ANNESSO TECNICO 6.

Elaborati di calcolo
Scenari incidentali ragionevolmente credibili

Ipotesi N. 26

TRR S.r.l.
Il Direttore Generale
Ing. Alfredo Romano

70977-Fase 1-Metanolo

Tubazione

Vessel/Pipe Source

Base Case

Data

Weather: Global Weathers\Category 2/F

Speed: 2,00 m/s **Stability:** F

Full Case Path: \70977-Fase 1-Metanolo\Tubazione\Vessel/Pipe Source

User-Defined Quantities

Material	METHANOL	
Temperature	25,00	degC
Pressure	101,01	bar
Inventory	25,00	kg
Scenario	Line rupture	

Calculated Quantities

Mass Flow of Air (Vent from Vapor Space only)	n/a	kg/s
Wind Speed at Height	0,52	m/s

Average Values for Segment Number 1

Liquid Fraction	1,00	fraction
FinalTemperature	27,99	degC
Final Velocity	39,02	m/s
Droplet Diameter	139,62	um
Continuous Release Data:		
Mass Flowrate	6.02699E+001	kg/s
Release Duration	0,41	s
Orifice Velocity	39,02	m/s
Exit Pressure	1,01	bar
Exit Temperature	27,99	degC
Discharge Coefficient	1,00	
Expanded Radius	0,03	m

Weather: Global Weathers\Category 5/D
Speed: 5,00 m/s **Stability:** D

Full Case Path: \70977-Fase 1-Metanolo\Tubazione\Vessel/Pipe Source

User-Defined Quantities

Material	METHANOL	
Temperature	25,00	degC
Pressure	101,01	bar
Inventory	25,00	kg
Scenario	Line rupture	

Calculated Quantities

Mass Flow of Air (Vent from Vapor Space only)	n/a	kg/s
Wind Speed at Height	2,58	m/s

Average Values for Segment Number 1

Liquid Fraction	1,00	fraction
FinalTemperature	27,99	degC
Final Velocity	39,02	m/s
Droplet Diameter	139,62	um
Continuous Release Data:		
Mass Flowrate	6.02699E+001	kg/s
Release Duration	0,41	s
Orifice Velocity	39,02	m/s
Exit Pressure	1,01	bar
Exit Temperature	27,99	degC
Discharge Coefficient	1,00	
Expanded Radius	0,03	m

DETAILED DISPERSION REPORT

Study Folder: 70977-Fase 1-Metanolo

Unique Audit Number: 183.668

Phast 6.6

70977-Fase 1-Metanolo

Tubazione

User Defined Source-F2/D5

Base Case

Data

Weather: Global Weathers\Category 2/F

Speed: 2,00 m/s **Stability:** F

\70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

Material: METHANOL

Note:	C/Line Concentration is calculated at an averaging time of:	18,75	s
	Plume Width and Height are calculated at an averaging time of:	600,00	s
	and a Concentration of Interest of:	6.700,00	ppm
	Concentration at Height calculated at a Height of :	0,00	m

For Instantaneous releases (and if present in this report) the Mass Flowrate is the Mass of Released Material in the cloud, and the C/Line Distance is the same as the Time.

Downwind Distance m	C/Line Height m	C/Line Conc ppm	Plume Half-width m	Plume Total Depth m	Vapor Temperature degC	Liquid Fraction fraction	Time s	Liquid Temperature degC	Centroid Velocity m/s	Cloud Density kg/m3
Segment Number:	**1**		**Start Time:**	**0,00 s**						
0,00	1,00	472.563,02	0,27	0,47	46,13	0,04	0,00	46,13	0,31	1,19
0,00	1,00	472.563,02	0,27	0,47	46,13	0,04	0,00	46,13	0,31	1,19
0,01	1,00	436.126,08	0,27	0,47	44,33	0,04	0,06	44,33	0,33	1,19
0,03	1,00	375.707,40	0,28	0,48	41,07	0,04	0,12	41,07	0,35	1,19
0,07	1,00	288.788,52	0,29	0,51	35,55	0,03	0,23	35,55	0,39	1,19
0,15	0,99	186.555,73	0,32	0,56	27,10	0,01	0,42	27,10	0,44	1,20
0,31	0,97	93.909,79	0,38	0,69	25,02	0,00	0,77		0,48	1,19
0,47	0,95	61.560,65	0,51	0,75	25,02	0,00	1,10		0,50	1,18
0,63	0,93	52.964,24	0,68	0,72	25,02	0,00	1,42		0,50	1,18
0,79	0,90	50.716,90	0,68	0,72	25,02	0,00	1,74		0,51	1,18

Downwind Distance m	C/Line Height m	C/Line Conc ppm	Plume Half-width m	Plume Total Depth m	Vapor Temperature degC	Liquid Fraction fraction	Time s	Liquid Temperature degC	Centroid Velocity m/s	Cloud Density kg/m3
1,10	0,82	46.656,94	0,68	0,73	25,02	0,00	2,36		0,52	1,18
1,71	0,63	39.951,78	0,67	0,73	25,01	0,00	3,58		0,53	1,18
2,30	0,39	34.699,93	0,67	0,77	25,01	0,00	4,77		0,55	1,18
2,42	0,34	33.809,17	0,67	0,77	25,01	0,00	5,00		0,55	1,18
2,54	0,29	32.982,16	0,66	0,74	25,01	0,00	5,23		0,56	1,18
2,78	0,21	31.517,97	0,66	0,71	25,01	0,00	5,69		0,56	1,18
3,03	0,15	30.250,21	0,66	0,71	25,00	0,00	6,15		0,56	1,18
3,53	0,07	28.078,47	0,66	0,72	25,00	0,00	7,06		0,56	1,18
4,55	0,00	24.569,56	0,64	0,72	25,00	0,00	8,93		0,54	1,18
5,58	0,00	21.678,21	0,62	0,70	25,00	0,00	10,84		0,53	1,18
7,62	0,00	17.221,80	0,51	0,60	25,00	0,00	14,74		0,52	1,18
11,72	0,00	11.635,57	0,00	0,00	25,00	0,00	22,60		0,52	1,18
15,82	0,00	8.402,85	0,00	0,00	25,00	0,00	30,49		0,52	1,17
24,01	0,00	4.988,87	0,00	0,00	25,00	0,00	46,25		0,52	1,17
40,39	0,00	2.355,83	0,00	0,00	25,00	0,00	77,66		0,52	1,17
56,78	0,00	1.303,00	0,00	0,00	25,00	0,00	105,68		0,65	1,17
89,54	0,00	560,60	0,00	0,00	25,00	0,00	154,69		0,69	1,17
97,74	0,00	465,76	0,00	0,00	25,00	0,00	165,19		0,87	1,17
99,78	0,00	447,02	0,00	0,00	25,00	0,00	167,62		0,81	1,17
101,83	0,00	431,54	0,00	0,00	25,00	0,00	170,07		0,86	1,17
103,88	0,00	417,14	0,00	0,00	25,00	0,00	172,48		0,84	1,17
107,98	0,00	390,31	0,00	0,00	25,00	0,00	177,30		0,86	1,17
116,17	0,00	344,15	0,00	0,00	25,00	0,00	186,80		0,87	1,17
132,55	0,00	273,65	0,00	0,00	25,00	0,00	205,44		0,89	1,17
165,32	0,00	185,63	0,00	0,00	25,00	0,00	241,23		0,94	1,17
230,86	0,00	102,23	0,00	0,00	25,00	0,00	308,16		1,02	1,17
330,86	0,00	52,97	0,00	0,00	25,00	0,00	399,95		1,16	1,17
430,86	0,00	32,42	0,00	0,00	25,00	0,00	480,99		1,31	1,17
530,86	0,00	21,98	0,00	0,00	25,00	0,00	554,39		1,42	1,17

DETAILED DISPERSION REPORT

Study Folder: **70977-Fase 1-Metanolo**

Unique Audit Number: **183.668**

Phast 6.6

Weather: **Global Weathers\Category 5/D**

Speed: **5,00 m/s** **Stability:** **D**

\70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

Material: METHANOL

Note: C/Line Concentration is calculated at an averaging time of: 18,75 s
Plume Width and Height are calculated at an averaging time of: 600,00 s
and a Concentration of Interest of: 6.700,00 ppm
Concentration at Height calculated at a Height of : 0,00 m

For Instantaneous releases (and if present in this report) the Mass Flowrate is the Mass of Released Material in the cloud, and the C/Line Distance is the same as the Time.

Downwind Distance m	C/Line Height m	C/Line Conc ppm	Plume Half-width m	Plume Total Depth m	Vapor Temperature degC	Liquid Fraction fraction	Time s	Liquid Temperature degC	Centroid Velocity m/s	Cloud Density kg/m3
Segment Number:	**1**		**Start Time:**	**0,00 s**						
0,00	1,00	472.566,86	0,13	0,26	46,13	0,04	0,00	46,13	1,34	1,19
0,00	1,00	472.566,86	0,13	0,26	46,13	0,04	0,00	46,13	1,34	1,19
0,01	1,00	428.709,92	0,13	0,26	43,95	0,04	0,01	43,95	1,45	1,19
0,03	1,00	361.225,43	0,13	0,26	40,22	0,04	0,03	40,22	1,62	1,19
0,07	1,00	272.050,38	0,13	0,27	34,35	0,03	0,05	34,35	1,85	1,19
0,15	1,00	174.916,56	0,15	0,29	25,93	0,00	0,09	25,93	2,11	1,20
0,31	1,00	90.678,62	0,17	0,35	24,99	0,00	0,16		2,33	1,19
0,63	1,00	44.156,29	0,31	0,34	24,99	0,00	0,30		2,46	1,18
0,95	0,99	30.677,02	0,29	0,36	24,99	0,00	0,42		2,50	1,18
1,59	0,99	17.470,95	0,20	0,29	24,99	0,00	0,68		2,53	1,18
2,87	0,98	7.970,13	0,00	0,00	24,99	0,00	1,18		2,56	1,17
4,15	0,98	4.572,42	0,00	0,00	24,99	0,00	1,68		2,57	1,17
6,71	0,97	2.108,38	0,00	0,00	24,99	0,00	2,68		2,58	1,17
9,27	0,96	1.228,54	0,00	0,00	24,99	0,00	3,66		2,64	1,17
11,83	0,96	809,13	0,00	0,00	24,99	0,00	4,61		2,76	1,17
16,95	0,96	433,45	0,00	0,00	24,99	0,00	6,43		2,87	1,17

DETAILED DISPERSION REPORT

Study Folder: **70977-Fase 1-Metanolo**

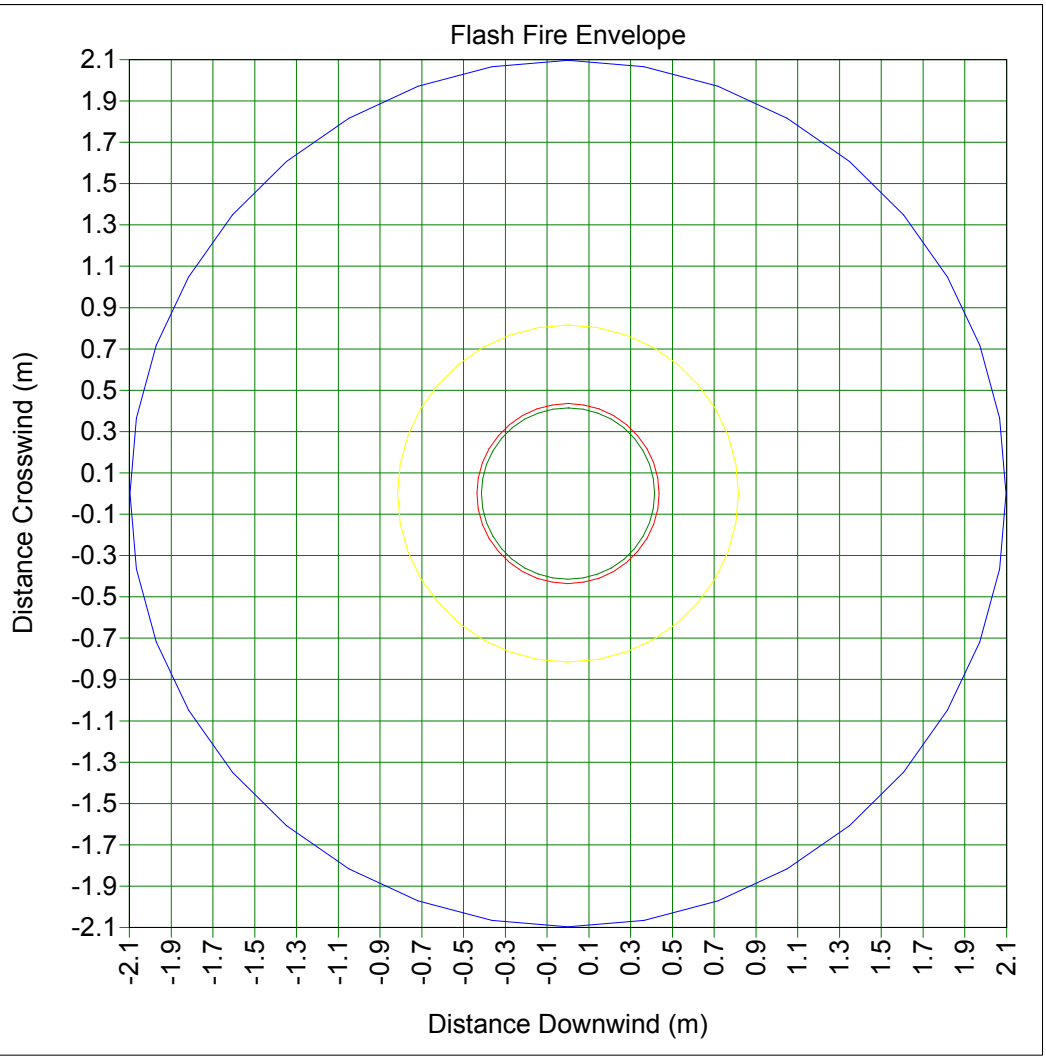
Unique Audit Number: **183.668**

Phast 6.6

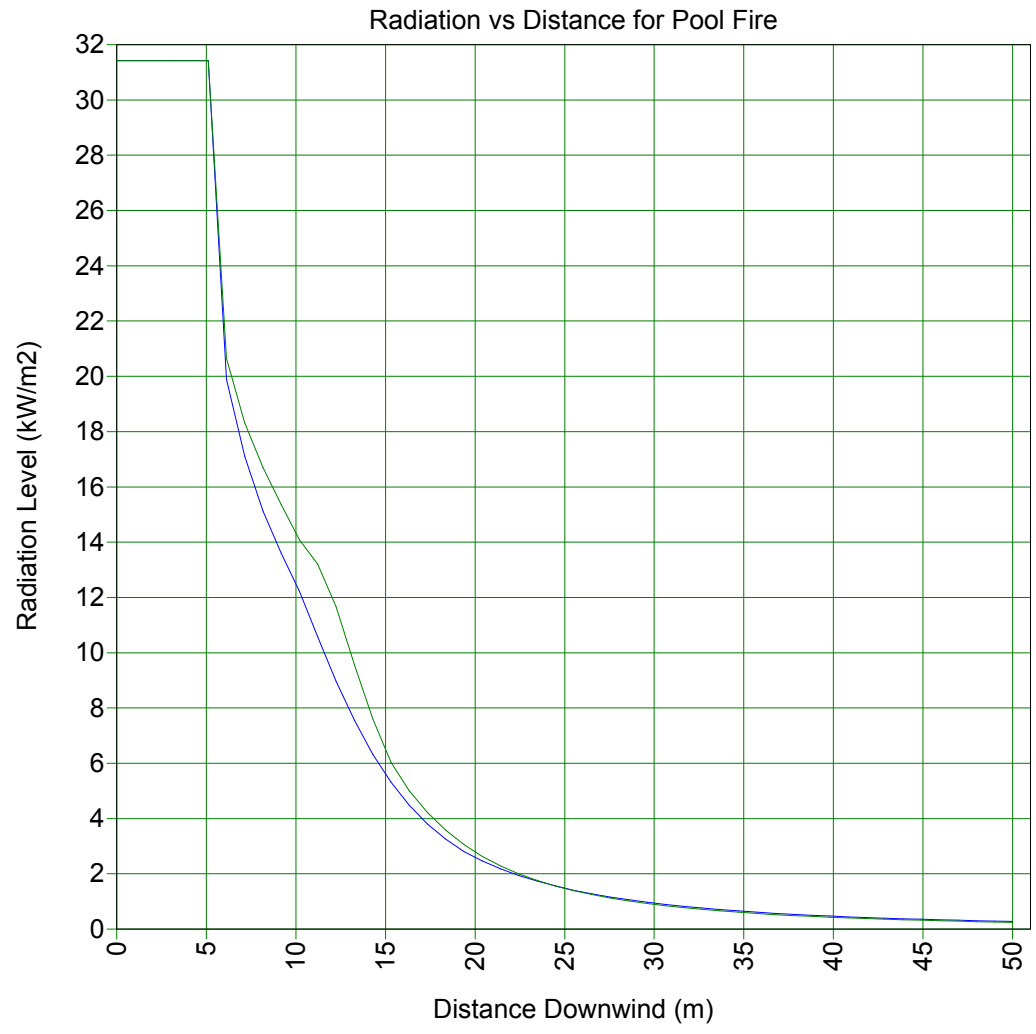
Downwind Distance m	C/Line Height m	C/Line Conc ppm	Plume Half-width m	Plume Total Depth m	Vapor Temperature degC	Liquid Fraction fraction	Time s	Liquid Temperature degC	Centroid Velocity m/s	Cloud Density kg/m3
27,19	0,96	186,28	0,00	0,00	24,99	0,00	9,87		3,09	1,17
37,43	0,96	102,53	0,00	0,00	24,99	0,00	13,02		3,41	1,17
57,91	0,96	44,85	0,00	0,00	24,99	0,00	18,84		3,63	1,17
78,39	0,96	24,68	0,00	0,00	24,99	0,00	24,18		4,04	1,17
98,87	0,96	15,51	0,00	0,00	24,99	0,00	29,09		4,29	1,17
103,99	0,96	14,12	0,00	0,00	24,99	0,00	30,25		4,53	1,17
109,11	0,96	12,94	0,00	0,00	24,99	0,00	31,39		4,52	1,17
119,35	0,96	10,99	0,00	0,00	24,99	0,00	33,63		4,58	1,17
139,83	0,96	8,23	0,00	0,00	24,99	0,00	38,06		4,67	1,17
180,79	0,96	5,15	0,00	0,00	24,99	0,00	46,67		4,84	1,17
221,75	0,96	3,54	0,00	0,00	24,99	0,00	54,89		5,12	1,17
262,71	0,96	2,59	0,00	0,00	24,99	0,00	62,74		5,31	1,17
344,63	0,96	1,58	0,00	0,00	24,99	0,00	77,90		5,50	1,17
426,55	0,96	1,06	0,00	0,00	24,99	0,00	92,34		5,84	1,17
508,47	0,96	0,77	0,00	0,00	24,99	0,00	106,09		6,07	1,17

Study Folder: 70977-Fase 1-Metanolo
Audit No: 181644
Model: User Defined Source-F2/D5
Material: METHANOL
Weathers

- Category 2/F 3.65e+004
- Category 2/F 7.3e+004 p
- Category 5/D 3.65e+004
- Category 5/D 7.3e+004 p



Study Folder: 70977-Fase 1-Metanolo
Audit No: 181526
Model: Pool Fire
Material: METHANOL
Weathers



POOL VAPORIZATION REPORT

Unique Audit Number: 181.607

Study Folder: 70977-Fase 1-Metanolo

Phast 6.6

70977-Fase 1-Metanolo

Tubazione

Pool Vaporization

Base Case

Data

Weather: Global Weathers\Category 2/F

Speed: 2,00 m/s **Stability:** F

\70977-Fase 1-Metanolo\Tubazione\Pool Vaporization

User-Defined Quantities

Material	METHANOL	
Type of Spill	Instantaneous	
Surface Type	Concrete	
Bund Diameter	11,00	m
Ambient Temperature	25,00	degC
Bund Surface Temperature	25,00	degC
Ambient Wind Speed	2,00	m/s
Solar Flux	1,20	kW/m2

Calculated Quantities

Status of Bund:	The Bund was not hit	
Maximum Pool Radius	1,42	m

Averages for Release Segment: 1

Number of Cloud Segments	1	
Rainout Fraction	1,00	fraction
Spill Rate	25.000,00	kg/s
Spill Duration	0,00	s
Spill Mass	25,00	kg
Spill Temperature	25,00	degC
Mass Remaining	21,71	kg

Cloud Segments for this Release Segment

Cloud Segment	Rate	Duration	Temperature	Total Mass	Radius	Mass Air Entrained
	kg/s	s	degC	kg	m	kg/s
1	0,01	300,00	19,13	3,29	1,36	0,07

POOL VAPORIZATION REPORT

Unique Audit Number: 181.607

Study Folder: 70977-Fase 1-Metanolo

Phast 6.6

Weather: Global Weathers\Category 5/D

Speed: 5,00 m/s **Stability:** D

\70977-Fase 1-Metanolo\Tubazione\Pool Vaporization

User-Defined Quantities

Material	METHANOL	
Type of Spill	Instantaneous	
Surface Type	Concrete	
Bund Diameter	11,00	m
Ambient Temperature	25,00	degC
Bund Surface Temperature	25,00	degC
Ambient Wind Speed	5,00	m/s
Solar Flux	1,20	kW/m2

Calculated Quantities

Status of Bund:	The Bund was not hit	
Maximum Pool Radius	1,42	m

Averages for Release Segment: 1

Number of Cloud Segments	1	
Rainout Fraction	1,00	fraction
Spill Rate	25.000,00	kg/s
Spill Duration	0,00	s
Spill Mass	25,00	kg
Spill Temperature	25,00	degC
Mass Remaining	21,04	kg

Cloud Segments for this Release Segment

Cloud Segment	Rate	Duration	Temperature	Total Mass	Radius	Mass Air Entrained
	kg/s	s	degC	kg	m	kg/s
1	0,01	300,00	15,82	3,96	1,34	0,11

70977-Fase 1-Metanolo

Tubazione

User Defined Source-F2/D5

Base Case

CASE Name: **Data**

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

User-Defined Data

Material			
	Material Identifier	METHANOL	
Scenario			
	Building Wake Effect	None	
Vessel/Tank			
	Release Type	Pool Source (Radius given)	
Location			
	[Elevation	1	m]
	Concentration of Interest	6700	ppm
	Averaging time associated with Concentration	Toxic	
	Distances for Radiation Modeling and Dispersion Scope(1)	50	m
	Distances for Radiation Modeling and Dispersion Scope(2)	250	m
	Distances for Radiation Modeling and Dispersion Scope(3)	500	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			
	Explosion Method	TNT	
	Jet Fire Method	API Model	
Dispersion			
	Number of Release Segments	1	
	Fluid Phase(1)	Vapor	
	Duration of Discharge(1)	2500	s
	Final Temperature(1)	25	degC
	Release Rate(1)	0.01	kg/s
	Pool Radii(1)	11	m
	Pre-Dilution Air Rates(1)	0.01	kg/s

Late Ignition Location	No ignition location	
Mass Inventory of material to Disperse	25	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)	0	m
North(1)	0	m

Consequence Results

Distance to Concentration Results

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

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 (6700)	600	s	10.427	No Hazard
UFL (360000)	18.75	s	0.0413158	0.0346489
LFL (73000)	18.75	s	0.415173	0.435695
LFL Frac (36500)	18.75	s	2.09739	0.815849

Concentration(ppm)	Averaging Time		Heights (m) for above distances	
			Category 2/F	Category 5/D
User Conc (6700)	600	s	0	0
UFL (360000)	18.75	s	0.999188	0.999974
LFL (73000)	18.75	s	0.95913	0.99811
LFL Frac (36500)	18.75	s	0.471141	0.995842

Concentration At Distance Results

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

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
50	m	1738.48	67.1371
250	m	92.8034	2.8871
500	m	25.2025	0.801076

Distance		Heights (m) for above concentrations	
		Category 2/F	Category 5/D
50	m	0	0.958595
250	m	0	0.956879
500	m	0	0.956517

Distance		Conc.(ppm) at Toxic Avg.Time of 600 s	
		Category 2/F	Category 5/D
50	m	869.239	32.8976
250	m	46.4017	1.44109
500	m	12.6012	0.400288

Distance		Heights (m) for above concentrations	
		Category 2/F	Category 5/D
50	m	0	0
250	m	0	0
500	m	0	0

Distance		Conc.(ppm) at Core Avg.Time of 18.75 s	
		Category 2/F	Category 5/D
50	m	1738.48	65.7952
250	m	92.8034	2.88217
500	m	25.2025	0.800575

Distance		Heights (m) for above concentrations	
		Category 2/F	Category 5/D
50	m	0	0
250	m	0	0
500	m	0	0

Distance to Equivalent Toxic Dose

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

Toxic Calculation Method = Mixture Probit

Concentration(ppm)	Reference Time		Distance (m)	
			Category 2/F	Category 5/D
User Conc (6700)	600	s	35.0404	No Hazard

Time to Equivalent Toxic Dose

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

Toxic Calculation Method = Mixture Probit

At 50 m

Concentration(ppm)	Reference Time		Time (s)	
			Category 2/F	Category 5/D
User Conc (6700)	600	s	No Hazard	No Hazard

At 250 m

Concentration(ppm)	Reference Time		Time (s)	
			Category 2/F	Category 5/D
User Conc (6700)	600	s	No Hazard	No Hazard

At 500 m

Concentration(ppm)	Reference Time		Time (s)	
			Category 2/F	Category 5/D
User Conc (6700)	600	s	No Hazard	No Hazard

Late Pool Fire Hazard

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

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

Radiation Effects: Late Pool Fire Ellipse

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

			Distance (m)	
			Category 2/F	Category 5/D
Radiation Level	4	kW/m2	31.9226	32.8968
Radiation Level	12.5	kW/m2	19.8206	22.512
Radiation Level	37.5	kW/m2	Not Reached	Not Reached

Radiation Effects: Late Pool Fire Distance

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

			Radiation Level (kW/m2)	
			Category 2/F	Category 5/D
Distance Of Interest	50	m	1.25595	1.22453
Distance Of Interest	250	m	0.0297453	0.0259814
Distance Of Interest	500	m	0.00635365	0.00550813

Flash Fire Envelope

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

All flammable results are reported at the cloud centreline height

				Distance (m)
			Category 2/F	Category 5/D
Furthest Extent	36500	ppm	2.09739	0.815849
Furthest Extent	73000	ppm	0.415173	0.435695

				Heights (m) for above distances
			Category 2/F	Category 5/D
Furthest Extent	36500	ppm	0.471141	0.995842
Furthest Extent	73000	ppm	0.95913	0.99811

Weather Conditions

Path: \70977-Fase 1-Metanolo\Tubazione\User Defined Source-F2/D5

		Category 2/F	Category 5/D
Wind Speed	m/s	2	5
Pasquill Stability		F	D
Surface Roughness Length	mm	1000	1000
Surface Roughness Parameter		0.173718	0.173718
Atmospheric Temperature	degC	25	25
Surface Temperature	degC	25	25
Relative Humidity	fraction	0.75	0.75