar	897,913	897,913

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Hip29Aa - BLEVE da caldeira Fase A

			Diurno 4,39/B-C Noturno 2,97/E	
Wind Speed	m/s		4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length	mm		170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature	degC		19,2	15,9
Surface Temperature	degC		24,2	20,9
Relative Humidity	fraction		0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip2ABC - Explosão no prédio do gerador de H2

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip2ABC - Explosão no prédio do gerador de H2

### User-Defined Data

#### Material

Material Identifier HYDROGEN

#### TNT Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	300 m
Flammable Mass	8,5 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1

#### TNT Explosion Parameters

Explosion efficiency	100 %
Air or Ground burst	Ground burst

#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	8,27 m
North(1)	-447 m



**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Hip2ABC - Explosão no prédio do gerador de H2

Early Explosions are assumed to be centered at the release location

Explosion Model Used : TNT

			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass	kg		8,5	8,5
Distance (m) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	129,371	129,371
Overpressure	0,1	bar	80,3119	80,3119
Overpressure	0,3	bar	40,1026	40,1026
Overpressure	0,43	bar	32,3727	32,3727
Used Mass (kg) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	8,5	8,5
Overpressure	0,1	bar	8,5	8,5
Overpressure	0,3	bar	8,5	8,5
Overpressure	0,43	bar	8,5	8,5

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Hip2ABC - Explosão no prédio do gerador de H2

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s		4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length	mm		170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature	degC		19,2	15,9
Surface Temperature	degC		24,2	20,9
Relative Humidity	fraction		0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip30B Explosão de GLP na fornalha da Fase B

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip30B Explosão de GLP na fornalha da Fase B

### User-Defined Data

#### Material

Material Identifier GLP

#### TNT Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	900 m
Flammable Mass	476 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1

#### TNT Explosion Parameters

Explosion efficiency 100 %

#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	17 m
North(1)	-279 m



**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Hip30B Explosão de GLP na fornalha da Fase B

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

				Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass	kg			476	476
Distance (m) at Overpressure Levels					
Diurno 4,39/B-C Noturno 2,97/E					
Overpressure	0,05	bar		285,638	285,638
Overpressure	0,1	bar		177,32	177,32
Overpressure	0,3	bar		88,5423	88,5423
Overpressure	0,43	bar		71,4756	71,4756
Used Mass (kg) at Overpressure Levels					
Diurno 4,39/B-C Noturno 2,97/E					
Overpressure	0,05	bar		476	476
Overpressure	0,1	bar		476	476
Overpressure	0,3	bar		476	476
Overpressure	0,43	bar		476	476

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Hip30B Explosão de GLP na fornalha da Fase B

				Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s			4,39	2,97
Pasquill Stability				B/C	E
Surface Roughness Length	mm			170	170
Surface Roughness Parameter				0,0981705	0,0981705
Atmospheric Temperature	degC			19,2	15,9
Surface Temperature	degC			24,2	20,9
Relative Humidity	fraction			0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

Phast 6.6

## Hip31B - Explosão de diesel na fornalha Fase B

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip31B - Explosão de diesel na fornalha Fase B

### User-Defined Data

#### Material

Material Identifier n-TETRADECANE

#### TNT Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	900 m
Flammable Mass	510 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1

#### TNT Explosion Parameters

Explosion efficiency 100 %

#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	17 m
North(1)	-279 m





**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Hip31B - Explosão de diesel na fornalha Fase B

Early Explosions are assumed to be centered at the release location

Explosion Model Used : TNT

			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass	kg		510	510
Distance (m) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	287,793	287,793
Overpressure	0,1	bar	178,658	178,658
Overpressure	0,3	bar	89,21	89,21
Overpressure	0,43	bar	72,0147	72,0147
Used Mass (kg) at Overpressure Levels				
Diurno 4,39/B-C Noturno 2,97/E				
Overpressure	0,05	bar	510	510
Overpressure	0,1	bar	510	510
Overpressure	0,3	bar	510	510
Overpressure	0,43	bar	510	510

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Hip31B - Explosão de diesel na fornalha Fase B

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed	m/s		4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length	mm		170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature	degC		19,2	15,9
Surface Temperature	degC		24,2	20,9
Relative Humidity	fraction		0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip5ABC - Explosão do cilindro de H2

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip5ABC - Explosão do cilindro de H2

### User-Defined Data

#### Material

Material Identifier HYDROGEN

#### Multi Energy Explosion

Distance Step Size	1 m
Minimum Distance	5 m
Maximum Distance	300 m
Flammable Mass	14,7 kg
Liquid Fraction	0 fraction
Mass Modification Factor	1
Use Unconfined Strength	Do not use unconfined strength
Use Fractions	Use volumes
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)	5
Source 1 (Volume)	3000 m3

#### Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	6,7 m
North(1)	-439 m



**Consequence Results**

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Hip5ABC - Explosão do cilindro de H2

Early Explosions are assumed to be centered at the release location

Explosion Model Used : Multi Energy

			Diurno 4,39/B-C	Noturno 2,97/E
Supplied Flammable Mass		kg	14,7	14,7
			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	56,2125	56,2125
Overpressure	0,1	bar	27,9641	27,9641
Overpressure	0,3	bar	Not Reachable	Not Reachable
Overpressure	0,43	bar	Not Reachable	Not Reachable
			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	14,7	14,7
Overpressure	0,1	bar	14,7	14,7
Overpressure	0,3	bar	Not Reachable	Not Reachable
Overpressure	0,43	bar	Not Reachable	Not Reachable

**Weather Conditions**

**Path:** \Candiota Fases A B C - 2011\Study\Hip5ABC - Explosão do cilindro de H2

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed		m/s	4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length		mm	170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature		degC	19,2	15,9
Surface Temperature		degC	24,2	20,9
Relative Humidity		fraction	0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

Phast 6.6

## Hip7A - Vazamento linha diesel 55 m3 Fase A

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

### User-Defined Data

#### Material

Material Identifier	n-TETRADECANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	16,9 degC
Volume Inventory	55 m3

#### Scenario

Scenario Type	Line rupture
Phase to be Released	Liquid
Building Wake Effect	None
Pump Head	30 m
Specify Pump Head	Pump head supplied
Tank Head	6 m
Number of Excess Flow Valves	0
Number of Non-Return Valves	0
Number of Shut-Off Valves	0

#### Pipe

Internal Diameter	50,8 mm
Line length	100 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	707 m2
[Type of Bund Surface	Concrete]
Bund Height	1 m
[Bund Failure Modeling	Bund cannot fail]

#### Indoor/Outdoor

Location of release	Open air release
Outdoor Release Direction	Horizontal

#### Flammable

Explosion Method	TNT
Jet Fire Method	Cone Model

#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	4,206E4 kg

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## Fireball Parameters

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

## Toxic Parameters

[Indoor Calculations Unselected]  
[Wind Dependent Exchange Rate Case Specified]  
[Building Exchange Rate 4 /hr]  
[Tail Time 1800 s]  
[Set averaging time equal to exposure time Use a fixed averaging time]  
[Cut-off fraction of toxic load for exposure time calculation 0,05 fraction]  
[Cut-off concentration for exposure time calculations 0 fraction]

## Geometry

Shape Point  
Dimension 2D  
System Absolute  
East(1) -22,4 m  
North(1) -328 m

Path: \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

## Discharge Data

### User-Defined Quantities

Material n-TETRADECANE  
Temperature 16,90 degC  
Pressure 0,89 bar  
Inventory 42.064,73 kg  
Scenario Line rupture  
Fixed Duration n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

Average Values for Segment Number 1

Liquid Fraction 1,00 fraction  
FinalTemperature 17,10 degC  
Final Velocity 4,29 m/s  
Droplet Diameter 402,39 um

Continuous Release Data:

Mass Flowrate 6.64601E+000 kg/s  
Release Duration 3.600,00 s  
Orifice Velocity 4,29 m/s  
Exit Pressure 0,89 bar  
Exit Temperature 17,10 degC  
Discharge Coefficient 1,00  
Expanded Radius 0,03 m

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Study Folder: Candiota Fases A B C - 2011

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Weather: Global Weathers\Noturno 2,97/E

Mass Flow of Air (Vent from Vapor Space Only)	n/a
<b>Average Values for Segment Number</b>	<b>1</b>
Liquid Fraction	1,00 fraction
Final Temperature	17,10 degC
Final Velocity	4,29 m/s
Droplet Diameter	402,39 um
Continuous Release Data:	
Mass Flowrate	6.64601E+000 kg/s
Release Duration	3.600,00 s
Orifice Velocity	4,29 m/s
Exit Pressure	0,89 bar
Exit Temperature	17,10 degC
Discharge Coefficient	1,00
Expanded Radius	0,03 m



**Consequence Results**

**Pool Vaporization Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

Diurno 4,39/B-C Noturno 2,97/E

		Release Segment 1	
Release Duration	s	3600	3600
Liquid Rainout	fraction	0,999977	0,99999
Maximum Pool Radius	m	15,0015	15,0015

**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

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 cloud centreline height

Concentration(ppm)	Averaging Time		Distance (m)
			Diurno 4,39/B-C Noturno 2,97/E
UFL (45000)	18,75	s	1,97045
LFL (5000)	18,75	s	1,98948
LFL Frac (2500)	18,75	s	1,99066

  

Concentration(ppm)	Averaging Time		Heights (m) for above distances
			Diurno 4,39/B-C Noturno 2,97/E
UFL (45000)	18,75	s	0,12131
LFL (5000)	18,75	s	0,111307
LFL Frac (2500)	18,75	s	0,110682

**Jet Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

Jet fire method used: Cone model - DNV recommended

		Diurno 4,39/B-C Noturno 2,97/E
Jet Fire Status		Hazard Hazard
Flame Direction		Horizontal Horizontal

**Radiation Effects: Jet Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

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

		Distance (m)	
		Diurno 4,39/B-C Noturno 2,97/E	
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	71,2	kW/m2	Not Reached Not Reached



**Radiation Effects: Jet Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A  
 Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

**Early Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A  
 Diurno 4,39/B-C Noturno 2,97/E  
 Early Pool Fire Status Hazard Hazard

**Radiation Effects: Early Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A  
 Distance (m)  
 Diurno 4,39/B-C Noturno 2,97/E

Radiation Level	3	kW/m2	40,9331	39,3519
Radiation Level	12,5	kW/m2	21,2354	18,9525
Radiation Level	37,5	kW/m2	7,59122	7,35979
Radiation Level	71,2	kW/m2		

**Radiation Effects: Early Pool Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A  
 Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

**Late Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A  
 Diurno 4,39/B-C Noturno 2,97/E  
 Late Pool Fire Status Hazard Hazard

**Radiation Effects: Late Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A  
 Distance (m)  
 Diurno 4,39/B-C Noturno 2,97/E

Radiation Level	3	kW/m2	72,3162	67,7053
Radiation Level	12,5	kW/m2	21,6078	20,4633
Radiation Level	37,5	kW/m2	Not Reached	Not Reached
Radiation Level	71,2	kW/m2	Not Reached	Not Reached



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## Radiation Effects: Late Pool Fire Distance

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

Radiation Level (kW/m2)  
Diurno 4,39/B-C Noturno 2,97/E

## Flash Fire Envelope

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	1,99066	1,76033
Furthest Extent	5000	ppm	1,98948	1,76028
			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	0,110682	0,182576
Furthest Extent	5000	ppm	0,111307	0,182618

## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Hip7A - Vazamento linha diesel 55 m3 Fase A

			Diurno 4,39/B-C	Noturno 2,97/E
Wind Speed		m/s	4,39	2,97
Pasquill Stability			B/C	E
Surface Roughness Length		mm	170	170
Surface Roughness Parameter			0,0981705	0,0981705
Atmospheric Temperature		degC	19,2	15,9
Surface Temperature		degC	24,2	20,9
Relative Humidity		fraction	0,699	0,821

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Study Folder: Candiota Fases A B C - 2011

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## Hip8A - Ruptura do tanque de diesel 55 m3 Fase A

### Base Case

CASE Name: Data

Path: \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A

### User-Defined Data

#### Material

Material Identifier	n-TETRADECANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Temperature	16,9 degC
Volume Inventory	55 m3

#### Scenario

Scenario Type	Catastrophic rupture
Phase to be Released	Liquid
Building Wake Effect	None
Tank Head	6 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	60 m2
[Type of Bund Surface	Concrete]
Bund Height	1 m
[Bund Failure Modeling	Bund cannot fail]

#### Indoor/Outdoor

Location of release	Open air release
---------------------	------------------

#### Flammable

Explosion Method	TNT
Jet Fire Method	Cone Model

#### Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	4,206E4 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

[Indoor Calculations	Unselected]
[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]

## Geometry

Shape	Point
Dimension	2D
System	Absolute
East(1)	-109,5 m
North(1)	-271,4 m

Path: \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A

## Discharge Data

### User-Defined Quantities

Material	n-TETRADECANE
Temperature	16,90 degC
Pressure	0,89 bar
Inventory	42.064,73 kg
Scenario	Catastrophic rupture
Fixed Duration	n/a s

### Calculated Quantities

Weather: Global Weathers\Diurno 4,39/B-C

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

#### Continuous Release Data:

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

Weather: Global Weathers\Noturno 2,97/E

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

#### Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	16,90 degC
Final Velocity	4,41 m/s
Droplet Diameter	10.000,00 um

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Continuous Release Data:

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



**Consequence Results**

**Pool Vaporization Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A

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

		Diurno 4,39/B-C	Noturno 2,97/E
Liquid Rainout	fraction	0,999953	0,999847
Initial Vapor Cloud			
Time Pool Left Behind			

Maximum Pool Radius	m	4,37019	4,37019
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**Distance to Concentration Results**

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A

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 cloud centreline height

Concentration(ppm)	Averaging Time		Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
UFL (45000)	18,75	s	8,70065	9,65722
LFL (5000)	18,75	s	8,78576	9,75149
LFL Frac (2500)	18,75	s	8,80519	9,77301

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
UFL (45000)	18,75	s	0,952347	0,809821
LFL (5000)	18,75	s	0,952347	0,809821
LFL Frac (2500)	18,75	s	0,952347	0,809821

**Late Pool Fire Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A

	Diurno 4,39/B-C	Noturno 2,97/E
Late Pool Fire Status	Hazard	Hazard

**Radiation Effects: Late Pool Fire Ellipse**

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Radiation Level	3	kW/m2	38,7517	37,549
Radiation Level	12,5	kW/m2	19,9975	18,1995
Radiation Level	37,5	kW/m2	6,18367	6,33888
Radiation Level	71,2	kW/m2	Not Reached	Not Reached



**Radiation Effects: Late Pool Fire Distance**

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A  
 Radiation Level (kW/m2)  
 Diurno 4,39/B-C Noturno 2,97/E

**Fireball Hazard**

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A  
 Diurno 4,39/B-C Noturno 2,97/E  
 Fireball Flame Status No Hazard No Hazard

**Flash Fire Envelope**

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A  
 All flammable results are reported at the cloud centreline height

			Distance (m)	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	8,80519	9,77301
Furthest Extent	5000	ppm	8,78576	9,75149

  

			Heights (m) for above distances	
			Diurno 4,39/B-C	Noturno 2,97/E
Furthest Extent	2500	ppm	0,952347	0,809821
Furthest Extent	5000	ppm	0,952347	0,809821

**Explosion Effects: Early Explosion**

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A  
 Early Explosions are assumed to be centered at the release location  
 Explosion Model Used : TNT

			Diurno 4,39/B-C Noturno 2,97/E	
Supplied Flammable Mass		kg	42064,7	42064,7

  

			Distance (m) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
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	0,43	bar	No Hazard	No Hazard

  

			Used Mass (kg) at Overpressure Levels	
			Diurno 4,39/B-C	Noturno 2,97/E
Overpressure	0,05	bar	0	0
Overpressure	0,1	bar	0	0
Overpressure	0,3	bar	0	0
Overpressure	0,43	bar	0	0

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## Weather Conditions

**Path:** \Candiota Fases A B C - 2011\Study\Hip8A - Ruptura do tanque de diesel 55 m3 Fase A

		Diurno 4,39/B-C Noturno 2,97/E	
Wind Speed	m/s	4,39	2,97
Pasquill Stability		B/C	E
Surface Roughness Length	mm	170	170
Surface Roughness Parameter		0,0981705	0,0981705
Atmospheric Temperature	degC	19,2	15,9
Surface Temperature	degC	24,2	20,9
Relative Humidity	fraction	0,699	0,821