

E SIMULAÇÃO DOS EFEITOS FÍSICOS

Nas páginas seguintes apresentamos as simulações realizadas. Como os programas utilizados não possuem versão em português, foi elaborado um glossário contendo as considerações utilizadas nos dados de entrada.

INPUT DATA	DADOS DE ENTRADA	CONSIDERAÇÕES
<i>Model: Pool evaporation, non-boiling spreading liquid</i>	Modelo: Evaporação de poça, líquido sem ebulição se espalhando	
<i>Chemical:</i> , <i>Date</i>	Produto: , Data:	Nome do produto químico envolvido
<i>Description:</i>	Descrição:	Nome da(s) hipótese(s)
<i>Total mass released</i>	Massa total vazada	Vem da tabela de dados de entrada
<i>Inicial Liquid temperature</i>	Temperatura inicial do líquido	Vem da tabela de dados de entrada
<i>Fixed pool surface</i>	Área da superfície de espalhamento	Vem da tabela de dados de entrada
<i>Type of subsoil (1 .. 6)</i>	Tipo de solo (1 ... 6)	Conforme manual do EFFECTS
<i>Roughness subsoil</i>	Rugosidade do solo	Conforme manual do EFFECTS
<i>Temperature subsoil</i>	Temperatura do solo	Vem da tabela 5-6
<i>Ambient Temperature</i>	Temperatura ambiente	Vem da tabela 5-6
<i>Wind velocity at 10m height</i>	Velocidade do vento a 10 m de altura	Vem da tabela 5-6
<i>Pasquill stability class</i>	Classe de estabilidade Pasquill	Vem da tabela 5-6
<i>Time t after start release</i>	Tempo de interesse (t) após o início do vazamento	20 segundos TNO <i>Purple Book</i> , pág. 4.10, item 4.6.2

OUTPUT DATA	DADOS DE SAÍDA
<i>Model: Pool evaporation, non-boiling spreading liquid</i>	Modelo: evaporação de poça, líquido sem ebulição se espalhando
<i>Chemical:</i> , <i>Date</i>	Produto: , Data:
<i>Description:</i>	Descrição:
<i>Evaporation rate at t sec</i>	Taxa de evaporação em t segundos
<i>Liquid temperature at t sec</i>	Temperatura do líquido em t segundos
<i>Actual Maximum pool area</i>	Área máxima da poça

INPUT DATA	DADOS DE ENTRADA	CONSIDERAÇÕES
<i>Model: Explosive mass due to semi-continuous release neutral gas</i>	Modelo: Massa explosiva devido a um vazamento semi-contínuo de gás neutro	
<i>Chemical: , Date</i>	Produto: , Data	Nome do produto químico envolvido
<i>Description:</i>	Descrição:	Nome da(s) hipótese(s)
<i>(Max) Mass flow rate of the source</i>	(Máx) Vazão mássica na fonte	Resultado obtido na simulação anterior
<i>Duratio of release</i>	Duração do vazamento	600 s (padrão CETESB)
<i>Source width</i>	Largura da fonte	Utilizado o diâmetro da poça
<i>Length source in z-direction</i>	Comprimento da fonte na direção z	0 m
<i>Height source</i>	Altura da fonte	0 m
<i>Pasquill stability class</i>	Classe de estabilidade Pasquill	Vem da tabela 5-6
<i>Ambient Temperature</i>	Temperatura ambiente	Vem da tabela 5-6
<i>Wind velocity at 10m height</i>	Velocidade do vento a 10 m de altura	Vem da tabela 5-6
<i>Roughness length class</i>	Classe de rugosidade	Conforme manual do EFFECTS
<i>Time t after start release</i>	Tempo t após o início de vazamento	20 segundos TNO <i>Purple Book</i> , pág. 4.10, item 4.6.2

OUTPUT DATA	DADOS DE SAÍDA
<i>Model: Explosive mass due to semi-continuous release neutral gas</i>	Modelo: Massa explosiva devido a um vazamento semi-contínuo de gás neutro
<i>Chemical: , Date</i>	Produto: , Data
<i>Description:</i>	Descrição:
<i>Explosive mass LEL < c < UEL</i>	Massa explosiva LEL < c < UEL
<i>Maximum distance of source to LEL</i>	Distância máxima da fonte ao LEL
<i>Minimum distance of source to LEL</i>	Distância mínima da fonte ao LEL
<i>Maximum width between LEL</i>	Largura máxima entre LEL
<i>Maximum relative height to LEL</i>	Altura relativa máxima para LEL
<i>Maximum distance of source to UEL</i>	Distância máxima da fonte ao UEL
<i>Minimum distance of source to UEL</i>	Distância mínima da fonte ao UEL
<i>Maximum width between UEL</i>	Largura máxima entre UEL
<i>Maximum relative height to UEL</i>	Altura relativa máxima para UEL

INPUT DATA	DADOS DE ENTRADA	CONSIDERAÇÕES
Model Pool Fire	Modelo de Radiação Térmica Emitida pela Poça	
Model Pool fire (137)	Modelo de incêndio de poça	
Case description	Estudo de caso	Nome da(s) hipótese(s)
Chemical name	Nome do produto	Nome do produto químico envolvido
Total mass released	Massa total vazada	Vem da tabela de dados de entrada
Fixed pool surface	Área da poça fixa	Vem da tabela de dados de entrada
Temperature of the pool	Temperatura da poça	Vem da tabela de dados de entrada
Fraction combustion heat radiated	Fração do calor do combustão radiante	Vem da tabela de dados de entrada
Wind speed at 10 m height	Velocidade do vento a 10 m de altura	Vem da tabela de dados de entrada
Ambient temperature	Temperatura ambiente	Vem da tabela de dados de entrada
Ambient relative humidity	Umidade relativa do ambiente	Vem da tabela de dados de entrada
Fraction CO ₂ in atmosphere (%)	Fração de CO ₂ na atmosfera	0.03
Distance from centre of the pool (Xd)	Distância do vazamento (m)	Distância de interesse a partir do centro da poça
Exposure duration to heat radiation (s)	Duração da exposição à radiação térmica (s)	20
Take protective effects of clothing into account?	Levar em consideração os efeitos de proteção de roupas?	não
X-coordinate of release (for mapping purposes)	X - Coordenada do vazamento (m) para mapeamentos	Utilizada quando programa mapeia sobre a imagem (opção não utilizada = 0 m)
Y-coordinate of release (for mapping purposes)	Y - Coordenada do vazamento (m) para mapeamentos	Utilizada quando programa mapeia sobre a imagem (opção não utilizada = 0 m)
Calculate all contours for: Consequences	Calcula todos os contornos para: consequências	Parâmetro não interfere no cálculo

OUTPUT DATA	DADOS DE SAÍDA
<i>Model Pool Fire</i>	Modelo de Radiação Térmica Emitida pela Poça
<i>Heat Radiation at X</i>	Radiação em X
<i>Combustion rate</i>	Taxa de combustão
<i>Duration of the pool fire</i>	Duração do incêndio em poça
<i>Heat emission from fire surface</i>	Calor emitido na superfície do fogo
<i>Flame tilt</i>	Direção da chama
<i>View factor</i>	Fator de vista
<i>Atmospheric transmissivity</i>	Transmissividade atmosférica
<i>Flame temperature</i>	Temperatura da chama
<i>Weight ratio of HCL/chemical</i>	Fração mássica de HCl / produto
<i>Weight ratio of NO2/chemical</i>	Fração mássica de NO2 / produto
<i>Weight ratio of SO2/chemical</i>	Fração mássica de SO2 / produto
<i>Weight ratio of CO2/chemical</i>	Fração mássica de CO2 / produto
<i>Weight ratio of H2O/chemical</i>	Fração mássica de H2O / produto

INPUT DATA	DADOS DE ENTRADA	CONSIDERAÇÕES
Model energy explosion model	Dados de Entrada Modelo de Explosão Multi-energia	
<i>Multi energy explosion model</i>	Modelo multi-energia	Calcula os efeitos da explosão
<i>Case description</i>	Estudo de caso	Referência a hipótese acidental e período de ocorrência
<i>Chemical name</i>	Nome do produto	Nome do produto químico envolvido
<i>Ambient temperature</i>	Temperatura ambiente	Vem da tabela de Condições Meteorológicas no cap.2
<i>Total mass in explosive range</i>	Massa total nos limites de explosividade	Vem do cálculo da massa nas condições de inflamabilidade
<i>Fraction of flammable cloud confined</i>	Fração da nuvem inflamável confinada	Usado 30% ou 100% dependendo das circunstâncias
<i>Curve number</i>	Número da curva	Usado curva 6 e curva 10 dependendo das circunstâncias, como ilustrado no cap. 5
<i>Distance from release (Xd)</i>	Distância do vazamento (Xd) (m)	Distância de interesse a partir do vazamento
<i>Offset between release centre and cloud centre</i>	Distância entre o centro de liberação e o centro da nuvem	0 m, para ignição no centro da nuvem
<i>Offset between cloud centre and explosion centre</i>	Distância entre o centro da nuvem e o centro de explosão	0 m, para ignição no centro da nuvem
<i>X-coordinate of release (for mapping purposes)</i>	X - Coordenada do vazamento (m) para mapeamentos	Utilizada quando programa mapeia sobre a imagem (opção não utilizada = 0 m)
<i>Y-coordinate of release (for mapping purposes)</i>	Y - Coordenada do vazamento (m) para mapeamentos	Utilizada quando programa mapeia sobre a imagem (opção não utilizada = 0 m)
<i>Predefined wind direction</i>	Direção do vento predefinida	Sul (vento proveniente da esquerda do vazamento)
<i>Wind comes from (West = 180 degrees)</i>	Direção do vento	De onde vem o vento
<i>Calculate all contours for</i>	Cálculos de todos os contornos para (ver opções abaixo)	Cálculo das distâncias para os níveis de interesse

E.1 Simulação Etanol

E.1.1 PT 27

E.1.1.1 Ruptura

E.1.1.1.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 27 dia rup

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,4537E06
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10013
Temperature of the subsoil (°C)	28,4
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,28
Ambient temperature (°C)	23,4
Ambient relative humidity (%)	64,7
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	13,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	9,1238
Purple book representative evaporation duration (s)	585,3
Representative temperature (°C)	24,717
Representative pool diameter (m)	112,91
Density after mixing with air (kg/m3)	1,2237
Total evaporated mass (kg)	5340,1
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10013

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

• Noite

Case description: PT 27 noite rup

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,4537E06
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10013
Temperature of the subsoil (°C)	24,3
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,07
Ambient temperature (°C)	19,3
Ambient relative humidity (%)	81,1
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil
Subsoil roughness description (pool)	flat sandy soil, concrete, tiles, plant-

Maximum evaluation time for evaporation (s)	yard 600
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Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	13,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	6,3382
Purple book representative evaporation duration (s)	587,02
Representative temperature (°C)	24,742
Representative pool diameter (m)	112,91
Density after mixing with air (kg/m3)	1,2428
Total evaporated mass (kg)	3720,6
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10013

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

E.1.1.1.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (30/1/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	9,1238	6,3382
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	10013	10013
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		

Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very	No damage or very

	minor damage	minor damage
	No damage	No damage
	or very minor damage	or very minor damage
Damage to structures (empirical) at Xd (ME 2)		

Sub model information

Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 13:10:48

E.1.1.1.3 Cálculo da Radiação Térmica

- Dia e Noite**

ModelSet: PT 27 dia rup_IP Set

Model: Pool fire

version: 5.14 (30/1/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

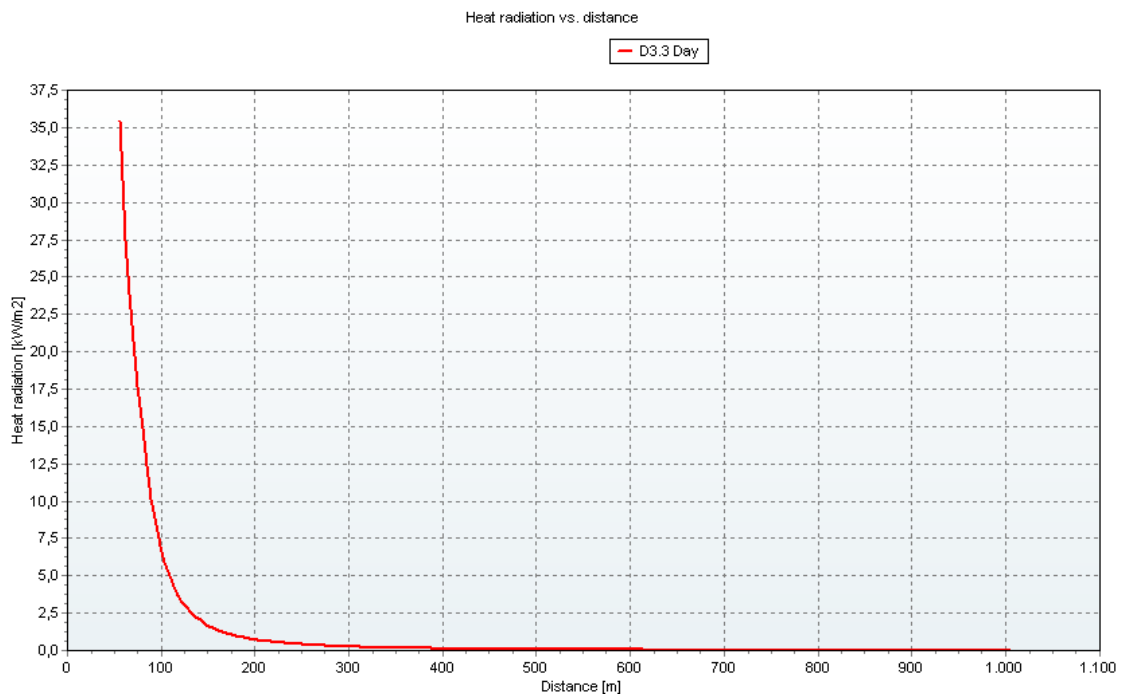
Inputs	D3.3 Day (linked to Session 19)	D2.1 Night (linked to Session 19)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	1,4537E06	1,4537E06
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Pool surface poolfire (m2)	10013	10013
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0

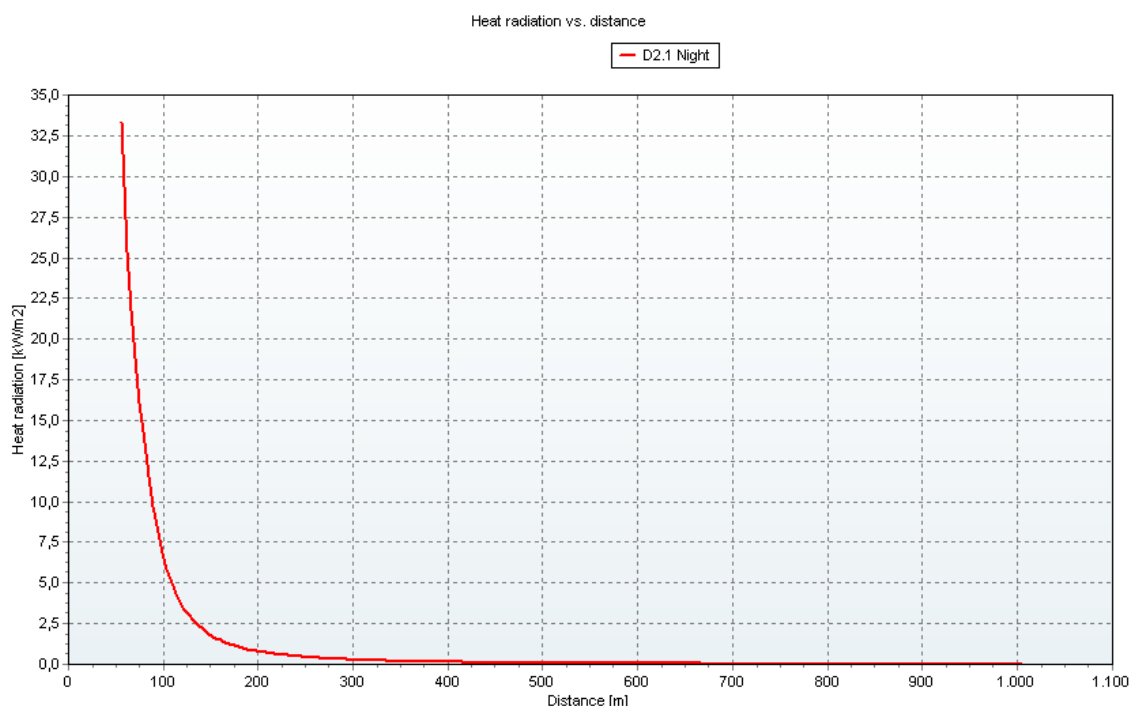
Results	D3.3 Day (linked to Session 19)	D2.1 Night (linked to Session 19)
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	Session (linked to 19)	Session 19)
Max Diameter of the Pool Fire (m)	112,91	112,91
Heat radiation at X (kW/m ²)	0,014662	0,016418
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	90,363	89,049
Combustion rate (kg/s)	150,2	150,2
Duration of the pool fire (s)	9679,1	9679,1
Heat emission from fire surface (kW/m ²)	39,272	38,126
Flame tilt (deg)	39,051	31,961
View factor (-)	0,00089017	0,0010261
Atmospheric transmissivity (%)	41,941	41,967
Flame temperature (°C)	641,64	634,83
Length of the flame (m)	29,579	31,316
Calculated pool surface area (m ²)	10013	10013
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO ₂ /chemical (%)	0	0
Weight ratio of SO ₂ /chemical (%)	0	0
Weight ratio of CO ₂ /chemical (%)	191,09	191,09
Weight ratio of H ₂ O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 13:10:50





E.1.1.2 Furo 20%

E.1.1.2.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 27 dia fenda

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,4537E06
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10013
Temperature of the subsoil (°C)	28,4
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	

Wind speed at 10 m height (m/s)	3,28
Ambient temperature (°C)	23,4
Ambient relative humidity (%)	64,7
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil
Subsoil roughness description (pool)	flat sandy soil, concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	13,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	9,1238
Purple book representative evaporation duration (s)	585,3
Representative temperature (°C)	24,717
Representative pool diameter (m)	112,91
Density after mixing with air (kg/m3)	1,2237
Total evaporated mass (kg)	5340,1
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10013

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

• Noite

Case description: PT 27 noite fenda

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,4537E06
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25

Maximum pool surface area (m2)	10013
Temperature of the subsoil (°C)	24,3
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,07
Ambient temperature (°C)	19,3
Ambient relative humidity (%)	81,1
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil
	flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant-
	yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	13,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	6,3382
Purple book representative evaporation duration (s)	587,02
Representative temperature (°C)	24,742
Representative pool diameter (m)	112,91
Density after mixing with air (kg/m3)	1,2428
Total evaporated mass (kg)	3720,6
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10013

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

E.1.1.2.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

Scenario: 2 Furo 20%D _VCE_Flash

Parameters

Inputs

Base Frequency (/km.year)	0,00014
Frequency Correction Factor (-)	1
Frequency equally distributed day/night	Yes
Fraction frequency in daytime hours (-)	
Chance Direct Ignition (-)	

<i>Chance Delayed Ignition (-)</i>	
<i>Bleve Fraction (-)</i>	
Fraction with explosion phenomena (-)	0,4
User comment	

Results

Frequency used (/year)	1,40E-04
Maximum Effect Distance (m)	0
Relevant Phenomenon	
Maximum Distance for 1% Lethality (m)	0

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 13:10:47

E.1.1.2.3 Cálculo da Radiação Térmica

• Dia e Noite

ModelSet: PT 27 dia fenda_IP Set

Model: Pool fire

version: 5.14 (30/1/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

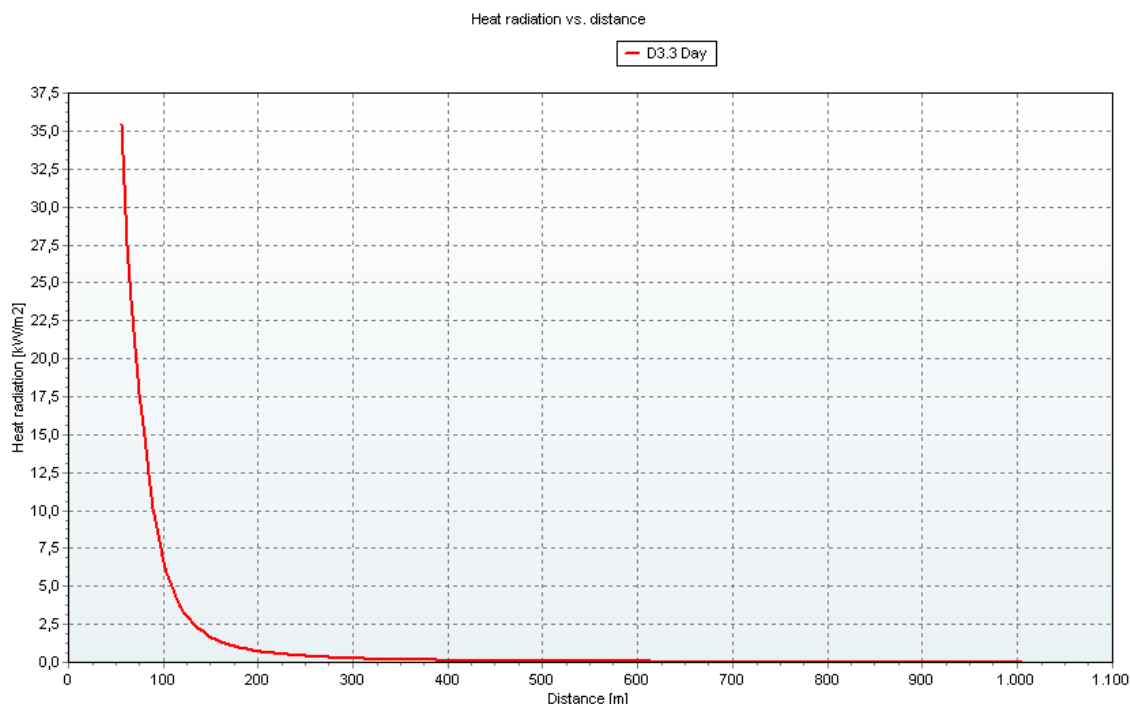
Inputs	D3.3 Day (linked to Session 19)	D2.1 Night (linked to Session 19)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	1,4537E06	1,4537E06
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	10013	10013
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0

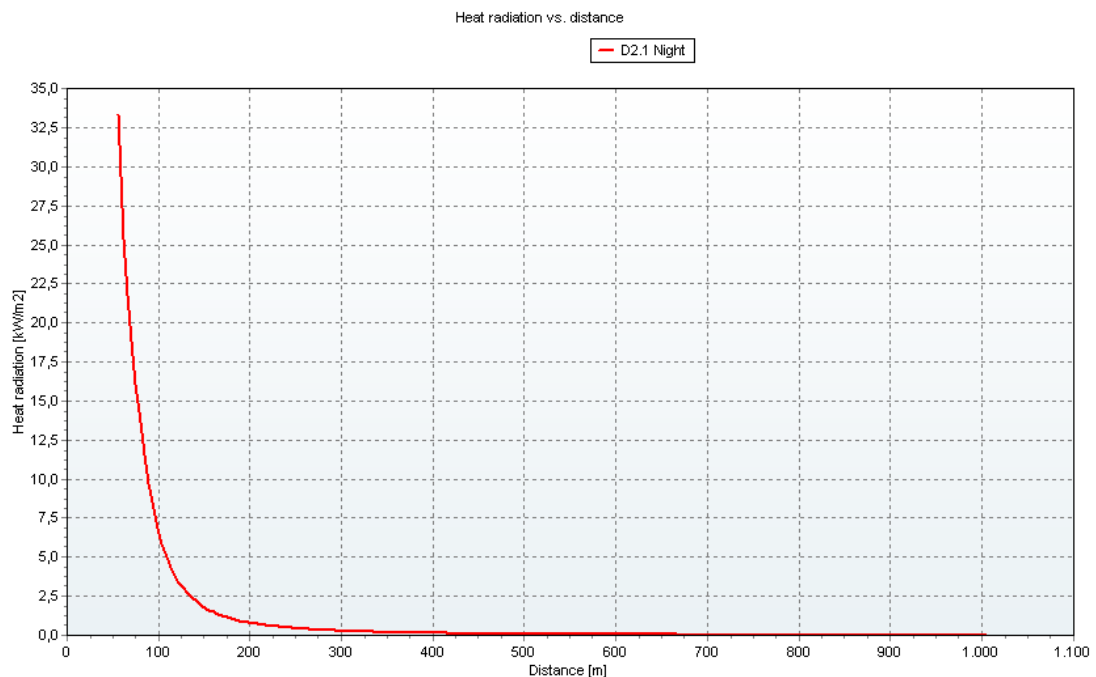
Results	D3.3 Day (linked to Session 19)	D2.1 Night (linked to Session 19)
Max Diameter of the Pool Fire (m)	112,91	112,91

Heat radiation at X (kW/m2)	0,014662	0,016418
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	90,363	89,049
Combustion rate (kg/s)	150,2	150,2
Duration of the pool fire (s)	9679,1	9679,1
Heat emission from fire surface (kW/m2)	39,272	38,126
Flame tilt (deg)	39,051	31,961
View factor (-)	0,00089017	0,0010261
Atmospheric transmissivity (%)	41,941	41,967
Flame temperature (°C)	641,64	634,83
Length of the flame (m)	29,579	31,316
Calculated pool surface area (m2)	10013	10013
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 13:10:49





E.1.1.3 Furo 5 %

E.1.1.3.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 27 dia furo

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	4,6893E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10013
Temperature of the subsoil (°C)	28,4
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	

Wind speed at 10 m height (m/s)	3,28
Ambient temperature (°C)	23,4
Ambient relative humidity (%)	64,7
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	16,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	8,8627
Purple book representative evaporation duration (s)	570,09
Representative temperature (°C)	24,186
Representative pool diameter (m)	112,91
Density after mixing with air (kg/m3)	1,2229
Total evaporated mass (kg)	5052,5
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10013

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

• Noite

Case description: PT 27 noite furo_IP

Model: Pool fire

version: 5.14 (28/1/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Pool size determination	Confined
Total mass released (kg)	4,6893E05
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Pool surface poolfire (m2)	10013
Height of the receiver (m)	0
Height of the confined pool above ground level (m)	0
Temperature of the pool (°C)	25
Pool burning rate	User defined
Value of pool burning rate (kg/m2*s)	0,015

Fraction combustion heat radiated (-)	0,2
Soot Fraction	User defined
Value of soot fraction (-)	0
Wind speed at 10 m height (m/s)	2,07
Ambient temperature (°C)	19,3
Ambient relative humidity (%)	81,1
Amount of CO2 in atmosphere (-)	0,0003
Distance from centre of the pool (Xd) (m)	200
Maximum heat exposure duration (s)	20
X-coordinate of release (m)	0
Y-coordinate of release (m)	0
Predefined wind direction	User defined
Wind comes from (North = 0 degrees) (deg)	0
Calculate contours for	Physical effects
Heat radiation level (lowest) for first contour plot (kW/m2)	9,8
Heat radiation level for second contour plot (kW/m2)	19,5
Heat radiation level (highest) for third contour plot (kW/m2)	35,5
<i>Take protective effects of clothing into account</i>	
<i>Correction lethality protection clothing (-)</i>	
<i>Percentage of mortality for contour calculations (%)</i>	
<i>Heat radiation damage Probit A ((sec*(W/m2)^n))</i>	
<i>Heat radiation damage Probit B</i>	
<i>Heat radiation damage Probit N</i>	

Results

Max Diameter of the Pool Fire (m)	112,91
Heat radiation at X (kW/m2)	0,80209
Heat radiation first contour at (m)	89,071
Heat radiation second contour at (m)	69,378
Heat radiation third contour at (m)	56,457
Combustion rate (kg/s)	150,2
Duration of the pool fire (s)	3122,1
Heat emission from fire surface (kW/m2)	38,126
Flame tilt (deg)	31,734
View factor (-)	0,036471
Atmospheric transmissivity (%)	57,683
Flame temperature (°C)	634,83
Length of the flame (m)	31,316
Calculated pool surface area (m2)	10013
Weight ratio of HCL/chemical (%)	0
Weight ratio of NO2/chemical (%)	0
Weight ratio of SO2/chemical (%)	0
Weight ratio of CO2/chemical (%)	191,09
Weight ratio of H2O/chemical (%)	117,35

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

E.1.1.3.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (30/1/2014)

Reference: No ref

Parameters		
Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	8,8627	6,1715
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	10013	10013
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0

Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage

Sub model information

Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 13:10:46

E.1.1.3.3 Cálculo da Radiação Térmica

- Dia e Noite**

ModelSet: PT 27 dia furo_IP Set

Model: Pool fire

version: 5.14 (30/1/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	4,6893E05	4,6893E05
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	10013	10013
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0

Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	112,91	112,91
Heat radiation at X (kW/m2)	0,014662	0,016418
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	90,363	89,049
Combustion rate (kg/s)	150,2	150,2
Duration of the pool fire (s)	3122,1	3122,1
Heat emission from fire surface (kW/m2)	39,272	38,126
Flame tilt (deg)	39,051	31,961
View factor (-)	0,00089017	0,0010261
Atmospheric transmissivity (%)	41,941	41,967
Flame temperature (°C)	641,64	634,83
Length of the flame (m)	29,579	31,316
Calculated pool surface area (m2)	10013	10013
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09

Weight ratio of H ₂ O/chemical (%)	117,35	117,35
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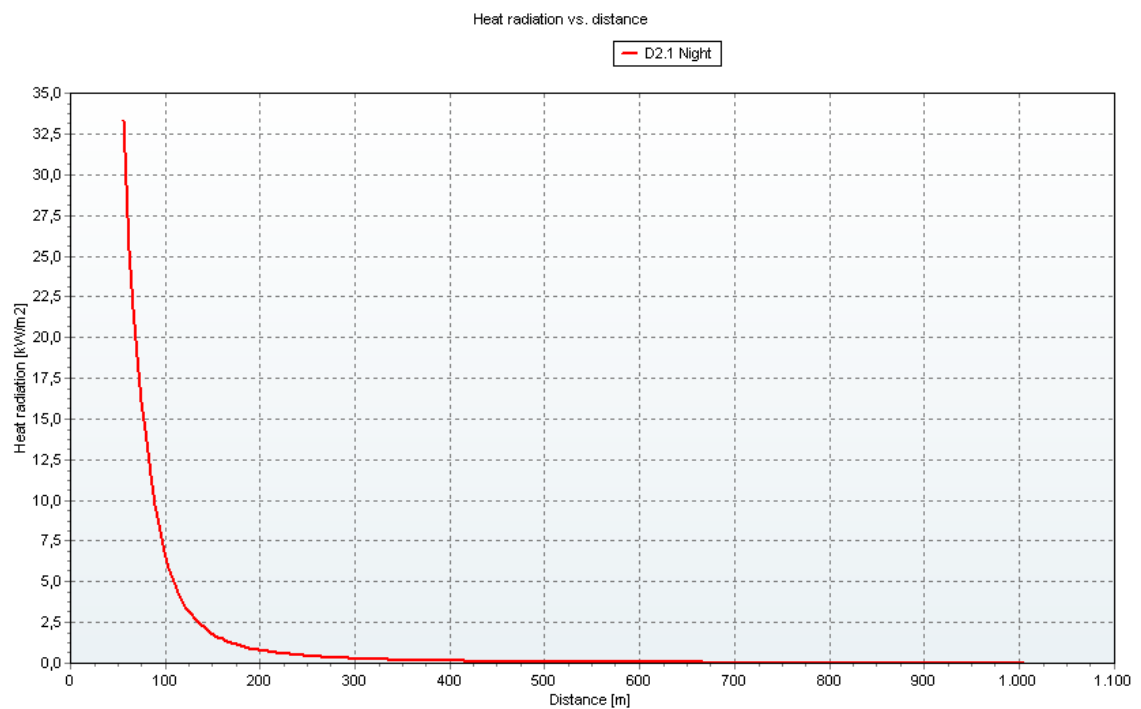
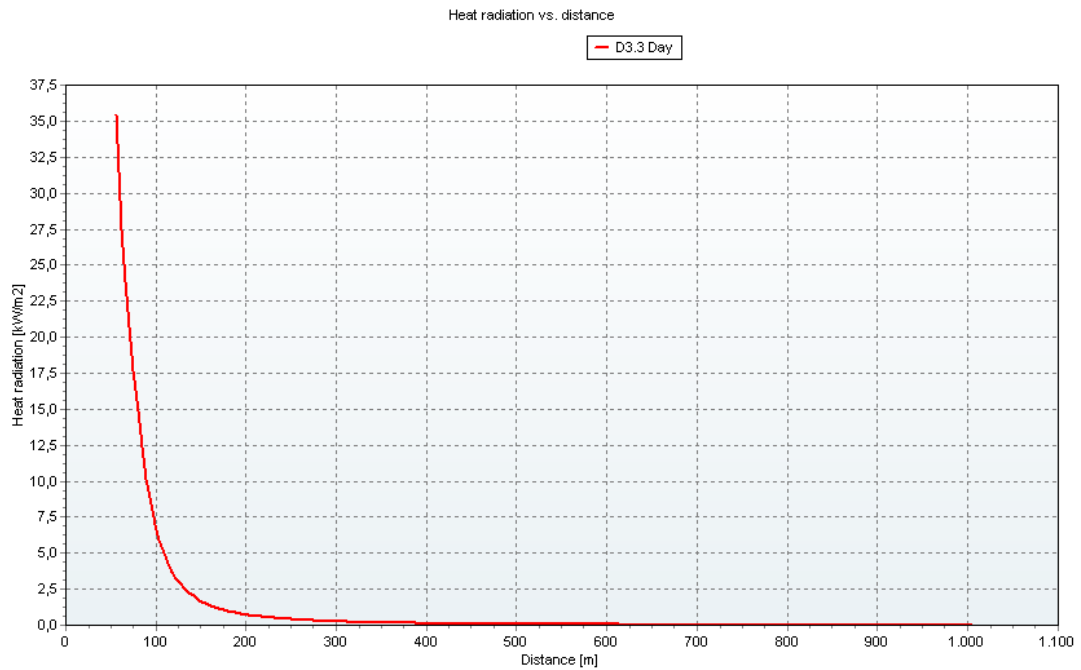
Other Information

Main program

Riskcurves 9.0.15.7719

Last Calculation

30/1/2014 13:10:49



E.2.1 PT 104

E.2.1.1 Ruptura

E.2.1.1.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 104 dia rup

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,7742E06
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10083
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Isolation concrete flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	13
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	9,4217

Purple book representative evaporation duration (s)	586,18
Representative temperature (°C)	24,706
Representative pool diameter (m)	113,31
Density after mixing with air (kg/m3)	1,2307
Total evaporated mass (kg)	5522,8
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10083

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

• Noite

Case description: PT 104 noite rup

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,7742E06
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10083
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Isolation concrete flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	13
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	7,9139
Purple book representative evaporation duration (s)	586,47
Representative temperature (°C)	24,666
Representative pool diameter (m)	113,31
Density after mixing with air (kg/m3)	1,2429
Total evaporated mass (kg)	4641,2
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10083

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

E.2.1.1.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (30/1/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	9,4217	7,1139
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	10083	10083
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3

Curve number	6 (Strong deflagration)	6 (Strong deflagration)
Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage

	damage	damage
Sub model information		
Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)	
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)	
Other Information		
Main program	Riskcurves 9.0.15.7719	
Last Calculation	30/1/2014 16:16:56	

E.2.1.1.3 Cálculo da Radiação Térmica

- Dia e Noite**

ModelSet: PT 104 dia rup_IP Set

Model: Pool fire

version: 5.14 (30/1/2014)

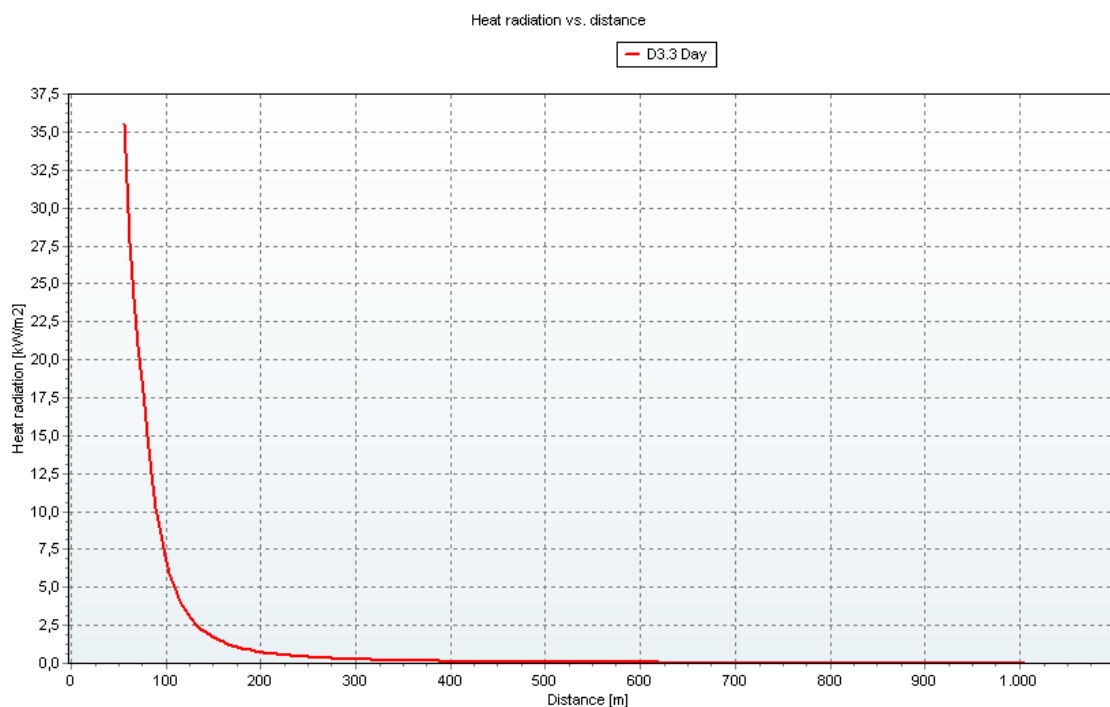
Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

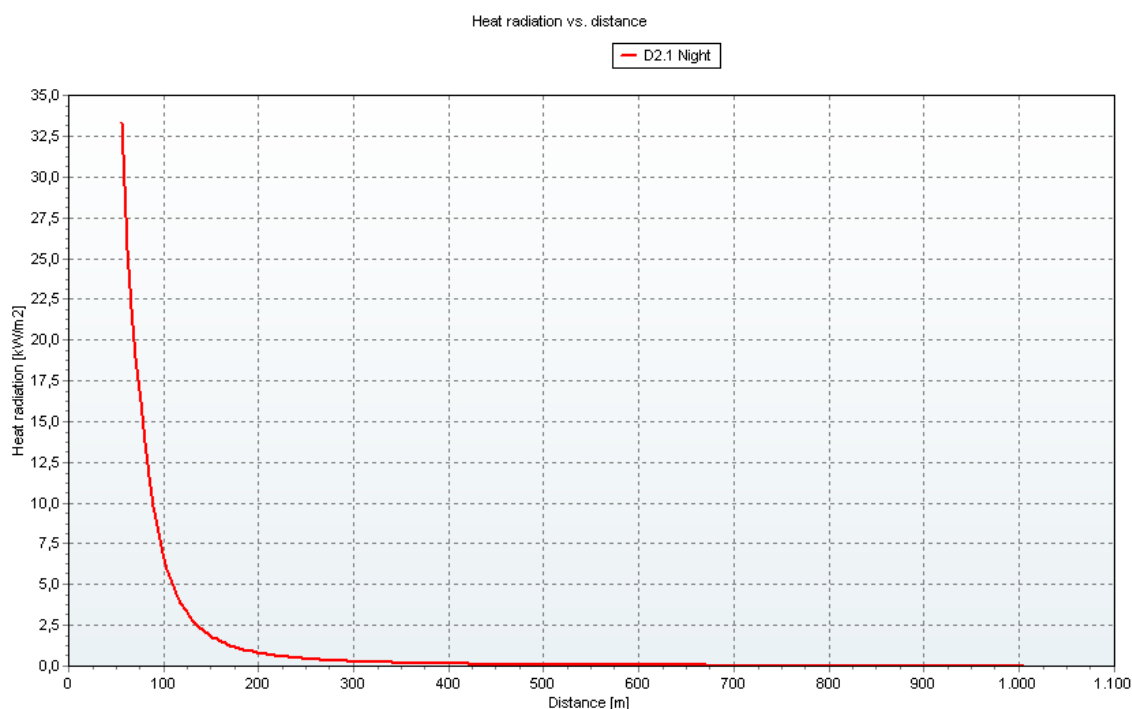
Parameters		
Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	1,7742E06	1,7742E06
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	10083	10083
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0
Results		
	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)

Max Diameter of the Pool Fire (m)	113,31	113,31
Heat radiation at X (kW/m2)	0,014881	0,016642
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	90,803	89,459
Combustion rate (kg/s)	151,25	151,25
Duration of the pool fire (s)	11731	11731
Heat emission from fire surface (kW/m2)	39,381	38,173
Flame tilt (deg)	39,061	31,953
View factor (-)	0,00089152	0,0010312
Atmospheric transmissivity (%)	42,385	42,278
Flame temperature (°C)	642,21	635,09
Length of the flame (m)	29,521	31,353
Calculated pool surface area (m2)	10083	10083
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 16:16:57





E.2.1.2 Furo 20%

E.2.1.2.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 104 dia fenda

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,7742E06
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10083
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	

<i>Max temperature difference between pool and water (K)</i>	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Isolation concrete
Subsoil roughness description (pool)	flat sandy soil, concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results	
Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	13
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	9,4217
Purple book representative evaporation duration (s)	586,18
Representative temperature (°C)	24,706
Representative pool diameter (m)	113,31
Density after mixing with air (kg/m3)	1,2307
Total evaporated mass (kg)	5522,8
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10083

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

• Noite

Case description: PT 104 noite fenda

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2rd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,7742E06

Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10083
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Isolation concrete flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results	
Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	13
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	7,9139
Purple book representative evaporation duration (s)	586,47
Representative temperature (°C)	24,666
Representative pool diameter (m)	113,31
Density after mixing with air (kg/m3)	1,2429
Total evaporated mass (kg)	4641,2
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10083

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

E.2.1.2.2 Cálculo da Dispersão e da Sobrepressão

• Dia e Noite

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (30/1/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to	D2.1 Night (linked to
--------	------------------------	--------------------------

	Default)	Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	9,4217	7,1139
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	10083	10013
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0

Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage

Sub model information

Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 16:16:55

E.2.1.2.3 Cálculo da Radiação Térmica

• Dia e Noite

ModelSet: PT 104 dia fenda_IP Set

Model: Pool fire

version: 5.14 (30/1/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

Inputs	D3.3 Day (linked to Session (linked to 17)	D2.1 Night Session
--------	---	--------------------------

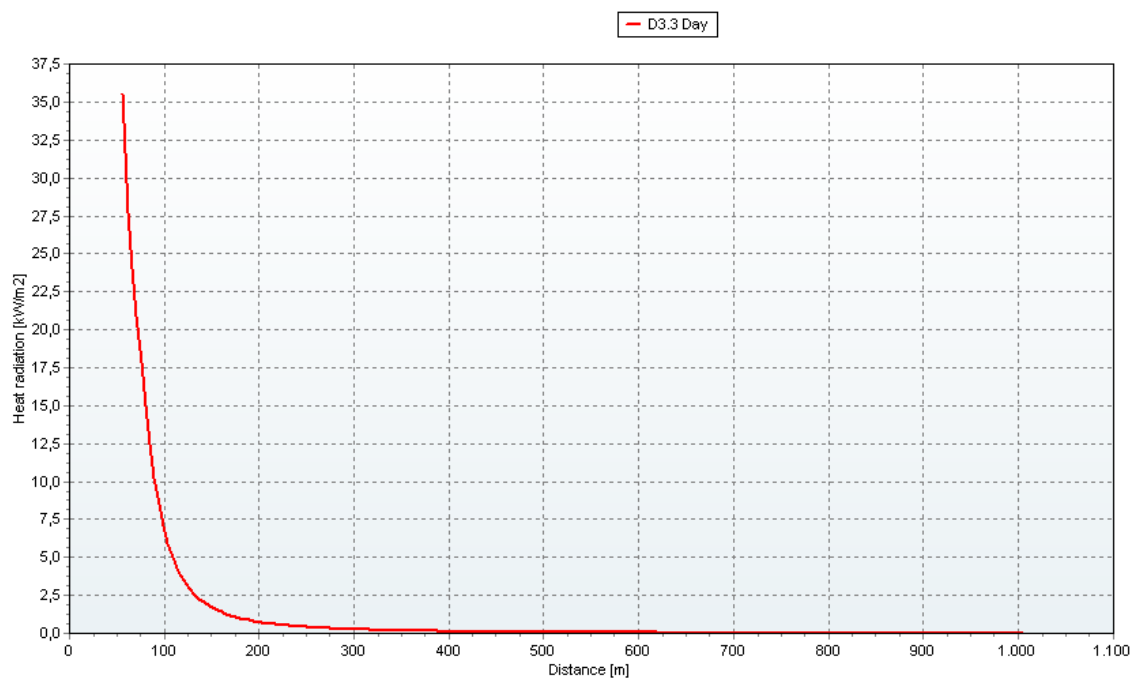
17)		
Chemical name	ETHANOLETHANOL (DIPPR) (DIPPR)	
Pool size determination	Confined	Confined
Total mass released (kg)	1,7742E06	1,7742E06
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	10083	10083
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0

Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	113,31	113,31
Heat radiation at X (kW/m2)	0,014881	0,016642
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	90,803	89,459
Combustion rate (kg/s)	151,25	151,25
Duration of the pool fire (s)	11731	11731
Heat emission from fire surface (kW/m2)	39,381	38,173
Flame tilt (deg)	39,061	31,953
View factor (-)	0,00089152	0,0010312
Atmospheric transmissivity (%)	42,385	42,278
Flame temperature (°C)	642,21	635,09
Length of the flame (m)	29,521	31,353
Calculated pool surface area (m2)	10083	10083
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

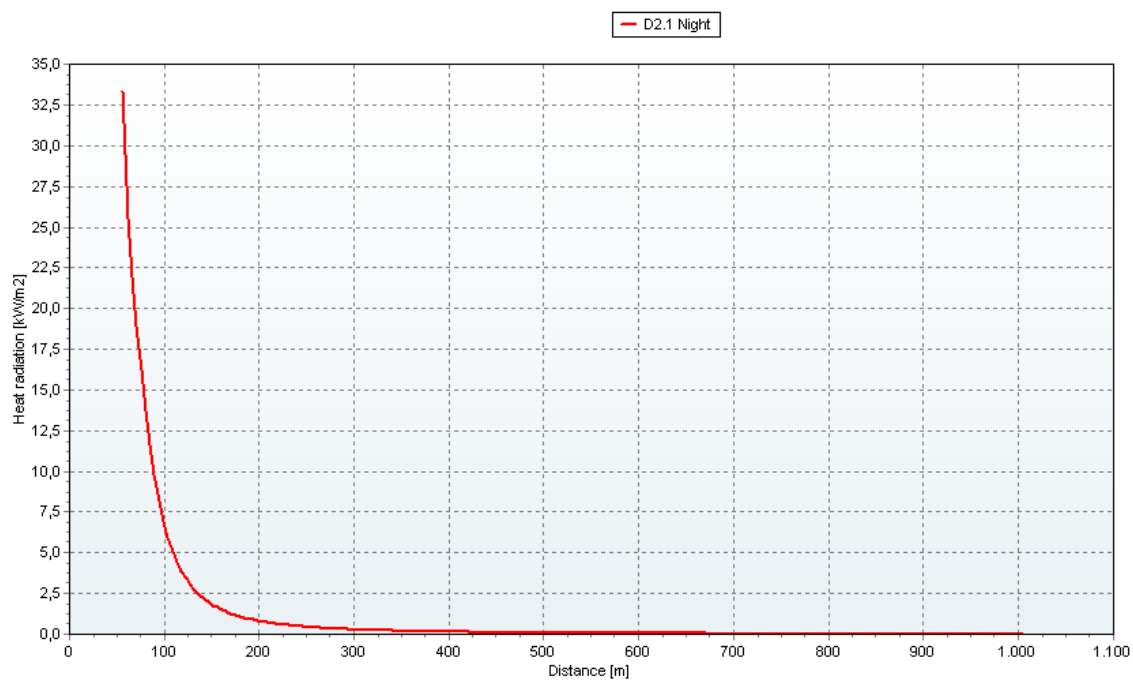
Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 16:16:57

Heat radiation vs. distance



Heat radiation vs. distance



E.2.1.3 Furo 5 %

E.2.1.3.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 104 dia furo

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2rd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	5,5592E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10083
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Isolation concrete flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant-yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	16
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	9,1274
Purple book representative evaporation duration (s)	570,73
Representative temperature (°C)	24,125
Representative pool diameter (m)	113,31

Density after mixing with air (kg/m3)	1,2298
Total evaporated mass (kg)	5209,2
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10083

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

• Noite

Case description: PT 104 noite furo

Model: Pool evaporation

version: 5.16 (28/1/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	5,5592E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	10083
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Isolation concrete flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600
Results	
Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	16
Time until pool has totally evaporated (s)	

Purple book representative evaporation rate (kg/s)	7,6347
Purple book representative evaporation duration (s)	571,44
Representative temperature (°C)	24,009
Representative pool diameter (m)	113,31
Density after mixing with air (kg/m3)	1,2419
Total evaporated mass (kg)	4362,8
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	10083

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	
Chemical source date	

E.2.1.3.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (30/1/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	9,1274	7,6347
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	10083	10083
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Sub model information		

Sub model HGDE (1)

Dense Gas
Dispersion: Explosive
mass (Uninitialized)

Sub model ME (2)

Explosion (Multi
Energy model)
(Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 16:16:55

E.2.1.3.3 Cálculo da Radiação Térmica

- Dia e Noite**

ModelSet: PT 104 dia furo_IP Set

Model: Pool fire

version: 5.14 (30/1/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

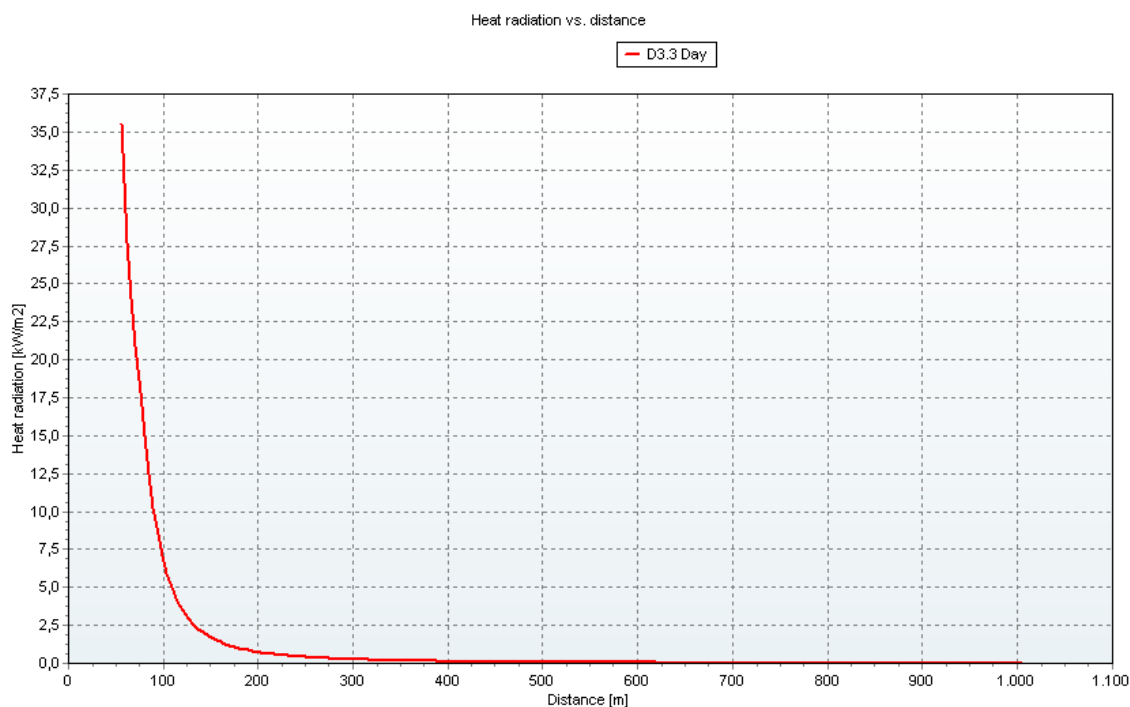
Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	5,5592E05	5,5592E05
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	10083	10083
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0

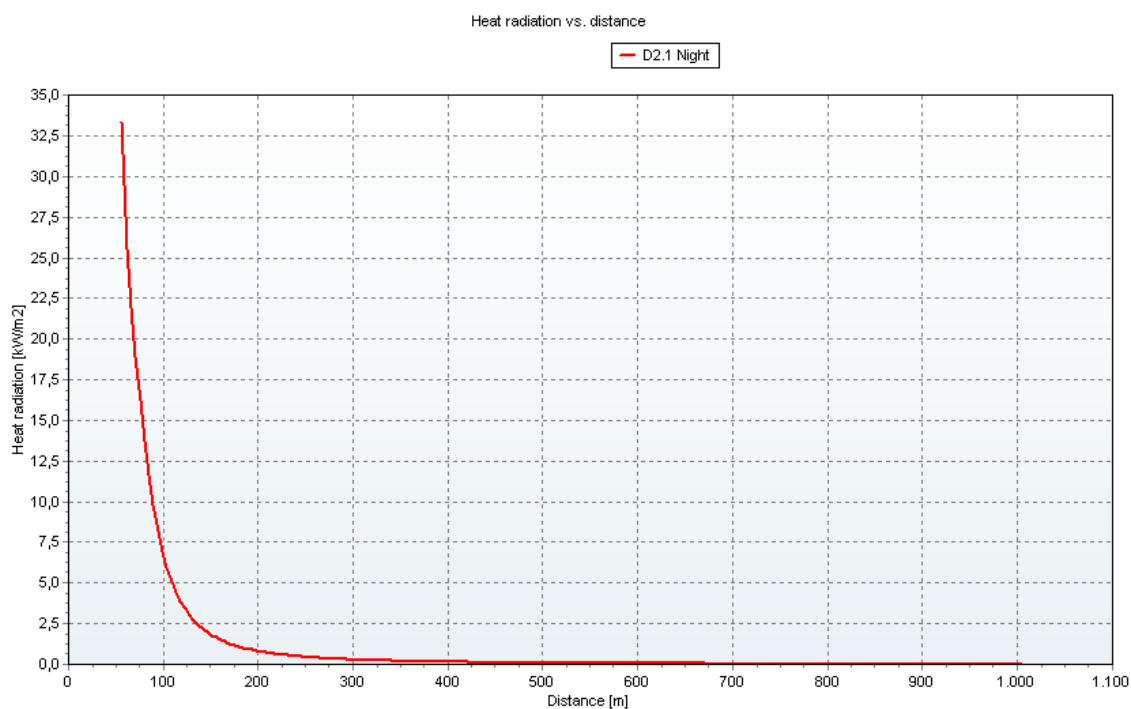
Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	113,31	113,31
Heat radiation at X (kW/m2)	0,014881	0,016642
1% First degree burns distance (m)		
1% Second degree burns distance (m)		

1% Third degree (Lethal) burns distance (m)	90,803	89,459
Combustion rate (kg/s)	151,25	151,25
Duration of the pool fire (s)	3675,6	3675,6
Heat emission from fire surface (kW/m2)	39,381	38,173
Flame tilt (deg)	39,061	31,953
View factor (-)	0,00089152	0,0010312
Atmospheric transmissivity (%)	42,385	42,278
Flame temperature (°C)	642,21	635,09
Length of the flame (m)	29,521	31,353
Calculated pool surface area (m2)	10083	10083
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	30/1/2014 16:16:56





E.3.1 PT 274

E.3.1.1 Ruptura

E.3.1.1.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 274 dia rup

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2rd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	73229
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	3100
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	12,5

Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	2,8365
Purple book representative evaporation duration (s)	551,96
Representative temperature (°C)	23,141
Representative pool diameter (m)	62,825
Density after mixing with air (kg/m3)	1,2155
Total evaporated mass (kg)	1565,6
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	3100

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

• Noite

Case description: PT 274 noite rup

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	73229
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	3100
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	12,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	2,3359
Purple book representative evaporation duration (s)	545,29
Representative temperature (°C)	24,887
Representative pool diameter (m)	59,007
Density after mixing with air (kg/m3)	1,2279
Total evaporated mass (kg)	1273,7
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	2734,6

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

E.3.1.1.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (31/01/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	2,8365	2,3359
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	3100	2734,6
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
Roughness length description	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20

Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage

Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
---	--------------------------------	--------------------------------

Sub model information

Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:02:02

E.3.1.1.3 Cálculo da Radiação Térmica

• Dia e Noite

ModelSet: PT 274 dia rup_IP Set

Model: Pool fire

version: 5.14 (31/01/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

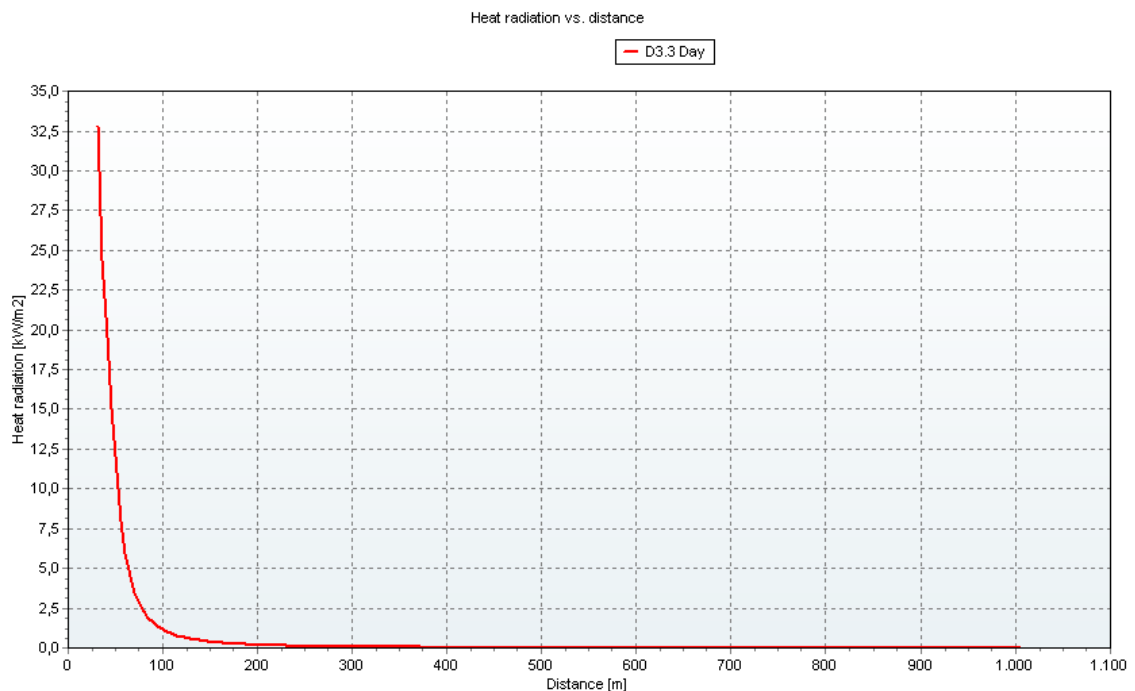
Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	73229	73229
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	3100	2734,6
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0,015	0,015

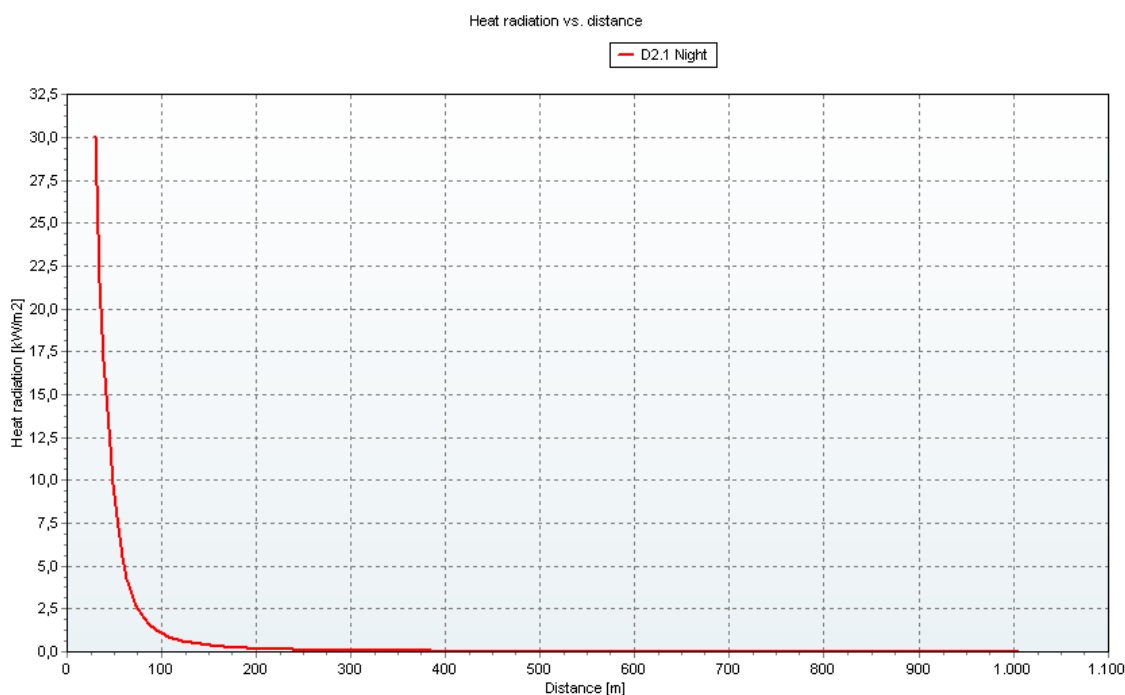
Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	62,825	59,007

Heat radiation at X (kW/m2)	0,0044995	0,0045217
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	52,698	48,778
Combustion rate (kg/s)	46,5	41,019
Duration of the pool fire (s)	1574,8	1785,2
Heat emission from fire surface (kW/m2)	36,008	33,972
Flame tilt (deg)	41,598	34,799
View factor (-)	0,000299310	0,00032067
Atmospheric transmissivity (%)	41,749	41,508
Flame temperature (°C)	622,17	609,28
Length of the flame (m)	19,138	19,954
Calculated pool surface area (m2)	3100	2734,6
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:02:03





E.3.1.2 Furo 5 %

E.3.1.3.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 274 dia furo

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	43785
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	1867
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41

Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil
Subsoil roughness description (pool)	flat sandy soil, concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	10,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	1,7694
Purple book representative evaporation duration (s)	545,69
Representative temperature (°C)	24,958
Representative pool diameter (m)	46,417
Density after mixing with air (kg/m3)	1,2123
Total evaporated mass (kg)	965,52
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	1692,2

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

• Noite

Case description: PT 274 noite furo

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	43785
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25

Maximum pool surface area (m2)	1867
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil
	flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant-
	yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	10,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	1,4609
Purple book representative evaporation duration (s)	537,52
Representative temperature (°C)	24,894
Representative pool diameter (m)	46,016
Density after mixing with air (kg/m3)	1,224
Total evaporated mass (kg)	785,24
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	1663

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

E.3.1.3.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (31/01/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL	ETHANOL

	(DIPPR) Evaporating pool release	(DIPPR) Evaporating pool release
Type of heavy gas release		
<i>Total mass released (kg)</i>		
Mass flow rate of the source (kg/s)	1,7696	1,4609
Duration of the release (s)	600	600
<i>Initial liquid mass fraction (-)</i>		
Fixed pool surface (m2)	1692,2	1663
<i>Diameter of expanded jet (m)</i>		
Temperature after release (°C)	25	25
<i>Z-coordinate (height) of release (m)</i>		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0

Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage

Sub model information

Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:02:02

E.3.1.3.3 Cálculo da Radiação Térmica

• Dia e Noite

ModelSet: PT 274 dia furo_IP Set

Model: Pool fire

version: 5.14 (31/01/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

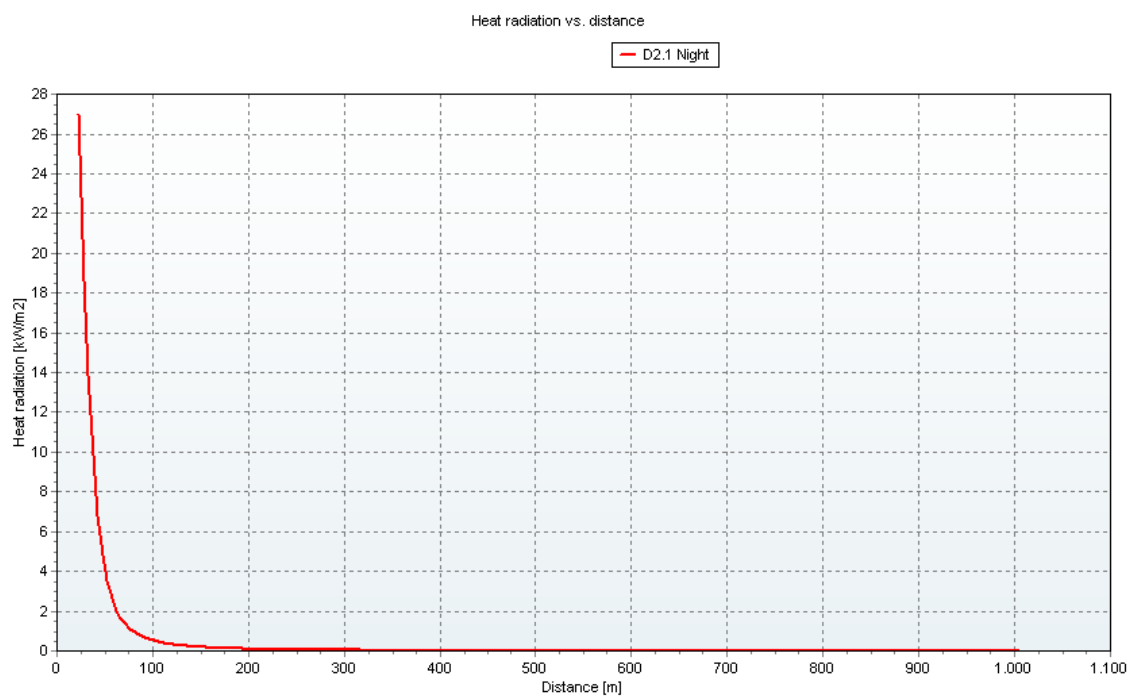
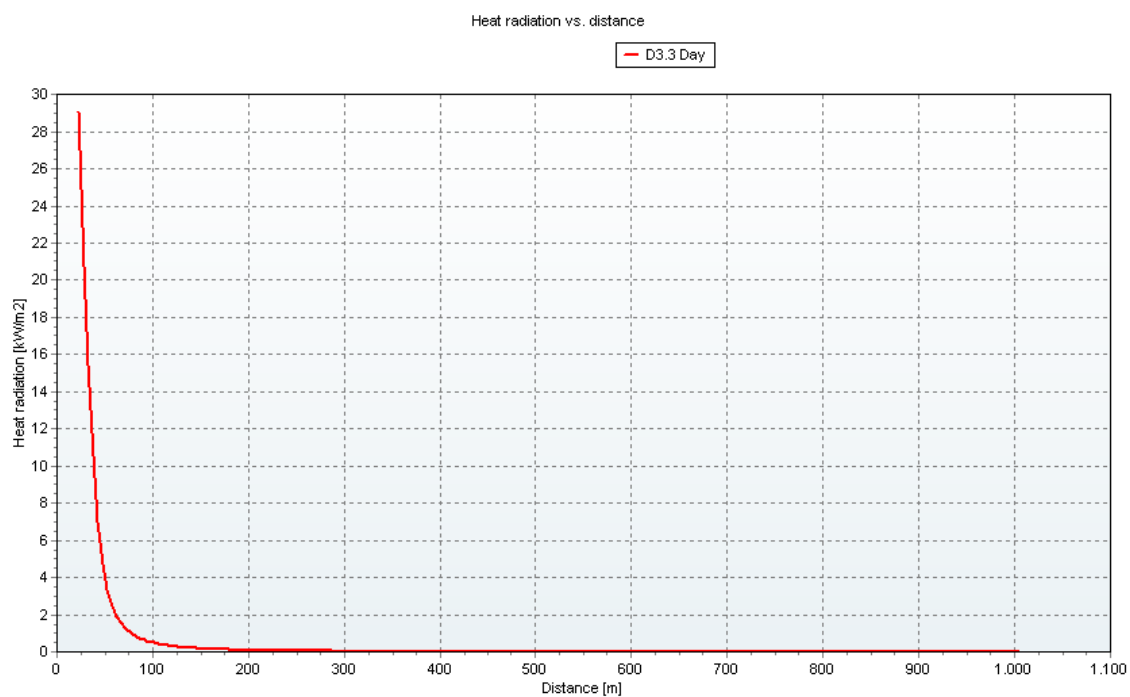
Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	43785	43785

Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	1692,2	1663
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0,2	0,2

Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	46,417	46,015
Heat radiation at X (kW/m2)	0,0022398	0,0025315
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	38,867	37,639
Combustion rate (kg/s)	25,383	24,945
Duration of the pool fire (s)	1725	1755,3
Heat emission from fire surface (kW/m2)	31,73	30,317
Flame tilt (deg)	42,882	35,887
View factor (-)	0,000171690	0,00020389
Atmospheric transmissivity (%)	41,117	40,953
Flame temperature (°C)	594,64	584,84
Length of the flame (m)	15,32	16,621
Calculated pool surface area (m2)	1692,2	1663
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:02:03



E.4.1 PT 290

E.4.1.1 Ruptura

E.4.1.1.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 290 dia rup

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2rd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,9788E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	8400
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600
Results	
Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	17,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	7,3183

Purple book representative evaporation duration (s)	551,2
Representative temperature (°C)	23,246
Representative pool diameter (m)	103,42
Density after mixing with air (kg/m3)	1,226
Total evaporated mass (kg)	4033,8
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	8400

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

• Noite

Case description: PT 290 noite rup

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,9788E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	8400
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	17,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	5,9736
Purple book representative evaporation duration (s)	549,56
Representative temperature (°C)	22,689
Representative pool diameter (m)	103,42
Density after mixing with air (kg/m3)	1,2375
Total evaporated mass (kg)	3282,9
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	8400

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

E.4.1.1.2 Cálculo da Dispersão e da Sobrepressão

• Dia e Noite

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (31/01/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	7,3183	5,9736
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	8400	8400
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3

Curve number 6 (Strong deflagration) 6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage

	damage	damage
Sub model information		
Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)	
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)	
Other Information		
Main program	Riskcurves 9.0.15.7719	
Last Calculation	31/01/2014 12:08:44	

E.4.1.1.3 Cálculo da Radiação Térmica

- Dia e Noite**

ModelSet: PT 290 dia rup_IP Set

Model: Pool fire

version: 5.14 (31/01/2014)

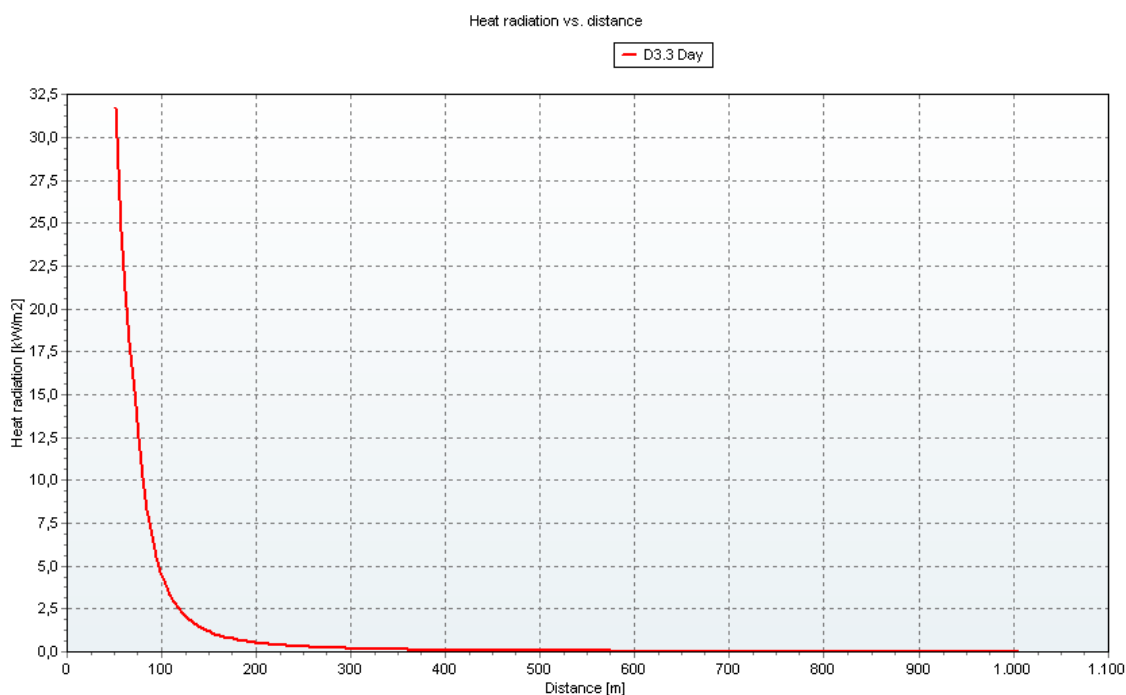
Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

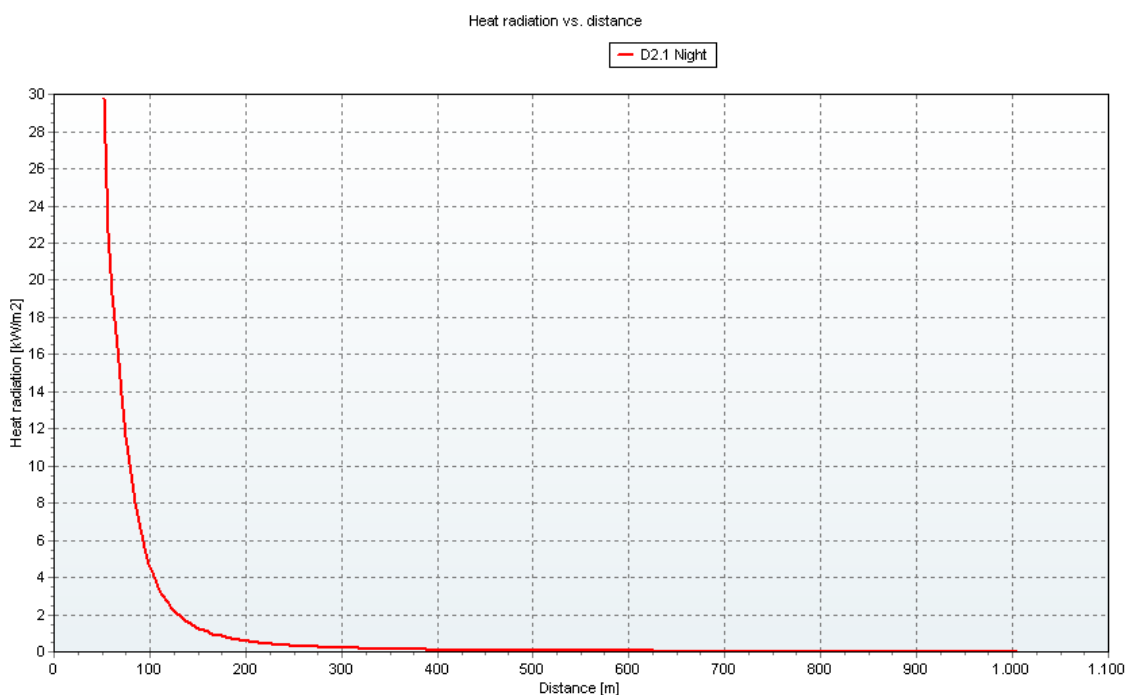
Parameters		
Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	1,9788E05	1,9788E05
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	8400	8400
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0,2	0,2
Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	103,42	103,42
Heat radiation at X (kW/m2)	0,011046	0,012458
1% First degree burns distance (m)		

1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	80,992	79,612
Combustion rate (kg/s)	126	126
Duration of the pool fire (s)	1570,4	1570,4
Heat emission from fire surface (kW/m2)	35,116	34,048
Flame tilt (deg)	39,456	32,349
View factor (-)	0,000752140	0,00087706
Atmospheric transmissivity (%)	41,82	41,718
Flame temperature (°C)	616,64	609,77
Length of the flame (m)	27,605	29,506
Calculated pool surface area (m2)	8400	8400
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:08:45





E.4.1.2 Furo 20%

E.4.1.2.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 290 dia fenda

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2rd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,9788E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	8400

Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil
	flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant-
	yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	17,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	7,3183
Purple book representative evaporation duration (s)	551,2
Representative temperature (°C)	23,246
Representative pool diameter (m)	103,42
Density after mixing with air (kg/m3)	1,226
Total evaporated mass (kg)	4033,8
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	8400

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

• Noite

Case description: PT 290 noite fenda

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,9788E05

Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	8400
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	17,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	5,9736
Purple book representative evaporation duration (s)	549,56
Representative temperature (°C)	22,689
Representative pool diameter (m)	103,42
Density after mixing with air (kg/m3)	1,2375
Total evaporated mass (kg)	3282,9
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	8400

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

E.4.1.2.2 Cálculo da Dispersão e da Sobrepressão

• Dia e Noite

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (31/01/2014)

Reference: No ref

Parameters

Inputs

D3.3 Day D2.1 Night
(linked to (linked to

	Default)	Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
<i>Total mass released (kg)</i>		
Mass flow rate of the source (kg/s)	7,3183	5,9736
Duration of the release (s)	600	600
<i>Initial liquid mass fraction (-)</i>		
Fixed pool surface (m2)	8400	8400
<i>Diameter of expanded jet (m)</i>		
Temperature after release (°C)	25	25
<i>Z-coordinate (height) of release (m)</i>		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0

Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage

Sub model information

Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:08:43

E.4.1.2.3 Cálculo da Radiação Térmica

• Dia e Noite

ModelSet: PT 290 dia fenda_IP Set

Model: Pool fire

version: 5.14 (31/01/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
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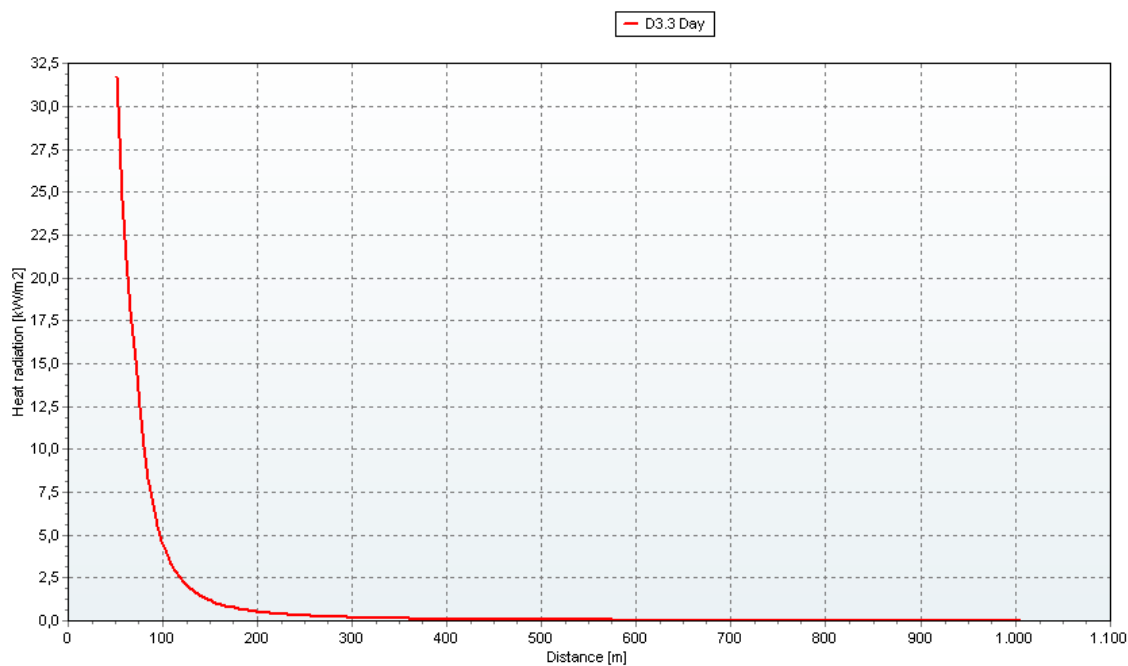
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	1,9788E05	1,9788E05
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	8400	8400
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0,2	0,2

Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	103,42	103,42
Heat radiation at X (kW/m2)	0,011046	0,012458
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	80,992	79,612
Combustion rate (kg/s)	126	126
Duration of the pool fire (s)	1570,4	1570,4
Heat emission from fire surface (kW/m2)	35,116	34,048
Flame tilt (deg)	39,456	32,349
View factor (-)	0,000752140	0,00087706
Atmospheric transmissivity (%)	41,82	41,718
Flame temperature (°C)	616,64	609,77
Length of the flame (m)	27,605	29,506
Calculated pool surface area (m2)	8400	8400
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

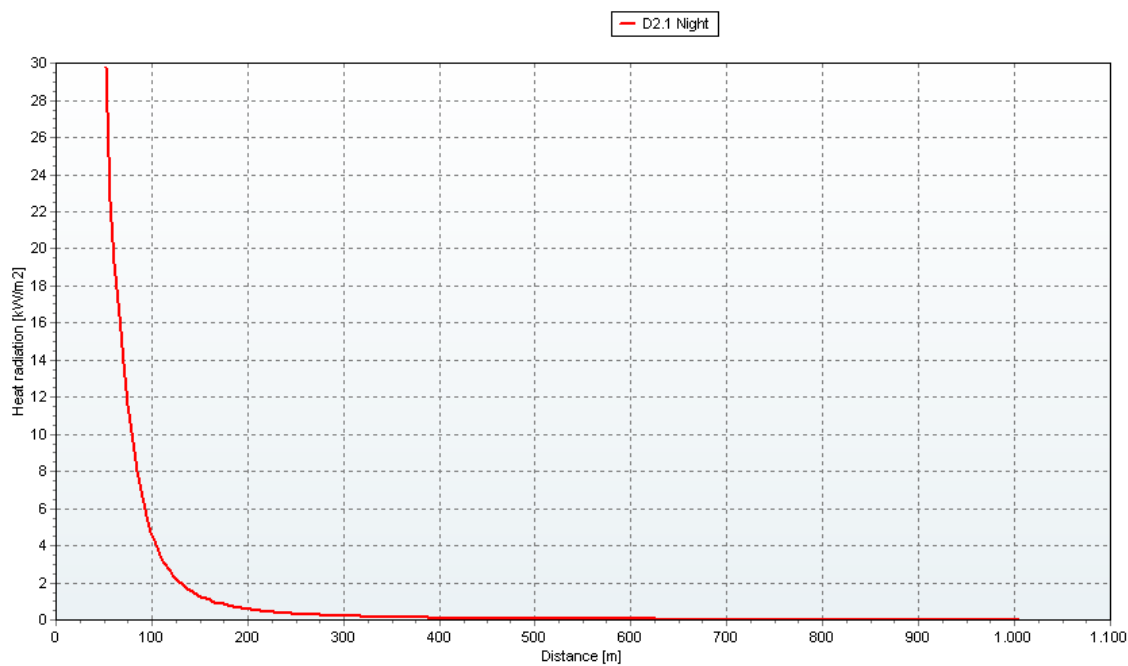
Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:08:45

Heat radiation vs. distance



Heat radiation vs. distance



E.4.1.3 Furo 5 %

E.4.1.3.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 290 dia furo

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,0505E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	4467
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	14,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	4,0135
Purple book representative evaporation duration (s)	551,7
Representative temperature (°C)	23,174
Representative pool diameter (m)	75,416

Density after mixing with air (kg/m ³)	1,2188
Total evaporated mass (kg)	2214,2
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m ²)	4467

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

• Noite

Case description: PT 290 noite furo

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,0505E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m ²)	4467
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m ²)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Dry sandy subsoil flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600
Results	
Heat flux from solar radiation (kW/m ²)	0,12
Time pool spreading ends (s)	14,5
Time until pool has totally evaporated (s)	

Purple book representative evaporation rate (kg/s)	3,2738
Purple book representative evaporation duration (s)	550,25
Representative temperature (°C)	22,605
Representative pool diameter (m)	75,416
Density after mixing with air (kg/m3)	1,2303
Total evaporated mass (kg)	1801,4
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	4467

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

E.4.1.3.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (31/01/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	4,0135	3,2738
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	4467	4467
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Sub model information		

Sub model HGDE (1)

Dense Gas
Dispersion: Explosive
mass (Uninitialized)

Sub model ME (2)

Explosion (Multi
Energy model)
(Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:08:43

E.4.1.3.3 Cálculo da Radiação Térmica

- Dia e Noite**

ModelSet: PT 290 dia furo_IP Set

Model: Pool fire

version: 5.14 (31/01/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

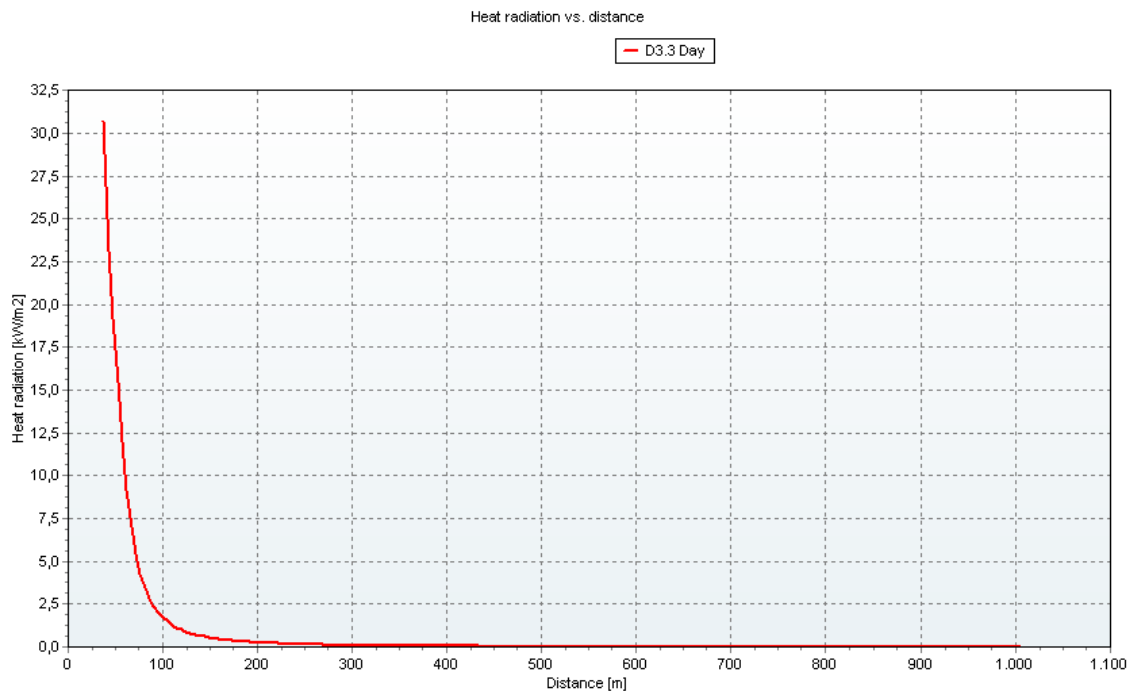
Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	1,0505E05	1,0505E05
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m ²)	4467	4467
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m ² *s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0,2	0,2

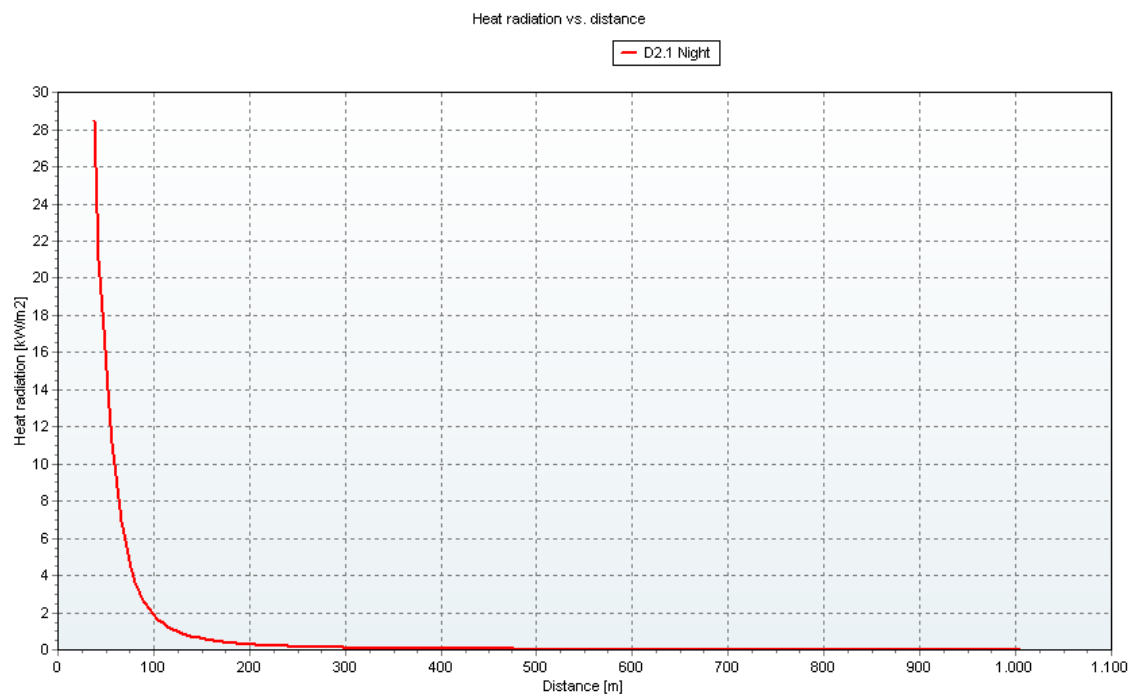
Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	75,416	75,416
Heat radiation at X (kW/m ²)	0,0058769	0,0067233
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	60,605	59,598

Combustion rate (kg/s)	67,005	67,005
Duration of the pool fire (s)	1567,8	1567,8
Heat emission from fire surface (kW/m2)	33,774	32,374
Flame tilt (deg)	40,817	33,726
View factor (-)	0,00041909	0,000502
Atmospheric transmissivity (%)	41,52	41,369
Flame temperature (°C)	608,12	598,85
Length of the flame (m)	21,888	23,897
Calculated pool surface area (m2)	4467	4467
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:08:44





E.5.1 PT 293

E.5.1.1 Ruptura

E.5.1.1.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 293 dia rup

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2rd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	2,0927E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	8867
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Wet sand
Subsoil roughness description (pool)	flat sandy soil, concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	18
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	7,7607

Purple book representative evaporation duration (s)	554,1
Representative temperature (°C)	23,383
Representative pool diameter (m)	106,25
Density after mixing with air (kg/m3)	1,2269
Total evaporated mass (kg)	4300,2
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	8867

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

• Noite

Case description: PT 293 noite rup

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	2,0927E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	8867
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Wet sand flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	18
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	6,188
Purple book representative evaporation duration (s)	549,32
Representative temperature (°C)	22,403
Representative pool diameter (m)	106,25
Density after mixing with air (kg/m3)	1,2378
Total evaporated mass (kg)	3399,2
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	8867

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

E.5.1.1.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (31/01/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	7,7607	6,188
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	8867	8867
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3

Curve number	6 (Strong deflagration)	6 (Strong deflagration)
Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor	No damage or very minor

	damage	damage
Sub model information		
Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)	
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)	
Other Information		
Main program	Riskcurves 9.0.15.7719	
Last Calculation	31/01/2014 12:12:45	

E.5.1.1.3 Cálculo da Radiação Térmica

- Dia e Noite**

ModelSet: PT 293 dia rup_IP Set

Model: Pool fire

version: 5.14 (31/01/2014)

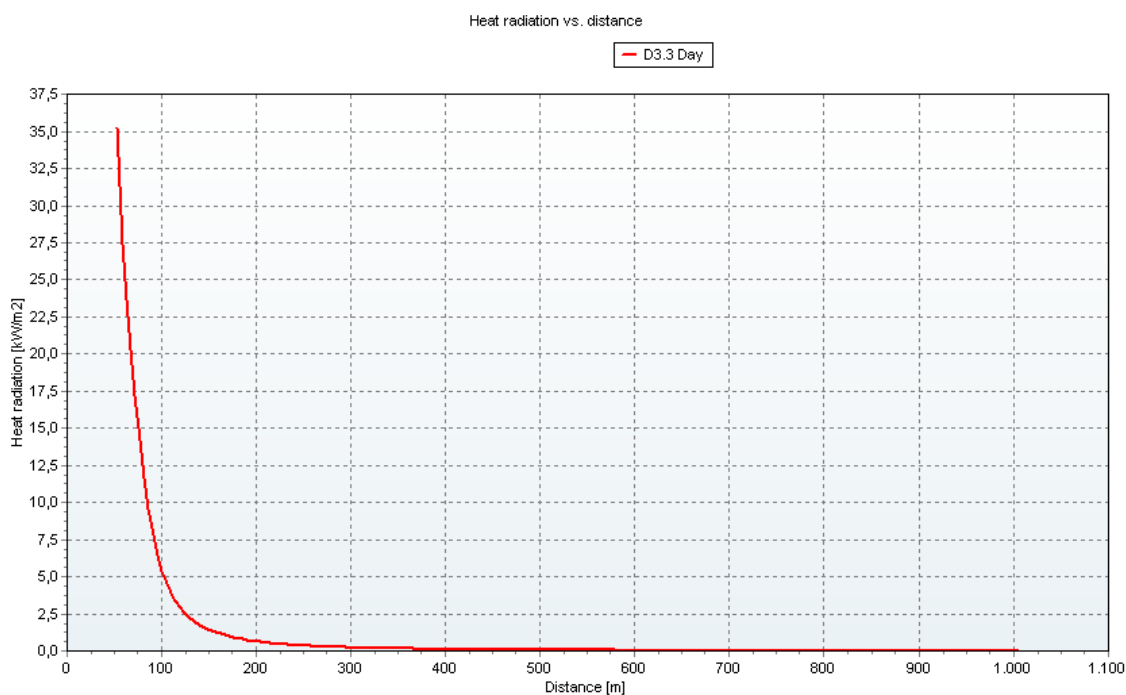
Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

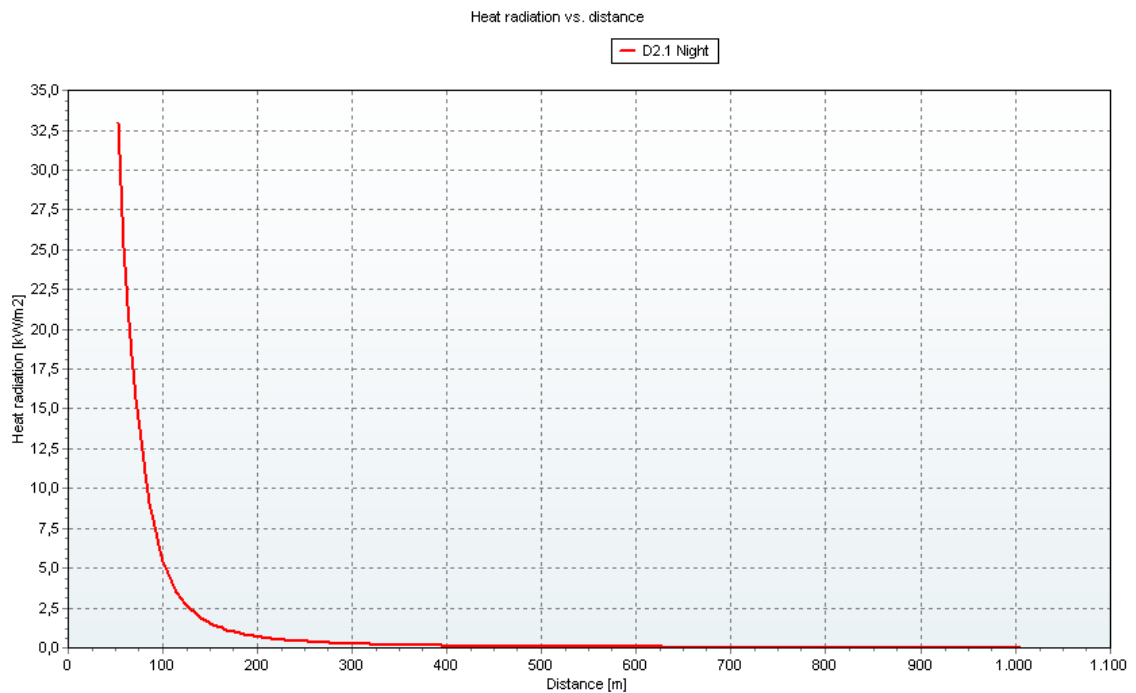
Parameters		
Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	2,0927E05	2,0927E05
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	8867	8867
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0
Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	106,25	106,25
Heat radiation at X (kW/m2)	0,013065	0,014652
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	85,553	84,392

Combustion rate (kg/s)	133,01	133,01
Duration of the pool fire (s)	1573,4	1573,4
Heat emission from fire surface (kW/m2)	39,039	37,741
Flame tilt (deg)	39,339	32,232
View factor (-)	0,000790960	0,00092011
Atmospheric transmissivity (%)	42,312	42,194
Flame temperature (°C)	640,23	632,54
Length of the flame (m)	28,159	30,041
Calculated pool surface area (m2)	8867	8867
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:12:46





E.5.1.2 Furo 20%

E.5.1.2.1 Estimativa da Massa Evaporada

- Dia**

Case description: PT 293 dia furo

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,1027E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m²)	4667
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	

<i>Max temperature difference between pool and water (K)</i>	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
<i>Cloud cover (%)</i>	
<i>Date: day number</i>	
<i>Date: month number</i>	
<i>Date: year number</i>	
<i>Latitude of the location (deg)</i>	
Type of subsoil (evaporation)	Wet sand
Subsoil roughness description (pool)	flat sandy soil, concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	14,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	4,2164
Purple book representative evaporation duration (s)	554,83
Representative temperature (°C)	23,318
Representative pool diameter (m)	77,086
Density after mixing with air (kg/m3)	1,2194
Total evaporated mass (kg)	2339,4
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	4667

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

• Noite

Case description: PT 293 noite furo

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
<i>Mass flow rate of the source (kg/s)</i>	
<i>Duration of the release (s)</i>	
Total mass released (kg)	1,1027E05

Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	4667
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Wet sand
Subsoil roughness description (pool)	flat sandy soil, concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	14,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	3,3721
Purple book representative evaporation duration (s)	548,02
Representative temperature (°C)	24,848
Representative pool diameter (m)	71,735
Density after mixing with air (kg/m3)	1,2317
Total evaporated mass (kg)	1848
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m2)	4041,6

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

E.5.1.2.2 Cálculo da Dispersão e da Sobrepressão

• Dia e Noite

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (31/01/2014)

Reference: No ref

Parameters

Inputs

D3.3 Day D2.1 Night
(linked to (linked to

	Default)	Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	7,7607	6,188
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m2)	8867	8867
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0

Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage

Sub model information

Sub model HGDE (1)	Dense Gas Dispersion: Explosive mass (Uninitialized)
Sub model ME (2)	Explosion (Multi Energy model) (Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:12:45

E.5.1.2.3 Cálculo da Radiação Térmica

• Dia e Noite

ModelSet: PT 293 dia fenda_IP Set

Model: Pool fire

version: 5.14 (31/01/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL	ETHANOL

	(DIPPR)	(DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	2,0927E05	2,0927E05
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	8867	8867
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0

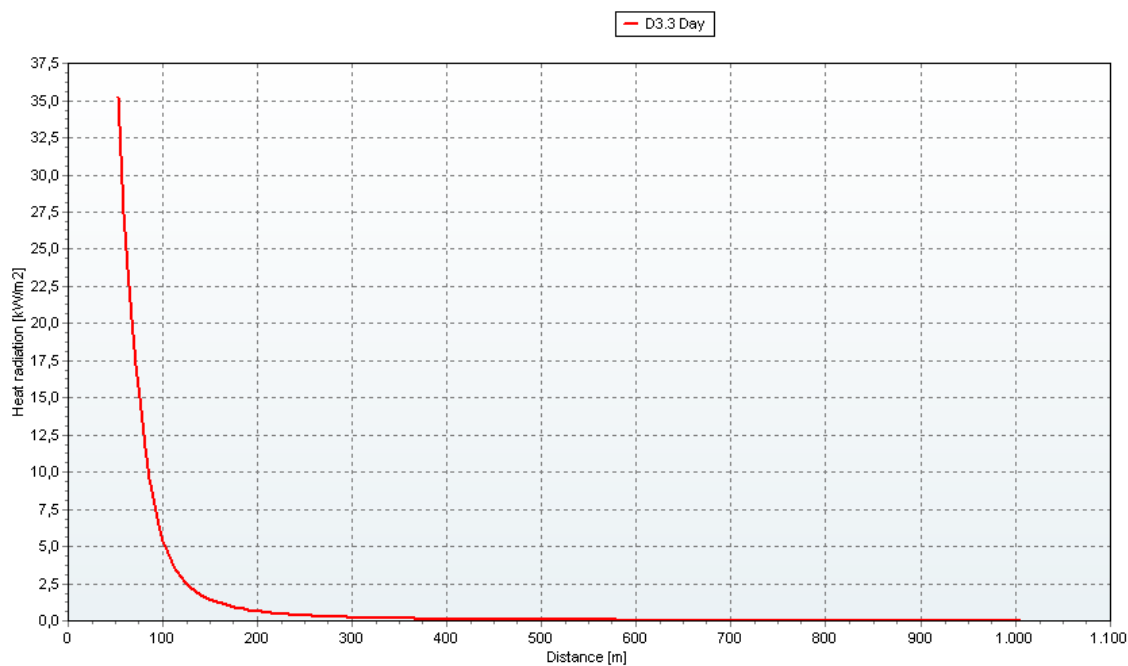
Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	106,25	106,25
Heat radiation at X (kW/m2)	0,013065	0,014652
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	85,553	84,392
Combustion rate (kg/s)	133,01	133,01
Duration of the pool fire (s)	1573,4	1573,4
Heat emission from fire surface (kW/m2)	39,039	37,741
Flame tilt (deg)	39,339	32,232
View factor (-)	0,000790960	0,00092011
Atmospheric transmissivity (%)	42,312	42,194
Flame temperature (°C)	640,23	632,54
Length of the flame (m)	28,159	30,041
Calculated pool surface area (m2)	8867	8867
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

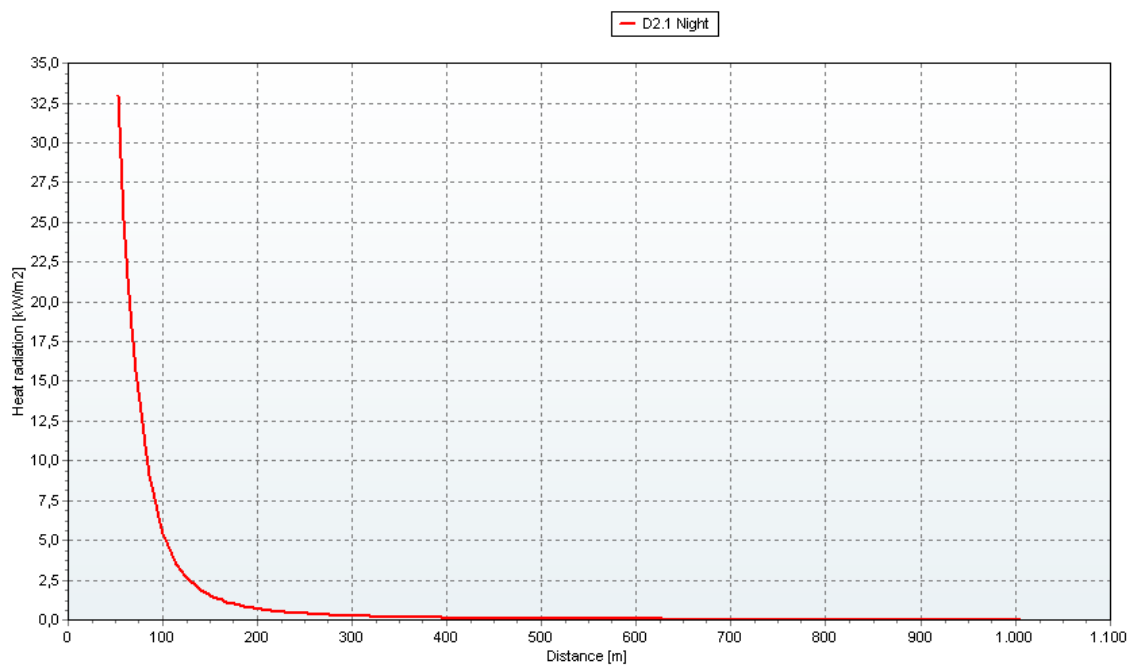
Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:12:46

Riskcurves report created by EIDOS1-PC\diego at 31/01/2014 14:47:43

Heat radiation vs. distance



Heat radiation vs. distance



E.5.1.3 Furo 5 %

E.5.1.3.1 Estimativa da Massa Evaporada

- **Dia**

Case description: PT 293 dia furo

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs

Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,1027E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m2)	4667
Temperature of the subsoil (°C)	26,6
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	3,41
Ambient temperature (°C)	21,6
Ambient relative humidity (%)	67,5
Solar radiation flux	User defined
Solar heat radiation flux (W/m2)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Wet sand flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600

Results

Heat flux from solar radiation (kW/m2)	0,12
Time pool spreading ends (s)	14,5
Time until pool has totally evaporated (s)	
Purple book representative evaporation rate (kg/s)	4,2164
Purple book representative evaporation duration (s)	554,83
Representative temperature (°C)	23,318
Representative pool diameter (m)	77,086

Density after mixing with air (kg/m ³)	1,2194
Total evaporated mass (kg)	2339,4
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m ²)	4667

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

• Noite

Case description: PT 293 noite furo

Model: Pool evaporation

version: 5.16 (31/01/2014)

Reference: Yellow Book CPR14E 2nd Edition - Chapter 5: Evaporation

Parameters

Inputs	
Chemical name	ETHANOL (DIPPR)
Use which representative step	First 20% average (flammable)
Evaporation from land or water	Land
Type of release in pool	Instantaneous
Mass flow rate of the source (kg/s)	
Duration of the release (s)	
Total mass released (kg)	1,1027E05
Type of pool growth on Land	Spreading in bunds
Type of pool growth on Water	
Temperature of the pool (°C)	25
Maximum pool surface area (m ²)	4667
Temperature of the subsoil (°C)	18,8
Temperature of the water (°C)	
Max temperature difference between pool and water (K)	
Wind speed at 10 m height (m/s)	2,74
Ambient temperature (°C)	18,8
Ambient relative humidity (%)	79,8
Solar radiation flux	User defined
Solar heat radiation flux (W/m ²)	120
Cloud cover (%)	
Date: day number	
Date: month number	
Date: year number	
Latitude of the location (deg)	
Type of subsoil (evaporation)	Wet sand flat sandy soil,
Subsoil roughness description (pool)	concrete, tiles, plant- yard
Maximum evaluation time for evaporation (s)	600
Results	
Heat flux from solar radiation (kW/m ²)	0,12
Time pool spreading ends (s)	14,5
Time until pool has totally evaporated (s)	

Purple book representative evaporation rate (kg/s)	3,3721
Purple book representative evaporation duration (s)	548,02
Representative temperature (°C)	24,848
Representative pool diameter (m)	71,735
Density after mixing with air (kg/m ³)	1,2317
Total evaporated mass (kg)	1848
... duration evaporation time (s)	599,5
Corresponding representative pool surface area (m ²)	4041,6

Other information

Main program	Effects 9.0.15.7718
Chemical database	DIPPR database
Chemical source	DIPPR Jan2010
Chemical source date	14/09/2010

E.5.1.3.2 Cálculo da Dispersão e da Sobrepressão

- Dia e Noite**

ModelSet: Dense Gas Dispersion: Explosive mass ME overpressure Set

Model: Dense Gas Dispersion: Explosive mass ME overpressure

version: 0.1.0.0 (31/01/2014)

Reference: No ref

Parameters

Inputs	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Type of heavy gas release	Evaporating pool release	Evaporating pool release
Total mass released (kg)		
Mass flow rate of the source (kg/s)	4,2164	3,3721
Duration of the release (s)	600	600
Initial liquid mass fraction (-)		
Fixed pool surface (m ²)	4667	4041,6
Diameter of expanded jet (m)		
Temperature after release (°C)	25	25
Z-coordinate (height) of release (m)		
	Regular large obstacle coverage (suburb or forest).	Regular large obstacle coverage (suburb or forest).
Roughness length description		
Time t after start release (s)	20	20
Concentration averaging time (s)	20	20
Use mass between LEL and UEL	Yes	Yes
Resolution of the time consuming graphs	Medium	Medium
Fraction of flammable cloud confined (-)	0,3	0,3
Curve number	6 (Strong deflagration)	6 (Strong deflagration)

Results	D3.3 Day (linked to Default)	D2.1 Night (linked to Default)
Explosive mass at time t (HGDE 1) (kg)	0	0
Height to LEL at time t (HGDE 1) (m)	0	0
Length of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time t (HGDE 1) (m)	0	0
Offset between release location and LEL at time t (HGDE 1) (m)	0	0
Maximum explosive mass (HGDE 1) (kg)	0	0
...at time tmem (HGDE 1) (s)	0	0
Start time where 95% of maximum of explosive mass is reached (HGDE 1) (s)	0	0
Time where explosive mass starts decreasing below 95% of max (HGDE 1) (s)	0	0
Length of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmem (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmem (HGDE 1) (m)	0	0
Maximum area of explosive cloud (HGDE 1) (m2)	0	0
...at time tmac (HGDE 1) (s)	0	0
Explosive mass at time tmac (HGDE 1) (kg)	0	0
Length of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Width of cloud (between LEL) at time tmac (HGDE 1) (m)	0	0
Offset between release location and LEL at time tmac (HGDE 1) (m)	0	0
Offset between release centre and cloud centre at time tmac (HGDE 1) (m)	0	0
Inverse Monin-Obukhov length (1/L) used (HGDE 1) (1/m)	0	0
Confined mass in explosive range (ME 2) (kg)	0	0
Total combustion energy (ME 2) (MJ)	0	0
Peak overpressure at Xd (ME 2) (mbar)	0	0
Peak dynamic pressure at Xd (ME 2) (mbar)	0	0
Pressure impulse at Xd (ME 2) (Pa*s)	0	0
Positive phase duration at Xd (ME 2) (ms)	0	0
Dist. from center mass of cloud at threshold overpressure (ME 2) (m)	0	0
Blast-wave shape at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage (general description) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to brick houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to typical American-style houses at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Damage to structures (empirical) at Xd (ME 2)	No damage or very minor damage	No damage or very minor damage
Sub model information		

Sub model HGDE (1)

Dense Gas
Dispersion: Explosive
mass (Uninitialized)

Sub model ME (2)

Explosion (Multi
Energy model)
(Uninitialized)

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:12:44

E.5.1.3.3 Cálculo da Radiação Térmica

- Dia e Noite**

ModelSet: PT 293 dia furo_IP Set

Model: Pool fire

version: 5.14 (31/01/2014)

Reference: Yellow Book (CPR-14E), 3rd edition 1997, Paragraph 6.5.4

Parameters

Inputs	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Chemical name	ETHANOL (DIPPR)	ETHANOL (DIPPR)
Pool size determination	Confined	Confined
Total mass released (kg)	1,1027E05	1,1027E05
Mass flow rate of the source (kg/s)		
Duration of the release (s)		
Maximum pool surface (m2)	4667	4041,6
Height of the confined pool above ground level (m)	0	0
Temperature of the pool (°C)	25	25
Pool burning rate	User defined	User defined
Value of pool burning rate (kg/m2*s)	0,015	0,015
Fraction combustion heat radiated (-)	0,2	0,2
Soot Fraction	User defined	User defined
Value of soot fraction (-)	0	0

Results	D3.3 Day (linked to Session 17)	D2.1 Night (linked to Session 17)
Max Diameter of the Pool Fire (m)	77,086	71,735
Heat radiation at X (kW/m2)	0,0068386	0,0067288
1% First degree burns distance (m)		
1% Second degree burns distance (m)		
1% Third degree (Lethal) burns distance (m)	63,666	58,708
Combustion rate (kg/s)	70,005	60,624

Duration of the pool fire (s)	1575,2	1818,9
Heat emission from fire surface (kW/m2)	37,334	35,205
Flame tilt (deg)	40,723	33,945
View factor (-)	0,000436380	0,00045809
Atmospheric transmissivity (%)	41,976	41,724
Flame temperature (°C)	630,2	617,1
Length of the flame (m)	22,243	23,034
Calculated pool surface area (m2)	4667	4041,6
Weight ratio of HCL/chemical (%)	0	0
Weight ratio of NO2/chemical (%)	0	0
Weight ratio of SO2/chemical (%)	0	0
Weight ratio of CO2/chemical (%)	191,09	191,09
Weight ratio of H2O/chemical (%)	117,35	117,35

Other Information

Main program	Riskcurves 9.0.15.7719
Last Calculation	31/01/2014 12:12:46

