

# JET FIRE REPORT

Study Folder: RDS San Benedetto

Unique Audit Number: 2.659

PHAST 6.5



RDS San Benedetto

Study

4" 290 bar Vertical

Base Case

Data



Weather: Study\Category 2/F

Speed: 2,00 m/s

Stability: F

\RDS San Benedetto\Study\4" 290 bar Vertical

## Flame Data

### User-Defined Quantities

Model Correlation Type	<b>SHELL - DNV recommended</b>	
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	-132,54	degC
Release Rate	4,05	kg/s
Liquid Fraction		fraction
Jet Angle from Horizontal	90,00	deg
Crosswind Angle	0,00	deg

	Input	Output
Flame Emissive Power		146,87 kW/m2
Expanded Radius		0,04 m
Jet Velocity	500,00	m/s
Flame Length		20,22 m
Frustrum Lift Off Distance		3,77 m
Frustrum Length		16,48 m
Frustrum Base Width		1,30 m
Frustrum Tip Width		5,68 m
Flame Length in Still Air		28,12 m
Hole to Flame Angle		6,91 deg
Plane Angular Rotation		0,00 deg

### Flame Co-ordinates

X	Z	R	Phi
m	m	m	deg
0,00	4,77	0,00	6,91
0,00	4,77	0,65	6,91
1,98	21,13	2,84	6,91
1,98	21,13	0,00	6,91

*Mauro Gotti*

**Radiation Intensity Ellipse**

**User-Defined Quantities**

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

**Calculated Quantities**

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

Downwind semi-axis (A)	19,89	m
Crosswind semi-axis (B)	19,92	m
Offset Ratio (D)	0,09	
Effect Distance	21,77	m
Area	1.244,89	m2

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

Downwind semi-axis (A)	10,44	m
Crosswind semi-axis (B)	10,82	m
Offset Ratio (D)	0,19	
Effect Distance	12,48	m
Area	354,96	m2

<b>Incident Radiation Level:</b>	<b>12,50</b>	<b>kW/m2</b>
Lethality Level	6,53	%
View Factor	0,09	
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	21,77	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			3,26		
0,44			3,98		
0,89			4,64		
1,33			5,22		
1,78			5,71		
2,22			6,11		
2,67			6,41		
3,11			6,63		
3,55			6,77		
4,00			6,85		
4,44			6,83		
4,89			6,89		
5,33			6,85		
5,77			6,78		
6,22			6,70		
6,66			6,60		
7,11			6,49		
7,55			6,38		
8,00			6,26		
8,44			6,14		
8,88			6,01		
9,33			5,89		
9,77			5,76		
10,22			5,63		
10,66			5,50		
11,11			5,38		
11,55			5,25		
11,99			5,13		
12,44			5,01		
12,88			4,89		
13,33			4,77		
13,77			4,66		
14,21			4,55		
14,66			4,44		
15,10			4,33		
15,55			4,22		
15,99			4,12		

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X Coordinates m	Y Coordinates m	Z Coordinates m	Incident Radiation kW/m2	Lethality Level %	View Factor
16,44			4,01		
16,88			3,91		
17,32			3,82		
17,77			3,72		
18,21			3,63		
18,66			3,54		
19,10			3,45		
19,55			3,37		
19,99			3,30		
20,43			3,22		
20,88			3,15		
21,32			3,07		
21,77			3,00		

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

\RDS San Benedetto\Study\4" 290 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	-132,54	degC
Release Rate	4,05	kg/s
Liquid Fraction		fraction
Jet Angle from Horizontal	90,00	deg
Crosswind Angle	0,00	deg

	Input	Output
Flame Emissive Power		206,85 kW/m2
Expanded Radius		0,04 m
Jet Velocity	500,00	m/s
Flame Length		15,72 m
Frustrum Lift Off Distance		2,66 m
Frustrum Length		13,16 m
Frustrum Base Width		1,31 m
Frustrum Tip Width		4,86 m
Flame Length in Still Air		28,12 m
Hole to Flame Angle		17,27 deg
Plane Angular Rotation		0,00 deg

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## Flame Co-ordinates

X	Z	R	Phi
m	m	m	deg
0,00	3,66	0,00	17,27
0,00	3,66	0,65	17,27
3,91	16,23	2,43	17,27
3,91	16,23	0,00	17,27

## Radiation Intensity Ellipse

### User-Defined Quantities

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

### Calculated Quantities

<b>Incident Radiation Level:</b>	<b>3,00</b>	kW/m2
Lethality Level	0,00	%
View Factor	0,01	
Dose Level	865.118,83	(W/m2)^Probit N.s
Downwind semi-axis (A)	22,91	m
Crosswind semi-axis (B)	23,31	m
Offset Ratio (D)	0,15	
Effect Distance	26,45	m
Area	1.678,25	m2
<b>Incident Radiation Level:</b>	<b>5,00</b>	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)	15,81	m
Crosswind semi-axis (B)	15,95	m
Offset Ratio (D)	0,24	
Effect Distance	19,65	m
Area	792,32	m2
<b>Incident Radiation Level:</b>	<b>12,50</b>	kW/m2
Lethality Level	6,53	%
View Factor	0,06	
Dose Level	5.800.161,90	(W/m2)^Probit N.s
Downwind semi-axis (A)	2,27	m
Crosswind semi-axis (B)	3,42	m
Offset Ratio (D)	1,56	
Effect Distance	5,80	m
Area	24,40	m2

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## Radiation Distance

### User-Defined Quantities

Maximum Distance	26,45	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			8,78		
0,54			10,62		
1,08			12,09		
1,62			13,13		
2,16			13,74		
2,70			13,99		
3,24			14,01		
3,78			13,83		
4,32			13,54		
4,86			13,19		
5,40			12,80		
5,94			12,40		
6,48			11,99		
7,02			11,58		
7,56			11,18		
8,10			10,80		
8,64			10,57		
9,18			10,32		
9,72			10,05		
10,26			9,78		
10,79			9,49		
11,33			9,18		
11,87			8,87		
12,41			8,56		
12,95			8,26		
13,49			7,96		
14,03			7,66		
14,57			7,36		
15,11			7,08		
15,65			6,80		
16,19			6,53		
16,73			6,26		
17,27			6,01		
17,81			5,76		
18,35			5,53		
18,89			5,30		
19,43			5,08		

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X Coordinates m	Y Coordinates m	Z Coordinates m	Incident Radiation kW/m2	Lethality Level %	View Factor
19,97			4,88		
20,51			4,68		
21,05			4,49		
21,59			4,30		
22,13			4,13		
22,67			3,96		
23,21			3,80		
23,75			3,65		
24,29			3,51		
24,83			3,37		
25,37			3,24		
25,91			3,12		
26,45			3,00		

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## RDS San Benedetto

### Study

#### 4" 290 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)	290 bar
Discharge Temperature	25 degC
Mass Inventory of material to discharge	2000 kg

##### Scenario

Type of Event	Leak
Phase	Vapor
HoleDiameter	10 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 <sup>2</sup>
Jet fire radiation intensity level 3	12,5 kW/m <sup>2</sup>

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## Discharge Data

### User-Defined Quantities

Material	METHANE
Temperature	25,00 degC
Pressure	291,01 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	-132,54 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

#### Continuous Release Data:

Mass Flowrate	4.04555E+000 kg/s
Release Duration	494,37 s
Orifice Velocity	441,88 m/s
Exit Pressure	122,42 bar
Exit Temperature	-25,23 degC
Discharge Coefficient	0,82
Expanded Radius	0,04 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	-132,54 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

#### Continuous Release Data:

Mass Flowrate	4.04555E+000 kg/s
Release Duration	494,37 s
Orifice Velocity	441,88 m/s
Exit Pressure	122,42 bar
Exit Temperature	-25,23 degC
Discharge Coefficient	0,82
Expanded Radius	0,04 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		Category 2/F	Category 5/D
User Conc (10000)	18,75	s	No Hazard	No Hazard
UFL (165000)	18,75	s	0,0410201	0,107947
LFL (44000)	18,75	s	0,765784	1,12044
LFL Frac (22000)	18,75	s	2,44547	2,84389

Concentration(ppm)	Averaging Time		Category 2/F	Category 5/D	Heights (m) for above distances
User Conc (10000)	18,75	s	0	0	
UFL (165000)	18,75	s	5,06554	4,38582	
LFL (44000)	18,75	s	13,3746	9,36442	
LFL Frac (22000)	18,75	s	18,8227	12,2924	

## 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	39456	48890,4
5	m	13063,4	14521,6
10	m	8240,66	8090,53

Distance		Heights (m) for above concentrations	
		Category 2/F	Category 5/D
1	m	14,3693	8,9777
5	m	22,8641	14,1965
10	m	26,819	16,839

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		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 - 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

Radiation Level	Category 2/F	Category 5/D	Distance (m)
3 kW/m <sup>2</sup>	21,7664	26,4471	
5 kW/m <sup>2</sup>	12,4776	19,6473	
12,5 kW/m <sup>2</sup>	Not Reached	5,79757	

## Radiation Effects: Jet Fire Distance

Distance Of Interest	Category 2/F	Category 5/D	Radiation Level (kW/m <sup>2</sup> )
1 m	4,79249	11,9029	
5 m	6,87831	13,0884	
10 m	5,69292	9,9205	

## Flash Fire Envelope

All flammable results are reported at the cloud centreline height

Furthest Extent	Category 2/F	Category 5/D	Distance (m)
22000 ppm	2,44547	2,84389	
44000 ppm	0,765784	1,12044	

Furthest Extent	Category 2/F	Category 5/D	Heights (m) for above distances
22000 ppm	18,8227	12,2924	
44000 ppm	13,3746	9,36442	

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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

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Study

4" 290 bar

Base Case

Data

Weather: Study\Category 2/F

Speed: 2,00 m/s

Stability: F

\\RDS San Benedetto\Study\4" 290 bar

## Flame Data

### User-Defined Quantities

	SHELL - Johnson	
	METHANE	
Model Correlation Type		
Material		
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	-132,54	degC
Release Rate	4,05	kg/s
Liquid Fraction		fraction
Jet Angle from Horizontal	0,00	deg
Crosswind Angle	0,00	deg

	Input	Output
Flame Emissive Power		201,86 kW/m2
Expanded Radius		0,04 m
Jet Velocity	500,00	m/s
Flame Length		22,74 m
Frustrum Lift Off Distance		6,87 m
Frustrum Length		16,07 m
Frustrum Base Width		1,34 m
Frustrum Tip Width		3,77 m
Flame Length in Still Air		28,12 m
Hole to Flame Angle		16,23 deg
Plane Angular Rotation		0,00 deg

### Flame Co-ordinates

X	Z	R	Phi
m	m	m	deg
6,87	1,00	0,00	73,77
6,87	1,00	0,67	73,77
22,30	5,49	1,88	73,77
22,30	5,49	0,00	73,77

**Radiation Intensity Ellipse**

**User-Defined Quantities**

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

**Calculated Quantities**

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

Downwind semi-axis (A)	18,12	m
Crosswind semi-axis (B)	24,87	m
Offset Ratio (D)	1,09	
Effect Distance	37,93	m
Area	1.415,70	m2

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

Downwind semi-axis (A)	15,41	m
Crosswind semi-axis (B)	19,33	m
Offset Ratio (D)	1,20	
Effect Distance	33,87	m
Area	935,68	m2

<b>Incident Radiation Level:</b>	<b>12,50</b>	<b>kW/m2</b>
Lethality Level	6,53	%
View Factor	0,06	
Dose Level	5.800.161,90	(W/m2)^Probit N.s

Downwind semi-axis (A)	11,78	m
Crosswind semi-axis (B)	11,65	m
Offset Ratio (D)	1,39	
Effect Distance	28,18	m
Area	431,16	m2

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## Radiation Distance

### User-Defined Quantities

Maximum Distance	44,59	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			2,28		
0,91			2,60		
1,82			3,09		
2,73			4,30		
3,64			6,84		
4,55			11,95		
5,46			22,86		
6,37			48,34		
7,28			88,43		
8,19			106,35		
9,10			98,04		
10,01			90,95		
10,92			85,38		
11,83			81,00		
12,74			77,33		
13,65			74,27		
14,56			71,64		
15,47			69,32		
16,38			67,37		
17,29			65,02		
18,20			62,73		
19,11			59,98		
20,02			56,33		
20,93			52,00		
21,84			44,10		
22,75			35,32		
23,66			26,41		
24,57			23,18		
25,48			20,16		
26,39			17,27		
27,30			14,66		
28,21			12,42		
29,12			10,56		
30,03			9,02		
30,94			7,76		
31,85			6,72		
32,76			5,86		



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X Coordinates m	Y Coordinates m	Z Coordinates m	Incident Radiation kW/m2	Lethality Level %	View Factor
33,67			5,14		
34,58			4,54		
35,49			4,03		
36,40			3,59		
37,31			3,22		
38,22			2,90		
39,13			2,63		
40,04			2,39		
40,95			2,18		
41,86			1,99		
42,77			1,83		
43,68			1,69		
44,59			1,56		

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

\RDS San Benedetto\Study\4" 290 bar

## Flame Data

### User-Defined Quantities

Model Correlation Type	<b>SHELL - Johnson</b>
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	-132,54 degC
Release Rate	4,05 kg/s
Liquid Fraction	fraction
Jet Angle from Horizontal	0,00 deg
Crosswind Angle	0,00 deg

	<b>Input</b>	<b>Output</b>
Flame Emissive Power		193,66 kW/m2
Expanded Radius		0,04 m
Jet Velocity	500,00	m/s
Flame Length		24,10 m
Frustrum Lift Off Distance		6,87 m
Frustrum Length		17,34 m
Frustrum Base Width		1,34 m
Frustrum Tip Width		3,50 m
Flame Length in Still Air		28,12 m
Hole to Flame Angle		12,15 deg
Plane Angular Rotation		0,00 deg



**Flame Co-ordinates**

<b>X</b>	<b>Z</b>	<b>R</b>	<b>Phi</b>
m	m	m	deg
6,87	1,00	0,00	77,85
6,87	1,00	0,67	77,85
23,82	4,65	1,75	77,85
23,82	4,65	0,00	77,85

**Radiation Intensity Ellipse**

**User-Defined Quantities**

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

**Calculated Quantities**

<b>Incident Radiation Level:</b>	<b>3,00</b>	kW/m2
Lethality Level	0,00	%
View Factor	0,02	
Dose Level	865.118,83	(W/m2)^Probit N.s
Downwind semi-axis (A)	17,92	m
Crosswind semi-axis (B)	24,72	m
Offset Ratio (D)	1,11	
Effect Distance	37,82	m
Area	1.392,02	m2
<b>Incident Radiation Level:</b>	<b>5,00</b>	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)	15,55	m
Crosswind semi-axis (B)	19,13	m
Offset Ratio (D)	1,20	
Effect Distance	34,22	m
Area	934,05	m2
<b>Incident Radiation Level:</b>	<b>12,50</b>	kW/m2
Lethality Level	6,53	%
View Factor	0,06	
Dose Level	5.800.161,90	(W/m2)^Probit N.s
Downwind semi-axis (A)	12,26	m
Crosswind semi-axis (B)	11,36	m
Offset Ratio (D)	1,38	
Effect Distance	29,23	m
Area	437,65	m2

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## Radiation Distance

### User-Defined Quantities

Maximum Distance	47,65	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			1,66		
0,97			2,07		
1,94			2,96		
2,92			4,51		
3,89			7,50		
4,86			13,90		
5,83			29,90		
6,81			70,15		
7,78			110,10		
8,75			5,27		
9,72			97,30		
10,70			91,72		
11,67			80,34		
12,64			83,48		
13,61			80,37		
14,59			77,72		
15,56			75,40		
16,53			73,34		
17,50			71,42		
18,48			69,54		
19,45			67,53		
20,42			65,07		
21,39			61,71		
22,37			55,81		
23,34			46,58		
24,31			34,14		
25,28			26,52		
26,25			23,28		
27,23			19,16		
28,20			15,56		
29,17			12,65		
30,14			10,36		
31,12			8,57		
32,09			7,16		
33,06			6,04		
34,03			5,15		
35,01			4,43		

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X Coordinates m	Y Coordinates m	Z Coordinates m	Incident Radiation kW/m2	Lethality Level %	View Factor
35,98			3,85		
36,95			3,36		
37,92			2,96		
38,90			2,62		
39,87			2,34		
40,84			2,10		
41,81			1,89		
42,79			1,71		
43,76			1,55		
44,73			1,42		
45,70			1,30		
46,67			1,19		
47,65			1,10		

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## RDS San Benedetto

### Study

4" 290 bar

#### Base Case

CASE Name: Data User-Defined Data

#### Material

Material Identifier	METHANE
Type of Vessel	Pressurized Gas
Pressure Specification	Pressure specified
Discharge Pressure (gauge)	290 bar
Discharge Temperature	25 degC
Mass Inventory of material to discharge	2000 kg

#### Scenario

Type of Event	Leak
Phase	Vapor
HoleDiameter	10 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
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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 <sup>2</sup>
Jet fire radiation intensity level 3	12,5 kW/m <sup>2</sup>

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## Discharge Data

### User-Defined Quantities

Material	METHANE
Temperature	25,00 degC
Pressure	291,01 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	-132,54 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

#### Continuous Release Data:

Mass Flowrate	4.04555E+000 kg/s
Release Duration	494,37 s
Orifice Velocity	441,88 m/s
Exit Pressure	122,42 bar
Exit Temperature	-25,23 degC
Discharge Coefficient	0,82
Expanded Radius	0,04 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	-132,54 degC
Final Velocity	500,00 m/s
Droplet Diameter	0,00 um

#### Continuous Release Data:

Mass Flowrate	4.04555E+000 kg/s
Release Duration	494,37 s
Orifice Velocity	441,88 m/s
Exit Pressure	122,42 bar
Exit Temperature	-25,23 degC
Discharge Coefficient	0,82
Expanded Radius	0,04 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		Category 2/F	Category 5/D
User Conc (10000)	18,75	s	153,022	111,81
UFL (165000)	18,75	s	4,43234	4,04821
LFL (44000)	18,75	s	20,6502	15,9626
LFL Frac (22000)	18,75	s	69,959	51,2964

Concentration(ppm)	Averaging Time		Category 2/F	Category 5/D	Heights (m) for above distances
User Conc (10000)	18,75	s	0	0	
UFL (165000)	18,75	s	1,00014	1,00008	
LFL (44000)	18,75	s	1,00645	1,00343	
LFL Frac (22000)	18,75	s	0,192569	0,898198	

## 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	487288	483003
5	m	150066	139099
10	m	73503,9	63165,9

Distance		Heights (m) for above concentrations	
		Category 2/F	Category 5/D
1	m	0,999996	0,999996
5	m	1,00022	1,00022
10	m	1,00173	1,00154

Distance		Conc.(ppm) at Core Avg.Time of 18,75 s	
		Category 2/F	Category 5/D
1	m	0	8,46147e-017
5	m	2126,75	8447,67
10	m	37774	36343,5

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	Hazard	Hazard
	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 <sup>2</sup>	37,934	37,8219
Radiation Level	5	kW/m <sup>2</sup>	33,8674	34,2214
Radiation Level	12,5	kW/m <sup>2</sup>	28,177	29,2292

## Radiation Effects: Jet Fire Distance

			Category 2/F	Category 5/D
Distance Of Interest 1	m		2,63542	2,08964
Distance Of Interest 5	m		16,3344	15,3615
Distance Of Interest 10	m		91,0229	95,588

## Flash Fire Envelope

All flammable results are reported at the cloud centreline height

			Category 2/F	Category 5/D
Furthest Extent	22000	ppm	69,959	51,2964
Furthest Extent	44000	ppm	20,6502	15,9626

			Category 2/F	Category 5/D
Furthest Extent	22000	ppm	0,192569	0,898198
Furthest Extent	44000	ppm	1,00645	1,00343

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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	98,5361	81,0486
Overpressure	0,1379	bar	69,978	58,0393
Overpressure	0,2068	bar	67,7207	56,2206

			Supplementary Data at 0,02068 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	1,46849	0,768059
Used Flammable Mass		kg	1,46849	0,768059
Overpressure Radius		m	38,5361	31,0486
Distance to:				
- Ignition Source		m	60	50
- Cloud Front/Centre		m	60	50
- Explosion Centre		m	60	50

			Supplementary Data at 0,1379 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	1,46849	0,768059
Used Flammable Mass		kg	1,46849	0,768059
Overpressure Radius		m	9,97795	8,03926
Distance to:				
- Ignition Source		m	60	50
- Cloud Front/Centre		m	60	50
- Explosion Centre		m	60	50

			Supplementary Data at 0,2068 bar	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	1,46849	0,768059
Used Flammable Mass		kg	1,46849	0,768059
Overpressure Radius		m	7,72071	6,22059
Distance to:				
- Ignition Source		m	60	50
- Cloud Front/Centre		m	60	50
- Explosion Centre		m	60	50

			Overpressures (bar gauge) at Distances	
			Category 2/F	Category 5/D
Distance	1	m	0,0966145	0,0933854
Distance	5	m	0,242442	0,233656
Distance	10	m	1	1

			Supplementary Data at 1 m	
			Category 2/F	Category 5/D
Supplied Flammable Mass		kg	0,535233	0,499986
Used Flammable Mass		kg	0,535233	0,499986

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		Supplementary Data at 5 m	
		Category 2/F	Category 5/D
Supplied Flammable Mass	kg	0,535233	0,499986
Used Flammable Mass	kg	0,535233	0,499986

		Supplementary Data at 10 m	
		Category 2/F	Category 5/D
Supplied Flammable Mass	kg	0,535233	0,499986
Used Flammable Mass	kg	0,535233	0,499986

## 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