

SUMMARY REPORT

Unique Audit Number:

534



Study Folder: TOP EVENT 23

PHAST v6.00



TOP EVENT 23



Propane spill out

LPG tanks

Base Case

CASE Name:

Data

User-Defined Data

Material

Material Identifier	PROPANE
Type of Vessel	Padded Liquid
Pressure Specification	Pressure specified
Discharge Pressure (gauge)	17.65 bar
Discharge Temperature	44 C
Inventory of material to discharge	950 kg

Scenario

Type of Event	Leak
Phase	Liquid
Hole Diameter	100 mm

Vessel

Averaging used for time varying	Overall Average
Type of Tank	Vertical
Tank Height	2.25 m
Tank Diameter	1.2 m

Location

Northern location of dispersion source	0 m
Eastern location of dispersion source	0 m
Height of Discharge above surface	0.1 m
Dispersion Concentration of Interest	10 ppm
Averaging time associated with Concentration	Flammable
Status of Dike	No dike present
ERPG selection	ERPG is not set
IDLH selection	IDLH is not set
STEL selection	STEL is not set
User Defined Averaging	No user defined averaging time supplied

Indoor/Outdoor

Outdoor Release Direction	Down - Impinging on the Ground
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Flammable

Location of Ignition	5 m
Method to use for explosions	TNT
Jet Fire Method	Shell

Dispersion

Ignition Location	Ignition location supplied
Inventory of material to Disperse	950 kg

Bleve Parameters

BLEVE radiation level 1	3 kW/m2
BLEVE radiation level 2	5 kW/m2
BLEVE radiation level 3	7 kW/m2

Jet Fire Parameters

Date: 13/01/2014

1 of 8

Time: 9.55.31

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Jet fire radiation level 1	3 kW/m2
Jet fire radiation level 2	5 kW/m2
Jet fire radiation level 3	7 kW/m2

Pool Fire Parameters

Pool fire radiation level 1	3 kW/m2
Pool fire radiation level 2	5 kW/m2
Pool fire radiation level 3	7 kW/m2

Multi Energy Explosion

Use Unconfined Volumes	No
Use Fractions	No
Use 1st Confined Source	No
Use 2nd Confined Source	No
Use 3rd Confined Source	No
Use 4th Confined Source	No
Use 5th Confined Source	No
Use 6th Confined Source	No
Use 7th Confined Source	No

TNT Explosion Parameters

Air or Ground burst	Ground burst
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Discharge Data

User-Defined Quantities

Material	PROPANE
Temperature	44,00 C
Pressure	18,66 bar
Inventory	950,00 kg
Scenario	Leak

Calculated Quantities

Weather: Category 2/F

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

Liquid Fraction	0,61 fraction
Final Temperature	-42,09 C
Final Velocity	247,63 m/s
Droplet Diameter	0,00 mm

Continuous Release Data:

Mass Flowrate	161,11 kg/s
Release Duration	5,83 s
Orifice Velocity	n/a m/s
Exit Pressure	n/a bar
Exit Temperature	n/a C
Discharge Coefficient	n/a
Expanded Radius	n/a m

Weather: Category 5/D

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

1

Liquid Fraction	0,61 fraction
FinalTemperature	-42,09 C
Final Velocity	247,63 m/s
Droplet Diameter	0,00 mm
Continuous Release Data:	
Mass Flowrate	161,11 kg/s
Release Duration	5,83 s
Orifice Velocity	n/a m/s
Exit Pressure	n/a bar
Exit Temperature	n/a C
Discharge Coefficient	n/a
Expanded Radius	n/a m

Consequence Results

Pool Vaporization Results

		Category 2/F	Category 5/D
Release Segment 1			
Release Duration	s	5.83296	5.83296
Liquid Rainout	fraction	0.605683	0.605683
Release Segment 1 Cloud Segment 1			
Cloud Segment Duration	s	985.912	905.962
Pool Vaporization Rate	kg/s	0.509723	0.57252
Total Vapor Flowrate	kg/s	64.0374	64.1002
Maximum Pool Radius	m	5.33338	5.311

Distance to Concentration Results

Concentration(ppm) Averaging Time				Distance (m)	
				Category 2/F	Category 5/D
User Conc (10)	18.75	s		50047.9	18666.1
UFL (95000)	18.75	s		83.1849	78.1649
LFL (21000)	18.75	s		282.906	200.608
LFL Frac (10500)	18.75	s		365.237	272.418

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Concentration At Distance Results

Distance		Conc.(ppm) at Flammable Avg.Time of 18.75 s	
		Category 2/F	Category 5/D
10	m	430934	437062
25	m	245643	229908
50	m	144434	135374

Distance		Conc.(ppm) at Core Avg.Time of 18.75 s	
		Category 2/F	Category 5/D
10	m	430934	437062
25	m	245643	229908
50	m	144434	135374

BLEVE/Fireball Hazard

	Category 2/F	Category 5/D
BLEVE Flame Status	Hazard	Hazard

Radiation Effects: BLEVE/Fireball Ellipse

			Distance (m)	
			Category 2/F	Category 5/D
Radiation Level	3	kW/m2	Model Error	Model Error
Radiation Level	5	kW/m2	Model Error	Model Error
Radiation Level	7	kW/m2	Model Error	Model Error

Radiation Effects: BLEVE/Fireball Distance

			Radiation Level (kW/m2)	
			Category 2/F	Category 5/D
Distance Of Interest	10	m	198.258	198.258
Distance Of Interest	25	m	108.256	108.256
Distance Of Interest	50	m	43.295	43.295

Jet Fire Hazard

	Category 2/F	Category 5/D
Jet Fire Status	Hazard	Hazard

Radiation Effects: Jet Fire Ellipse

			Distance (m)	
			Category 2/F	Category 5/D
Radiation Level	3	kW/m2	Model Error	Model Error
Radiation Level	5	kW/m2	Model Error	Model Error
Radiation Level	7	kW/m2	Model Error	Model Error

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Radiation Effects: Jet Fire Distance

			Radiation Level (kW/m2)	
			Category 2/F	Category 5/D
Distance Of Interest 10	m	Engulfed	Engulfed	Engulfed
Distance Of Interest 25	m	Engulfed	Engulfed	Engulfed
Distance Of Interest 50	m	Engulfed	Engulfed	Engulfed

Early Pool Fire Hazard

		Category 2/F	Category 5/D
Early Pool Fire Status		Hazard	Hazard

Radiation Effects: Early Pool Fire Ellipse

			Distance (m)	
			Category 2/F	Category 5/D
Radiation Level 3	kW/m2	Model Error	Model Error	Model Error
Radiation Level 5	kW/m2	Model Error	Model Error	Model Error
Radiation Level 7	kW/m2	Model Error	Model Error	Model Error

Radiation Effects: Early Pool Fire Distance

			Radiation Level (kW/m2)	
			Category 2/F	Category 5/D
Distance Of Interest 10	m	Engulfed	Engulfed	Engulfed
Distance Of Interest 25	m	65.7814	71.8496	
Distance Of Interest 50	m	29.7548	39.6842	

Late Pool Fire Hazard

		Category 2/F	Category 5/D
Late Pool Fire Status		Hazard	Hazard

Radiation Effects: Late Pool Fire Ellipse

			Distance (m)	
			Category 2/F	Category 5/D
Radiation Level 3	kW/m2	Model Error	Model Error	Model Error
Radiation Level 5	kW/m2	Model Error	Model Error	Model Error
Radiation Level 7	kW/m2	Model Error	Model Error	Model Error

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Radiation Effects: Late Pool Fire Distance

			Radiation Level (kW/m2)	
			Category 2/F	Category 5/D
Distance Of Interest 10	m		57.3704	62.0232
Distance Of Interest 25	m		21.5421	29.1844
Distance Of Interest 50	m		5.36903	5.48028

Flash Fire Envelope

			Distance (m)	
			Category 2/F	Category 5/D
Furthest Extent	10500	ppm	365.237	272.418
Furthest Extent	21000	ppm	282.906	200.608

Explosion Effects: Early Explosion

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

			Category 2/F	Category 5/D
Supplied Flammable Mass	kg		939.735	939.735
Distance (m) at Overpressure Levels				
			Category 2/F	Category 5/D
Overpressure	0.02068	bar	407.826	407.826
Overpressure	0.1379	bar	105.596	105.596
Overpressure	0.2068	bar	81.708	81.708
Used Mass (kg) at Overpressure Levels				
			Category 2/F	Category 5/D
Overpressure	0.02068	bar	939.735	939.735
Overpressure	0.1379	bar	939.735	939.735
Overpressure	0.2068	bar	939.735	939.735
Overpressures (bar gauge) at Distances				
			Category 2/F	Category 5/D
Distance Of Interest 10	m		1	1
Distance Of Interest 25	m		1	1
Distance Of Interest 50	m		0.46572	0.46572
Used Mass (kg) at Distances				
			Category 2/F	Category 5/D
Distance Of Interest 10	m		939.735	939.735
Distance Of Interest 25	m		939.735	939.735
Distance Of Interest 50	m		939.735	939.735

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Explosion Effects: Late Ignition

Explosion Model Used : TNT

Explosion Location Criterion: Cloud Front (LFL Fraction)

All distances are measured from the Source

Maximum Distance (m) at Overpressure Level

			Category 2/F	Category 5/D
Overpressure	0.02068	bar	465.241	391.694
Overpressure	0.1379	bar	322.079	250.845
Overpressure	0.2068	bar	314.822	246.62

Supplementary Data at 0.02068 bar

			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	158.314	220.902
Used Flammable Mass		kg	158.314	220.902
Overpressure Radius		m	225.241	251.694
Distance to:				
- Ignition Source		m	240	140
- Cloud Front/Centre		m	240	140
- Explosion Centre		m	240	140

Supplementary Data at 0.1379 bar

			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	26.3467	7.22852
Used Flammable Mass		kg	26.3467	7.22852
Overpressure Radius		m	32.0791	20.8447
Distance to:				
- Ignition Source		m	290	230
- Cloud Front/Centre		m	290	230
- Explosion Centre		m	290	230

Supplementary Data at 0.2068 bar

			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	26.3467	0.499878
Used Flammable Mass		kg	26.3467	0.499878
Overpressure Radius		m	24.8221	6.62041
Distance to:				
- Ignition Source		m	290	240
- Cloud Front/Centre		m	290	240
- Explosion Centre		m	290	240

Overpressures (bar gauge) at Distances

			Category 2/F	Category 5/D
Distance	10	m	1	1
Distance	25	m	1	1
Distance	50	m	1	1

Supplementary Data at 10 m

			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	1.50866	1.48492
Used Flammable Mass		kg	1.50866	1.48492

Supplementary Data at 25 m

			Category 2/F	Category 5/D

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Supplied Flammable Mass	kg	9.56438	6.91399
Used Flammable Mass	kg	9.56438	6.91399
Supplementary Data at 50 m			
		Category 2/F	Category 5/D
Supplied Flammable Mass	kg	77.7163	43.4501
Used Flammable Mass	kg	77.7163	43.4501

Weather Conditions

		Category 2/F	Category 5/D
Wind Speed	m/s	2	5
Pasquill Stability		F	D
Surface Roughness Parameter		0.1	0.1
Atmospheric Temperature	C	9.85	9.85
Surface Temperature	C	9.85	9.85
Relative Humidity	fraction	0.7	0.7