

ANEXO 14.I
CENÁRIOS

SUMMARY REPORT

Unique Audit Number: 43.695



Study Folder: Projeto Alemão

Phast 6.54



Projeto Alemão



Cenário acidental

1

Cenário 1 - Ruptura catastrófica do tanque de diesel do posto de abastecimento de veículos leves

Base Case

CASE Name: Data

Path: \Projeto Alemão\Cenário acidental\1

User-Defined Data

Material

Material Identifier	N-OCTANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Discharge Temperature	25 degC
Volume Inventory of material to discharge	15 m3

Scenario

Type of Event	Catastrophic rupture
Phase	Liquid
Building Wake Option	None
Tank Head	0 m

Location

[Release 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
[Surface type	Concrete]
[Height	0 m]
[Modelling of bund failure	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
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Flammable

Method to use for explosions	TNT
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1,049E4 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]

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Toxic Parameters

[Indoor calculations	Unselected]
[Ventilation specification	Case Specified]
[Building exchange rate	4 /hr]
[Tail time	1800 s]
[Method of setting time	Use a fixed averaging time]
[Cut-off fraction of toxic load	0,05 fraction]
[Cut-off concentration	0 fraction]

Geometry

Geometry shape	Point
Coordinates	Absolute
East(1)	0 m
North(1)	0 m

Path: \Projeto Alemão\Cenário acidental\1

Discharge Data

User-Defined Quantities

Material	N-OCTANE
Temperature	25,00 degC
Pressure	1,01 bar
Inventory	10.487,97 kg
Scenario	Catastrophic rupture
Fixed Duration	n/a s

Calculated Quantities

Weather: Cenário acidental\Tempo

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

Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	25,00 degC
Final Velocity	0,00 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

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Consequence Results

Pool Vaporization Results

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

		Tempo
Liquid Rainout	fraction	0,999999
Initial Vapor Cloud	kg	0,0122006
Time Pool Left Behind	s	34,9

Cloud Segment 1

Cloud Segment Duration	s	61,6225
Pool Vaporization Rate	kg/s	0,961265

Cloud Segment 2

Cloud Segment Duration	s	225,68
Pool Vaporization Rate	kg/s	2,07391

Cloud Segment 3

Cloud Segment Duration	s	3312,7
Pool Vaporization Rate	kg/s	1,62527

Maximum Pool Radius	m	30,8957
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Distance to Concentration Results

Path: \Projeto Alemão\Cenário acidental\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		Tempo	Distance (m)
UFL (65000)	18,75	s	4,25151	
LFL (8000)	18,75	s	17,3343	
LFL Frac (4000)	18,75	s	27,5277	

Concentration(ppm)	Averaging Time		Tempo	Heights (m) for above distances
UFL (65000)	18,75	s	0	
LFL (8000)	18,75	s	0	
LFL Frac (4000)	18,75	s	0	

Late Pool Fire Hazard

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Late Pool Fire Status	Tempo Hazard
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Radiation Effects: Late Pool Fire Ellipse

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			Tempo	Distance (m)
Radiation Level	7,3	kW/m2	47,9223	
Radiation Level	14,4	kW/m2	31,9357	
Radiation Level	37,5	kW/m2	Not Reached	

Radiation Effects: Late Pool Fire Distance

Path: \Projeto Alemão\Cenário acidental\1

Tempo
Radiation Level (kW/m2)

Fireball Hazard

Path: \Projeto Alemão\Cenário acidental\1

Fireball Flame Status
Tempo
No Hazard

Flash Fire Envelope

Path: \Projeto Alemão\Cenário acidental\1

All flammable results are reported at the cloud centreline height

			Tempo	Distance (m)
Furthest Extent	4000	ppm	27,5277	
Furthest Extent	8000	ppm	17,3343	

			Tempo	Heights (m) for above distances
Furthest Extent	4000	ppm	0	
Furthest Extent	8000	ppm	0	

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Explosion Effects: Early Explosion

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

Supplied Flammable Mass		kg	Tempo
			10488
			Distance (m) at Overpressure Levels
			Tempo
Overpressure	0,1	bar	No Hazard
Overpressure	0,3	bar	No Hazard
Overpressure	0,2068	bar	No Hazard
			Used Mass (kg) at Overpressure Levels
			Tempo
Overpressure	0,1	bar	0
Overpressure	0,3	bar	0
Overpressure	0,2068	bar	0

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Explosion Effects: Late Ignition

Path: \Projeto Alemão\Cenário acidental\1

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
			Tempo
Overpressure	0,1	bar	32,2205
Overpressure	0,3	bar	26,1021
Overpressure	0,2068	bar	27,6635

Supplementary Data at 0,1 bar

Tempo

Supplied Flammable Mass	kg	1,61742
Used Flammable Mass	kg	1,61742
Overpressure Radius	m	12,2205
Distance to:		
- Ignition Source	m	20
- Cloud Front/Centre	m	10,8452
- Explosion Centre	m	20

Supplementary Data at 0,3 bar

Tempo

Supplied Flammable Mass	kg	1,61742
Used Flammable Mass	kg	1,61742
Overpressure Radius	m	6,10212
Distance to:		
- Ignition Source	m	20
- Cloud Front/Centre	m	10,8452
- Explosion Centre	m	20

Supplementary Data at 0,2068 bar

Tempo

Supplied Flammable Mass	kg	1,61742
Used Flammable Mass	kg	1,61742
Overpressure Radius	m	7,66346
Distance to:		
- Ignition Source	m	20
- Cloud Front/Centre	m	10,8452
- Explosion Centre	m	20

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Weather Conditions

Path: \Projeto Alemão\Cenário acidental\1

		Tempo
Wind Speed	m/s	2
Pasquill Stability		D
Surface Roughness Length	mm	1000
Surface Roughness Parameter		0,173718
Atmospheric Temperature	degC	25
Surface Temperature	degC	32
Relative Humidity	fraction	0,78

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Projeto Alemão



Cenário accidental

2

Cenário 2 - Ruptura catastrófica do tanque de gasolina do posto de abastecimento de veículos leves

Base Case

CASE Name: Data

Path: \Projeto Alemão\Cenário accidental\2

User-Defined Data

Material

Material Identifier	N-HEPTANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Discharge Temperature	25 degC
Volume Inventory of material to discharge	15 m3

Scenario

Type of Event	Catastrophic rupture
Phase	Liquid
Building Wake Option	None
Tank Head	0 m

Location

[Release 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
[Surface type	Concrete]
[Height	0 m]
[Modelling of bund failure	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
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Flammable

Method to use for explosions	TNT
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	1,022E4 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]

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Toxic Parameters

[Indoor calculations	Unselected]
[Ventilation specification	Case Specified]
[Building exchange rate	4 /hr]
[Tail time	1800 s]
[Method of setting time	Use a fixed averaging time]
[Cut-off fraction of toxic load	0,05 fraction]
[Cut-off concentration	0 fraction]

Geometry

Geometry shape	Point
Coordinates	Absolute
East(1)	0 m
North(1)	0 m

Path: \Projeto Alemão\Cenário accidental\2

Discharge Data

User-Defined Quantities

Material	N-HEPTANE
Temperature	25,00 degC
Pressure	1,01 bar
Inventory	10.223,24 kg
Scenario	Catastrophic rupture
Fixed Duration	n/a s

Calculated Quantities

Weather: Cenário accidental\Tempo

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

Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	25,00 degC
Final Velocity	0,00 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

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Consequence Results

Pool Vaporization Results

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

		Tempo
Liquid Rainout	fraction	0,999996
Initial Vapor Cloud	kg	0,036045
Time Pool Left Behind	s	41,7

Cloud Segment 1

Cloud Segment Duration	s	49,7025
Pool Vaporization Rate	kg/s	2,36275

Cloud Segment 2

Cloud Segment Duration	s	23,4
Pool Vaporization Rate	kg/s	4,94574

Cloud Segment 3

Cloud Segment Duration	s	3526,9
Pool Vaporization Rate	kg/s	2,3285

Maximum Pool Radius	m	30,648
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Distance to Concentration Results

Path: \Projeto Alemão\Cenário acidental\2

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		Tempo	Distance (m)
UFL (70000)	18,75	s	8,3659	
LFL (10000)	18,75	s	24,7285	
LFL Frac (5000)	18,75	s	36,6988	

Concentration(ppm)	Averaging Time		Tempo	Heights (m) for above distances
UFL (70000)	18,75	s	0	
LFL (10000)	18,75	s	0	
LFL Frac (5000)	18,75	s	0	

Late Pool Fire Hazard

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Late Pool Fire Status	Tempo	Hazard
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Radiation Effects: Late Pool Fire Ellipse

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			Tempo	Distance (m)
Radiation Level	7,3	kW/m2	47,609	
Radiation Level	14,4	kW/m2	31,6881	
Radiation Level	37,5	kW/m2	Not Reached	

Radiation Effects: Late Pool Fire Distance

Path: \Projeto Alemão\Cenário acidental\2

Tempo
Radiation Level (kW/m2)

Fireball Hazard

Path: \Projeto Alemão\Cenário acidental\2

Fireball Flame Status
Tempo
No Hazard

Flash Fire Envelope

Path: \Projeto Alemão\Cenário acidental\2

All flammable results are reported at the cloud centreline height

			Tempo	Distance (m)	
Furthest Extent	5000	ppm	36,6988		
Furthest Extent	10000	ppm	24,7285		
					Heights (m) for above distances
Furthest Extent	5000	ppm	0		
Furthest Extent	10000	ppm	0		

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Explosion Effects: Early Explosion

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

Supplied Flammable Mass		kg	Tempo	10223,2
			Distance (m) at Overpressure Levels	
			Tempo	
Overpressure	0,1	bar	No Hazard	
Overpressure	0,3	bar	No Hazard	
Overpressure	0,2068	bar	No Hazard	
			Used Mass (kg) at Overpressure Levels	
			Tempo	
Overpressure	0,1	bar	0	
Overpressure	0,3	bar	0	
Overpressure	0,2068	bar	0	

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Explosion Effects: Late Ignition

Path: \Projeto Alemão\Cenário acidental\2

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
			Tempo
Overpressure	0,1	bar	48,7736
Overpressure	0,3	bar	39,3743
Overpressure	0,2068	bar	41,7729

Supplementary Data at 0,1 bar

Tempo

Supplied Flammable Mass	kg	5,84612
Used Flammable Mass	kg	5,84612
Overpressure Radius	m	18,7736
Distance to:		
- Ignition Source	m	30
- Cloud Front/Centre	m	15,1131
- Explosion Centre	m	30

Supplementary Data at 0,3 bar

Tempo

Supplied Flammable Mass	kg	5,84612
Used Flammable Mass	kg	5,84612
Overpressure Radius	m	9,37431
Distance to:		
- Ignition Source	m	30
- Cloud Front/Centre	m	15,1131
- Explosion Centre	m	30

Supplementary Data at 0,2068 bar

Tempo

Supplied Flammable Mass	kg	5,84612
Used Flammable Mass	kg	5,84612
Overpressure Radius	m	11,7729
Distance to:		
- Ignition Source	m	30
- Cloud Front/Centre	m	15,1131
- Explosion Centre	m	30

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Weather Conditions

Path: \Projeto Alemão\Cenário acidental\2

		Tempo
Wind Speed	m/s	2
Pasquill Stability		D
Surface Roughness Length	mm	1000
Surface Roughness Parameter		0,173718
Atmospheric Temperature	degC	25
Surface Temperature	degC	32
Relative Humidity	fraction	0,78

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Projeto Alemão



Cenário acidental

3

Cenário 3 - Ruptura catastrófica do tanque de diesel do Posto de Abastecimento para Caminhões e Máquinas Pesadas

Base Case

CASE Name: Data

Path: \Projeto Alemão\Cenário acidental\3

User-Defined Data

Material

Material Identifier	N-OCTANE
Type of Vessel	Unpressurized (at atmospheric pressure)
Pressure Specification	Pressure not used
Discharge Temperature	25 degC
Volume Inventory of material to discharge	40 m3

Scenario

Type of Event	Catastrophic rupture
Phase	Liquid
Building Wake Option	None
Tank Head	0 m

Location

[Release 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
[Surface type	Concrete]
[Height	0 m]
[Modelling of bund failure	Bund cannot fail]

Indoor/Outdoor

Location of release	Open air release
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Flammable

Method to use for explosions	TNT
Jet Fire Method	Cone Model

Dispersion

Late Ignition Location	No ignition location
Mass Inventory of material to Disperse	2,797E4 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]

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Toxic Parameters

[Indoor calculations	Unselected]
[Ventilation specification	Case Specified]
[Building exchange rate	4 /hr]
[Tail time	1800 s]
[Method of setting time	Use a fixed averaging time]
[Cut-off fraction of toxic load	0,05 fraction]
[Cut-off concentration	0 fraction]

Geometry

Geometry shape	Point
Coordinates	Absolute
East(1)	0 m
North(1)	0 m

Path: \Projeto Alemão\Cenário acidental\3

Discharge Data

User-Defined Quantities

Material	N-OCTANE
Temperature	25,00 degC
Pressure	1,01 bar
Inventory	27.967,92 kg
Scenario	Catastrophic rupture
Fixed Duration	n/a s

Calculated Quantities

Weather: Cenário acidental\Tempo

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

Average Values for Segment Number 1

Liquid Fraction	1,00 fraction
FinalTemperature	25,00 degC
Final Velocity	0,00 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



Consequence Results

Pool Vaporization Results

Path: \Projeto Alemão\Cenário acidental\3

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

		Tempo
Liquid Rainout	fraction	0,999999
Initial Vapor Cloud	kg	0,0286043
Time Pool Left Behind	s	50,6
Cloud Segment 1		
Cloud Segment Duration	s	82,81
Pool Vaporization Rate	kg/s	2,10249
Cloud Segment 2		
Cloud Segment Duration	s	38,19
Pool Vaporization Rate	kg/s	4,6056
Cloud Segment 3		
Cloud Segment Duration	s	225,891
Pool Vaporization Rate	kg/s	5,34667
Cloud Segment 4		
Cloud Segment Duration	s	3253,11
Pool Vaporization Rate	kg/s	4,24339
Maximum Pool Radius	m	50,3541

Distance to Concentration Results

Path: \Projeto Alemão\Cenário acidental\3

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		Tempo	Distance (m)
UFL (65000)	18,75	s	6,60756	
LFL (8000)	18,75	s	25,0754	
LFL Frac (4000)	18,75	s	36,7035	
Concentration(ppm)	Averaging Time		Tempo	Heights (m) for above distances
UFL (65000)	18,75	s	0	
LFL (8000)	18,75	s	0	
LFL Frac (4000)	18,75	s	0	

Late Pool Fire Hazard

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	Tempo
Late Pool Fire Status	Hazard

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Radiation Effects: Late Pool Fire Ellipse

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			Tempo	Distance (m)
Radiation Level	7,3	kW/m2	72,5627	
Radiation Level	14,4	kW/m2	51,448	
Radiation Level	37,5	kW/m2	Not Reached	

Radiation Effects: Late Pool Fire Distance

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Tempo
Radiation Level (kW/m2)

Fireball Hazard

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Fireball Flame Status
Tempo
No Hazard

Flash Fire Envelope

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All flammable results are reported at the cloud centreline height

			Tempo	Distance (m)
Furthest Extent	4000	ppm	36,7035	
Furthest Extent	8000	ppm	25,0754	

			Tempo	Heights (m) for above distances
Furthest Extent	4000	ppm	0	
Furthest Extent	8000	ppm	0	

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Explosion Effects: Early Explosion

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

Supplied Flammable Mass		kg	Tempo
			27967,9
Distance (m) at Overpressure Levels			
Tempo			
Overpressure	0,1	bar	No Hazard
Overpressure	0,3	bar	No Hazard
Overpressure	0,2068	bar	No Hazard
Used Mass (kg) at Overpressure Levels			
Tempo			
Overpressure	0,1	bar	0
Overpressure	0,3	bar	0
Overpressure	0,2068	bar	0

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Explosion Effects: Late Ignition

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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
			Tempo
Overpressure	0,1	bar	48,0092
Overpressure	0,3	bar	38,9926
Overpressure	0,2068	bar	41,2936

Supplementary Data at 0,1 bar

Tempo

Supplied Flammable Mass	kg	5,17657
Used Flammable Mass	kg	5,17657
Overpressure Radius	m	18,0092
Distance to:		
- Ignition Source	m	30
- Cloud Front/Centre	m	15,4855
- Explosion Centre	m	30

Supplementary Data at 0,3 bar

Tempo

Supplied Flammable Mass	kg	5,17657
Used Flammable Mass	kg	5,17657
Overpressure Radius	m	8,99264
Distance to:		
- Ignition Source	m	30
- Cloud Front/Centre	m	15,4855
- Explosion Centre	m	30

Supplementary Data at 0,2068 bar

Tempo

Supplied Flammable Mass	kg	5,17657
Used Flammable Mass	kg	5,17657
Overpressure Radius	m	11,2936
Distance to:		
- Ignition Source	m	30
- Cloud Front/Centre	m	15,4855
- Explosion Centre	m	30

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Phast 6.54

Weather Conditions

Path: \Projeto Alemão\Cenário acidental\3

		Tempo
Wind Speed	m/s	2
Pasquill Stability		D
Surface Roughness Length	mm	1000
Surface Roughness Parameter		0,173718
Atmospheric Temperature	degC	25
Surface Temperature	degC	32
Relative Humidity	fraction	0,78