

JET FIRE REPORT

Study Folder: RDS San Benedetto

Unique Audit Number: 3.265

PHAST 6.5



 RDS San Benedetto

 Study

14" 90 bar Horizontal

Base Case

Data



Weather: Study\Category 2/F

Speed: 2.00 m/s

Stability: F

\RDS San Benedetto\Study\14" 90 bar Horizontal

Flame Data

User-Defined Quantities

Model Correlation Type	SHELL - Johnson	
Material	METHANE	
Ambient Temperature	25,00	degC
Ambient Relative Humidity	0,75	fraction
Ambient Pressure	1,01	bar
Ambient Wind Speed	2,00	m/s
Maximum Exposure Duration	20,00	s
Elevation	1,00	m
Expanded Temperature	-76,82	degC
Release Rate	14,29	kg/s
Liquid Fraction		fraction
Jet Angle from Horizontal	0,00	deg
Crosswind Angle	0,00	deg

	Input	Output
Flame Emissive Power		244,96 kW/m2
Expanded Radius		0,10 m
Jet Velocity	500,00	m/s
Flame Length		39,14 m
Frustrum Lift Off Distance		12,91 m
Frustrum Length		26,80 m
Frustrum Base Width		3,22 m
Frustrum Tip Width		7,48 m
Flame Length in Still Air		49,00 m
Hole to Flame Angle		20,71 deg
Plane Angular Rotation		0,00 deg

Flame on-ground impingement with partial truncation

Radiation Intensity Ellipse

User-Defined Quantities

Observer Inclination	Variable	deg
Observer Orientation	Variable	deg
Exposure Duration	20,00	s

Calculated Quantities

Incident Radiation Level:	3,00	kW/m2
Lethality Level	0,00	%
View Factor	0,01	
Dose Level	865.118,83	(W/m2)^Probit N.s

Downwind semi-axis (A)	39,26	m
Crosswind semi-axis (B)	50,63	m
Offset Ratio (D)	0,83	
Effect Distance	72,03	m
Area	6.244,84	m2

Incident Radiation Level:	5,00	kW/m2
Lethality Level	0,00	%
View Factor	0,02	
Dose Level	1.709.490,54	(W/m2)^Probit N.s

Downwind semi-axis (A)	31,59	m
Crosswind semi-axis (B)	39,29	m
Offset Ratio (D)	1,01	
Effect Distance	63,41	m
Area	3.899,08	m2

Incident Radiation Level:	12,50	kW/m2
Lethality Level	6,53	%
View Factor	0,05	
Dose Level	5.800.161,90	(W/m2)^Probit N.s

Downwind semi-axis (A)	22,49	m
Crosswind semi-axis (B)	24,32	m
Offset Ratio (D)	1,30	
Effect Distance	51,63	m
Area	1.718,15	m2

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Weather: Study/Category 5/D

Speed: 5.00

m/s

Stability: D

\RDS San Benedetto\Study\14" 90 bar Horizontal

Flame Data

User-Defined Quantities

Model Correlation Type	SHELL - Johnson	
Material	METHANE	
Ambient Temperature	25,00	degC
Ambient Relative Humidity	0,75	fraction
Ambient Pressure	1,01	bar
Ambient Wind Speed	5,00	m/s
Maximum Exposure Duration	20,00	s
Elevation	1,00	m
Expanded Temperature	-76,82	degC
Release Rate	14,29	kg/s
Liquid Fraction		fraction
Jet Angle from Horizontal	0,00	deg
Crosswind Angle	0,00	deg

	Input	Output
Flame Emissive Power		235,54 kW/m2
Expanded Radius		0,10 m
Jet Velocity	500,00	m/s
Flame Length		41,78 m
Frustrum Lift Off Distance		12,91 m
Frustrum Length		29,18 m
Frustrum Base Width		3,22 m
Frustrum Tip Width		7,05 m
Flame Length in Still Air		49,00 m
Hole to Flame Angle		15,05 deg
Plane Angular Rotation		0,00 deg

Flame on-ground impingement with partial truncation

Radiation Intensity Ellipse

User-Defined Quantities

Observer Inclination	Variable	deg
Observer Orientation	Variable	deg
Exposure Duration	20,00	s

Calculated Quantities

Incident Radiation Level:	3,00	kW/m2
Lethality Level	0,00	%
View Factor	0,01	
Dose Level	865.118,83	(W/m2)^Probit N.s

Downwind semi-axis (A)	37,04	m
Crosswind semi-axis (B)	50,50	m
Offset Ratio (D)	0,94	
Effect Distance	71,70	m
Area	5.877,29	m2

Incident Radiation Level:	5,00	kW/m2
Lethality Level	0,00	%
View Factor	0,02	
Dose Level	1.709.490,54	(W/m2)^Probit N.s

Downwind semi-axis (A)	30,75	m
Crosswind semi-axis (B)	39,22	m
Offset Ratio (D)	1,08	
Effect Distance	64,06	m
Area	3.788,82	m2

Incident Radiation Level:	12,50	kW/m2
Lethality Level	6,53	%
View Factor	0,05	
Dose Level	5.800.161,90	(W/m2)^Probit N.s

Downwind semi-axis (A)	23,48	m
Crosswind semi-axis (B)	24,22	m
Offset Ratio (D)	1,29	
Effect Distance	53,71	m
Area	1.786,59	m2

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Study

14" 90 bar Horizontal

Base Case

CASE Name:	Data	User-Defined Data
Material		
Material Identifier		METHANE
Type of Vessel		Pressurized Gas
Pressure Specification		Pressure specified
Discharge Pressure (gauge)		90 bar
Discharge Temperature		25 degC
Mass Inventory of material to discharge		2000 kg
Scenario		
Type of Event		Leak
Phase		Vapor
HoleDiameter		35 mm
Building Wake Option		None
Location		
[Elevation		1 m]
Dispersion Concentration of Interest		1E4 ppm
Averaging time associated with Concentration		Flammable
Distances of Interest(1)		1 m
Distances of Interest(2)		5 m
Distances of Interest(3)		10 m
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
Bund		
Status of Bund		No bund present
[Type of Bund Surface		Concrete]
[Bund Height		0 m]
[Bund Failure Modeling		Bund cannot fail]
Indoor/Outdoor		
Outdoor Release Direction		Horizontal
Flammable		
Jet Fire Method		Shell
Dispersion		
Ignition Location		No ignition location
Mass Inventory of material to Disperse		2000 kg
Fireball Parameters		
[Mass Modification Factor		3]
[Calculation method for fireball		DNV Recommended]
[Temperature of fireball		1727 degC]
Jet Fire Parameters		
Jet fire radiation intensity level 1		3 kW/m2

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Jet fire radiation intensity level 2	5 kW/m ²
Jet fire radiation intensity level 3	12,5 kW/m ²

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Discharge Data

User-Defined Quantities

Material	METHANE
Temperature	25,00 degC
Pressure	91,01 bar
Inventory	2.000,00 kg
Scenario	Leak
Fixed Duration	n/a s

Calculated Quantities

Weather: Study\Category 2/F

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

Average Values for Segment Number 1

Liquid Fraction	0,00 fraction
Final Temperature	-76,82 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

Continuous Release Data:

Mass Flowrate	1.42855E+001 kg/s
Release Duration	140,00 s
Orifice Velocity	394,83 m/s
Exit Pressure	48,12 bar
Exit Temperature	-21,22 degC
Discharge Coefficient	0,87
Expanded Radius	0,10 m

Weather: Study\Category 5/D

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

Average Values for Segment Number 1

Liquid Fraction	0,00 fraction
Final Temperature	-76,82 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

Continuous Release Data:

Mass Flowrate	1.42855E+001 kg/s
Release Duration	140,00 s
Orifice Velocity	394,83 m/s
Exit Pressure	48,12 bar
Exit Temperature	-21,22 degC
Discharge Coefficient	0,87
Expanded Radius	0,10 m

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Distance to Concentration Results

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		Category 2/F	Category 5/D
User Conc (10000)	18,75	s	162,501	200,478
UFL (165000)	18,75	s	7,65791	7,16918
LFL (44000)	18,75	s	56,7481	47,0768
LFL Frac (22000)	18,75	s	126,775	122,746

Concentration(ppm)	Averaging Time		Category 2/F	Category 5/D
User Conc (10000)	18,75	s	0	0
UFL (165000)	18,75	s	1,00144	1,00124
LFL (44000)	18,75	s	2,02575	1,25821
LFL Frac (22000)	18,75	s	6,81576	2,9016

Concentration At Distance Results

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

Distance		Conc.(ppm) at Flammable Avg.Time of 18,75 s	Category 2/F	Category 5/D
1	m	614762	610947	
5	m	236080	225438	
10	m	132291	121770	

Distance		Category 2/F	Category 5/D
1	m	1,00001	1,00001
5	m	1,00044	1,00044
10	m	1,00312	1,0031

Distance		Conc.(ppm) at Core Avg.Time of 18,75 s	Category 2/F	Category 5/D
1	m	6,60864e-018	1,79118e-005	
5	m	9195,94	20616,4	
10	m	73942	69576,6	

Distance		Category 2/F	Category 5/D
1	m	0	0
5	m	0	0
10	m	0	0

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Jet Fire Hazard

Jet fire method used: SHELL - Johnson

Jet Fire Status	Category 2/F	Category 5/D
Flame Direction	Truncated	Truncated
	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

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

			Category 2/F	Category 5/D
Radiation Level	3	kW/m2	72,034	71,7029
Radiation Level	5	kW/m2	63,4115	64,0593
Radiation Level	12,5	kW/m2	51,6258	53,7108

Radiation Effects: Jet Fire Distance

			Category 2/F	Radiation Level (kW/m2) Category 5/D
Distance Of Interest 1	m		5,38334	4,13529
Distance Of Interest 5	m		8,90825	7,66884
Distance Of Interest 10	m		47,2706	45,3787

Flash Fire Envelope

All flammable results are reported at the cloud centreline height

			Category 2/F	Category 5/D
Furthest Extent	22000	ppm	126,775	122,746
Furthest Extent	44000	ppm	56,7481	47,0768

			Category 2/F	Category 5/D
Furthest Extent	22000	ppm	6,81576	2,9016
Furthest Extent	44000	ppm	2,02575	1,25821

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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

All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Category 2/F	Category 5/D
Overpressure	0,02068	bar	220,791	198,196
Overpressure	0,1379	bar	146,097	140,247
Overpressure	0,2068	bar	140,194	135,667

			Supplementary Data at 0,02068 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	26,2747	12,2694
Used Flammable Mass		kg	26,2747	12,2694
Overpressure Radius		m	100,791	78,1961
Distance to:				
- Ignition Source		m	120	120
- Cloud Front/Centre		m	120	120
- Explosion Centre		m	120	120

			Supplementary Data at 0,1379 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	26,2747	12,2694
Used Flammable Mass		kg	26,2747	12,2694
Overpressure Radius		m	26,0974	20,2469
Distance to:				
- Ignition Source		m	120	120
- Cloud Front/Centre		m	120	120
- Explosion Centre		m	120	120

			Supplementary Data at 0,2068 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	26,2747	12,2694
Used Flammable Mass		kg	26,2747	12,2694
Overpressure Radius		m	20,1936	15,6666
Distance to:				
- Ignition Source		m	120	120
- Cloud Front/Centre		m	120	120
- Explosion Centre		m	120	120

			Overpressures (bar gauge) at Distances	
			Category 2/F	Category 5/D
Distance	1	m	0,145298	0,146757
Distance	5	m	0,377325	0,381426
Distance	10	m	1	1

			Supplementary Data at 1 m	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	1,1922	1,21534
Used Flammable Mass		kg	1,1922	1,21534

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		Supplementary Data at 5 m	
		Category 2/F	Category 5/D
Supplied Flammable Mass	kg	1,1922	1,21534
Used Flammable Mass	kg	1,1922	1,21534

		Supplementary Data at 10 m	
		Category 2/F	Category 5/D
Supplied Flammable Mass	kg	1,1922	1,21534
Used Flammable Mass	kg	1,1922	1,21534

Weather Conditions

		Category 2/F	Category 5/D
Wind Speed	m/s	2	5
Pasquill Stability		F	D
Surface Roughness Length		183,156	183,156
Surface Roughness Parameter		0,0999999	0,0999999
Atmospheric Temperature	degC	25	25
Surface Temperature	degC	25	25
Relative Humidity	fraction	0,75	0,75

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Study

14" 90 bar Horizontal

Base Case

CASE Name:	Data	User-Defined Data
Material		
Material Identifier		METHANE
Type of Vessel		Pressurized Gas
Pressure Specification		Pressure specified
Discharge Pressure (gauge)		90 bar
Discharge Temperature		25 degC
Mass Inventory of material to discharge		2000 kg
Scenario		
Type of Event		Leak
Phase		Vapor
HoleDiameter		35 mm
Building Wake Option		None
Location		
[Elevation		1 m]
Dispersion Concentration of Interest		1E4 ppm
Averaging time associated with Concentration		Flammable
Distances of Interest(1)		1 m
Distances of Interest(2)		5 m
Distances of Interest(3)		10 m
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
Bund		
Status of Bund		No bund present
[Type of Bund Surface		Concrete]
[Bund Height		0 m]
[Bund Failure Modeling		Bund cannot fail]
Indoor/Outdoor		
Outdoor Release Direction		Horizontal
Flammable		
Jet Fire Method		Shell
Dispersion		
Ignition Location		No ignition location
Mass Inventory of material to Disperse		2000 kg
Fireball Parameters		
[Mass Modification Factor		3]
[Calculation method for fireball		DNV Recommended]
[Temperature of fireball		1727 degC]
Jet Fire Parameters		
Jet fire radiation intensity level 1		3 kW/m2

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Jet fire radiation intensity level 2	5 kW/m ²
Jet fire radiation intensity level 3	12,5 kW/m ²

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Discharge Data

User-Defined Quantities

Material	METHANE
Temperature	25,00 degC
Pressure	91,01 bar
Inventory	2.000,00 kg
Scenario	Leak
Fixed Duration	n/a s

Calculated Quantities

Weather: Study\Category 2/F

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

Average Values for Segment Number 1

Liquid Fraction	0,00 fraction
Final Temperature	-76,82 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

Continuous Release Data:

Mass Flowrate	1.42855E+001 kg/s
Release Duration	140,00 s
Orifice Velocity	394,83 m/s
Exit Pressure	48,12 bar
Exit Temperature	-21,22 degC
Discharge Coefficient	0,87
Expanded Radius	0,10 m

Weather: Study\Category 5/D

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

Average Values for Segment Number 1

Liquid Fraction	0,00 fraction
Final Temperature	-76,82 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

Continuous Release Data:

Mass Flowrate	1.42855E+001 kg/s
Release Duration	140,00 s
Orifice Velocity	394,83 m/s
Exit Pressure	48,12 bar
Exit Temperature	-21,22 degC
Discharge Coefficient	0,87
Expanded Radius	0,10 m

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Distance to Concentration Results

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)	
			Category 2/F	Category 5/D
User Conc (10000)	18,75	s	162,501	200,478
UFL (165000)	18,75	s	7,65791	7,16918
LFL (44000)	18,75	s	56,7481	47,0768
LFL Frac (22000)	18,75	s	126,775	122,746

Concentration(ppm) Averaging Time			Heights (m) for above distances	
			Category 2/F	Category 5/D
User Conc (10000)	18,75	s	0	0
UFL (165000)	18,75	s	1,00144	1,00124
LFL (44000)	18,75	s	2,02575	1,25821
LFL Frac (22000)	18,75	s	6,81576	2,9016

Concentration At Distance Results

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

Distance		Conc.(ppm) at Flammable Avg.Time of 18,75 s	
		Category 2/F	Category 5/D
1	m	614762	610947
5	m	236080	225438
10	m	132291	121770

Distance		Heights (m) for above concentrations	
		Category 2/F	Category 5/D
1	m	1,00001	1,00001
5	m	1,00044	1,00044
10	m	1,00312	1,0031

Distance		Conc.(ppm) at Core Avg.Time of 18,75 s	
		Category 2/F	Category 5/D
1	m	6,60864e-018	1,79118e-005
5	m	9195,94	20616,4
10	m	73942	69576,6

Distance		Heights (m) for above concentrations	
		Category 2/F	Category 5/D
1	m	0	0
5	m	0	0
10	m	0	0

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Jet Fire Hazard

Jet fire method used: SHELL - Johnson

Jet Fire Status	Category 2/F	Category 5/D
Flame Direction	Truncated	Truncated
	Horizontal	Horizontal

Radiation Effects: Jet Fire Ellipse

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

			Category 2/F	Category 5/D
Radiation Level	3	kW/m ²	72,034	71,7029
Radiation Level	5	kW/m ²	63,4115	64,0593
Radiation Level	12,5	kW/m ²	51,6258	53,7108

Radiation Effects: Jet Fire Distance

			Category 2/F	Radiation Level (kW/m ²) Category 5/D
Distance Of Interest 1	m		5,38334	4,13529
Distance Of Interest 5	m		8,90825	7,66884
Distance Of Interest 10	m		47,2706	45,3787

Flash Fire Envelope

All flammable results are reported at the cloud centreline height

			Category 2/F	Category 5/D
Furthest Extent	22000	ppm	126,775	122,746
Furthest Extent	44000	ppm	56,7481	47,0768

			Category 2/F	Category 5/D
Furthest Extent	22000	ppm	6,81576	2,9016
Furthest Extent	44000	ppm	2,02575	1,25821

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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

All flammable results are reported at the cloud centreline height

			Maximum Distance (m) at Overpressure Level	
			Category 2/F	Category 5/D
Overpressure	0,02068	bar	220,791	198,196
Overpressure	0,1379	bar	146,097	140,247
Overpressure	0,2068	bar	140,194	135,667

			Supplementary Data at 0,02068 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	26,2747	12,2694
Used Flammable Mass		kg	26,2747	12,2694
Overpressure Radius		m	100,791	78,1961
Distance to:				
- Ignition Source		m	120	120
- Cloud Front/Centre		m	120	120
- Explosion Centre		m	120	120

			Supplementary Data at 0,1379 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	26,2747	12,2694
Used Flammable Mass		kg	26,2747	12,2694
Overpressure Radius		m	26,0974	20,2469
Distance to:				
- Ignition Source		m	120	120
- Cloud Front/Centre		m	120	120
- Explosion Centre		m	120	120

			Supplementary Data at 0,2068 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	26,2747	12,2694
Used Flammable Mass		kg	26,2747	12,2694
Overpressure Radius		m	20,1936	15,6666
Distance to:				
- Ignition Source		m	120	120
- Cloud Front/Centre		m	120	120
- Explosion Centre		m	120	120

			Overpressures (bar gauge) at Distances	
			Category 2/F	Category 5/D
Distance	1	m	0,145298	0,146757
Distance	5	m	0,377325	0,381426
Distance	10	m	1	1

			Supplementary Data at 1 m	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	1,1922	1,21534
Used Flammable Mass		kg	1,1922	1,21534

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		Supplementary Data at 5 m	
		Category 2/F	Category 5/D
Supplied Flammable Mass	kg	1,1922	1,21534
Used Flammable Mass	kg	1,1922	1,21534

		Supplementary Data at 10 m	
		Category 2/F	Category 5/D
Supplied Flammable Mass	kg	1,1922	1,21534
Used Flammable Mass	kg	1,1922	1,21534

Weather Conditions

		Category 2/F	Category 5/D
Wind Speed	m/s	2	5
Pasquill Stability		F	D
Surface Roughness Length		183,156	183,156
Surface Roughness Parameter		0,0999999	0,0999999
Atmospheric Temperature	degC	25	25
Surface Temperature	degC	25	25
Relative Humidity	fraction	0,75	0,75

JET FIRE REPORT

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 Study

14" 90 bar Vertical

Base Case

Data



Weather: Study\Category 2/F

Speed: 2,00 m/s

Stability: F

\RDS San Benedetto\Study\14" 90 bar Vertical

Flame Data

User-Defined Quantities

Model Correlation Type	SHELL - DNV recommended	
Material	METHANE	
Ambient Temperature	25,00	degC
Ambient Relative Humidity	0,75	fraction
Ambient Pressure	1,01	bar
Ambient Wind Speed	2,00	m/s
Maximum Exposure Duration	20,00	s
Elevation	1,00	m
Expanded Temperature	-76,82	degC
Release Rate	14,29	kg/s
Liquid Fraction		fraction
Jet Angle from Horizontal	90,00	deg
Crosswind Angle	0,00	deg

	Input	Output
Flame Emissive Power		167,71 kW/m2
Expanded Radius		0,10 m
Jet Velocity	500,00	m/s
Flame Length		35,24 m
Frustrum Lift Off Distance		6,56 m
Frustrum Length		28,71 m
Frustrum Base Width		2,52 m
Frustrum Tip Width		9,90 m
Flame Length in Still Air		49,00 m
Hole to Flame Angle		6,04 deg
Plane Angular Rotation		0,00 deg

Flame Co-ordinates

X	Z	R	Phi
m	m	m	deg
0,00	7,56	0,00	6,04
0,00	7,56	1,26	6,04
3,02	36,11	4,95	6,04
3,02	36,11	0,00	6,04

Radiation Intensity Ellipse

User-Defined Quantities

Observer Inclination	Variable	deg
Observer Orientation	Variable	deg
Exposure Duration	20,00	s

Calculated Quantities

Incident Radiation Level:	3,00	kW/m2
Lethality Level	0,00	%
View Factor	0,02	
Dose Level	865.118,83	(W/m2)^Probit N.s

Downwind semi-axis (A)	38,57	m
Crosswind semi-axis (B)	38,48	m
Offset Ratio (D)	0,07	
Effect Distance	41,36	m
Area	4.662,94	m2

Incident Radiation Level:	5,00	kW/m2
Lethality Level	0,00	%
View Factor	0,03	
Dose Level	1.709.490,54	(W/m2)^Probit N.s

Downwind semi-axis (A)	23,26	m
Crosswind semi-axis (B)	23,47	m
Offset Ratio (D)	0,11	
Effect Distance	25,84	m
Area	1.714,82	m2

Incident Radiation Level:	12,50	kW/m2
Lethality Level	6,53	%
View Factor	0,07	
Dose Level	5.800.161,90	(W/m2)^Probit N.s

Downwind semi-axis (A)	Not Reached	m
Crosswind semi-axis (B)	Not Reached	m
Offset Ratio (D)	Not Reached	
Effect Distance	n/a	m
Area	n/a	m2

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Radiation Distance

User-Defined Quantities

Maximum Distance	41,36	m
Angle from Wind Direction	0,00	deg
Height above Origin	0,00	m
Observer Inclination	Variable	deg
Observer Orientation	Variable	deg

Calculated Quantities

X Coordinates m	Y Coordinates m	Z Coordinates m	Incident Radiation kW/m2	Lethality Level %	View Factor
0,00			4,34		
0,84			5,32		
1,69			6,25		
2,53			7,02		
3,38			7,62		
4,22			8,06		
5,07			8,35		
5,91			8,51		
6,75			8,56		
7,60			8,55		
8,44			8,40		
9,29			8,37		
10,13			8,22		
10,97			8,06		
11,82			7,87		
12,66			7,69		
13,51			7,50		
14,35			7,31		
15,20			7,12		
16,04			6,93		
16,88			6,75		
17,73			6,57		
18,57			6,39		
19,42			6,21		
20,26			6,04		
21,10			5,87		
21,95			5,70		
22,79			5,54		
23,64			5,39		
24,48			5,23		
25,33			5,09		
26,17			4,94		
27,01			4,80		
27,86			4,67		
28,70			4,53		
29,55			4,40		
30,39			4,28		

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X Coordinates m	Y Coordinates m	Z Coordinates m	Incident Radiation kW/m2	Lethality Level %	View Factor
31,23			4,16		
32,08			4,04		
32,92			3,93		
33,77			3,82		
34,61			3,72		
35,46			3,62		
36,30			3,53		
37,14			3,43		
37,99			3,34		
38,83			3,25		
39,68			3,17		
40,52			3,08		
41,36			3,00		

 **Weather:** Study/Category 5/D
Speed: 5.00 **m/s** **Stability:** D

\RDS San Benedetto\Study\14" 90 bar Vertical

Flame Data

User-Defined Quantities

Model Correlation Type	SHELL - DNV recommended	
Material	METHANE	
Ambient Temperature	25,00	degC
Ambient Relative Humidity	0,75	fraction
Ambient Pressure	1,01	bar
Ambient Wind Speed	5,00	m/s
Maximum Exposure Duration	20,00	s
Elevation	1,00	m
Expanded Temperature	-76,82	degC
Release Rate	14,29	kg/s
Liquid Fraction		fraction
Jet Angle from Horizontal	90,00	deg
Crosswind Angle	0,00	deg

	Input	Output
Flame Emissive Power		236,55 kW/m2
Expanded Radius		0,10 m
Jet Velocity	500,00	m/s
Flame Length		27,39 m
Frustrum Lift Off Distance		4,61 m
Frustrum Length		22,91 m
Frustrum Base Width		2,49 m
Frustrum Tip Width		8,46 m
Flame Length in Still Air		49,00 m
Hole to Flame Angle		15,09 deg
Plane Angular Rotation		0,00 deg

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Flame Co-ordinates

X	Z	R	Phi
m	m	m	deg
0,00	5,61	0,00	15,09
0,00	5,61	1,24	15,09
5,97	27,74	4,23	15,09
5,97	27,74	0,00	15,09

Radiation Intensity Ellipse

User-Defined Quantities

Observer Inclination	Variable	deg
Observer Orientation	Variable	deg
Exposure Duration	20,00	s

Calculated Quantities

Incident Radiation Level:	3,00	kW/m2
Lethality Level	0,00	%
View Factor	0,01	
Dose Level	865.118,83	(W/m2)^Probit N.s
Downwind semi-axis (A)	43,10	m
Crosswind semi-axis (B)	43,58	m
Offset Ratio (D)	0,12	
Effect Distance	48,26	m
Area	5.901,86	m2
Incident Radiation Level:	5,00	kW/m2
Lethality Level	0,00	%
View Factor	0,02	
Dose Level	1.709.490,54	(W/m2)^Probit N.s
Downwind semi-axis (A)	30,75	m
Crosswind semi-axis (B)	30,71	m
Offset Ratio (D)	0,18	
Effect Distance	36,27	m
Area	2.966,10	m2
Incident Radiation Level:	12,50	kW/m2
Lethality Level	6,53	%
View Factor	0,05	
Dose Level	5.800.161,90	(W/m2)^Probit N.s
Downwind semi-axis (A)	6,90	m
Crosswind semi-axis (B)	10,11	m
Offset Ratio (D)	1,05	
Effect Distance	14,14	m
Area	219,20	m2

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Radiation Distance

User-Defined Quantities

Maximum Distance	48,26	m
Angle from Wind Direction	0,00	deg
Height above Origin	0,00	m
Observer Inclination	Variable	deg
Observer Orientation	Variable	deg

Calculated Quantities

X Coordinates m	Y Coordinates m	Z Coordinates m	Incident Radiation kW/m2	Lethality Level %	View Factor
0,00			11,60		
0,98			14,19		
1,97			16,16		
2,95			17,35		
3,94			17,83		
4,92			17,76		
5,91			17,44		
6,89			16,91		
7,88			16,29		
8,86			15,65		
9,85			15,00		
10,83			14,38		
11,82			13,78		
12,80			13,20		
13,79			12,65		
14,77			12,27		
15,76			11,91		
16,74			11,53		
17,73			11,14		
18,71			10,76		
19,70			10,36		
20,68			9,96		
21,67			9,57		
22,65			9,18		
23,64			8,81		
24,62			8,44		
25,61			8,09		
26,59			7,74		
27,58			7,41		
28,56			7,09		
29,55			6,78		
30,53			6,48		
31,52			6,20		
32,50			5,93		
33,49			5,67		
34,47			5,42		
35,46			5,19		

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X Coordinates m	Y Coordinates m	Z Coordinates m	Incident Radiation kW/m2	Lethality Level %	View Factor
36,44			4,96		
37,43			4,75		
38,41			4,55		
39,40			4,35		
40,38			4,17		
41,37			4,00		
42,35			3,83		
43,34			3,67		
44,32			3,52		
45,31			3,38		
46,29			3,25		
47,28			3,12		
48,26			3,00		

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RDS San Benedetto

Study

14" 90 bar Vertical

Base Case

CASE Name: Data User-Defined Data

Material

Material Identifier	METHANE
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Discharge Pressure (gauge)	90 bar
Discharge Temperature	25 degC
Mass Inventory of material to discharge	2000 kg

Scenario

Type of Event	Leak
Phase	Vapor
HoleDiameter	35 mm
Building Wake Option	None

Location

[Elevation	1 m]
Dispersion Concentration of Interest	1E4 ppm
Averaging time associated with Concentration	Flammable
Distances of Interest(1)	1 m
Distances of Interest(2)	5 m
Distances of Interest(3)	10 m
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

Bund

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

Indoor/Outdoor

Outdoor Release Direction	Vertical
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Flammable

Jet Fire Method	Shell
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Dispersion

Ignition Location	No ignition location
Mass Inventory of material to Disperse	2000 kg

Fireball Parameters

[Mass Modification Factor	3]
[Calculation method for fireball	DNV Recommended]
[Temperature of fireball	1727 degC]

Jet Fire Parameters

Jet fire radiation intensity level 1	3 kW/m2
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Jet fire radiation intensity level 2	5 kW/m ²
Jet fire radiation intensity level 3	12,5 kW/m ²

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Discharge Data

User-Defined Quantities

Material	METHANE
Temperature	25,00 degC
Pressure	91,01 bar
Inventory	2.000,00 kg
Scenario	Leak
Fixed Duration	n/a s

Calculated Quantities

Weather: Study\Category 2/F

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

Average Values for Segment Number 1

Liquid Fraction	0,00 fraction
Final Temperature	-76,82 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

Continuous Release Data:

Mass Flowrate	1.42855E+001 kg/s
Release Duration	140,00 s
Orifice Velocity	394,83 m/s
Exit Pressure	48,12 bar
Exit Temperature	-21,22 degC
Discharge Coefficient	0,87
Expanded Radius	0,10 m

Weather: Study\Category 5/D

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

Average Values for Segment Number 1

Liquid Fraction	0,00 fraction
Final Temperature	-76,82 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

Continuous Release Data:

Mass Flowrate	1.42855E+001 kg/s
Release Duration	140,00 s
Orifice Velocity	394,83 m/s
Exit Pressure	48,12 bar
Exit Temperature	-21,22 degC
Discharge Coefficient	0,87
Expanded Radius	0,10 m

Consequence Results

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Distance to Concentration Results

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)	
			Category 2/F	Category 5/D
User Conc (10000)	18,75	s	No Hazard	No Hazard
UFL (165000)	18,75	s	0,121626	0,273138
LFL (44000)	18,75	s	1,5922	2,17072
LFL Frac (22000)	18,75	s	4,68534	5,61189

Concentration(ppm)	Averaging Time		Category 2/F	Category 5/D	Heights (m) for above distances	
					Category 2/F	Category 5/D
User Conc (10000)	18,75	s	0	0	0	0
UFL (165000)	18,75	s	8,78209	7,21229	7,21229	7,21229
LFL (44000)	18,75	s	22,2127	15,6355	15,6355	15,6355
LFL Frac (22000)	18,75	s	30,7222	20,7024	20,7024	20,7024

Concentration At Distance Results

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

Distance		Conc.(ppm) at Flammable Avg.Time of 18,75 s	
		Category 2/F	Category 5/D
1	m	64562,8	74374,9
5	m	20972,8	23845,4
10	m	13988,8	14095,8

Distance		Category 2/F	Category 5/D	Heights (m) for above concentrations	
				Category 2/F	Category 5/D
1	m	18,6388	11,962	11,962	11,962
5	m	31,2453	20,0896	20,0896	20,0896
10	m	36,9158	24,1572	24,1572	24,1572

Distance		Conc.(ppm) at Core Avg.Time of 18,75 s	
		Category 2/F	Category 5/D
1	m	<Min. Conc.	<Min. Conc.
5	m	<Min. Conc.	<Min. Conc.
10	m	<Min. Conc.	<Min. Conc.

Distance		Category 2/F	Category 5/D	Heights (m) for above concentrations	
				Category 2/F	Category 5/D
1	m	0	0	0	0
5	m	0	0	0	0
10	m	0	0	0	0

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Jet Fire Hazard

Jet fire method used: SHELL - DNV recommended

Jet Fire Status	Category 2/F	Category 5/D
Flame Direction	Hazard	Hazard
	Vertical	Vertical

Radiation Effects: Jet Fire Ellipse

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

			Category 2/F	Category 5/D
Radiation Level	3	kW/m ²	41,3647	48,2623
Radiation Level	5	kW/m ²	25,8423	36,2704
Radiation Level	12,5	kW/m ²	Not Reached	14,1361

Radiation Effects: Jet Fire Distance

			Category 2/F	Radiation Level (kW/m ²) Category 5/D
Distance Of Interest 1	m		5,50427	14,2293
Distance Of Interest 5	m		8,33401	17,7403
Distance Of Interest 10	m		8,24449	14,9067

Flash Fire Envelope

All flammable results are reported at the cloud centreline height

			Category 2/F	Category 5/D
Furthest Extent	22000	ppm	4,68534	5,61189
Furthest Extent	44000	ppm	1,5922	2,17072

			Category 2/F	Category 5/D
Furthest Extent	22000	ppm	30,7222	20,7024
Furthest Extent	44000	ppm	22,2127	15,6355

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Weather Conditions

		Category 2/F	Category 5/D
Wind Speed	m/s	2	5
Pasquill Stability		F	D
Surface Roughness Length		183,156	183,156
Surface Roughness Parameter		0,0999999	0,0999999
Atmospheric Temperature	degC	25	25
Surface Temperature	degC	25	25
Relative Humidity	fraction	0,75	0,75